



## Correlates of suicidality in firefighter/EMS personnel

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### ABSTRACT

**Background:** Firefighter and Emergency Medical Services (EMS) personnel experience higher rates of lifetime suicidal ideation and attempts than the general population and other protective service professions. Several correlates of suicidality (alcohol use, depression, posttraumatic stress) have been identified in the literature as applicable to firefighter/EMS populations; however, few studies to date have examined the specific correlates of suicidality (lifetime suicidal ideation and/or attempts) in a firefighter/EMS sample.

**Methods:** Participants (N=3036) from a large, urban fire department completed demographic and self-report measures of alcohol dependence, depression, posttraumatic stress disorder (PTSD) symptom severity, and lifetime suicidal ideation and attempts. Participants in this sample performed both firefighter and EMS duties, were predominately male (97%), White (61.6%), and 25–34 years old (32.1%).

**Results:** Through hierarchical linear regressions, depression ( $\beta=.22, p < .05$ ) and PTSD symptom severity ( $\beta=.21, p < .05$ ) were significantly associated with lifetime suicidal ideation ( $R^2 = 17.5$ ). Depression ( $\beta=.15, p < .001$ ), and PTSD symptom severity ( $\beta=.07, p < .01$ ) were significantly associated with lifetime suicide attempts ( $R^2=5.1$ ).

**Limitations:** Several limitations are addressed in the current study. The survey was a self-report pre-existing dataset and lifetime suicidal ideation and attempts were measured using sum scores. Additionally, the disproportionately large sample of males and large, urban setting, may not generalize to female firefighters and members of rural community fire departments.

**Conclusions:** The current study highlights the importance of targeting depression and PTSD symptom severity in efforts to reduce suicidality in firefighter/EMS personnel.

### 1. Introduction

The firefighting profession is among the most dangerous and stressful occupations, yet the existing literature base lacks empirical evidence examining the effects of stress in both firefighter and Emergency Services (EMS) populations (Corneil et al., 1999; Finney et al., 2015). Recent research suggests that firefighters are at increased risk for adverse mental health concerns, such as posttraumatic stress disorder (PTSD) and depression (American Psychiatric Association, 2000), due to repeated exposure to traumatic and critical incidents (Homish et al., 2012; Armstrong et al., 2015; Pinto et al., 2015). These experiences place firefighter/EMS personnel at an increased risk for suicidality. Generally, protective service workers (police officers, firefighters, EMS) have among the highest rates of suicide fatalities in the workplace (Milner et al., 2015; Tiesman et al., 2015).

Suicidality, which encompasses varying degrees of suicidal ideation, attempts and suicidal behaviors (Krysinska and Lester, 2010), represents a growing public health concern for the general population in the

U.S. and elsewhere. In fact, approximately 40,000 people in the U.S. and 800,000 worldwide commit suicide each year (Centers for Disease Control CDC, 2015). The lifetime prevalence rates for the general population of suicidal ideation (5.6–14.3%), plans (3.9%), attempts (1.9–8.7%), and non-suicidal self-injury (5.9%) (Nock et al., 2008) are lower than the rates found in the firefighter population. Furthermore, firefighters endorse suicidal ideation (46.8%), plans (19.2%), attempts (15.5%), and non-suicidal self-injury (16.4%) at much higher rates, which underscores the high-risk nature of this occupation (Stanley et al., 2015).

As compared with other high-risk service professions, firefighters exhibit comparable, if not higher, rates of suicidal ideation, attempts, and plans. For example, in a study examining suicidal ideation in police officers, 13% exhibited suicidal ideation (Steyn et al., 2013) as compared to the 46.8% rate of suicidal ideation found in firefighters (Stanley et al., 2015). Additionally, several studies have found the suicide rates of veterans to be similar to the general population. For example, veterans endorsed lower rates of suicidal ideation (3.8–

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13.9%), attempts (.4–2.4%), and plans (5.3%) than firefighters have endorsed. Such discrepancies demonstrate the severity of suicidality in the firefighter population (Bossarte et al., 2014; Nock et al., 2014).

The complexity of the etiology and maintenance of suicidality presents a challenge in accurately capturing its underlying mechanisms. Many psychiatric symptoms and demographic characteristics are associated with increased risk for suicidality in several populations (e.g., general, police officers, college students, military populations), with depression and PTSD being among the strongest risk correlates. (Corneil et al., 1999; Brezo et al., 2006; Bacharach et al., 2008; Stack and Scourfield, 2015; Stanley et al., 2015). Little is still known about the specific factors that are associated with suicidality among firefighters/EMS personnel. The high prevalence of mental health concerns and increased exposure to trauma in this population warrants a closer empirical examination. For the purpose of the current study, suicidality will be defined as suicidal ideation and suicide attempts.

## 2. Correlates of suicidality in current literature

In order to address the staggering suicide rates of this population, it is necessary to conduct a thorough examination the correlates of suicidality unique to firefighter/EMS personnel. Therefore, the following section identifies factors associated with suicidality in the literature that are pertinent to firefighter/EMS personnel (Carpenter et al., 2015; Stanley et al., 2015).

### 2.1. Alcohol use

Alcohol use is one of the most well established correlates of suicidality in the general population and protective service workers (Kessler et al., 1999; Carey et al., 2011; Langhinrichsen-Rohling et al., 2011). This is a particularly salient correlate in the firefighter/EMS population, due to the increased risk for alcohol use (Carey et al., 2011; Haddock et al., 2012) among first responders who repeatedly make emergency response calls. As an attempt at numbing the pain of the incident and/or avoiding intrusive thoughts/memories, firefighters may consume alcohol to recover long enough to make it to their next shift (Volpicelli et al., 1999; Brewin and Holmes, 2003; Homish et al., 2012). Generally speaking, traumatic events often elicit problematic drinking behaviors, such as consuming dangerous amounts of alcohol or driving while intoxicated, in approximately 30% of firefighters in response to stress (McFarlane, 1998; Sims and Sims, 1998; Bacharach et al., 2008). For trauma-exposed populations, heavy alcohol use is also associated with higher levels of reported suicidal ideation, depression, and anxiety, potentially through increased risky and impulsive behaviors (Kessler et al., 1996; Gonzalez et al., 2009; Mash et al., 2014).

### 2.2. Depression and PTSD

Heavy alcohol use is often comorbid with many psychiatric diagnoses (e.g., depression, PTSD, borderline personality disorder) that are significant correlates of suicidality (Brent et al., 1994; Engstrom et al., 1999; APA, 2000; Conner et al., 2001; Brown et al., 2002; Beautrais, 2005). In particular, traumatic and highly stressful events place firefighters at increased risk to develop and maintain symptoms of depression, PTSD, and anxiety (Cogle et al., 2009; Davis et al., 2013; Christensen et al., 2014). In other trauma-exposed populations, depression and PTSD are the strongest correlates of suicidality when controlling for other Axis I and Axis II disorders. Depression and PTSD are frequently co-occurring psychiatric diagnoses, and researchers have highlighted the importance of examining them individually in relation to suicidality to inform treatment and suicide prevention efforts (Cogle et al., 2009; Bolton and Robinson, 2010; Stevens et al., 2013).

### 2.3. Years of service

Individuals exposed to highly stressful occupations are at risk of developing more severe mental health issues, thus it could be that one's tenure may influence his or her risk for suicidality. Mixed findings exist regarding the influence of years of service on suicidality in firefighter/EMS and other populations. Some studies have found that years of service were predictive of suicidality, while others found years of service to act as a protective factor (Stanley et al., 2015). Years of service may be a proxy for trauma exposure for some, while for others it may allude to resilience developed from years of experience with coping with stress. A linear relationship between years of service and levels of traumatic stress and depression was found in one sample of firefighters (Corneil et al., 1999); however, fewer years of service was associated with increased suicidal ideation, plans, attempts, and non-suicidal self injury in another sample of firefighters (Stanley et al., 2015). In military and protective service populations, fewer years of service (4 years or less) were associated with increased rates of suicidality (Reger et al., 2015). Thus, the mixed findings regarding the influence of years of service suggest the need for closer examination.

### 2.4. Relationship status

While many of these risk correlates of suicidality exist in high-risk occupations, the extent to which an individual is connected with and feels supported by a partner or close person in their life may incur additional suicidality risk. In Vietnam veterans and firefighters, those participants who were unmarried, divorced, or separated endorsed higher levels of suicidal ideation than those who were partnered or married, while controlling for PTSD symptoms and negative life events (Thoresen et al., 2006). The disconnection from others that can accompany divorce or separation likely places these individuals at a higher risk for suicidality (Denney et al., 2009; Joiner, 2005). Individuals who are partnered or married may find a sense of belonging and support that could potentially serve as a protective factor against the stress experienced in firefighter/EMS populations.

### 2.5. Race/ethnicity

Other personal factors in addition to relationship status, such as race/ethnicity, are associated with suicidality in the literature. In the general population, being a member of a racial/ethnic minority group has been associated with increased risk for suicidality (Walker et al., 2008; Shadick et al., 2015). Conversely in community samples, White individuals were more likely to seek hospital care for suicide attempts (Ahmedani et al., 2015). Given the discrepant findings and lack of empirical studies in the firefighter/EMS population, race/ethnicity is an important construct to examine in the current study.

There is a critical need for further research on correlates of suicidality in a firefighter/EMS sample, given the unique stressors of this occupation. The rate at which firefighter/EMS personnel attempt and/or commit suicide is alarming, and further investigation in this area may help inform mental health and administrative interventions. Surprisingly, only three studies to date have examined suicidal ideation and attempts in this population, necessitating more research in this area (Kessler et al., 1999; Stanley et al., 2015; Chu et al., 2016). Additionally, the current literature examining firefighter/EMS samples has been comprised of convenience samples and is predominately prevalence-based. It may be more possible to detect salient within-group differences in association with suicidality by exploring a homogeneous group of a large, urban fire department.

### 2.6. Current study

The current study seeks to gather a deeper understanding of the

correlates of suicidality in a firefighter/EMS population. The aim of the current study is to explore the associations of established correlates of suicidality (relationship status, race/ethnicity, years of service, PTSD symptom severity, depression, and alcohol dependence) with lifetime suicidal ideation and attempts in a sample of firefighter/EMS personnel.

### 3. Method

#### 3.1. Participants

A total of 3036 participants completed a self-report survey, which represented approximately 76% of the department's personnel. The only criterion for participation was employment by the department. Additionally, all participants provided written informed consent to participate. In this department, firefighter and EMS roles are combined, which differs from many other departments in which these positions are separate roles. All firefighters are trained to perform both firefighting and EMS duties, and many times, both roles are performed. The participants in the study were predominately male (97%), White (61.6%), between ages 25–34 (32.1%), married or living with a partner (76.2%), and had 21 or more years of service (32.6%) (see Table 1). Of total participants, 31.2% screened positive for alcohol dependence, had a mean PTSD symptom severity score of 26.24 (range 17–85), and a mean score of 3.33 (range 0–27) for depressive symptom severity. The mean score of the PCL ( $M=26.24$ ) was not clinically significant based on prior research suggesting a cutoff score of 39 in firefighter populations (Chiu et al., 2011), and the mean score on the PHQ-9 ( $M=3.33$ ) is indicative of minimal depressive symptoms in the current sample (Kroenke et al., 2001).

**Table 1**  
Participant characteristics (N=3036).

Variable	M/%	SD/N
Age (%)		
19–24	4.2	128
25–34	32.3	975
35–44	28.1	848
45–54	29.9	903
55–64	5.5	167
65 or older	.1	2
Race/ethnicity (%)		
White	61.1	1855
Black/African-American	16.3	494
Hispanic	19.0	93
Other	3.6	93
Gender (%)		
Male	97.5	2951
Female	2.5	75
Relationship status (%)		
Married/living with Partner	76.2	2314
Divorced/separated	10.6	321
Widowed	0.3	8
Never married	12.8	390
Years of service (%)		
1–2 years	10.0	304
3–20 years	57.3	1739
21+ years	32.6	990
Suicidality (%)		
Suicidal ideation before HFD	9.8	297
Suicidal ideation after HFD	9.1	275
Suicide attempts before HFD	1.4	44
Suicide attempts after HFD	.7	22
PCL-C <sup>a</sup>	26.24	10.46
PHQ-9 <sup>a</sup>	11.25	3.91
RAPS-4 (%)		
Positive for alcohol dependence	31.2	895
Negative for alcohol dependence	68.8	1970

<sup>a</sup> Ranges for continuous variables: PCL-C (17–78), PHQ-9 (8–32).

#### 3.2. Measures

The first part of the survey included questions about the demographics of the subjects including age, years of service, relationship status, and race/ethnicity.

The *Rapid Alcohol Problems Screen-4 (RAPS4; Cherpitel, 2000)* was used to assess alcohol dependence. The RAPS4 is a 4-item, dichotomous “yes/no” questionnaire regarding drinking habits and has been effective in predicting alcohol dependence (Cherpitel, 2002). A positive response to any item (e.g., “Have you failed to do what was normally expected of you because of drinking?”) on the RAPS4 signifies a positive screen for alcohol dependence based on DSM-IV criteria (Cherpitel, 2000). Therefore, a dichotomous variable was created to indicate the presence of alcohol dependence: participants who screened positive (answered yes to any one of the four items) were considered “alcohol dependent” in the current study.

The *Patient Health Questionnaire – 9 (PHQ-9; Kroenke et al., 2001)* is an instrument used for screening and assessing depression symptom severity. The PHQ-9 is a 9-item instrument that asks respondents to rate how frequently an individual experiences symptoms of depression (e.g., “Feeling down, depressed, or hopeless”) on a scale of 1 (not at all) to 3 (nearly every day). The instrument has demonstrated good internal consistency ( $\alpha=.87-.89$ ) in other trauma-exposed samples (Tracy et al., 2014; Park et al., 2015) and criterion validity with major depression (Kroenke et al., 2001). In the current study, Cronbach's internal reliability coefficient for the PHQ-9 scale's total score was  $\alpha=.86$  for the total sample. For this study, the ninth item assessing suicidal thoughts was eliminated from analyses to examine the association between the potential correlates and suicidality (Chopko et al., 2014).

The *PTSD Checklist – Civilian Version (PCL-C; Weathers et al., 1993)* was used to assess the 17 PTSD symptoms identified in the DSM-IV (APA, 2000). The PCL-C, a self-administered screening instrument, asks respondents to consider the “list of problems and complaints that people sometimes have in response to stressful experiences” and to indicate how much they have been bothered by each problem in the past month (e.g., “Repeated disturbing memories, thoughts, or images, of a stressful experience from the past”) in a Likert-type scale ranging from 1 (not at all) to 5 (extremely). Additionally, participants were not presented with a prompting event before completing this instrument, thus exposure to specific types of trauma was not assessed in the survey. The PCL-C has demonstrated sound psychometric properties including test-re-test reliability ( $\alpha=.75-.88$ ), internal consistency ( $\alpha=.83-.94$ ), and convergence validity with scores in other PTSD measures ( $\alpha=.63-.90$ ) (Wilkins et al., 2011). In the current study, Cronbach's internal reliability coefficient for the PCL-C scale's total score was  $\alpha=.93$  for the total sample.

*Lifetime Suicidal Ideation* was measured by summing scores on two items used to screen for lifetime suicidal ideation (“Have you ever seriously considered suicide before joining the department?” and “Have you ever seriously considered suicide since joining the department?”). Participants responded 1 (yes) or 0 (no) and total scores ranged from 0 to 2, with higher scores indicating greater levels of lifetime suicidal ideation.

*Lifetime Suicide Attempts* was measured by summing scores on two items used to screen for lifetime suicide attempts (“Have you ever attempted suicide before joining the department?” and “Have you ever attempted suicide since joining the department?”). Participants responded 1 (yes) or 0 (no) and total scores ranged from 0 to 2, with higher scores indicating greater lifetime suicide attempts. Other studies examining suicidality have used screening questions, such as the questions presented in the current study, as outcome variables (Whitlock and Knox, 2007; Irwin and Austin, 2013).

3.3. Procedures

This study was approved by the Institutional Review Board at the authors' university and was conducted in a large fire department of around 4000 members in a major metropolitan city in the Southwestern U.S. The data were collected in 2008 as part of a department-wide suicide prevention program developed by the department's psychologist, where members of the department viewed a PowerPoint presentation concerning suicide prevention. Immediately afterwards, the members were asked to fill out an optional paper-and-pencil survey that asked questions about health, stress, suicidal thoughts/behaviors, depression, substance use, social support, and the use of mental health services. Participants were given informed consent and participation was voluntary. The surveys were completed anonymously, and doctoral students and faculty members of a local university analyzed the data. The results were summarized and presented to fire department management. The current study concerns only a portion of the overall survey that might be related to suicidal behavior among firefighters/EMS personnel.

4. Results

4.1. Descriptive statistics and bivariate correlations

Missing data were found to be 2.7% of the total data and missing completely at random (MCAR; Little's MCAR test:  $\chi^2=9.63$ ,  $df=6$ ,  $p=.14$ ). Maximum likelihood estimates using the expectation maximization algorithm were employed to compute values for the missing data prior to regression analysis (Allison, 2001).

A preliminary analysis was conducted to examine the bivariate correlations of the variables included in the study. None of the significant correlations exceeded .80, indicating multicollinearity was not a concern. Means and standard deviations for the main study variables are found in Table 1.

A chi-square test of independence was performed to examine the relation between lifetime suicidal ideation before and after joining the department. The relation between these two variables was significant,  $\chi^2(1,3001)=315.14$ ,  $p < .001$ , with suicidal ideation prior to joining the department significantly higher than after joining the department. Additionally the relation between lifetime suicide attempts before and after joining the department was significant,  $\chi^2(1,3012)=43.05$ ,  $p < .001$ . Suicide attempts before joining the department were greater than attempts after joining the department.

5. Regression results

**Lifetime Suicidal Ideation.** A hierarchical linear regression was conducted with lifetime suicidal ideation as the outcome variable and included variables that were significantly correlated with lifetime suicidal ideation ( $p$ 's  $< .05$ ) at the bivariate level (years of service, relationship status, race/ethnicity, PTSD symptom severity, depression, and alcohol dependence). The overall model was statistically significant,  $R^2=.18$ ,  $F(3, 2662)=51.29$ ,  $p < .001$ . The adjusted  $R^2$  was .17, reflecting a relatively small overall strength of relationship/percentage of variance explained. The standard error of estimate was .44. The effects of the individual independent variables on suicidal ideation are summarized in Table 2. Increased severity of depression ( $\beta=.21$ ,  $p < .001$ ) and PTSD symptom severity ( $\beta=.22$ ,  $p < .001$ ) were significantly associated with increased lifetime suicidal ideation, over and above effects of other study variables. The effects of years of service, race/ethnicity, relationship status, and alcohol dependence were not statistically significant.

**Lifetime Suicide Attempts.** A hierarchical linear regression was conducted with lifetime suicide attempts as the outcome variable and included variables that were significantly correlated with lifetime suicide attempts ( $p$ 's  $< .05$ ) at the bivariate level (years of service,

**Table 2**  
Hierarchical regression analysis for lifetime suicidal ideation.

	B	SE	$\beta$	R <sup>2</sup>	p	
<b>Step 1</b>					1.51	< .001
Constant	.02	.28			.95	
Race						
Black	-.04	.03	-.03		.19	
Other Races	.03	.06	.01		.57	
Relationship Status						
Married/Living with partner	.18	.28	.16		.52	
Never married	.24	.28	.17		.40	
Divorced or Separated	.34	.28	.22		.23	
Widowed	.20	.34	.02		.56	
Years of Service	-.01	.01	-.04		.07	
<b>Step 2</b>					17.5	< .001***
Constant	-.55	.26			.03	
Race						
Black	-.02	.03	-.01		.52	
Other Races	-.01	.05	-.003		.85	
Relationship Status						
Married/Living with partner	.21	.25	.18		.42	
Never married	.24	.26	.17		.35	
Divorced or Separated	.28	.26	.18		.28	
Widowed	.17	.31	.02		.58	
Years of Service	-.01	.01	-.02		.20	
PTSD symptom severity	.01	.00	.21		.00***	
Depressive symptom severity	.03	.00	.22		.00***	
Alcohol dependence	.02	.02	.02		.38	

Hierarchical regression analysis for lifetime suicide attempts

	B	SE	$\beta$	R <sup>2</sup>	p	
<b>Step 1</b>					0.6	< .05
Constant		.28			.87	
Race						
Black	-.02	.01	-.04		.10	
Other Races	.02	.02	.02		.31	
Relationship Status						
Married/Living with partner	.03	.09	.09		.71	
Never married	.03	.09	.06		.78	
Divorced or Separated	.06	.09	.11		.54	
Widowed	.02	.11	.01		.83	
Years of Service	-.00	.00	-.05		.02	
<b>Step 2</b>					5.1	< .001
Constant	-.08	.09			.35	
Race						
Black	-.01	.01	-.03		.20	
Other Races	-.01	.02	.01		.56	
Relationship Status						
Married/Living with partner	.04	.09	.10		.68	
Never married	.02	.09	.05		.79	
Divorced or Separated	.04	.09	.09		.63	
Widowed	.17	.12	.01		.87	
Years of Service	-.00	.00	-.04		.054	
PTSD symptom severity	.00	.00	.07		.01**	
Depressive symptom severity	.01	.00	.15		.00***	
Alcohol dependence	.00	.01	.01		.82	

Note:  
\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .



relationship status, race/ethnicity, PTSD symptom severity, depression, and alcohol dependence). The overall model was statistically significant,  $R^2=.05$ ,  $F(3, 2672)=13.13$ ,  $p < .001$ . The adjusted  $R^2$  was .05, reflecting a relatively small overall strength of relationship/percentage of variance explained. The standard error of estimate was .15. The effects of the individual independent variables on lifetime suicide attempts are also summarized in Table 2. Increased severity of depression ( $\beta=.15$ ,  $p < .05$ ) and PTSD symptom severity ( $\beta=.07$ ,  $p < .001$ ) were significantly associated with an increased lifetime suicide attempts score, over and above effects of other study variables. The effects of years of service, race/ethnicity, relationship status, and alcohol dependence were not statistically significant.

## 6. Discussion

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 populations (3.8–13.9%, 5.3%, and 0.4–2.4%, respectively) (Nock et al., 2008, 2014; Stanley et al., 2015). Furthermore, those firefighters who also respond to Emergency Medical Services (EMS) calls are six times more likely to have made a career suicide attempt (Stanley et al., 2015). Yet, there is little empirical research on suicidality among combined firefighter and EMS personnel. Stanley et al.'s (2015) article, a notable exception to that trend, found a high prevalence of suicidal thoughts and behaviors among firefighters as compared to the general public. They also found a number of variables that were significantly correlated with suicidality among firefighters such as age, race/ethnicity, military service, physical health, volunteer vs. professional career status, and provision of EMS services. The participants in their study were a convenience sample from a nationwide web-based survey and included few ethnic minority members.

The present study extends the research on firefighter suicidality in several important ways. First, it utilizes a larger, ethnically diverse sample encompassing about 75% of the total membership of a single fire department in a metropolitan area. This sample was also exclusively career firefighter/EMS personnel, which may differ from departments that contain both volunteer and career members. Secondly, it examines the relationship between several established correlates of suicidality in the literature (years of service, relationship status, race/ethnicity, depression, PTSD symptom severity, and alcohol dependence; Kessler et al., 1999; Stanley et al., 2015) and suicidality among firefighters.

Previous research on the effect of years of service on suicidality has been inconclusive with some studies showing an increased risk for suicidality with greater years of service (Corneil et al., 1999), depression, and traumatic stress (Regehr et al., 2003) and others showing that less experienced firefighters were at greater risk (Reger et al., 2015; Stanley et al., 2015). The current results did not find years of service to significantly contribute to lifetime suicidal ideation or attempts. In this urban department, virtually all firefighters/EMS personnel witness traumatic events on a routine basis throughout their career. New employees are often assigned to the busiest stations where they are initially exposed to multiple traumatic incidents, while senior employees have a cumulative history of seeing such events. Perhaps this frequent exposure to trauma, regardless of experience level, reduces the effect of years of service.

Similarly, earlier research on suicidality among other groups has shown that being partnered or married is a protective factor against suicidality; however, this was not found in the present study. Firefighters, more than most other occupational groups, get a great deal of their emotional support from their fellow coworkers, particularly with regard to work-related experiences. This may explain why a significant relationship between suicidality and relationship status did not exist in the current sample. Firefighters' perceptions of social support from their peers may be a stronger correlate of suicidality than

relationship status. Peer support may be the functional equivalent of the "sense of belonging" cited in Joiner's Interpersonal Theory of Suicide (Joiner, 2005). Many firefighters speak of the "brotherhood" or "sisterhood" in the fire service, and this sense of connectedness may reduce the lack of belonging that contributes to suicidality (Joiner, 2005). This may also explain why rates of lifetime suicidal ideation and attempts decreased once firefighters/EMS personnel joined the department. Peer support and sense of belonging may have been protective factors for this sample, which is consistent with other research in firefighter samples (Chu et al., 2016).

Race/ethnicity was also not significantly related to suicidality in the current study. The results from the current study do not coincide with findings from other cross-cultural studies of suicidality showing that members of racial and/or ethnic minority groups are generally at greater risk of suicidality (Joe and Kaplan, 2001; Stanley et al., 2015). Specifically Native American firefighters have been found to be at greater risk for suicidality than other racial groups (Stanley et al., 2015). It may be that the influence of depression and PTSD symptom severity accounted for more variance in lifetime suicidal ideation and attempts, thus weakening the effects of race/ethnicity on suicidality.

Finally, the severity of depression and PTSD symptom severity reported by firefighters were significantly associated with increased suicidality (i.e., those with increased mental health issues were at greater risk for lifetime suicidal ideation and attempts). Certain symptoms such as worthlessness and intrusive thoughts/memories may lead firefighters/EMS personnel to seek relief or an escape through suicide (Cogle et al., 2009; Davis et al., 2013; Christensen et al., 2014). Unexpectedly, there was no significant association between alcohol dependence and suicidality. The current study's findings differed from other samples where alcohol dependence was a significant correlate of suicidality (Mash et al., 2014). This suggests that alcohol dependence in the current sample may have been a means of coping with other psychiatric conditions. In the Fire Service, abuse of alcohol is unfortunately common (Mash et al., 2014). This finding is consistent with literature on alcohol consumption as a method of coping with distress in this population (Volpicelli et al., 1999; Brewin and Holmes, 2003; Homish et al., 2012). Firefighter/EMS personnel may cope with the pain of traumatic stress by consuming alcohol to effectively function in their next shift. It may be the case that other mental health factors (e.g., depression, PTSD) influence the association of alcohol dependence with suicidality in firefighter/EMS personnel.

### 6.1. Limitations

The current research was based on a pre-existing data set from a 2008 survey of firefighter/EMS personnel, and it was not designed as a test of Joiner's (2005) Interpersonal Theory of Suicide. Recent research by Chu et al. (2016) has examined the utility of the model in understanding suicidality among firefighters. It would have been interesting to see this model tested in such a large sample of firefighters. In addition, the measures of lifetime suicidal ideation and attempts were summative scores of questions related to suicidal ideation and attempts (e.g., "Have you ever seriously considered suicide before joining the department?"). It would have been preferable to use a more standardized measure of suicidality such as the Self-injurious Thoughts and Behaviors Interview (SITBI) (Nock et al., 2007) or the Beck Scale of Suicide Ideation (BSS; Beck et al., 1991). Additionally, the study is limited by the nature of self-report. Both experienced and early-career firefighter/EMS personnel may be reluctant to admit the negative impact of their experiences at work on their mental health. Although the survey was anonymous, the participants still may have been reticent to acknowledge lifetime suicidal ideation and/or attempts. Another limitation is that the version of the PCL used in this study, the PCL-C, is based on the symptoms of PTSD as described in DSM-IV. It would have been beneficial to employ the newer PCL-5, which is based on the DSM-V, to compare the current results with a second sample

from the same population that was gathered in 2015. Additionally, the gender disproportion in the current study was a limitation in that 97% of the participants were male. Although this reflects the actual composition of the department, it is not possible to generalize these results to female firefighters. Furthermore, the current sample was made up exclusively of career firefighters/EMS personnel in a large city; thus, the results might not be representative of volunteer or hybrid firefighter departments, particularly those that serve rural communities. Finally, it should be noted that all of the participants perform both firefighting and EMS duties. Those first responders who serve in only one of those roles may have a very different experience than those who serve in both capacities. Specifically, individuals who perform exclusively EMS duties may have higher rates of lifetime suicidal ideation and attempts given the severe nature of calls made in this position.

### 6.2. Future research

The limited research on firefighters and suicidality suggests that suicidality is a substantial problem in the fire service. Future studies of suicidality among firefighters should include standardized measures of suicidality to improve the assessment reliability and validity. Furthermore, future studies examining suicidality should be designed to further test Joiner's Interpersonal Theory of Suicide in this population. Concepts within this theory, such as a sense of belonging, should be operationalized in terms of the ways first responders experience them (for example, the sense of belonging in their crew). Differences in the correlates of suicidality between members of volunteer rural departments and those who work in large, urban departments are still unknown. It is also unclear what relationship, if any, exists between the types and numbers of traumatic incidents that first responders face and subsequent risk of suicidality. For example, firefighters/EMS personnel commonly report that the most stressful incidents they experience involve deaths of children. Given the intense and high-risk nature of the firefighting/EMS profession, it is necessary to understand when and how repeated exposure threatens the health of the first responders themselves. In comparison, those who work with radioactive materials must wear badges that show the risk from their exposure to dangerous elements, but an equivalent measure of stress exposure for first responders does not exist. In combat, soldiers are rotated out of the "front lines" after a period of time to reduce their stress levels, but first responders may serve for 30 years responding daily to a variety of traumatic events. It is important to understand the predisposing factors, history, and/or personality variables that might make applicants to the fire service more resilient or more vulnerable after they have been deployed in the field and experience traumatic events. It might be possible and effective to design pre-employment screening assessments to select and de-select candidates based on their ability to tolerate the high stress environment of the first responder career. Future research should also seek to evaluate and adjust proven methods of treatment for combat and other trauma-related reactions (e.g. PTSD and depression) to the specific needs and environment of firefighter/EMS personnel, a population that is known to be treatment-reluctant.

### 6.3. Implications

Given the alarming rates of suicidality (ideation and attempts) in this population, the current study sought to identify predictive factors that could be used to influence clinical work and administrative decisions in firefighter/EMS populations regarding mental health. The strongest correlates of both lifetime suicidal ideation and attempts were depression and PTSD symptom severity, above and beyond all other correlates. These findings are particularly relevant if fire departments are attempting to reduce suicides. By increasing awareness, prevention, and treatment of depression and posttraumatic stress, fire

departments will be targeting the deeper etiological and maintenance factors of suicidality.

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