PTSD Symptoms and Suicide Risk in Male Firefighters: The Mediating Role of Anxiety Sensitivity

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Abstract

PTSD symptoms are positively related to suicide risk among firefighters. One mechanism that may account for this relationship is anxiety sensitivity (AS) cognitive concerns—the fear that cognitive symptoms of anxiety will have catastrophic consequences. We sought to replicate the mediating effect of AS cognitive concerns on the relationship between PTSD symptoms and suicide risk among 214 trauma-exposed male firefighters with non-zero suicide risk. Bootstrap mediation analyses tested AS cognitive concerns as a statistical mediator of PTSD symptoms (total and symptoms clusters scores) and suicide risk, controlling for depression symptoms and relevant demographic variables. AS cognitive concerns statistically mediated the relationship between PTSD symptoms (total score, as well as intrusion, avoidance, and arousal-reactivity symptoms clusters) and suicide risk; however, the reverse was also true. AS cognitive concerns may confer risk for suicide among trauma-exposed firefighters. Firefighters may benefit from AS-specific interventions, which are shown to reduce PTSD symptoms and suicidality.

Keywords

anxiety sensitivity; posttraumatic stress disorder; suicide; risk factors; firefighter

Suicide is a significant public health concern (Centers for Disease Control and Prevention [CDC], 2017). Recent research has demonstrated that firefighters represent a group at elevated suicide risk (see Stanley, Hom, & Joiner, 2016, for review), and rates of suicidal thoughts and behaviors among firefighters exceed those found among the general population (Martin, Tran, & Buser, 2016; Stanley, Hom, Hagan, & Joiner, 2015; Stanley, Hom, Spencer-Thomas, & Joiner, 2017b). Moreover, protective service workers, an umbrella term that

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subsumes firefighters, are at increased risk of death by suicide compared to other occupational groups (McIntosh et al., 2016; Tiesman et al., 2015). Despite research demonstrating elevated levels of suicide risk among firefighters, few studies have investigated factors that may exacerbate risk—an important endeavor to inform the provision of suicide intervention initiatives within the fire service.

One factor that may, in part, be responsible for elevated suicide risk among this population is repeated exposure to traumatic events. Firefighters routinely respond to situations in which they bear witness to actual or threatened death of others—or, indeed, themselves. The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (*DSM-5*; American Psychiatric Association [APA], 2013) recognizes repeated work-related trauma exposure as potentially fulfilling Criterion A of the posttraumatic stress disorder (PTSD) diagnostic criteria (APA, 2013). Thus, firefighters represent a group at increased risk for developing PTSD. In addition to exposure to traumatic events, *DSM-5* PTSD diagnoses also require the presence of symptoms related to re-experiencing (i.e., intrusions), negative alterations in cognition and mood (NACM), avoidance, and alterations in arousal and reactivity (AR) to be present for at least one month post-exposure. Rates of PTSD among firefighters appear elevated, with point prevalence estimates ranging from 6.5 to 30% (Berninger et al., 2010; Bryant & Harvey, 1995; Haslam & Mallon, 2003; Heinrichs et al., 2005). These estimates are especially concerning because PTSD shows strong associations with suicidality (see Panagioti, Gooding, & Tarrier, 2012, for review).

PTSD demonstrates a robust association with suicide risk among the general population (Bryan, Grove, & Kimbrel, 2017; Cougle, Keough, Riccardi, & Sachs-Ericsson, 2009), and rates of PTSD are elevated among suicide attempters compared to ideators (Klonsky, May, & Saffer, 2016; Nock et al., 2009). The link between PTSD symptoms and suicidality has been replicated among firefighter samples, as well. Martin, Tran, and Buser (2016) examined 3,036 firefighters and found that PTSD symptoms were associated with lifetime suicidal ideation (SI) and attempts. Further, Boffa and colleagues (2017) found that among 893 U.S. firefighters, PTSD symptoms were related to increased levels of SI and previous suicide attempts. Despite the importance of these studies for potentially informing suicide prevention efforts within the fire service, reasons for the association between PTSD symptoms and suicidality have not been fully elucidated.

The prevalence of, and link between, PTSD symptoms and suicidality among firefighters raises questions related to potential therapeutic targets that may mitigate their psychological impact. For this purpose, a crucial first step is to identify a maintenance factor of PTSD and suicidality (Stice, 2002), one which is associated with the persistence of these conditions. One promising target relevant to PTSD and suicidality is anxiety sensitivity (AS), defined as an exaggerated fear of the potential consequences which may arise from anxious arousal (Reiss & McNally, 1985). Conceptualized as a hierarchical construct, AS comprises a 'global' fear of anxious arousal, as well as three lower-order dimensions specific to the cognitive, physical, and social consequences associated with anxiety symptoms (Taylor et al., 2007; Allan, Albanese, Short, Raines, & Schmidt, 2015). For example, AS cognitive concerns reflect one's perception that concentration difficulties presage "going crazy". Elevated AS physical concerns lead one to interpret somatic symptoms (e.g., upset stomach,

tightness of the throat) as a harbinger of illness or death. AS social concerns reflect the fear of negative evaluation in the event of observable signs of anxiety (e.g., blushing, sweating). Indeed, AS–both globally and its sub-components–is a transdiagnostic vulnerability factor for an array of anxiety and mood disorders (Naragon-Gainey, 2010; Olthuis, Watt, & Stewart, 2014), including PTSD and suicidality.

Specifically, AS and PTSD symptoms are positively related in samples of active-duty police officers (Asmundson & Stapleton, 2008), motor-vehicle accident survivors (Fedoroff, Taylor, Asmundson, & Koch, 2000), undergraduates exposed to campus shootings (Boffa et al., 2016; Stephenson, Valentiner, Kumpula, & Orcutt, 2009), and victims of interpersonal violence (Lang, Kennedy, & Stein, 2002). Within the suicide literature, global AS is associated with current SI and history of suicide attempts (Allan et al., 2015). Other studies suggest that AS cognitive concerns, specifically, may be most strongly related to SI and past suicide attempts (Allan, Capron, Raines, & Schmidt, 2014; Capron et al., 2012; Oglesby, Capron, Raines, & Schmidt, 2015). As a transdiagnostic maintenance factor, AS has consistently demonstrated associations with PTSD symptoms and suicidality; it is therefore of interest as a risk mitigation mechanism in samples with high rates of PTSD and suicidality (i.e., protective service workers).

Recognizing this, Stanley, Hom, Spencer-Thomas, and Joiner (2017a) further examined AS as a potential link between PTSD symptoms and suicide risk among a sample of 254 women firefighters. Stanley and colleagues (2017a) found that AS mediated the association between PTSD symptoms and global suicide risk, even after controlling for depression symptoms. Consistent with prior work, AS cognitive concerns appeared to be most implicated as the link between PTSD symptoms, including the *DSM-5* PTSD symptom clusters, and suicide risk, a finding that was replicated in a sample of male veterans (Raines et al., 2017). These studies are noted for their elucidation of a malleable vulnerability factor that may in part explain why PTSD symptoms confer increased risk for suicide among protective service workers, including firefighters. However, these results bear replication, primarily because the study conducted in firefighters included only women (Stanley et al., 2017a), significantly limiting its generalizability to the fire service which is majority (>90%) male (Haynes & Stein, 2016).

The present study therefore aimed to replicate the finding that AS accounts in part for (i.e., statistically mediates) the relationship between PTSD symptoms (total and symptom cluster) and suicidality in an all-male sample of firefighters. Moreover, given the theoretical basis for the position of AS as a maintenance factor of pre-existing PTSD symptoms and suicidality, we conducted these analyses among individuals with (1) a self-reported history of trauma exposure and (2) non-zero suicide risk. Consistent with prior reports (Raines et al., 2017; Stanley et al., 2017), it was hypothesized that AS cognitive concerns would emerge as the only significant mediator of this relationship when accounting for the other two AS domains (physical and social). As a replication of prior work, we tested these effects in a sample of exclusively male firefighters. Consistent with Stanley et al. (2017a), effects were expected after controlling for depression symptoms as well as relevant demographic variables.

Methods

Participants

Data for the current study were culled from a larger ongoing project examining stress and health-related behaviors among firefighters in a large southern U. S. metropolitan city. In this department, all firefighters perform emergency medical service (EMS) duties. To participate in the parent project, participants were required to be current firefighters over 18-years-old, and consent to participate in all online questionnaires. In the interest of examining the role of AS as a maintenance variable for suicidality among individuals with pre-existing suicide risk (e.g., Schmidt, Norr, Allan, Raines, & Capron, 2017), individuals were selected for study analyses to include non-zero suicide risk and prior trauma exposure. Non-zero suicide risk was defined as a score > 3 on the Suicidal Behaviors Questionnaire–Revised (SBQ-R; Osman et al., 2001); SBQ-R scores range from 3–18, and therefore a score of 3 is the de-facto 'zero' suicide risk. Prior exposure to a *DSM-5* Criterion A traumatic event was determined based on responses to the Life Events Checklist Version-5 (LEC-5; Weathers et al., 2013). Complete data were available for 793 individuals, 241 of whom indicated non-zero suicide risk. Of those, 214 reported exposure to a PTSD Criterion A traumatic event (APA, 2013). Therefore, data from 214 participants were analyzed for the current study.

Participants ranged in age from 20 to 61 years (M = 39.05, SD = 8.94). Overall, 80.1% identified as White, 10.0% as Black, 23.7% as Hispanic or Latino/a, 2.5% as Native American or Alaska Native, 1.7% as Asian, and 5.8% as "other." Participants reported working as a firefighter for an average of 14.17 years (SD = 9.32). Approximately 25.3% of the sample reported to have served in active duty in the U.S. Armed Forces. Approximately 3.3% of the sample reported a previous suicide attempt.

Compared to civilians, those with active duty military service (n = 54) had greater PTSD symptoms (t[212] = −2.22, p < .05), but comparable levels of global AS (t[212] = −0.83, p = .41) and suicide risk (t[212] = −1.34, p = .18). Individuals with a previous suicide attempt (n = 6) had significantly greater suicide risk scores (t[212] = −3.86, p < .001), but did not differ from non-attempters in global AS (t[212] = 0.51, p = .61) or PTSD symptoms (t[212] = 1.47, p = .14). Because of the above differences, these variables were covaried in all subsequent analyses.

Procedure

Firefighters were invited via department-wide email to complete a voluntary online survey that included questions about stress and health. Participants were granted one continuing education credit and a chance to win various raffle prizes (e.g., restaurant gift cards, movie theatre passes) for completing the survey, which lasted approximately 20–30 minutes. The study has been approved by all relevant institutional review boards.

Measures

Demographic questionnaire—Participants reported sociodemographic factors as well as information regarding fire department and military service. Demographic variables regarding

history of active duty in any branch of the military, and prior suicide attempts were used as covariates in the current study.

Life Events Checklist Version-5 (LEC-5; Weathers et al., 2013)—The LEC-5 is a 17-item self-report questionnaire used to screen for lifetime exposure to potentially traumatic events. In the current study, the LEC-5 was administered as a prelude to the PTSD Checklist for *DSM-5* (PCL-5). Respondents were presented with 16 categories of traumatic stressors (e.g., combat, sexual assault, transportation accident), and one item assessing 'other' potentially traumatic events not listed. Respondents were asked to indicate whether each event "happened to me", "witnessed it", "learned about it", "part of my job", or "not sure"; they were then asked to identify and briefly describe the "worst" (if more than one) event. Responses were screened to verify that an indicated event was consistent with *DSM-5* PTSD Criterion A. In total, 27 individuals were removed from analyses for responding "not sure", typing "N/A" in the "other" descriptive box, or describing an "other" event (e.g., spousal infidelity) that did not qualify as a potentially traumatic event per *DSM-5*.

PTSD Checklist for DSM-5 (PCL-5; Blevins, Weathers, Davis, Witte, & Domino, 2015)—The PCL-5 is a 20-item self-report questionnaire that measures posttraumatic stress symptom severity over the past month per *DSM-5* criteria (APA, 2013). Respondents indicated the frequency with which they have been bothered by each symptom in the past month on a 5-point scale from 0 (*not at all*) to 4 (*extremely*). In the current study, PCL-5 total and subscale scores (for the four *DSM-5* symptom clusters) were calculated; and internal consistency was excellent for PCL-5 total, intrusion, avoidance, NACM, and AR subscale scores (a's = .97, .93, .93, .91, and .90, respectively)

Anxiety Sensitivity Index-3 (ASI-3; Taylor et al., 2007)—The ASI-3 is an 18-item self-report measure that assesses the degree to which individuals fear the potentially negative consequences of anxiety-related symptoms and/or sensations (Reiss & McNally, 1985). Items are rated on a scale from 0 (*very little)* to 4 (*very much*). The ASI-3 is a multidimensional measure that includes three 6-item sum-scored subscales consistent with physical, cognitive, and social concerns. The ASI-3 has good internal consistency and good convergent, discriminant, structural, and criterion-related validity (Taylor et al., 2007). In the present study, internal consistency for the ASI-3 total, physical, and social subscale scores were good (a's = .89, .85, and .88) and the internal consistency for cognitive subscale scores was acceptable (a = .76).

Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977)—Depressive symptom severity was measured with the 20-item CES-D measure. Respondents were asked to report the frequency of self-perceived symptoms in the past week on a 4-point Likert-style scale ranging from 0 (*less than 1 day per week*) to 3 (*5–7 days per week*), with higher scores indicating greater depressive symptom severity. This instrument has been validated in a wide range of samples, with alpha coefficients ranging from .63–.93 demonstrated across groups of healthy and clinical populations (Radloff, 1977; Verdier-Taillefer, Gourlet, Fuhrer, & Alperovitch, 2001). In the current study, internal consistency was good (a = .83).

***Suicidal Behaviors Questionnaire-Revised* (SBQ-R; Osman et al., 2001)—**The SBQ-R is a 4-item self-report measure used to assess suicide risk. Each of the four items on the SBQ-R assess a different aspect of suicidality, including: lifetime SI and suicide attempts; frequency of SI during the past 12 months; past expression of threat of suicide attempt; and self-reported likelihood of a future suicide attempt. The SBQ-R demonstrates good psychometric properties for adult psychiatric inpatient populations (Osman et al., 2001), and has been highlighted as an exemplar instrument of population-based suicide risk assessment (Batterham et al., 2015). Internal consistency for the current sample was poor (a = .55).

Data analytic plan

First, data were screened for outliers and corrected to be at the value of +/− three-times the standard deviation of that variable's mean score. Regarding normality, all variables, except for SBQ-R scores, fell within acceptable ranges for normally distributed data. Consistent with previous methods (e.g., Boffa, King, Turecki, & Schmidt, in press), SBQ-R scores were log-transformed to correct for non-normality, resulting in diminished skewness (skew = 1.00, SE = 0.17) and kurtosis (kurtosis = 0.49, SE = 0.33), which then fell within acceptable range for normally distributed data (Gravetter & Wallnau, 2014). Log-transformed SBQ-R values were used in all subsequent multivariate analyses.

Pearson correlation coefficients were generated to examine the hypothesized positive bivariate relationships among primary study variables (Table 1). To test the hypothesized indirect effect of PTSD symptoms on suicide risk through AS subfactors, we conducted separate mediation models using the PROCESS macro (Hayes, 2012) in SPSS version 22.0, with 95% confidence intervals (CI) estimated using 5,000 iterations of bootstrap resampling. Indirect effects are considered significant if the 95% CI do not cross zero. Separate analyses were conducted for each of the four PTSD symptom clusters, with each serving as the independent variable in their respective model. In each of these models, AS cognitive (a_1, b_1), physical (a_2, b_2), and social (a_3, b_3) subfactors were included as simultaneous mediators. Finally, consistent with prior research (Stanley et al., 2017a), we conducted mediation analyses to examine whether PTSD symptoms account for a significant portion of variance in the relationship between AS cognitive concerns and suicide risk, by using AS cognitive concerns as the independent variable and global PTSD symptoms as the mediator. Demonstration of equivalence between these models would be consistent with evidence that AS and PTSD symptoms share a high degree of overlap and bidirectionally influence one another (Marshall, Miles, & Stewart, 210). AS cognitive concerns was used in these alternate mediation models due to growing evidence for the specificity of this AS subdomain in the PTSD and suicide literature (Raines et al., 2017; Stanley et al., 2017a)

Results

Global PTSD symptoms

First, the hypothesized model testing the indirect effect of global PTSD symptoms (PCL-5 total) on suicide risk (SBQ-R) through the individual AS subfactors (ASI-3 cognitive, physical, and social subscales) was conducted. CES-D depression symptoms, active duty

military history, and suicide attempt history were entered as covariates. The full model accounted for a significant amount of variance in suicide risk ($R^2 = .287$, $F[8,205] = 10.32$, $p < .001$). The direct effect of PCL-5 total scores on SBQ-R scores was significant ($B = 0.002$, $SE = 0.001$, $p = .001$). Significant effects (Table 2) were observed for PCL-5 total scores on ASI-3 cognitive, physical, and social subscale scores (paths a_1, a_2, a_3), and ASI-3 cognitive scores on SBQ-R scores (path b_1); however, effects of ASI-3 physical and social scores on SBQ-R total scores (path b_2, b_3) were non-significant.

PTSD symptom clusters

Subsequent mediation models were tested to examine the indirect effects of each respective cluster on suicide risk through the individuals AS subfactors, controlling for the aforementioned covariates. Coefficients for all path effects of individual PTSD symptom clusters on AS subfactors (paths a_1, a_2, a_3), and AS subfactors on suicide risk (paths b_1, b_2, b_3), are presented in Table 2. Coefficients and 95% confidence intervals for indirect effects through the three AS subfactors in each subsequent model are presented in Table 3.

PTSD intrusion symptoms—The full model accounted for a significant amount of variance in suicide risk ($R^2 = 0.270$, $F[8,205] = 9.46$, $p < .001$). The direct effect of PCL-5 intrusion scores on SBQ-R scores was significant ($B = 0.004$, $SE = 0.002$, $p = .03$). Significant effects were observed for PCL-5 intrusion scores on all ASI-3 subscale scores (paths a_1, a_2, a_3), and ASI-3 cognitive scores on SBQ-R total scores (path b_1); however, direct effects of ASI-3 physical and social scores on SBQ-R total scores (paths b_2, b_3) were non-significant. Moreover, the indirect effect of PCL-5 intrusion scores on SBQ-R scores was significant through ASI-3 cognitive concerns, but not social or physical concerns.

PTSD avoidance symptoms—The full model accounted for a significant amount of variance in suicide risk ($R^2 = .275$, $F[8,205] = 9.69$, $p < .001$). The direct effect of PCL-5 avoidance scores on SBQ-R scores was significant ($B = 0.010$, $SE = 0.004$, $p = .01$). Significant effects were observed for PCL-5 avoidance scores on ASI-3 cognitive and social subscale scores (paths a_1, a_2, a_3), and ASI-3 cognitive scores on SBQ-R total scores (path b_1); however, effects of PCL-5 avoidance scores on ASI-3 physical scores was marginally significant (path a_2), and ASI-3 physical and social scores on SBQ-R total scores (paths b_2, b_3) were non-significant. Moreover, the indirect effect of PCL-5 avoidance scores on SBQ-R scores was significant through ASI-3 cognitive concerns, but not social or physical concerns.

PTSD NACM symptoms—The full model accounted for a significant amount of variance in suicide risk ($R^2 = .284$, $F[8,205] = 11.69$, $p < .001$). The direct effect of PCL-5 NACM scores on SBQ-R scores was significant ($B = 0.005$, $SE = 0.002$, $p < .01$). Significant effects were observed for PCL-5 NACM scores on all ASI-3 subscale scores (paths a_1, a_2, a_3), and ASI-3 cognitive scores on SBQ-R total scores (b_1 path); however, effects of ASI-3 physical and social scores on SBQ-R total scores (paths b_2, b_3) were non-significant. In this case, there were no significant indirect effect of PCL-5 NACM scores on SBQ-R scores through any of the ASI-3 subscales.

PTSD AR symptoms—The full model accounted for a significant amount of variance in suicide risk ($R^2 = .294$, $F[8,205] = 12.26$, $p < .001$). The direct effect of PCL-5 AR scores on SBQ-R scores was significant ($B = 0.006$, $SE = 0.002$, $p < .001$). Significant effects were observed for PCL-5 anxious arousal scores on all ASI-3 subscale scores (paths a_1, a_2, a_3), and ASI-3 cognitive scores on SBQ-R total scores (path b_1); however, effects of ASI-3 physical and social scores on SBQ-R total scores (paths b_2, b_3) were non-significant. The indirect effect of PCL-5 anxious arousal scores on SBQ-R scores was significant through ASI-3 cognitive and, unexpectedly, social concerns.

PTSD symptoms as a mediator

The full model accounted for a significant amount of variance in suicide risk ($R^2 = .282$, $F[8,205] = 13.53$, $p < .001$). Significant effects were observed for ASI-3 cognitive scores on PCL-5 total scores (path a; $B = 1.62$, $SE = 0.264$, $p < .001$), PCL-5 total scores on SBQ-R scores (path b; $B = 0.002$, $SE = 0.001$, $p = .002$), and ASI-3 cognitive scores on SBQ-R scores (path c; $B = 0.008$, $SE = 0.002$, $p < .001$). Notably, the indirect effect of ASI-3 cognitive scores on SBQ-R scores through PCL-5 total scores was significant ($B = 0.003$, $SE = 0.001$, 95% CI [.001, .006]). Of note, separate mediation models using the four PCL-5 symptom cluster subscales yielded similar results, such that PCL-5 intrusion, avoidance, NACM, and AR symptoms significantly mediated the relationship between AS cognitive concerns and SBQ-R scores.

Discussion

The present study sought to replicate findings that AS, specifically the cognitive concerns dimension, statistically accounts for a significant portion of the relationship between PTSD symptoms and suicide risk. Consistent with prior reports in female firefighter (Stanley et al., 2017a) and male veteran (Raines et al., 2017) samples, the present study found that greater AS and PTSD symptoms were associated with increased suicide risk among male firefighters; moreover, AS, and most reliably AS cognitive concerns, statistically mediated this relationship. These results held while controlling for depression symptom severity and relevant demographic variables. The results of this study largely support AS cognitive concerns as a link between PTSD symptom severity and suicide risk, and present several implications for our understanding of suicide risk and prevention among this unique occupational group.

Contrary to results in an all-female sample (Stanley et al., 2017a), AS cognitive concerns did not explain significant variance in the relationship between PTSD-NACM and suicide risk in our sample– though gender differences in AS (Norr, Albanese, Boffa, Short, & Schmidt, 2016) may in part account for this discrepancy. Indeed, scores on the SBQ-R ($t[466] = 0.46$, $p = .64$) and PCL-5 NACM subscale ($t[466] = 0.34$, $p = .74$) were statistically equivalent between the two studies, degree of AS cognitive concerns was greater ($t[466] = 7.33$, $p < .001$) in Stanley et al.'s female sample. Thus, although AS cognitive concerns is not evinced to account for a meaningful portion of variance between NACM symptoms and suicide risk in male firefighters, evidence for this effect among female firefighters suggests gender may moderate this relationship.

Unexpectedly, AS social concerns also significantly accounted for the relationship between PTSD—AR symptoms and suicide risk. Stanley et al. (2017a) reported that this effect emerged once depression symptoms were removed as a covariate, leading those authors to posit that this broadly reflects a high degree of comorbidity between depression and social anxiety symptoms. However, it has also been suggested that individuals with AS social concerns may fear the social consequences of PTSD symptoms and thus withdraw from others (Raines et al., 2017); in turn, this may produce a sense of loneliness and social isolation (i.e., thwarted belongingness), a sufficient condition for the desire for death (Joiner, 2005). Relevant to the present study, this effect may be accentuated among firefighters, whereby cultural stigma traditionally interferes with mental health issues (see Henderson et al., 2016, for discussion). Firefighters with greater AS social concerns may attempt to suppress PTSD–AR symptoms and withdraw from others for fear of being stigmatized, thereby increasing their risk for suicide.

Though we found that AS explained a signification portion of the relationship between PTSD symptoms and suicide risk, the reverse was also true (cf. Stanley et al., 2017a), indicating a high degree of overlap between PTSD symptoms and AS cognitive concerns in their contribution to suicide risk. However, our results are consistent with evidence that AS and PTSD symptoms bidirectionally account for one another (Marshall et al., 2010), which may explain the statistical mediation patterns observed in our data. Theoretically, trauma exposure may exacerbate psychological vulnerabilities such as AS cognitive concerns (Schmidt, Lerew, & Joiner, 2000), which in turn contribute to concomitant anxious and depressive symptoms (Schmidt, Lerew, & Joiner, 1998). Individuals who fear the consequences of anxious arousal may therefore increasingly avoid situations that evoke cognitive (e.g. difficulty concentrating, anhedonia) or physical (e.g., startle response) symptoms of traumatic stress, which through a negative feedback cycle further solidifies their belief that these psychological symptoms are dangerous and should be avoided (Dunmore, Clark, & Ehlers, 2001).

Although work is needed to clarify the dynamic relationship between AS, PTSD symptoms, and suicidality, this study suggests that, as a maintenance factor, AS perpetuates the presence of these psychiatric conditions. When AS and PTSD symptoms escalate, individuals may perceive these ongoing experiences as psychologically unbearable or unremittent, influencing, as leading theories suggest (Beck, Kovac, & Weissman, 1975; Joiner, 2005), the desire for death as a means of escape. Notably, other models relevant to AS and suicide suggest that AS, specifically the cognitive concerns dimension, may play an important role in amplifying the presence of psychiatric symptoms to increase suicide risk. A growing number of studies support a depression-distress amplification model such that the interaction of greater AS and depressive symptoms predict suicide risk (Capron, Lamis, & Schmidt, 2014). Notably, this work was recently extended to include firefighters (Stanley et al., under review). Similarly, AS and PTSD symptoms may synergistically work to escalate suicidal behaviors. Though this has not yet been tested with PTSD symptoms specifically, such effects warrant further investigation.

Importantly, while AS meets the criteria of a maintenance factor for PTSD and suicide, it is malleable through psychological intervention (e.g., Schmidt et al., 2017). Beyond its role in

perpetuating these psychological conditions, evidence further suggests that AS may act as a causal maintenance factor in that manipulating AS produces changes in PTSD symptoms and suicide risk. Specifically, a computerized cognitive anxiety sensitivity treatment (CAST) has been tested among clinical outpatients, and been shown to reduce PTSD symptoms (Allan, Short, Albanese, Keough, & Schmidt, 2015; Short et al., 2017) and suicide risk (Schmidt et al., 2017). In this respect, AS operates as a causal maintenance factor of PTSD symptoms and suicide, and presents a viable target for mitigating these conditions among populations with current symptomology. It bears mentioning that, to our knowledge, no AS-focused intervention has been piloted among firefighters. However, CAST may be a useful therapeutic adjunct among this segment of the population given that it is easily disseminable. Thus, CAST might be useful for addressing mental health needs among volunteer firefighters, who may experience greater structural barriers to mental health care (Stanley, Boffa, Hom, Kimbrel, & Joiner, 2017).

The results of the present study should be considered within the context of its limitations. First, the cross-sectional nature of these data cannot elucidate longitudinal pathways by which PTSD symptoms may confer risk for suicidality through AS. Future investigations will hopefully do so, not to mention formally test AS as a causal maintenance factor for PTSD symptoms and suicide risk through experimental manipulation. Second, PTSD symptoms were assessed only via self-report, and symptomology among this sample was relatively low, on average ($M_{PCL-5} = 15.14$, $SD = 15.73$). Though we were unable to clinically assess the presence of PTSD diagnoses, 16.8% of the sample exceeded the upper-end of suggested PCL-5 diagnostic cutoff scores (i.e., 33; Bovin et al., 2016). Third, the internal reliability of the SBQ-R was poor, which may have influenced the degree to which our variables were related to one another, and therefore the pattern of mediation results. However, a strength of using the SBQ-R is that it is a gold-standard measure (Batterham et al., 2015) that recognizes suicide risk is a multi-faceted construct, comprising information about past and current suicidal behaviors, as well as future likelihood of attempting suicide. Yet, we note that suicide risk is fluid, particularly among individuals with PTSD (Bryan & Rudd 2016), and may change depending on myriad factors (Kleiman et al., 2017). Finally, though our results extend the finding that AS influences suicide risk among firefighters, these results should be replicated among larger and more racially diverse samples to establish greater generalizability.

Conclusions

Firefighters represent a specific occupational group for whom PTSD symptoms and suicide risk appear to be elevated. A corpus of literature has identified AS, especially the cognitive concerns domain, to be a causal risk factor for these conditions primarily among community and veteran samples. Now, the role of AS in the relationship between PTSD symptoms and suicide risk among firefighters is being similarly codified. Since AS can be mitigated to influence the trajectory of both PTSD symptoms and suicidality, portable AS-specific interventions may improve mental health and reduce suicide risk among firefighters.

Acknowledgments

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Table 1

Zero-order correlations and descriptive statistics for all variables

	1	2	3	4	5	6	7	8	9	10	11
1. ASI-3 T	—										
2. ASI-3 C	.86	—									
3. ASI-3 P	.77	.59	—								
4. ASI-3 S	.84	.58	.41	—							
5. PCL-5 T	.49	.53	.32	.38	—						
6. PCL-5 In	.38	.42	.25	.30	.92	—					
7. PCL-5 Av	.39	.45	.21	.32	.87	.83	—				
8. PCL-5 NACM	.52	.57	.33	.40	.95	.85	.80	—			
9. PCL-5 AR	.44	.47	.33	.33	.91	.77	.72	.82	—		
10. SBQ-R	.40	.39	.26	.33	.43	.36	.38	.43	.43	—	
11. CES-D	.41	.44	.23	.35	.55	.48	.46	.52	.55	.30	—
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	0.00
Maximum	44.00	13.10	12.74	18.04	52.69	20.00	8.00	22.00	23.00	15.00	37.65
Mean	10.50	2.32	2.16	5.90	15.14	3.75	1.75	5.05	4.86	5.72	15.44
SD	9.77	3.50	3.34	4.58	15.73	4.31	2.11	5.97	5.38	2.07	7.85
Skewness	1.39	1.63	1.80	0.95	1.05	1.48	1.20	1.24	1.12	1.74	0.10
Kurtosis	1.46	1.74	2.29	0.23	0.03	1.83	0.69	0.60	0.47	3.78	0.68

Note. ASI-3 T: Anxiety Sensitivity Index 3-Total Score; ASI-3 C: ASI-3 cognitive concerns subscale; ASI-3 P: ASI-3 physical concerns subscale; ASI-3 S: ASI-3 social concerns subscale; PCL-5 T: PTSD Checklist for DSM5- Total Score; PCL-5 In: PCL-5 Intrusions subscale; PCL-5 Av: PCL-5 Avoidance subscale; PCL-5 NACM: PCL-5 Negative alterations in cognitions and mood subscale; PCL-5 AR: PCL-5 Alterations in arousal and reactivity subscale; SBQ-R: Suicidal Behaviors Questionnaire Revised-Total Score; CES-D: Center for Epidemiologic Studies Depression Scale- Total Score. All *p*s < .01

Table 2

Path effects for models including PTSD symptoms, anxiety sensitivity subfactors, and suicide risk

Model Variables	ASI-3 Cognitive			ASI-3 Physical			ASI-3 Social		
	B	SE	p	B	SE	p	B	SE	p
Global PTSD symptoms									
(IV) PCL-5 Total	**0.09**	**0.02**	**<.001**	**0.06**	**0.02**	**<.001**	**0.07**	**0.02**	**<.001**
(DV) SBQ-R	**0.01**	**0.003**	**.03**	0.0003	0.003	0.86	0.002	0.002	0.23
Intrusions (In)									
(IV) PCL-5 In	**0.23**	**0.06**	**<.001**	**0.15**	**0.06**	**0.01**	**0.17**	**0.08**	**0.03**
(DV) SBQ-R	**0.008**	**0.003**	**0.01**	0.001	0.003	0.84	0.002	0.002	0.20
Avoidance (Av)									
(IV) PCL-5 Av	**0.55**	**0.11**	**<.001**	0.23	0.12	0.06	**0.41**	**0.16**	**0.01**
(DV) SBQ-R	**0.01**	**0.003**	**0.02**	0.001	0.003	0.67	0.002	0.002	0.22
Negative Cognitions/Mood (NACM)									
(IV) PCL-5 NACM	**0.28**	**0.04**	**<.001**	**0.16**	**0.04**	**<.001**	**0.23**	**0.06**	**<.001**
(DV) SBQ-R	**0.01**	**0.003**	**<0.05**	0.001	0.03	0.83	0.002	0.002	.24
Arousal and Reactivity (AR)									
(IV) PCL-5 AA	**0.22**	**0.05**	**<.001**	**0.18**	**0.05**	**<.001**	**0.16**	**0.07**	**0.01**
(DV) SBQ-R	**0.01**	**0.003**	**0.01**	−0.00	0.003	0.89	0.003	0.002	0.18

Note. B = regression coefficient; *SE* = standard error of the regression coefficient; ASI-3 = Anxiety Sensitivity Index-3; PCL-5 = PTSD Check List for DSM-5; SBQ-R = Suicidal Behaviors Questionnaire Revised; IV = model independent variable associated with a path; DV = model dependent variable associated with b path. Significant effects are bolded.

Table 3

Indirect effects of PTSD symptoms on suicide risk through anxiety sensitivity subfactors.

AS Models	B	LL	UL	B	LL	UL	B	LL	UL
	PCL-5 Total			PCL-5 In			PCL-5 Av		
ASI-3 C	**.00062**	**.00031**	**.00154**	**.00229**	**.00095**	**.00475**	**.00394**	**.00014**	**.00983**
ASI-3 P	.00002	−.00038	.00039	.00006	−.00091	.00113	.00021	−.00108	.00216
ASI-3 S	.00017	−.00004	.00055	.00041	−.00005	.00165	.00098	−.00021	.00363
	PCL-5 NACM			PCL-5 AR					
ASI-3 C	.00169	−.00032	.00428	**.00162**	**.00008**	**.00419**			
ASI-3 P	.00009	−.00099	.00105	−.00007	−.00151	.00010			
ASI-3 S	.00049	−.00019	.00158	**.00040**	**.00006**	**.00140**			

Note. B = unstandardized coefficient; LL = lower limit of 95% confidence interval; UL = upper limit of 95% confidence interval; ASI-3 C: ASI-3 cognitive concerns subscale; ASI-3 P: ASI-3 physical concerns subscale; ASI-3 S: ASI-3 social concerns subscale; PCL-5: PTSD Checklist for DSM5; PCL-5 In: PCL-5 Intrusions subscale; PCL-5 Av: PCL-5 Avoidance subscale; PCL-5 NACM: PCL-5 Negative alterations in cognitions and mood subscale; PCL-5 AR: PCL-5 Alterations in arousal and reactivity subscale. Significant effects are bolded.