



Published in final edited form as:

*Psychiatry Res.* 2016 June 30; 240: 26–33. doi:10.1016/j.psychres.2016.03.041.

## A Test of the Interpersonal Theory of Suicide in a Large Sample of Current Firefighters

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### Abstract

Recent research suggests that firefighters experience elevated rates of suicidal ideation and behaviors. The interpersonal theory of suicide may shed light on this finding. This theory postulates that suicide desire is strongest among individuals experiencing perceived burdensomeness and thwarted belongingness, and that the combination of suicide desire and acquired capability for suicide is necessary for the development of suicidal behaviors. We tested the propositions of the interpersonal theory in a large sample of current United States firefighters ( $N=863$ ). Participants completed self-report measures of perceived burdensomeness, thwarted belongingness, fearlessness about death (FAD; a component acquired capability), and career suicidal ideation and suicide attempt history. Regression models were used to examine the association between interpersonal theory constructs, career suicidal ideation severity, and the presence of career suicide attempts. In line with theory predictions, the three-way interaction between perceived burdensomeness, thwarted belongingness, and FAD was significantly associated with career suicide attempts, beyond participant sex. However, findings were no longer significant after accounting for years of firefighter service or age. Contrary to predictions, the two-way interaction between perceived burdensomeness and thwarted belongingness was not significantly related to career suicidal ideation severity. Applications of the theory to firefighters and future research are discussed.

### Keywords

firefighters; acquired capability; thwarted belongingness; perceived burdensomeness; interpersonal theory of suicide; suicide; fearlessness about death

## 1. Introduction

Firefighters represent an occupational group at elevated risk for suicide. One study found that firefighters reported notably high rates of suicidal ideation, plans, and attempts during their firefighting careers (46.8%, 19.2%, and 15.5%, respectively; Stanley et al., 2015). These rates are higher than those found in the general population (Nock et al., 2008a; 2008b) and military samples (Nock et al., 2014). Further, firefighters have also been found to have

elevated rates of psychiatric conditions associated with increased suicide risk (Carey et al., 2011; Corneil et al., 1999; de Barros et al., 2012; Murphy et al., 1999). That the rates of suicidality among firefighters are higher than rates in the general population is particularly noteworthy, as firefighters undergo pre-enlistment screening for physical and mental health morbidities, and thus, are expected to be healthier than the general population (e.g., *lower* rates of suicidality)—an epidemiological phenomenon termed the “healthy-worker” effect (Li and Sung, 1999; Pearce et al., 2007).

To further our understanding of factors that may account for suicide risk among firefighters, specifically, the interpersonal theory of suicide may be particularly useful and applicable. The interpersonal theory of suicide (Joiner, 2005; Van Orden et al., 2010), one of the most empirically tested and corroborated theories of suicide, provides a framework through which to understand why individuals think about, attempt, and die by suicide. The theory posits that three constructs—*perceived burdensomeness*, *thwarted belongingness*, and *acquired capability*—interact to confer risk for death by suicide. Perceived burdensomeness is the belief that one is a burden to family, friends, and/or society and that one’s death will be worth more than one’s life to others; and thwarted belongingness is represented by an unmet need for social connection (cf. loneliness). The theory asserts that when these two constructs co-occur, suicidal ideation arises, and that when an individual feels hopeless about these constructs’ potential for improvement, active suicidal ideation emerges. However, the theory posits that individuals will not act on these thoughts unless they possess the capability for suicide, which is characterized by both a sense of fearlessness about death and elevated physical pain tolerance. Thus, according to the theory, individuals die by suicide not only because they desire suicide but also because they have developed (e.g., through painful and provocative experiences; Van Orden et al., 2008) and/or have an innate (e.g., through genetic predispositions; Smith et al., 2012) capability for lethal self-injury.

Over the past decade, numerous studies have sought to test the interpersonal theory’s conjectures, with empirical support emerging across various groups, including young adults (Cyz et al., 2014; Franklin et al., 2011; Joiner et al., 2009; Van Orden et al., 2008), adults (Christensen et al., 2013), older adults (Cukrowicz et al., 2013), and military personnel (Anestis et al., 2015; Bryan et al., 2010; Joiner et al., 2009; Monteith et al., 2013).

In examining the stressors and experiences that firefighters typically undergo, it seems reasonable to hypothesize that support for the interpersonal theory may also emerge among this occupational group. For example, firefighters are frequently exposed to various traumas (e.g., responding to suicide- and non-suicide-related fatalities, serious injuries) and are required to develop a distinct level of pain tolerance and fearlessness about death to successfully carry out job-related tasks (e.g., tolerating physical demands of firefighting, enduring pain and discomfort, putting oneself in potentially life-threatening situations). Therefore, it logically follows that this group may acquire a high capability for suicide, explaining their increased risk for suicide attempts (Bender et al., 2011; Franklin et al., 2011; Smith et al., 2010).

Furthermore, firefighters put themselves in harm’s way to save others—a trait marked by immense self-sacrificial qualities. Although this trait is essential and highly valued within

this line of work, it is possible that, over time, this pattern of thinking and behaving may increase risk for adopting the belief that one's death is worth more than one's life (Joiner et al., in press). This belief is central to the perceived burdensomeness construct, which has been repeatedly identified as a potent predictor of suicide risk (Batterham et al., 2014; Jahn et al., 2011; Joiner, 2005; Van Orden et al., 2006; Van Orden et al., 2010), thereby potentially accounting for, at least in part, the increased rates of suicidal ideation identified in this population.

Finally, firefighters may also experience significant strains in interpersonal relationships due to shift work schedules and difficulties maintaining a work-life balance (Regehr et al., 2005). This may increase firefighters' feelings of thwarted belongingness, the third construct within the interpersonal theory. Thwarted belongingness has been shown to interact with perceived burdensomeness to increase risk for suicidal ideation (Czyz et al., 2014; Joiner et al., 2009; Van Orden et al., 2008), again providing a plausible explanation for the elevated prevalence of suicidal ideation in this group. In support of this point, one study of 334 firefighters found that a relationship between occupational stress and suicidal ideation only emerged among those with low levels of social support (Carpenter et al., 2015).

Taken together, there are compelling reasons to believe that the interpersonal theory of suicide may help to explain the increased rates of suicidal ideation and behaviors identified among firefighters. Despite this, to our knowledge, no studies have probed these hypotheses within this specific occupational group. This work is clearly needed as findings from this type of investigation have the potential to bolster researchers' and clinicians' efforts to more effectively identify at-risk firefighters and craft prevention and intervention strategies to reduce suicide risk.

### 1.1. The Present Study

This study aimed to test the conjectures of the interpersonal theory of suicide (Joiner, 2005; Van Orden et al., 2010) in a large sample of current United States firefighters. Specifically, in line with the theory, we hypothesized that the interaction between perceived burdensomeness and thwarted belongingness would be significantly associated with severity of career suicidal ideation among firefighters.<sup>1</sup> We additionally hypothesized that the three-way interaction between perceived burdensomeness, thwarted belongingness, and fearlessness about death, a central component of the acquired capability for suicide, would be significantly associated with career suicide attempts.

## 2. Method

### 2.1. Participants and Procedures

This study is part of a larger investigation ( $N = 1,027$ ) on the prevalence and associated features of suicidal thoughts and behaviors among a convenience sample of firefighters within the United States who completed a web-based survey (Stanley et al., 2015). Participants for the current study reflect a subset of current firefighters who completed

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<sup>1</sup>Career suicidal ideation and suicide attempts are defined as self-reported suicidal ideation and attempts, respectively, from the time one began his/her career as a firefighter to the time one completed the survey.

variables of interest for the aforementioned aims ( $N = 863$ ). Sociodemographic characteristics of the study sample are presented in Table 1. Individuals were between 18 and 76 years old ( $M = 37.14$ ,  $SD = 10.87$ ), and 91.0% were male. The majority was non-Hispanic White (88.2%) and married (72.7%). Most respondents reported completing some college (34.0%) or having a 2- (20.4%) or 4-year (27.3%) college degree. Previous or current military service was reported by 25.6% of the sample.

Regarding firefighting occupational characteristics, respondents reported an average of 14.88 years ( $SD = 10.20$ , range = 0.5–60) of service as a firefighter. Respondent ranks included Firefighter I (10.9%); Firefighter II (21.1%); Engineer, Technician, or Chauffeur (14.1%); Sergeant (5.0%); Lieutenant (13.5%); Captain (12.5%); Chief Officers<sup>2</sup> (15.0%); and “other” rank (7.9%). In terms of characteristics of respondents’ fire departments, 41.4% were full-time, 28.7% volunteer, 27.8% hybrid of full-time and volunteer, 1.4% wildland, and 0.7% military. Only 7.1% of participants indicated that their departments did not respond to Emergency Medical Services (EMS) calls; 54.8% reported that their departments were full-service EMS providers. A comparison of our sample with data from the United States Bureau of Labor and Statistics regarding the national firefighter population reveals consistent sociodemographic (e.g., sex, age, race/ethnicity) characteristics (see Stanley et al., 2015).

Participants were recruited through email listservs and social media outlets maintained by national firefighter organizations (e.g., National Fallen Firefighters Foundation). Potential participants were presented with a web-based consent form; in order to proceed with the survey, respondents were required to correctly answer five comprehension questions demonstrating informed consent. The survey took approximately 30 minutes to complete, and participants who provided their email address received a \$10 electronic gift card for compensation. Following participation, all survey respondents were presented with a debriefing form listing several national resources, including the National Suicide Prevention Lifeline (i.e., 1-800-273-TALK). This study was carried out in accordance with the latest version of the Declaration of Helsinki and approved by the university’s Institutional Review Board.

## 2.2. Measures

**2.2.1. Demographics Overview**—The demographics overview questionnaire assesses for sociodemographic (e.g., age, sex, marital status) and firefighter occupational characteristics (e.g., rank, years served as firefighter).

**2.2.2. Interpersonal Needs Questionnaire (INQ; Van Orden et al., 2012)**—The INQ is a 15-item measure used to assess respondents’ current beliefs regarding the extent to which they either feel connected to others (i.e., belongingness) and/or feel like a burden on the people in their lives (i.e., perceived burdensomeness). Nine items measure belongingness (e.g., “These days I feel like I belong”), and six items measure perceived burdensomeness

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<sup>2</sup>Chief Officers include Battalion Chiefs, Assistant Chiefs, Deputy Chiefs, and Commissioners. These individuals were collapsed into a single category for privacy concerns, given the relatively small number of individuals within the fire service having a ranking within the Chief structure or as a Commissioner.

(e.g., “These days I think my death would be a relief to the people in my life”). Participants rate the degree to which each item has been true for them recently on a 7-point Likert scale. Select items are reverse-coded as appropriate, with higher summed scores reflecting greater levels of thwarted belongingness and perceived burdensomeness. The thwarted belongingness and perceived burdensomeness subscales have demonstrated adequate reliability in previous research (Van Orden et al., 2012) and in the current study ( $\alpha = 0.91$  and  $0.97$ , respectively).

**2.2.3. Acquired Capability for Suicide Scale—Fearless About Death (ACSS-FAD; Ribeiro et al., 2014)**—The ACSS-FAD is a 7-item measure designed to assess one’s fearlessness about death and lethal self-injury (e.g., “I am not at all afraid to die,” “The fact that I am going to die does not affect me”). Responses are rated on Likert-type scales with values ranging from 0 (“not at all like me”) to 4 (“very much like me”) and higher summed scores (range: 0–28) reflecting greater fearlessness about death. The ACSS-FAD has been found to have strong psychometric properties, including convergent and discriminant validity (Ribeiro et al., 2014), and this scale demonstrated acceptable reliability in this study ( $\alpha = 0.68$ ).

**2.2.4. Self-Injurious Thoughts and Behaviors Interview—Short Form (SITBI-SF; Nock et al., 2007)**—Suicide attempts that occurred throughout a participant’s firefighting career (i.e., career prevalence) were assessed using a modified version of the SITBI-SF, a comprehensive measure assessing the nature and timing of past suicidal behaviors (Nock et al., 2007). The SITBI-SF has demonstrated good psychometric properties, including high internal and test-retest reliability, and moderate-to-high concurrent validity (Nock et al., 2007). Suicide attempts were assessed using the question, “Since becoming a firefighter, have you ever made an actual attempt to kill yourself in which you had at least some intent to die?” The response option for this question was Yes/No.

**2.2.5. Depressive Symptom Index—Suicidality Subscale (DSI-SS; Metalsky and Joiner, 1997)**—The DSI-SS is a 4-item measure of suicidal ideation. Respondents rank each item on a 4-point Likert scale (e.g., 0 = “I do not have thoughts of killing myself,” 1 = “Sometimes I have thoughts of killing myself,” 2 = “Most of the time I have thoughts of killing myself,” 3 = “I always have thoughts of killing myself.”), with higher summed scores (range: 0–12) reflecting greater severity of suicidal ideation. For the current study, participants answered questions based on their experiences since they became firefighters. The scale has demonstrated adequate psychometric properties in previous research (Joiner et al., 2002) and in the current study ( $\alpha = 0.91$ ).

### 2.3. Data Analytic Plan

Descriptive statistics were used to describe the sample’s sociodemographic and occupational characteristics, mental health history, and career severity of suicidal ideation and career prevalence of suicidal behaviors. Multiple hierarchical linear regression analyses were used to evaluate the relationship between the interaction of thwarted belongingness and perceived burdensomeness in association with suicidal ideation, as measured by the DSI-SS. Career suicide attempt was a dichotomous variable, indicated by a composite score of the presence/

absence of suicidal behaviors since becoming a firefighter. In order to test the interpersonal theory of suicide, hierarchical logistic regression analyses were used to examine the interaction of fearlessness about death, thwarted belongingness, and perceived burdensomeness as a predictor of career suicide attempt history, each of which was centered at their means. Significant interactions were interpreted *post-hoc* (Aiken and West, 1991): the simple effects of the interaction between thwarted belongingness and perceived burdensomeness at high (i.e., one standard deviation [SD] above the mean) and low (i.e., one SD below the mean) levels of fearlessness about death were probed. *Post-hoc* follow-up analyses at high levels of fearlessness about death were conducted to examine the relationship between perceived burdensomeness and suicide attempt history at high (i.e., one SD above mean) and low (i.e., one SD below mean) levels of thwarted belongingness. For regression models examining interactions between variables, higher- and lower-order terms were included in all models. Given that suicide-related symptoms were assessed specifically for the time frame during which participants had served as firefighters, age and the number of years of service as a firefighter were included as covariates. Additionally, given evidence for sex differences in fearlessness about death, acquired capability and suicide (Bullman et al., 2015; Kerbrat et al., 2015), sex was entered as a covariate. All covariates were entered in the first step. All analyses were conducted in SPSS Version 23.

### 3. Results

To examine multicollinearity within the present study, tolerance and variance inflation factor values were analyzed and found to be acceptable (i.e.,  $>0.10$  or  $<10$ , respectively). All regression equations were also examined for suppression, and beta values were found to be acceptable (Beta  $<$  zero-order correlation). Correlations between study variables and descriptive statistics are presented in Table 2.

#### 3.1 Suicidal Ideation

Hierarchical linear regression was used to test the independent and interactive effects of thwarted belongingness and perceived burdensomeness on career suicidal ideation. In Step 1, number of years as a firefighter and sex were entered; the model explained 1.3% of the variance in DSI-SS total score. In Step 2, thwarted belongingness, perceived burdensomeness, and fearlessness about death were entered, with the model explaining 38.1% of the variance in DSI-SS total score. In Step 3, the interaction between thwarted belongingness and perceived burdensomeness was entered; however, no increase in total variance explained was observed. The overall model was found to be statistically significant ( $F[6, 843] = 85.98, p < 0.001$ ). Results were not significant for fearlessness about death's main effect [ $t(6, 843) = 0.38, p = 0.71$ ]. Significant main effects were observed for thwarted belongingness [ $t(6, 843) = 2.46, p = 0.014, \beta = 0.20, pr^2 = 0.01$ ] and perceived burdensomeness [ $t(6, 843) = 5.97, p < 0.001, \beta = 0.51, pr^2 = 0.03$ ]. No significant relationship was observed for the interaction between thwarted belongingness and perceived burdensomeness in association with career suicidal ideation [ $t(6, 843) = -0.71, p = 0.48$ ]. The pattern of findings remained the same after controlling for age and sex, all of the covariates individually, and without the inclusion of covariates. See Table 3 for summary.



### 3.2 Suicide Attempt History

Hierarchical logistic regression was utilized to examine the independent and interactive relationships between interpersonal theory of suicide constructs and career suicide attempts. The independent effects of thwarted belongingness, perceived burdensomeness, and fearlessness about death were entered in Block 1. The following interactions were entered in Block 2: fearlessness about death and thwarted belongingness, fearlessness about death and perceived burdensomeness, and thwarted belongingness and perceived burdensomeness. Finally, the three-way interaction between fearlessness about death, thwarted belongingness, and perceived burdensomeness was entered in Block 3.

The full model containing all predictors was statistically significant ( $\chi^2 [7, N = 863] = 406.87, p < 0.001$ ), indicating that the model was able to distinguish between participants with and without a career suicide attempt. As a whole, the model explained between 35.0% (Cox and Snell R square) and 63.9% (Nagelkerke R Square) of the variance in career suicide attempts. Additionally, the model correctly identified 94.8% of cases. Perceived burdensomeness was found to be significantly positively associated with career suicide attempts ( $p < 0.001$ , odds ratio [OR] = 1.49), fearlessness about death was found to have a significant negative relationship with career suicide attempts ( $p = .02$ , OR = 0.91),<sup>3</sup> and thwarted belongingness was not found to be significantly related to career attempts ( $p = 0.65$ ). The interaction between fearlessness about death and perceived burdensomeness ( $p = 0.004$ , OR = 0.98) and the interaction between thwarted belongingness and perceived burdensomeness ( $p < 0.001$ , OR = 0.99) were both found to be significantly negatively associated with career suicide attempts, whereas the interaction between fearlessness about death and thwarted belongingness ( $p = 0.17$ ) was not statistically significant. The three-way interaction was significantly positively associated with career suicide attempts ( $p = 0.04$ , OR = 1.001). The strongest predictor of career suicide attempts was perceived burdensomeness (OR = 1.36), indicating that participants reporting increased perceptions of burden were 1.36 times more likely to report a career suicide attempt than those who did not report elevated perceptions of burden. See Table 4 for detailed summary.

The three-way interaction was probed at high and low levels of fearlessness about death. Increases in the interaction between thwarted belongingness and perceived burdensomeness were associated with increased likelihood of a suicide attempt history at high (Wald = 20.93, SE = 0.001,  $p < 0.001$ , OR = 1.22) and low (Wald = 6.69, SE = 0.002,  $p = 0.01$ , OR = 1.00) levels of fearlessness about death. Notably, the interactive effect of suicidal desire on suicide attempt history is less robust among those with low levels of capability. Additionally, at high levels of fearlessness about death, the relationship between perceived burdensomeness and suicide attempt history was examined at high (i.e., one SD above mean) and low (i.e., one SD below mean) levels of thwarted belongingness. At high levels of fearlessness about death, increases in perceived burdensomeness were associated with increased likelihood of

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<sup>3</sup>That our analyses revealed a negative main effect of fearlessness about death on suicide attempt history is seemingly contradictory to the theory's conjectures. However, we wish to emphasize that the interpersonal theory of suicide does not hypothesize that acquired capability will have a main effect on suicidal behaviors. Instead, the theory states that suicidal behaviors will emerge only in the context of both acquired capability and suicidal desire constructs (cf. thwarted belongingness, perceived burdensomeness). Although the three-way interaction between these constructs is the most theoretically meaningful, we nonetheless present the main effects to provide context for our pattern of findings.

suicide attempt history at high (Wald = 14.90, SE = 0.051,  $p = 0.002$ , OR = 1.33) levels of thwarted belongingness. Consistent with hypotheses, the effect was stronger at high than at low levels of thwarted belongingness.

Next, we conducted the analyses to examine associations between interpersonal theory constructs and career suicide attempts, controlling for important covariates, including age, number of years as a firefighter, and sex. Specifically, covariates were entered in Block 1, the independent effects of the three interpersonal theory constructs were entered in Block 2, the two-way interactions were entered in Block 3, and the three-way interaction was entered in Block 4. The pattern of findings remained largely consistent with the abovementioned uncontrolled analyses. Notably, after controlling for sex, the three-way interaction remained significant (Wald = 4.16, SE < 0.001,  $p = 0.04$ , OR = 1.001). However, the three-way interaction was no longer significant after controlling for sex and either the number of years as a firefighter (Wald = 2.80,  $p = 0.09$ ) or participant age (Wald = 2.17,  $p = 0.14$ ). This result was likely driven by the significant effects of number of years as a firefighter (Wald = 12.76, SE = 0.02,  $p < 0.001$ , OR = 0.95) and participant age (Wald = 20.95, SE = 0.02,  $p < 0.001$ , OR = 0.93) on career suicide attempts since sex was not significantly related to attempts ( $p = 0.30$ ).<sup>4</sup>

#### 4. Discussion

According to the interpersonal theory of suicide, *suicidal desire* is necessary but insufficient to predict suicidal behavior—indeed, individuals must also possess significant *capability* for suicide (Van Orden et al., 2010). The purpose of this study was to examine the conjectures of the interpersonal theory of suicide in a large sample of current firefighters. Our findings provided mixed support for this theory. Consistent with the assertions of the interpersonal theory of suicide, analyses revealed that the three-way interaction between perceived burdensomeness, thwarted belongingness, and fearlessness about death was significantly associated with the presence of career suicide attempts among current firefighters. Further supporting the interpersonal theory, our findings indicated that the interaction of thwarted belongingness and perceived burdensomeness more robustly predicted suicide attempt history among those high in fearlessness about death than those with low levels of fearlessness. For individuals high in fearlessness about death, the relationship between perceived burdensomeness and suicide attempt history was greater in magnitude at high than at low levels of thwarted belongingness. Given that no previous studies have examined the interpersonal theory of suicide in a firefighter population, these findings are a valuable extension of previous literature supporting the interpersonal theory of suicide across various samples (e.g., Anestis et al., 2015; Van Orden et al., 2008).

However, not all studies have produced findings in support of the interpersonal theory. For example, studies conducted by Bryan et al. (2010) in a military sample and Czyz et al. (2014) in an adolescent inpatient sample both yielded a non-significant three-way

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<sup>4</sup>Consistent with theoretical predictions, the pattern of findings remained the same when utilizing the suicidal ideation variable in place of thwarted belongingness and perceived burdensomeness (i.e., examining the interaction between ideation and capability in association with attempts). Of note, thwarted belongingness and perceived burdensomeness are conjectured to comprise suicidal desire.



interaction. This discrepancy may be due to methodological variations. For example, Bryan et al. (2010) tested the interaction as a predictor of the Suicide Behavior Questionnaire-Revised (SBQ-R), which is a measure of both suicidal ideation *and* attempts (Osman et al., 2001). Given that the theory has differential hypotheses regarding the prediction of suicidal ideation and attempts, the use of the SBQ-R may have diminished the authors' abilities to detect significant, theoretically consistent effects. In Czyz et al.'s (2014) study, the presence of a history of multiple suicide attempts was used as proxy for the acquired capability for suicide; this is potentially problematic as the theory predicts that suicide attempts represent the outcome of the interpersonal theory variables and not the proximal predictor. Further, in order to achieve adequate power to detect significant effects in a three-way interaction, sample sizes must be substantial.

As illustrated in this study, the covariates entered into the analyses may also impact study conclusions. Our results showed that the three-way interaction remained significant after accounting for sex—a notable finding given the robust relationship between sex and suicide-related behaviors (e.g., Bullman et al., 2015). However, we found that the three-way interaction was no longer significant after accounting for age or the number of years served as a firefighter. Thus, further research using meta-analytic techniques to review the interpersonal theory of suicide variables and potential mediators across samples is needed to contextualize our findings within prior investigations.

Furthermore, although the interpersonal theory does not have any specific hypotheses regarding main effects, interestingly, the main effect of perceived burdensomeness also independently predicted suicide attempt history and the main effect of thwarted belongingness did not. This pattern of results may be specific to this particular population. As a member of a current firefighter department, firefighters may receive substantial social support and exhibit significantly lower levels of thwarted belongingness. Thus, perceived burdensomeness may be a more potent indicator of suicide risk in this population. Our findings also align with a growing body of research across other populations suggesting that perceived burdensomeness is more robustly related to suicidal behavior than thwarted belongingness (Bryan et al., 2010; Van Orden et al., 2008).

Alternatively, these discrepancies may instead indicate that the relationships between the interpersonal theory variables are more complex than the interpersonal theory has explicitly stated. One possibility is that there exists a subset of individuals high in suicide capability who attempt suicide after experiencing significant feelings of burden towards people to whom they also feel strongly connected. In samples with high proportions of this subset of individuals high on acquired capability and perceived burdensomeness but low on thwarted belongingness, the coefficient of the 3-way interaction would be negative in valence. Statistically, the inclusion of this subset of individuals into analyses with those that report a theoretically consistent presentation would mask the effects of thwarted belongingness. Therefore, replication of the present study will be of paramount importance for furthering our understanding the role of these constructs in explaining suicide-related behaviors among firefighters and analog first responder populations.

Interestingly, however, while the thwarted belongingness and perceived burdensomeness individually predicted higher levels of suicidal ideation, the interaction between thwarted belongingness and perceived burdensomeness was not associated with career ideation among current firefighters. This contrasts with what might be expected according to the theory (i.e., that co-occurrence of the two constructs are required for suicidal desire) and may suggest that a significant elevation in either variable is sufficient to increase suicidal desire. Replication of these findings using additional firefighter samples is needed to generate conclusions regarding the relationship between interpersonal theory and suicide-related variables. However, that this study found support for theoretical predictions regarding suicide attempts is nontrivial, as suicide attempts are arguably a more clinically meaningful outcome than suicidal ideation alone (see Chu et al., 2015).

Further, in this sample of firefighters, fearlessness about death scores ( $M$  ACSS-FAD = 19.79,  $SD$  = 5.23) were higher than those reported in young adults ( $M$  ACSS-FAD = 14.30,  $SD$  = 7.02; Zuromski et al., 2014) and individuals with a history of suicide attempts ( $M$  ACSS-FAD = 13.83,  $SD$  = 6.59; Anestis et al., 2014). Instead, levels of fearlessness about death in this sample were comparable to levels of fearlessness about death reported in a study of a large sample of military personnel ( $M$  ACSS-FAD = 20.28,  $SD$  = 6.21; Anestis et al., 2015), a population that is known to have high rates of suicide and capability for suicide (Bryan et al., 2010). Although a matched comparison sample and a measure of pain tolerance were not available in the present study, this finding lends support to the proposition that firefighters exhibit an elevated capability for suicide. Given that approximately one quarter of the firefighters in this sample also reported a military service history, combat exposure may be one explanation for this fearlessness about death in this sample (Selby et al., 2010). However, notably, elevated levels of fearlessness about death were also observed among firefighters without military experience. Firefighters may habituate to injury, pain, and death through repeated exposure to painful and provocative experiences, which is routine in firefighter training and service experiences. According to the interpersonal theory of suicide, these experiences serve to increase capability for suicide (Bryan et al., 2010; Van Orden et al., 2010). Future studies directly comparing levels of acquired capability, fearlessness about death, and exposure to painful and provocative events among firefighters and the general population would be informative.

These findings, especially if replicated in other samples, may have implications for treating suicide-related symptoms among firefighters. Given that firefighters are routinely exposed to situations that may contribute to elevated levels of acquired capability, it may be particularly important to regularly assess these individuals for both suicidal desire and factors contributing to suicidal desire (e.g., thwarted belongingness, perceived burdensomeness). Additionally, interventions targeting thwarted belongingness and, perhaps to a greater extent, perceived burdensomeness (e.g., Joiner et al., 2009; Stellrecht et al., 2006) may be valuable for clinicians treating current firefighters with elevated suicidal desire. For example, cognitive-behavioral interventions prioritizing the restructuring of perceived burdensomeness-related cognitions and behavioral activation approaches emphasizing activities that increase feelings of belongingness and connectedness may be indicated (Joiner et al., 2009). Further, as rates of suicide-related behaviors are high in this population

(Stanley et al., 2015), implementation of routine suicide risk assessments using empirically informed approaches is recommended (e.g., Chu et al., 2015).

The present study, while largely consistent with the interpersonal theory, was limited by several factors that suggest directions for future research. First, this study was cross-sectional in nature, and as such, we were unable to evaluate the temporal relationship between firefighter status, interpersonal theory constructs, and suicidal ideation and behaviors. Relatedly, only one component of the acquired capability construct (i.e., fearlessness about death)—albeit a primary component—was assessed in this study. Future studies assessing both fearlessness about death and pain tolerance in association with suicidal behaviors are needed. Additionally, no direct comparison groups were available in this study; therefore, conclusions regarding the differences between firefighters and other populations could not be generated. Future studies using prospective designs to compare firefighters against matched clinical and/or community samples would be informative and build upon the present study. For example, studies examining whether firefighter training or years in service predicts increased capability over time would be particularly useful in illuminating possible avenues for suicide prevention and enhancing our understanding of how risk for suicide develops. Finally, this study did not examine additional interpersonal theory hypotheses that other predictors of suicide may be related to suicidal desire through their relationships with thwarted belongingness and perceived burdensomeness (e.g., hopelessness; Van Orden et al., 2008; 2010). Therefore, additional work is warranted to examine other suicide risk factors in order to generate a more comprehensive picture regarding suicide risk in this population.

Despite these limitations, the present findings not only provide corroborating evidence for the interpersonal theory of suicide in a national sample of firefighters but also support its clinical relevance. To our knowledge, this is the first investigation of the interpersonal theory of suicide within this occupational group. Moving forward, we encourage replication of our study findings in additional samples of firefighters—and other first responder groups—with the aim of informing suicide prevention efforts in this high-risk population.

## Acknowledgments

This research was supported, in part, by a grant from the National Institute of Mental Health (T32 MH093311-04). This research was also supported in part by a grant from the National Fallen Firefighters Foundation, and by the Military Suicide Research Consortium, an effort supported by the Office of the Assistant Secretary of Defense for Health Affairs under Award No. (W81XWH-10-2-0181). Opinions, interpretations, conclusions and recommendations are those of the authors and are not necessarily endorsed by the Military Suicide Research Consortium or the Department of Defense. The authors wish to acknowledge the assistance of Mr. Victor Stagnaro, the National Fallen Firefighters Foundation, and the men and women firefighters and emergency responders who serve and protect.

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**Table 1**

Sociodemographic and Occupational Characteristics of Current U.S. Firefighters

Characteristics	Current Firefighters (N=863)	Valid (%)
<b><u>Sociodemographic Characteristics</u></b>		
Age	M=37.14 years; SD=10.87; Range=18–76	
18–24 Years	131	15.2
25–34 Years	244	28.3
35–44 Years	267	30.9
45–54 Years	172	19.9
55+ Years	49	5.7
Sex		
Male	779	91.0
Female	77	9.0
<i>Missing</i>	7	--
Race/Ethnicity		
White	761	88.2
Hispanic or Latino	22	2.5
Native American or Alaska Native	61	7.1
Other	19	2.2
Marital Status		
Married	627	72.7
Divorced or Separated	66	7.6
Widowed	6	0.7
Never Married	164	19.0
Education Level		
Did Not Complete High School	7	0.8
High School/GED	66	7.7
Some College	293	34.0
2-Year College	176	20.4
4-Year College	235	27.3
Post-Graduate	85	9.9
<i>Missing</i>	1	--
Military Status		
Active Duty	74	8.6
Reserves	56	6.5
National Guard	18	2.1
Veteran or Retiree	65	7.6
Other	7	0.8
Civilian (No Military Service)	639	74.4
<i>Missing</i>	4	--
<b><u>Occupational Characteristics</u></b>		
Firefighter Rank		

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Characteristics	Current Firefighters (N=863)	Valid (%)
Firefighter I	94	10.9
Firefighter II	182	21.1
Engineer/Technician/Chauffeur	121	14.1
Sergeant	43	5.0
Lieutenant	116	13.5
Captain	108	12.5
Chief Officers <sup>1</sup>	129	15.0
Other	68	7.9
<i>Missing</i>	2	--
Years of Service as Firefighter	M=14.88; SD=10.20; Range=0.5–60	
0–10 Years	371	43.0
11–20 Years	244	28.3
21–30 Years	178	20.6
31+ Years	70	8.1
<i>Missing</i>	--	--
Department Type		
Full-Time	357	41.4
Volunteer	248	28.7
Hybrid (Full-Time & Volunteer)	240	27.8
Military	6	0.7
Wildland	12	1.4
<i>Missing</i>	--	--
Geographic Location of Department		
Large City (250,000+)	89	10.3
Mid-Size City (<250,000)	116	13.4
Urban Fringe of Large City	67	7.8
Urban Fringe of Mid-Size City	93	10.8
Large Town (25,000+)	153	17.7
Small Town (2,500–25,000)	250	29.0
Rural, Outside Large/Mid-Size City	82	9.5
Rural, Inside Large/Mid-Size City	13	1.5
<i>Missing</i>	--	--
Department Emergency Medical Services		
Yes, Full-Service	473	54.8
Yes, No Transport	291	33.7
Yes, Other	38	4.4
No	61	7.1
<i>Missing</i>	--	--
Responded to Suicide Attempt		
Yes	791	91.8
No	71	8.2
<i>Missing</i>	1	--

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Characteristics	Current Firefighters (N=863)	Valid (%)
Responded to Suicide Death		
Yes	751	87.1
No	111	12.9
<i>Missing</i>	1	--

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**Table 2**

Means, Standard Deviations, and Correlations between Study Variables

	1	2	3	4	5	6	M	SD
1. Sex	--						1.09	0.29
2. FF Years	-0.10*	--					14.88	10.20
3. SI	0.01	-0.14***	--				2.24	2.41
4. FAD	0.01	0.03	-0.03	--			19.79	5.23
5. PB	-0.07*	-0.29***	0.58***	-0.01	--		10.43	8.07
6. TB	0.05	-0.19***	0.50***	-0.07*	0.54***	--	24.11	12.42
7. SA	-0.07*	-0.33***	0.55***	-0.11**	0.73***	0.34***	0.16	0.37

Note.

\* p < 0.05;

\*\* p < 0.01;

\*\*\* p < 0.001

Sex coded 1=Male, 2=Female. FF Years = Number of years as a firefighter. SI = career suicidal ideation, total scores on the Depressive Symptom Index – Suicidality Subscale; FAD = Fearlessness About Death; PB = Perceived Burdensomeness; TB = Thwarted Belongingness; SA = career suicide attempts.

**Table 3**  
 Summary of Hierarchical Linear Regression Analysis Predicting Career Suicidal Ideation

Variables	b	S.E.	$\beta$	t	95% CI	$pr^2$	R	R <sup>2</sup>
Step 1 (constant)	2.58	0.35		7.30**	1.89–3.28		0.116	0.013
Sex	-0.04	0.29	-0.01	-0.15	-0.60–0.52	-		
FF Years	-0.03	0.01	-0.12	-3.39**	-0.04–0.01	0.01		
Step 2 (constant)	2.87	0.32		8.98**	2.24–3.50		0.617	0.38
Sex	0.24	0.23	0.03	1.03	-0.21–0.68	-		
FF Years	0.01	0.01	0.06	2.00*	0.00–0.03	0.01		
PB	0.14	0.01	0.45	13.63**	0.12–0.16	0.18		
TB	0.05	0.01	0.26	7.93**	0.04–0.06	0.07		
FAD	<0.001	0.01	0.01	0.25	-0.02–0.03	-		
Step 3 (constant)	3.13	0.49		6.40**	2.17–4.09		0.618	0.38
Sex	0.24	0.23	0.03	1.07	-0.21–0.69	-		
FF Years	0.01	0.01	0.06	2.09*	0.00–0.03	0.01		
PB	0.15	0.03	0.51	5.97**	0.10–0.20	0.04		
TB	0.04	0.02	0.20	2.46*	0.01–0.07	0.01		
FAD	0.01	0.01	0.01	0.38	-0.02–0.03	-		
PB × TB	<0.001	0.001	-0.06	-0.71	-0.002–0.001	-		

Note. N = 845;

\*  $p < 0.01$ ,

\*\*  $p < 0.001$ .

$pr^2$  = partial  $r^2$ .

Sex coded 1=Male, 2=Female; FF Years = Number of years as a firefighter; PB = Perceived Burdensomeness (Interpersonal Needs Questionnaire [INQ]); TB = Thwarted Belongingness (INQ); FAD = Fearlessness About Death (Acquired Capability for Suicide-Fearlessness About Death Scale).

**Table 4**  
 Summary of Hierarchical Logistic Regression Analysis of Interpersonal Theory of Suicide Variables Predicting Career Suicide Attempts

Variables	Cox & Snell R <sup>2</sup>	Nagelkerke R <sup>2</sup>	Chi-Square	$\beta$	S.E.	Wald	p	OR	95% CI
Block 1 (Constant)	0.33	0.59	373.87	(0.92)	(0.451)	(4.14)	(0.04)	(2.50)	
PB				0.25	0.021	137.28	<0.001	1.28	1.23–1.34
TB				-0.03	0.015	2.82	0.09	0.98	0.95–1.00
FAD				-0.13	0.031	18.76	<0.001	0.88	0.82–0.93
Block 2 (Constant)	0.34	0.63	28.79	(-2.58)	(0.203)	(61.44)	(<0.001)	13.89	
PB				0.37	0.048	59.24	<0.001	1.45	1.32–1.60
TB				-0.08	0.026	8.84	0.003	0.93	0.88–0.97
FAD				-0.26	0.111	5.47	0.02	0.77	0.62–0.96
FAD × TB				0.004	0.003	1.51	0.22	1.004	1.00–1.01
FAD × PB				-0.01	0.005	4.07	0.04	0.99	0.98–1.00
TB × PB				-0.005	0.002	9.389	0.002	1.00	0.99–1.00
Block 3 (Constant)	0.35	0.64	4.21	(3.06)	(0.821)	(13.93)	(<0.001)	(21.40)	
PB				0.40	0.050	63.14	<0.001	1.49	1.35–1.65
TB				-0.10	0.028	12.09	0.001	0.91	0.86–0.96
FAD				-0.57	0.186	9.32	0.002	0.57	0.39–0.82
FAD × TB				0.012	0.005	5.81	0.02	1.01	1.00–1.02
FAD × PB				-0.03	0.011	7.52	0.006	0.97	0.95–0.99
TB × PB				-0.01	0.002	12.92	<0.001	0.99	0.99–1.00
FAD × TB × PB				0.001	0.000	4.26	0.04	1.001	1.00–1.01

Note. N = 863. OR = odds ratio ( $e^{\beta}$ ). No covariates were included in this model.

PB = Perceived Burdensomeness (Interpersonal Needs Questionnaire [INQ]); TB = Thwarted Belongingness (INQ); FAD = Fearlessness About Death (Acquired Capability for Suicide-Fearlessness About Death Scale).