

POSTTRAUMATIC STRESS, ALCOHOL USE, AND ALCOHOL USE MOTIVES AMONG
FIREFIGHTERS: THE MEDIATING ROLE OF ANXIETY SENSITIVITY

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of Psychology

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In Partial Fulfillment

Of the Requirements for the Degree of

Master of Arts

By

Antoine M. Lebeaut

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ABSTRACT

Firefighters are frequently exposed to high-risk, potentially life-threatening events, and as a result, they are vulnerable to developing posttraumatic stress disorder (PTSD) and alcohol use disorder (AUD). The current study aimed to examine the mediating role of anxiety sensitivity (AS; fear of anxiety-related sensations) in the association of PTSD symptomology with alcohol use and alcohol use motives among a large sample of firefighters. It was hypothesized that heightened PTSD symptom severity would be indirectly associated with alcohol use and alcohol use coping motives, specifically, through high AS. This study is a secondary analysis of data from a larger study examining stress and health behaviors among firefighters. Participants were comprised of 652 urban firefighters who endorsed DSM-5 PTSD Criterion A trauma exposure and lifetime alcohol use. Firefighters completed an online questionnaire battery. Descriptive statistics and bivariate correlations were calculated for all study variables. A series of path analyses were conducted and regression coefficients for each hypothesized path were evaluated. Covariates included number of years in the fire service and trauma load (i.e., number of traumatic event types experienced). After accounting for covariates, AS partially mediated the association between PTSD symptom severity and alcohol use coping motives (indirect effect = .054, 95% CI [.006, .110]), conformity motives (indirect effect = .095, 95% CI [.034, .161]), and social motives (indirect effect = .054, 95% CI [.008, .109]). However, AS did not significantly mediate the relationship between PTSD symptom severity and enhancement motives (indirect effect = .047, 95% CI [-.002, .105]) or alcohol use severity (indirect effect = .026, 95% CI [-.026, .082]). Results indicate that AS reduction techniques may be effective in PTSD/AUD interventions for firefighters. Clinical and research implications are discussed.

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Introduction

Firefighters represent a population at significant risk of alcohol misuse and alcohol use disorder (AUD; Bacharach, Bamberger, & Doveh, 2008; Boxer & Wild, 1993; Haddock et al., 2012; Haddock, Poston, Jahnke, & Jitnarin, 2017; Piazza-Gardner et al., 2014). It is estimated that 50% of firefighters report excessive alcohol use (Haddock, Day, Poston, Jahnke, & Jitnarin, 2015) and one-third report heavy episodic drinking (Carey, Al-Zaiti, Dean, Sessanna, & Finnell, 2011; Haddock et al., 2015; Piazza-Gardner et al., 2014). For instance, prevalence rates for binge drinking (i.e., consuming four or more [men] or three or more [women] standard alcoholic drinks per day) and hazardous drinking behavior (i.e., engaging in binge drinking behavior two or more times per week) in firefighters have been documented to be as high as 58% and 14%, respectively (Carey et al., 2011). In comparison, the 12-month and lifetime prevalence rates of AUD among the general population were found to be 13.9% and 29.1%, respectively (Grant et al., 2015). A potential reason for this elevated alcohol consumption among firefighters is that alcohol may be used to cope with negative emotions stemming from the chronic stress of the profession. Indeed, previous findings suggest that firefighters report commonly using alcohol to cope with work-related trauma exposure and stress (Haddock et al., 2017; Jahnke, Poston, & Haddock, 2014; Smith, Gallagher, Tran, & Vujanovic, 2018). Relatedly, research has demonstrated that increases in alcohol use typically follows exposure to emergency situations and persists for several months after such situations (Homish, Frazer, & Carey, 2012). Therefore, high prevalence of heavy alcohol use among firefighters may be significantly influenced by the psychological consequences of their work.

Posttraumatic stress disorder (PTSD) provides a clinically meaningful avenue for understanding alcohol use and alcohol use motives among firefighters. The firefighting

profession is associated with chronic exposure to traumatic events (Meyer et al., 2012). Trauma exposure among firefighters has been estimated to be 91.5% (Meyer et al., 2012), with approximately 45% of firefighters endorsing exposure to four or more traumatic events (Skeffington, Rees, & Mazzucchelli, 2017). Among firefighters in the United States, prevalence rates for PTSD are found to be as high as 34% (Tomaka, Magoc, Morales-Monks, & Reyes, 2017). Many more firefighters may experience subthreshold PTSD symptoms, which are associated with similar levels of impairment as observed in PTSD (Bergman, Przeworski, & Feeny, 2017; Pietrzak, Goldstein, Southwick, & Grant, 2011a, 2011b; Zlotnick, Franklin, & Zimmerman, 2002). The comorbidity of PTSD and AUD is prevalent, complex, and difficult to treat (McCauley, Killeen, Gros, Brady, & Back, 2012). Indeed, PTSD/AUD comorbidity is well-established (Brown, Stout, & Mueller, 1999; Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995), with emerging studies suggesting that this comorbidity is also of particular concern within firefighter populations (e.g., Arbona, Fan, & Noor, 2016; Arbona & Schwartz, 2016; Harvey et al., 2016; Paulus, Vujanovic, Schuhmann, Smith, & Tran, 2017; Tomaka et al., 2017). A growing body of research suggests that there is a functional relationship between PTSD symptoms and problematic alcohol use, where individuals experiencing PTSD symptomatology use alcohol to ‘self-medicate,’ or cope with the negative emotions associated with PTSD (Brady, Back, & Coffey, 2004; Jacobsen, Southwick, & Kosten, 2001; Khantzian, 1985; Lehavot, Stappenbeck, Luterek, Kaysen, & Simpson, 2014; Simpson, Stappenbeck, Luterek, Lehavot, & Kaysen, 2014; Waldrop, Back, Verduin, & Brady, 2007). Given this association, it is important to consider malleable cognitive-affective mechanisms that underlie PTSD/AUD so as to inform specialized, evidence-based interventions for firefighters.

A promising cognitive-affective mechanism with clinical relevance to both PTSD and AUD is anxiety sensitivity (AS). AS is defined as the “fear of fear,” or fear of anxiety-related bodily sensations (Reiss, 1991; Reiss, Peterson, Gursky, & McNally, 1986). Elevated AS is implicated in the development and maintenance of PTSD (Asnaani, Farris, Carpenter, Zandberg, & Foa, 2015; Naragon-Gainey, 2010), and a bidirectional relationship between AS and PTSD symptom severity has been demonstrated, wherein AS predicts future PTSD symptom severity and vice versa (Marshall, Miles, & Stewart, 2010). Similarly, AS is positively related to alcohol use (Samoluk, Stewart, Sweet, & MacDonald, 1999; Stewart, Karp, Pihl, & Peterson, 1997) and increases the risk of developing AUD within a 24-month period (Schmidt, Buckner, & Keough, 2007). However, it is important to note that evidence supporting the association between AS and alcohol use is mixed, wherein some past work has found no relation between AS and daily alcohol consumption (DeMartini & Carey, 2011; Novak, Burgess, Clark, Zvolensky, & Brown, 2003; Stewart, Zvolensky, & Eifert, 2001; Vujanovic et al., 2018). Nonetheless, AS has also been strongly related to drinking motives. For instance, higher levels of AS are related to both alcohol-related coping (i.e., drinking to alleviate negative emotions; Novak et al., 2003; Stewart & Zeitlin, 1995) and conforming motives (i.e., drinking alcohol to assimilate with peers; Berenz et al., 2016; Stewart et al., 2001; Stewart, Zvolensky, & Eifert, 2002). Relatedly, research has demonstrated that those with high levels of AS are more likely to experience the arousal-dampening effects of alcohol compared to those with low levels of AS, which may augment the likelihood of using alcohol to cope (DeMartini & Carey, 2011; Stewart et al., 2001; Zack, Poulos, Aramakis, Khamba, & MacLeod, 2007). Indeed, both coping and conformity motives have been found to fully mediate the association between AS and increased alcohol consumption (Stewart et al., 2001).

Across trauma-exposed populations with current alcohol use co-occurring with either diagnostic or subclinical PTSD symptoms, AS is significantly, incrementally associated with PTSD symptom severity and coping motives for alcohol use (e.g., Berenz et al., 2016; Medina et al., 2011). Among a sample of individuals with co-occurring PTSD and AUD, baseline AS was related to PTSD symptom severity, including DSM-IV re-experiencing, avoidance, and hyperarousal symptoms, at one-month follow-up (Simpson, Jakupcak, & Luterek, 2006). Other work has documented a positive, incremental relationship between AS and emotional reactivity to trauma-related cues (i.e., a personally developed, audio-recorded script of the trauma memory) among trauma-exposed, treatment-seeking adults with substance use disorders (74% met criteria for AUD; McHugh, Gratz, & Tull, 2017). Furthermore, in individuals with co-occurring PTSD and AUD, AS significantly moderated PTSD-AUD treatment effects, where high baseline AS predicted slower rates of improvement throughout the course of treatment and resulted in higher levels of PTSD symptoms post-treatment (Zandberg, Rosenfield, Alpert, McLean, & Foa, 2016). Similarly, a positive association between AS and PTSD symptom severity has been established within firefighter populations (see Boffa et al., 2018; Stanley, Hom, Spencer-Thomas, & Joiner, 2017). However, no studies to date have investigated the role of AS in the association between PTSD symptoms and alcohol use and alcohol-related motives among firefighter populations.

Firefighters with heightened PTSD symptoms and high AS may be more likely to use alcohol and to do so in order to cope and manage stress and other negative emotions (DeMartini & Carey, 2011; Haddock et al., 2017; Jahnke et al., 2014; Smith et al., 2018; Stewart et al., 2001; Zack et al., 2007). Given fear of anxiety-related bodily sensations, firefighters with heightened AS may be especially sensitive to and fearful of PTSD symptoms. Such firefighters, due to their greater perceived discomfort with such symptoms and sensations, may therefore be more likely

to consume alcohol in attempts to avoid, dampen, or numb those psychological symptoms (e.g., intrusions, negative cognitions and mood, arousal and reactivity). It may follow that firefighters with amplified AS who endorse PTSD symptoms would be particularly likely to engage in negative reinforcement strategies, such as alcohol use, to help alleviate these negative emotional states. These firefighters may be more likely to report high rates of both alcohol use and coping-orientated alcohol use motives. AS may therefore mediate, or account for, the established association between PTSD symptom severity and alcohol use and coping-oriented alcohol use motives in firefighters.

Taken together, several gaps were noted in the extant literature relevant to firefighters. First, only two published studies (e.g., Boffa et al., 2018; Stanley, Hom, et al., 2017) have documented relations between AS and PTSD symptoms in firefighter populations. These studies have primarily focused on the mediating role of AS between PTSD symptomatology and suicide risk. This underscores an important gap, since AS represents a malleable, cognitive-affective factor with potential to inform specialized intervention efforts for firefighters. Relatedly, no studies have examined AS in relation to alcohol use or alcohol-related use motives in firefighters, despite the markedly high prevalence of alcohol misuse among this population (e.g., Boxer & Wild, 1993; Carey et al., 2011; Haddock et al., 2012; Haddock et al., 2017; Piazza-Gardner et al., 2014). Finally, no studies have examined AS in the association between PTSD and alcohol use or alcohol use motives in firefighter populations. Therefore, it is essential to further explore and advance our understanding of this association among firefighters, a vulnerable population who are required to respond to life-threatening situations in order to preserve public safety.

The current study aimed to examine the associations between PTSD symptom severity, AS, and alcohol use as well as alcohol-related use motives (i.e., coping, enhancement, conformity, social) among a large sample of career firefighters. First, it was hypothesized that both (a) PTSD symptom severity and (b) AS would be positively associated with alcohol use severity and alcohol use coping motives, specifically. Furthermore, it was hypothesized that AS would significantly mediate the association between PTSD symptom severity and alcohol use severity as well as coping-oriented alcohol use motives. No effects were expected for other alcohol use motives, including enhancement, conformity, and social motives. All effects were expected above and beyond theoretically relevant covariates, including number of years in the fire service and trauma load (i.e., number of traumatic event types endorsed). Covariates were included due to the well-documented negative correlation between number of fire service years and alcohol consumption among firefighters (e.g., Haddock et al., 2017; Piazza-Gardner et al., 2014), and the well-established association of trauma load with both PTSD symptom severity and alcohol use (e.g., Murphy, Beaton, Pike, & Johnson, 1999; Paulus et al., 2017). Therefore, the mediation models allowed for the examination of the unique effects of PTSD symptom severity and AS on alcohol-related outcomes, beyond the variance contributed by the selected covariates.

Method

Participants

This study was a secondary analysis of data from a larger project examining stress and health-related behaviors among firefighters. The overall sample included 652 urban firefighters. Participants included career urban firefighters, who perform emergency medical services and fire suppression services at the Houston Fire Department (HFD). In order to have been included in

the larger study, participants must have met the following criteria: 18 years of age or older at the time of consent, current HFD firefighters, and consented to participation and completion of all online questionnaires. For purposes of this secondary analysis, participants must have reported at least one traumatic event, as defined by the DSM-5 PTSD Criterion A (American Psychiatric Association, 2013) and indicated that they ever consumed alcohol (lifetime). Participants were excluded from the current study if they indicated an inability or unwillingness to provide informed consent for the completion of the online questionnaires.

Measures

Demographic Questionnaire. Firefighter participants were asked to self-report demographic information including sociodemographic factors, health and medical information, and firefighter service history. The questionnaire was used to describe the current sample. Number of years in the fire service (years of fire service) was used as a covariate in the mediation models.

Life Events Checklist Version-5 (LEC-5; Weathers et al., 2013). The LEC-5 is a self-report questionnaire that is used to screen for potentially traumatic events experienced at any time throughout the lifespan. Respondents are presented with 16 potentially traumatic events (e.g., natural disaster, combat, sexual assault, transportation accident) as well as an additional item assessing for ‘other’ potentially traumatic events not listed. In the current study, respondents were asked to indicate (via check mark) whether each listed event “happened to me,” “witnessed it,” “learned about it,” “part of my job,” or “not sure.” If participants endorse “happened to me,” “witnessed it,” or “part of my job” for a given item, this was coded as positive exposure to the particular traumatic event type. Total number of exposure event types

was summed to produce a variable indicating overall trauma load. The LEC-5 was used to assess trauma exposure and trauma load was entered as a covariate in the mediation models.

PTSD Checklist-Civilian Version-5 (PCL-5; Blevins, Weathers, Davis, Witte, & Domino, 2015). Respondents were asked to complete the PCL-5 with regard to the “worst” traumatic event endorsed on the LEC-5. The PCL-5 is a 20-item self-report questionnaire that measures PTSD symptom severity. Each of the 20 items reflects a symptom of PTSD as defined in the DSM-5 (American Psychiatric Association, 2013). Respondents are asked to rate each item on a 5-point Likert scale (0 = *Not at all* to 4 = *Extremely*) in regard to the frequency in which they have been bothered by the symptom in the past month (e.g., “In the past month, how much have you been bothered by repeated, disturbing, and unwanted memories of the stressful experience?”). Total symptom severity scores range from 0 to 80, with higher scores indicating higher symptom severity. The current guidelines for a PTSD diagnosis recommend a cut-off score of 33 (or higher) on the PCL-5 total symptom severity score (Bovin et al., 2016). The PCL-5 has demonstrated good psychometric properties (Blevins et al., 2015; Briere, 2001; Morey, 2007; Weathers et al., 2013) and the internal consistency in the current sample was excellent ($\alpha = 0.97$). The total symptom severity score of the PCL-5 was used as a predictor in the mediation models.

The Anxiety Sensitivity Index-3 (ASI-3; Taylor et al., 2007). The ASI-3 is an 18-item self-report questionnaire that assesses an individual’s fear of both anxiety and anxiety-related bodily sensations. Each item is rated using a 4-point Likert scale (0 = *Very little* to 4 = *Very much*) in regard to how much an individual agrees with the specific statement being rated. The questionnaire includes three subscales corresponding to the three subfactors of anxiety sensitivity as described by Taylor et al. (2007): Physical Concerns (e.g., “It scares me when my heart beats

rapidly”), Cognitive Concerns (e.g., “When my thoughts seem to speed up, I worry that I might be going crazy”), and Social Concerns (e.g., “I worry that other people will notice my anxiety”). For the current study, the total score of the ASI-3 (i.e., the sum of all 18 items rated by a participant) was used to indicate the severity of an individual’s anxiety sensitivity (i.e., global anxiety sensitivity). Past research has demonstrated the utility in using global anxiety sensitivity (e.g., Berenz et al., 2016; Stanley, Hom, et al., 2017). Furthermore, the ASI-3 has shown excellent psychometric properties, including strong construct validity (Kemper, Lutz, Bahr, Ruddel, & Hock, 2012) and good internal consistency (Osman et al., 2010). The internal consistencies for the ASI-3 subfactors in the current sample ranged from good to excellent: Physical Concerns: $\alpha = 0.87$, Cognitive Concerns: $\alpha = 0.91$, and Social Concerns: $\alpha = 0.80$. The total score of the ASI-3 was used as a mediating variable in all the mediation models, and the three ASI-3 subscales were each used as mediating variables in post hoc exploratory analyses.

Alcohol Use Disorders Identification Test (AUDIT; Saunders, Aasland, Babor, de la Fuente, & Grant, 1993). The AUDIT is a 10-item self-report, Likert-style screening instrument developed by the World Health Organization to identify individuals presenting with alcohol-related problems. Specific items on the AUDIT relate to three distinct subscales: hazardous alcohol use, alcohol dependence, and harmful alcohol use. The AUDIT has demonstrated strong psychometric properties (Garcia Carretero, Novalbos Ruiz, Martinez Delgado, & O’Ferrall Gonzalez, 2016; Hildebrand & Noteborn, 2015; Saunders et al., 1993). Moreover, the validity and efficiency of the AUDIT in the identification of harmful alcohol use, alcohol abuse, and alcohol dependence has been shown to be excellent (de Meneses-Gaya, Zuardi, Loureiro, & Crippa, 2009). The internal consistency for the AUDIT in the current sample was good ($\alpha = 0.85$). The first item on the AUDIT (“How often do you drink alcohol?”) was used to assess

lifetime alcohol use, where participants who indicated they never drank alcohol were excluded from the current study. The AUDIT total score was used as an outcome variable in the analyses.

Drinking Motives Questionnaire Revised Short Form (DMQ-R-SF; Kuntsche & Kuntsche, 2009). The DMQ-R-SF is a 12-item measure derived from the original Drinking Motive Questionnaire Revised (Cooper, 1994), which is used to assess motives related to consuming alcohol. Each item is rated on a 3-point scale (1 = *Never* to 3 = *Almost always*), corresponding to the frequency of an individual's alcohol consumption as related to four distinct drinking-related motives/subscales: Conformity (e.g., "To fit in with a group you like?"), Coping ("Because it helps you when you feel depressed or nervous?"), Enhancement (e.g., "Because you like the feeling?"), and Social (e.g., "Because it helps you enjoy the party?"). Each motive/subscale consists of three items, which are scored and summed in order to create a total score for each motive/subscale. The DMQ-R-SF has shown excellent psychometric properties (Kuntsche & Kuntsche, 2009; Mazzardis, Vieno, Kuntsche, & Santinello, 2010; Nemeth et al., 2011). The internal consistency of the DMQ-R-SF Conformity subscale was good ($\alpha = 0.86$). The internal consistency of the DMQ-R-SF Coping subscale was good ($\alpha = 0.85$). The internal consistency of the DMQ-R-SF Enhancement subscale was fair ($\alpha = 0.70$). The internal consistency of the DMQ-R-SF Social subscale was excellent ($\alpha = 0.92$). All DMQ-R-SF subscales were evaluated as outcome variables in the analyses.

Procedures

The current study utilized a subset of participants from a larger project examining stress and health-related behaviors among firefighters, approved by the University of Houston Institutional Review Board and the HFD. All firefighters were recruited for participation in the larger project through the HFD. A department wide email was sent to all firefighters in the HFD,

notifying them of the opportunity to complete an online research survey for one continuing education (CE) credit and a chance to win one of several raffle prizes, such as movie tickets or restaurant gift certificates. These notification emails indicated that the purpose of the survey was to better understand how firefighters cope with stress and how much firefighters engage in health-related behaviors. Firefighters were given access to the informed consent form and survey through an online HFD CE portal. Once firefighters accessed the portal, they were provided with a description of the survey and the choice to review the informed consent form, which described all aspects of the study. Those who did not wish to participate or consent to the study were given the option to indicate (by clicking ‘no’) that they did not wish to participate. All firefighters who considered participating in the survey (and confirmed consideration by clicking ‘yes’ or ‘no’) received one CE credit for participation. The total amount of time required for participation in this study was 45–60 min and firefighters could discontinue participation at any time without penalty.

Data Analytic Plan

All analyses were conducted using IBM SPSS version 25.0 (IBM Corporation). First, data was examined for multivariate outliers, normality, and missingness. Second, descriptive statistics and bivariate correlations were calculated for all study variables. Third, regression coefficients for each hypothesized path were evaluated. PTSD symptom severity (PCL-5 total score) was the predictor, with AS (ASI-3 total score) as the explanatory (mediator) variable in all models. Separate analyses were conducted for each outcome variable: (a) alcohol use severity (AUDIT total score), (b) alcohol use coping motives (DMQ-R-SF coping subscale), (c) alcohol use conformity motives (DMQ-R-SF conformity subscale), (d) alcohol use enhancement motives (DMQ-R-SF enhancement subscale), and (e) alcohol use social motives (DMQ-R-SF social

subscale). The direct effects of PTSD symptom severity (PCL-5 total score) and AS (ASI-3 total score) on each outcome variable were examined. Covariates included number of years in the fire service and trauma load (LEC-5 total).

As illustrated in Figure 1, path “a” examined the direct effect of PTSD symptom severity (PCL-5 total score) on AS (ASI-3 total score). Path “b” examined the direct effect of AS (ASI-3 total score) on all outcome variables. Path “c” examined the total effect of PTSD symptom severity (PCL-5 total score) on all outcome variables, and path “c’” examined the direct effect of PTSD symptom severity (PCL-5 total score) on all outcome variables controlling for AS (ASI-3 total score). Mediation analyses were conducted using ten thousand bootstrap re-samplings to detect the indirect effects of the predictor (PCL-5 total score) on the outcome variables via AS (ASI-3 total score), using PROCESS Macro for SPSS (Hayes, 2017). Bootstrapping is a nonparametric method that estimates the sampling distribution of an estimator based on resampling with replacement. The indirect effect was computed for each of the resamples, resulting in an empirically generated sampling distribution (Hayes & Preacher, 2014). The indirect effect was calculated as the product of the beta coefficients of the “a” and “b” paths. A bootstrap confidence interval that does not include zero provides evidence of a significant indirect effect (Preacher & Hayes, 2008).

Fourth, to test the specificity of the theoretical models and per recommendations for cross-sectional designs, two alternative models were tested for each outcome variable. Specifically, in the alternative models, first the predictor and explanatory variables were reversed (alternative model 1), and then the criterion and explanatory variables were reversed (alternative model 2) (Kraemer, Kiernan, Essex, & Kupfer, 2008; Preacher & Hayes, 2008).

Post hoc exploratory mediation analyses were employed to examine the mediating role of each lower-order AS factor in the meditation models determined to be significant in the main analyses. Exploratory mediation analyses were conducted utilizing the same data analytic procedures described above. Specifically, AS physical concerns (ASI-3 physical concerns subscale total score), AS cognitive concerns (ASI-3 cognitive concerns subscale total score), and AS social concerns (ASI-3 social concerns subscale total score) each in turn replaced AS (ASI total) as the explanatory variables in the association between PTSD symptom severity (PCL-5 total score) and each of the significant alcohol use-related outcomes.

Results

Descriptive Statistics

A summary of participant characteristics is presented in Table 1. No missing values were identified across all study variables. Examination of collinearity diagnostics did not reveal evidence of excess multicollinearity (variance inflation index [VIF] < 2.75) as VIF values did not exceed 10.0 (Mason & Perreault, 1991). Distributions for all study variables approximated normality (skewness < |2.25|; George & Mallery, 2003), except for alcohol use conformity motives (DMQ-R-SF conformity subscale; skewness = 3.05), AS physical concerns (ASI-3 physical concerns subscale; skewness = 2.58), AS cognitive concerns (ASI-3 cognitive concerns subscale; skewness = 2.75), and alcohol use severity (AUDIT total score; skewness = 2.25). However, given the absence of epidemiological studies on AS and alcohol use motives among firefighters, it may be the case that these indices manifest uniquely in this population. Therefore, the results of the original analyses are presented using non-transformed data.

The sample was comprised of 608 males (93.3%) and 39 females (6.0%) with a mean age of 38.72 ($SD = 8.57$). The average number of years in the fire service was 13.39 ($SD = 8.81$). The

mean AS score was 8.1 ($SD = 9.92$). The average number of traumatic event types endorsed was 11.57 ($SD = 3.78$), and approximately 9.51% of the sample met diagnostic criteria for PTSD per the recommended PCL-5 total score diagnostic cutoff of 33 (Bovin et al., 2016). Additionally, approximately 23.0% of the sample met diagnostic criteria for AUD per the recommended AUDIT total score diagnostic cutoff of 8 or greater (Babor, De La Fuente, Saunders, & Grant, 1992).

Bivariate Correlations

Bivariate correlations for all study variables are presented in Table 2. PTSD symptom severity was positively associated with AS ($r = .47, p < .01$), alcohol use severity ($r = .40, p < .01$), and alcohol use coping motives ($r = .51, p < .01$). AS was positively associated with alcohol use severity ($r = .24, p < .01$), alcohol use coping motives ($r = .33, p < .01$), alcohol use enhancement motives ($r = .20, p < .01$), alcohol use social motives ($r = .20, p < .01$), and alcohol use conformity motives ($r = .31, p < .01$). Regarding covariates, years of fire service was significantly negatively associated with only alcohol use enhancement motives ($r = -.12, p < .01$) and alcohol use social motives ($r = -.12, p < .01$). Trauma load was positively associated with PTSD symptom severity ($r = .12, p < .01$), AS ($r = .15, p < .01$), alcohol use severity ($r = .10, p < .05$), alcohol use enhancement motives ($r = .09, p < .05$), and alcohol use conformity motives ($r = .12, p < .01$).

Mediation Analyses

A summary of main mediation analyses is presented in Table 3, and the main mediation models are illustrated in Figure 1. Controlling for all covariates (i.e., years of fire service and trauma load), PTSD symptom severity (predictor) was positively associated with AS (mediator; path a in Model 1 in Table 3). AS was positively associated with alcohol use coping motives

(DMQ-Coping; outcome; path b in Model 2 in Table 3), alcohol use enhancement motives (DMQ-Enhancement; outcome; path b in Model 3 in Table 3), alcohol use social motives (DMQ-Social; outcome; path b in Model 4 in Table 3), and alcohol use conformity motives (DMQ-Conformity; outcome; path b in Model 5 in Table 3). However, AS was not significantly associated with alcohol use severity (AUDIT; outcome; path b in Model 1 in Table 3). In terms of the association between PTSD symptom severity and both alcohol use severity and all alcohol use motives, the total effects (path c in each model in Table 3) and the direct effects (path c' in each model in Table 3) were statistically significant. Through AS, PTSD symptom severity exerted a significant indirect effect (path a*b in Table 3) on alcohol use coping motives ($\beta = .054$; CI[.006, .110]), alcohol use social motives ($\beta = .054$; CI[.008, .109]), and alcohol use conformity motives ($\beta = .095$; CI[.034, .161]). These findings indicate that AS partially mediates the association between PTSD symptom severity and alcohol use coping motives, social motives, and conformity motives. In contrast, the indirect effects of PTSD symptom severity on both alcohol use severity ($\beta = .026$; CI[-.026, .082]) and alcohol use enhancement motives ($\beta = .047$; CI[-.002, .105]) through AS were not statistically significant, indicating that these associations are not mediated by AS.

In order to test the specificity of the main mediation models and per recommendations for cross-sectional designs, two alternative models were also tested for each significant mediation model: first the predictor and explanatory variables were reversed and then the criterion and explanatory variables were reversed. A summary of alternative model analyses is presented in Table 4. Through PTSD symptom severity, AS exerted a significant indirect effect (path a*b in Table 4) on alcohol use coping motives ($\beta = .211$; CI[.154, .274]), alcohol use social motives ($\beta = .076$; CI[.033, .122]), and alcohol use conformity motives ($\beta = .093$; CI[.042, .148]). The same

pattern of results was found when the criterion and explanatory variable were reversed: the indirect of effect of PTSD symptom severity on AS through alcohol use coping motives was significant ($\beta = .062$; CI[.007, .120]); the indirect of effect of PTSD symptom severity on AS through alcohol use social motives was significant ($\beta = .021$; CI[.003, .043]); and the indirect of effect of PTSD symptom severity on AS through alcohol use conformity motives was significant ($\beta = .052$; CI[.019, .092]). Overall, these findings indicate that the original mediation models (i.e., the mediating role of AS in the association between PTSD symptom severity and alcohol use coping motives) lack specificity.

Post Hoc Exploratory Analyses

Post hoc exploratory mediation analyses were employed to further examine the role of AS in the association between PTSD symptom severity and each significant alcohol use-related outcome (i.e., alcohol use coping, social, and conformity motives) based upon the main mediation analyses. Specifically, each lower-order AS factor – AS physical concerns (ASI-3 physical concerns subscale total score), AS cognitive concerns (ASI-3 cognitive concerns subscale total score), and AS social concerns (ASI-3 social concerns subscale total score) – replaced AS as the explanatory variable in the association between PTSD symptom severity and each significant alcohol use motive outcome. All models included the following covariates: number of years in the fire service and trauma load. First, PTSD symptom severity exerted a significant indirect effect (path a*b in Table 5) on alcohol use coping motives through AS cognitive concerns ($\beta = .061$; CI[.004, .128]) and AS social concerns ($\beta = .047$; CI[.015, .084]). Second, PTSD severity exerted a significant indirect effect on (a) alcohol use social motives through AS social concerns ($\beta = .068$; CI[.032, .109]), and (b) alcohol use conformity motives

through AS cognitive concerns ($\beta = .084$; CI[.011, .163]), AS social concerns ($\beta = .066$; CI[.025, .111]), and AS physical concerns ($\beta = .053$; CI[.012, .102]).

In contrast, through AS physical concerns, the indirect effects (path a*b in Table 5) of PTSD symptom severity on alcohol use coping motives ($\beta = .012$; CI[-.022, .050]) and alcohol use social motives ($\beta = .013$; CI[-.016, .049]) were not statistically significant, indicating that these associations are not mediated by AS physical concerns. Furthermore, through AS cognitive concerns, the indirect effect of PTSD symptom severity on alcohol use social motives ($\beta = .020$; CI[-.032, .075]) was not statistically significant, indicating that this association is not mediated by AS social concerns.

Discussion

The co-occurrence of PTSD and AUD is prevalent and difficult to treat, and both PTSD and AUD are prevalent among firefighters (Bacharach et al., 2008; Boxer & Wild, 1993; Haddock et al., 2017; Piazza-Gardner et al., 2014); however, research among firefighters has yet to identify the role of cognitive-affective mechanisms, such as AS, in this problematic association. The current study sought to investigate the mediating role of AS in the association of PTSD symptom severity with alcohol use and alcohol use motives among a large sample of firefighters. Specifically, it was hypothesized that heightened PTSD symptom severity would be indirectly associated with alcohol use and alcohol use coping motives through high AS. The hypotheses were partially supported, and all effects were documented after controlling for theoretically relevant covariates (i.e., number of years in the fire service and trauma load).

Associations of PTSD Symptomatology with Alcohol Use and Alcohol Use Motives

Consistent with study hypotheses, PTSD symptom severity was significantly associated with alcohol use severity as well as alcohol-related coping, enhancement, conformity, and social

motives, above and beyond the effects of covariates. As consistent with the well-established literature (e.g., Arbona et al., 2016; Brown et al., 1999; Harvey et al., 2016; Kessler et al., 1995; McCauley et al., 2012; Paulus et al., 2017; Tomaka et al., 2017), PTSD symptom severity was incrementally and positively associated with alcohol use severity, suggesting that firefighters with more elevated PTSD symptom severity used greater amounts of alcohol. Also consistent with hypotheses, PTSD symptom severity was positively associated with alcohol use coping motives, which aligns with extant literature demonstrating that individuals with heightened PTSD symptomology are more likely to use alcohol to cope with negative affective experiences (e.g., Lehavot et al., 2014; Simpson et al., 2014; Waldrop et al., 2007). Contrary to hypotheses, PTSD symptom severity was also positively associated with alcohol use enhancement, conformity, and social motives, indicating that firefighters with severe PTSD symptoms may be motivated to use alcohol for a variety of reasons, including enhancing desired emotional states, conforming to social settings, and facilitating social interactions. Indeed, some prior work has demonstrated that individuals with PTSD or those with trauma histories and subclinical PTSD may endorse higher rates of enhancement, social, and/or conformity motives (Grayson & Nolen-Hoeksema, 2005; Stappenbeck, Bedard-Gilligan, Lee, & Kaysen, 2013); however, the literature is mixed. Research among trauma-exposed populations (e.g., Dixon, Leen-Feldner, Ham, Feldner, & Lewis, 2009) and populations with co-occurring PTSD and problematic alcohol use (e.g., McDevitt-Murphy, Fields, Monahan, & Bracken, 2015) found that posttraumatic stress is associated only with coping motives and not with alcohol use enhancement, conformity, and social motives. Conversely, extant work among firefighters (e.g., Smith et al., 2018) has found that PTSD symptom severity has a positive association with alcohol use conformity motives but not enhancement or social motives. These divergent findings suggest that firefighters may

experience a greater urge to use alcohol to conform compared to other trauma-exposed populations. Therefore, future work should continue to explore the complex associations of PTSD symptoms and drinking motives among firefighters.

Associations of AS with PTSD Symptomatology, Alcohol Use, and Alcohol Use Motives

Furthermore, AS was significantly, incrementally associated with PTSD symptom severity and alcohol use coping motives, but not alcohol use severity, after accounting for covariates. First, results demonstrated a positive association between PTSD symptom severity and AS. Consistent with hypotheses, firefighters with heightened PTSD symptoms tend to also experience more severe AS, as consistent with previous literature (e.g., Asnaani et al., 2015; Marshall et al., 2010; Naragon-Gainey, 2010). Second, contrary to hypotheses, no significant association was found between AS and alcohol use. Previous research relevant to the AS-PTSD association has found conflicting results, wherein some studies have identified a positive association between AS and alcohol use (e.g., Samoluk et al., 1999; Stewart et al., 1997) while others have found no relation between AS and daily alcohol consumption (c.f. DeMartini & Carey, 2011; Novak et al., 2003; Stewart et al., 2001). Notably, this is the first study to examine AS in relation to alcohol use in firefighters, and thus, more research is needed to further examine this association. Third, consistent with study hypotheses, AS was positively associated with alcohol use coping motives, indicating that firefighters who experience high levels of AS are more likely to use alcohol to manage negative emotions. This finding builds upon previous literature (Novak et al., 2003; Stewart & Zeitlin, 1995) as the first study to examine the association between AS and alcohol use coping motives in firefighters.

Results further indicate that AS was positively associated with alcohol use enhancement, conformity, and social motives. Previous findings among university student populations support

the association between AS and both conformity motives (e.g., Berenz et al., 2016; Stewart et al., 1997; Stewart et al., 2001, 2002) and enhancement motives (e.g., Berenz et al., 2016). However, past studies among university students and the general population have found a negative association between AS and social motives (e.g., DeMartini & Carey, 2011; Stewart et al., 1997), which suggests firefighters may be more inclined to use alcohol to facilitate social gathering compared to these populations. Given that this is the first study to examine the associations between AS and alcohol use motives among firefighters, it is critical for future work to further assess these relationships in order to help inform clinical interventions targeting AUD in this population.

Indirect Effects

Indirect effects of PTSD symptom severity on alcohol use severity and alcohol use coping motives were examined, after controlling for covariates. First, contrary to hypotheses, no significant indirect effect of PTSD symptom severity on alcohol use severity through AS was found, indicating that AS does not mediate the association between these variables. As previously mentioned, past literature regarding AS-alcohol use associations is mixed (e.g., DeMartini & Carey, 2011; Novak et al., 2003; Stewart et al., 1997; Stewart et al., 2001). These findings are consistent with studies among university student populations, demonstrating that AS is not related to alcohol use but rather to motives for use (Novak et al., 2003; Stewart et al., 2001). That is, an individual's fear of anxiety-related sensations may increase his/her likelihood to be *motivated* to consume alcohol to reduce distress or negative emotional states rather than to use alcohol more frequently or in greater quantities *per se*.

Indeed, consistent with hypotheses, PTSD symptom severity exerted a significant indirect effect on alcohol use coping motives through AS. As shown in Table 3 (Model 2), the direct

effect of PTSD symptom severity on coping motives (path c') reduced in size compared to the total effect of PTSD symptom severity on coping motives (path c), indicating a partial mediating effect of AS in this association. In other words, these findings suggest that heightened levels of AS partially account for the association between PTSD symptom severity and the tendency to use alcohol to cope with negative emotions among firefighters. Firefighters with elevated PTSD symptoms may be more likely to use alcohol to cope with negative emotional states, and this association is accounted for by heightened fear of anxiety-related sensations. Although this is the first study to examine the mediating role of AS in this association, it is consistent with related research among trauma-exposed populations, where AS was incrementally associated with PTSD symptomology and alcohol use coping motives (e.g., Berenz et al., 2016; Medina et al., 2011).

Contrary to expectation, a similar pattern of results was also found for alcohol use conformity and social motives. Among firefighters, PTSD symptom severity was indirectly associated with alcohol use conformity and social motives through heightened AS. Nonetheless, these findings suggest that firefighters with elevated PTSD symptoms may use alcohol to avoid the distress related to feeling left out (i.e., conformity motives) and facilitate social gatherings (i.e., social motives), and that this is accounted for by heightened fears of their anxiety-related sensations. As hypothesized, the indirect effect of PTSD symptom severity on alcohol use enhancement motives through AS was not significant.

Specificity of Mediation Models: Examination of Alternate Models

Two alternative models were tested for each significant mediation model in order to test model specificity. First, the predictor and explanatory variables were reversed to examine the indirect effect of AS on alcohol use motives through PTSD symptom severity. Results indicated that AS exerted a significant indirect effect, through PTSD symptom severity, on alcohol use

coping, social, and conformity motives (see Table 4). These findings raise important theoretical considerations. Specifically, when PTSD symptom severity was included as the mediator in the proposed models, the effect sizes of the indirect effects of AS on alcohol use coping ($\beta = .211$; $CI[.154, .274]$) and social ($\beta = .076$; $CI[.033, .122]$) motives increased compared to the original model ($\beta = .054$; $CI[.006, .110]$ and $\beta = .054$; $CI[.008, .109]$, respectively), suggesting bi-directional relations and multiple pathways of relations among these variables. These findings are consistent with previous work supporting a bidirectional relationship between AS and PTSD symptom severity (e.g., Marshall et al., 2010). Thus, in this sample, it appears that AS explains the association between PTSD symptom severity and alcohol use coping, social, and conforming motives and vice versa (i.e., PTSD symptom severity explains the association between AS and these distinct motives).

Second, criterion and explanatory variables were reversed in order to examine the indirect effect of PTSD symptom severity on AS through alcohol use motives. PTSD symptom severity exerted a significant indirect effect, through alcohol use coping, social, and conformity motives, on AS (see Table 4). However, the theoretical rationale for these findings should be considered. A mediation analysis examines causal associations between variables and as such, the analysis is only valid if the causal assumptions are conceptually plausible (Judd & Kenny, 2010; Lemmer & Gollwitzer, 2017). Given the cross-sectional design of this study, statements of causality cannot be made, but the conceptual plausibility of a mediation hypothesis can be assessed. Theoretically, it may be plausible for an individual experiencing PTSD symptoms to routinely use alcohol to cope with their distress, which could subsequently lead to greater AS via increased emotional avoidance. However, given the directionality of the relationship of AS with alcohol use motives in previous research (e.g., Stewart, Samoluk, & MacDonald, 1999; Stewart

et al., 2001), this particular model may be less plausible but certainly worthy of further empirical exploration.

Post Hoc Exploratory Analyses

Each lower-order AS factor (i.e., AS physical concerns, cognitive concerns, and social concerns) was examined in order to investigate its role in the association between PTSD symptom severity and each alcohol use motive determined to be significant in the main mediation analyses (i.e., alcohol use coping, social, and conformity motives). Results indicated that PTSD symptom severity exerted a significant indirect effect on alcohol use coping motives through AS cognitive concerns and AS social concerns, specifically. This is the first study to demonstrate that AS cognitive concerns partially accounts for the association between PTSD symptoms and alcohol use coping motives, and this finding extends work examining the association between AS social concerns and problematic drinking behaviors to firefighters (e.g., McWilliams & Asmundson, 1999; Stewart et al., 2001). Firefighters with heightened PTSD symptoms and greater levels of AS cognitive (i.e., fear of loss of cognitive control) and social concerns (i.e., fear of publicly observable anxiety behaviors), but not physical concerns (i.e., fear of bodily sensations), may be more likely to use alcohol to manage distressing emotional states.

Furthermore, PTSD symptom severity exerted a significant indirect effect on (a) alcohol use social motives through AS social concerns and on (b) alcohol use conformity motives through AS cognitive concerns, AS social concerns, and AS physical concerns. This study extends past literature demonstrating associations between PTSD symptom severity and each of the AS subfacets among various substance-using samples (e.g., Buckner, Proctor, Reynolds, Kopetz, & Lejuez, 2011; Farris et al., 2016). No studies to date have evaluated PTSD symptoms, lower-order AS factors, and alcohol use motives in a single model. Firefighters with heightened

PTSD symptoms and greater levels of AS social concerns, but not AS physical concerns or AS cognitive concerns, may be more likely to use alcohol to facilitate or enhance social interactions. Moreover, firefighters with increased PTSD symptoms and greater levels of AS physical concerns, cognitive concerns, and social concerns may be more likely to use alcohol to conform or “fit in” to social contexts. The results of these analyses may indicate that lower-order AS factors are uniquely associated with specific motives for alcohol use. Specific lower-order AS factors play a complex, partially mediating role in the association between PTSD symptom severity and alcohol use coping motives, social motives, and conformity motives. Therefore, interventions that target specific low-order AS factors such as cognitive concerns (e.g., Mitchell, Capron, Raines, & Schmidt, 2014) may be particularly efficacious for firefighters with PTSD symptomology and problematic drinking motives.

Limitations and Future Directions

The findings of this current investigation should be interpreted in light of several limitations. First, the study utilized a cross-sectional design, and thus, no inferences about causality can be made regarding study variables. Future work should employ longitudinal or experimental designs to better elucidate the temporal relationships among PTSD, AS, and alcohol use and alcohol use motives. Second, the study relied on self-report measures, and therefore, method variance and reporting bias cannot be ruled out. It is important for future studies to include clinician-administered, structured diagnostic interviews to replicate and extend these findings. Third, this study utilized a convenience sample of firefighters to facilitate screening of a larger sample, and thus, generalizability to other firefighter populations is potentially limited. Future work that includes national, representative samples of firefighters is necessary. Relatedly, the current sample was primarily comprised of white (77.8%; $n = 507$),

male (93.3%; $n = 608$), career urban firefighters. Research that incorporates volunteer and rural firefighters as well as firefighters who identify as women and racial/ethnic minorities is imperative. Fourth, given that the DMQ-R-SF enhancement subscale demonstrated only fair internal consistency ($\alpha = 0.70$), future work focused on psychometric validation of the DMQ-R-SF in firefighter samples may be necessary. Finally, firefighters in this sample may have underreported the severity of psychiatric symptoms (e.g., PTSD symptoms, AS) and alcohol use due to potential stigma associated with negative health behaviors and mental health concerns and fears regarding confidentiality and negative career impact (e.g., Haugen, McCrillis, Smid, & Nijdam, 2017; Henderson, Van Hasselt, LeDuc, & Couwels, 2016; Stanley, Boffa, Hom, Kimbrel, & Joiner, 2017). Taken together, this study underscores the need for more research, integrating more rigorous methodologies, among firefighters to better understand, and in turn serve, this vulnerable and understudied population.

Clinical Implications

AS is a malleable cognitive-affective mechanism that can be targeted through psychological interventions. Past research has consistently found that cognitive-behavioral therapy can significantly reduce AS across a variety of treatment-seeking populations with diverse psychopathology (Smits, Berry, Tart, & Powers, 2008). Relatedly, single-session interventions that specifically target AS have proved to be efficacious at reducing AS in a variety of populations, including trauma-exposed adults (Vujanovic, Bernstein, Berenz, & Zvolensky, 2012), veterans (Short, Fuller, Norr, & Schmidt, 2017), university students (Keough & Schmidt, 2012; Schmidt, Eggleston, et al., 2007), non-treatment seeking (Schmidt, Eggleston, et al., 2007), and a non-treatment seeking community sample (Schmidt, Capron, Raines, & Allan, 2014). These single-session interventions typically include a combination of AS-focused

psychoeducation and interoceptive exposure exercises (i.e., tasks that expose individuals to varying degrees of physiological sensations associated with their anxiety, such as increased heart rate, respiration, or faintness) and despite their brevity, postintervention reductions in AS remain significant over time (e.g., Schmidt, Eggleston, et al., 2007; Vujanovic et al., 2012). To date, the literature examining AS reduction interventions in PTSD-AUD populations, especially firefighters, is lacking, despite the established role of AS in the association between PTSD and alcohol use problems (e.g., Berenz et al., 2016; McHugh et al., 2017; Simpson et al., 2006; Zandberg et al., 2016). Thus, future work should aim to not only expand specialized AS interventions to include firefighter populations, but also examine the efficacy of these treatment programs across samples with either PTSD, AUD, or co-occurring PTSD and AUD in order to better serve these vulnerable groups.

Conclusions

Firefighters represent a unique population susceptible to trauma-exposure, PTSD symptomology, and problematic alcohol use. The current study found that heightened levels of AS partially account for the association between PTSD symptom severity and alcohol use coping motives, conformity motives, and social motives, but not alcohol use severity. Moreover, this study found that firefighters with heightened PTSD symptoms and greater levels of AS cognitive and social concerns, but not physical concerns, may be more likely to use alcohol to cope. Given the malleability of AS, utilizing brief, specialized interventions as stand-alone or adjunctive treatments has great potential to inform care, improve treatment outcomes, and augment overall mental health among firefighter populations.

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Table 1
Participant characteristics (n = 652)

Variable	Mean (SD) / n (%)
Sex^a	
Female	39 (6.0%)
Male	608 (93.3%)
Transgender	5 (0.8%)
Race/Ethnicity^a	
White	507 (77.8%)
Hispanic/Latino	169 (25.9%)
Black/African American	71 (10.9%)
Other	50 (7.7%)
American Indian/Alaskan Native	12 (1.8%)
Asian	11 (1.7%)
Native Hawaiian/Pacific Islander	1 (0.2%)
Age^a	38.72 (8.57)
Education^a	
GED (or equivalent)	3 (0.5%)
High school	53 (8.1%)
Some college	303 (46.5%)
Bachelor's degree	293 (44.9%)
Years of Fire Service^a	13.39 (8.81)
Marital status^a	
Married	441 (67.6%)
Single	123 (18.9%)
Divorced	50 (7.7%)
Living with partner	36 (5.5%)
Widowed	2 (0.3%)
PTSD Diagnosis^b	62 (9.51%)
Trauma Exposure^c	11.57 (3.78)
Transportation accident	635 (97.4%)
Fire or explosion	627 (96.2%)
Natural disaster	618 (94.8%)
Serious accident	563 (86.3%)
Sudden violent death	545 (83.6%)
Sudden accidental death	537 (82.4%)
Physical assault	535 (82.1%)
Exposure to toxic substance	520 (79.8%)
Assault with a weapon	485 (74.4%)
Any other stressful event or experience	481 (73.8%)

Severe human suffering	449 (68.9%)
Life-threatening illness or injury	442 (67.8%)
Sexual assault	383 (58.7%)
Other unwanted or uncomfortable sexual experience	281 (43.1%)
Serious injury, harm, or death you caused to someone else	229 (35.1%)
Combat or exposure to a war-zone	117 (17.9%)
Captivity	94 (14.4%)
Anxiety Sensitivity^d	8.1 (9.92)
Alcohol Use Disorder Diagnosis^e	150 (23.0%)
Alcohol Use^f	
Drinks monthly or less	182 (27.9%)
Drinks 2-4 times a month	201 (30.8%)
Drinks 2-3 times a week	184 (28.2%)
Drinks 4 or more times a week	85 (13.0%)

Note. ^aDemographics questionnaire; ^bPTSD Checklist for DSM-5 (PCL-5; diagnostic cut-off of 33; Blevins et al., 2015); ^cLife Events Checklist for DSM-5: number of events endorsed as “happened to me,” “witnessed it,” and/or “part of my job” (LEC-5; Weathers et al., 2013); ^dAnxiety Sensitivity Index – 3 (ASI-3; total severity score; Taylor et al., 2007); ^eAlcohol Use Disorders Identification Test (AUDIT; diagnostic cut-off of 8; Saunders et al., 1993); ^fAUDIT item 1.

Table 2

Descriptive Statistics and Bivariate Correlations Between Study Variables

	1	2	3	4	5	6	7	8	9	10	11	12
1. Years of Fire Service	-											
2. Trauma Load	.04	-										
3. PTSD Symptom Severity	.02	.12**	-									
4. Anxiety Sensitivity	.01	.15**	.47**	-								
5. AS Physical Concerns	.07	.10*	.34**	.85**	-							
6. AS Cognitive Concerns	-.02	.11**	.51**	.89**	.71**	-						
7. AS Social Concerns	-.02	.16**	.39**	.88**	.57**	.65**	-					
8. Alcohol Use Severity	-.03	.10*	.40**	.24**	.17**	.24**	.21**	-				
9. Alcohol Use Coping Motives	-.03	.07	.51**	.33**	.20**	.35**	.30**	.54**	-			
10. Alcohol Use Enhancement Motives	-.12**	.09*	.25**	.20**	.11**	.16**	.24**	.51**	.54**	-		
11. Alcohol Use Social Motives	-.12**	.08	.22**	.20**	.11**	.15**	.25**	.42**	.46**	.74**	-	
12. Alcohol Use Conformity Motives	-.03	.12**	.31**	.31**	.24**	.28**	.28**	.35**	.51**	.37**	.40**	-
Mean	13.39	11.57	10.37	8.10	1.79	0.75	4.57	5.55	3.79	4.55	4.94	3.40
Standard Deviation	8.81	3.78	14.08	9.92	3.33	3.55	4.50	5.04	1.39	1.47	1.81	1.00
Range	0-40	1-17	0-67	0-69	0-21	0-24	0-24	1-32	3-9	3-9	3-9	3-9

Note. * $p < .05$, ** $p < .01$. Years of Fire Service = Demographics questionnaire; Trauma Load = Life Events Checklist for DSM-5 total score (LEC-5; Weathers et al., 2013); PTSD Symptom Severity = PTSD Checklist-5 total score (PCL-5; Blevins et al., 2015); Anxiety Sensitivity = Anxiety Sensitivity Index-3 total score (ASI-3; Taylor et al., 2007); AS Physical Concerns = ASI-3 physical concerns subscale total score; AS Cognitive Concerns = ASI-3 cognitive concerns subscale total score; AS Social Concerns = ASI-3 social concerns subscale total score; Alcohol Use Severity = Alcohol Use Disorders Identification Test total score (Saunders et al., 1993); Alcohol Use Coping Motives = Drinking Motives Questionnaire Revised Short Form coping motives subscale (DMQ-R-SF; Kuntsche & Kuntsche, 2009); Alcohol Use Enhancement Motives = DMQ-R-SF enhancement motives subscale; Alcohol Use Social Motives = DMQ-R-SF social motives subscale; Alcohol Use Conformity Motives = DMQ-R-SF conformity motives subscale.

Table 3

Standardized Regression Coefficients: Mediation Models

Y	Model	Model R²	β	<i>p</i>	Bootstrapped 95% CI	
1	PCL-5 → AS (a)	.23*	.326	<.001	.278	.374
	AS → AUDIT (b)	.17*	.029	.170	-.012	.069
	PCL-5 → AUDIT (c)	.16*	.141	<.001	.115	.166
	PCL-5 → AUDIT (c')		.132	<.001	.103	.160
	PCL-5 → AS → AUDIT (a*b)		.026		-.026	.082
2	PCL-5 → AS (a)	.23*	.326	<.001	.278	.374
	AS → DMQ-Coping (b)	.27*	.016	.002	.006	.027
	PCL-5 → DMQ-Coping (c)	.26*	.050	<.001	.044	.057
	PCL-5 → DMQ-Coping (c')		.045	<.001	.037	.052
	PCL-5 → AS → DMQ-Coping (a*b)		.054		.006	.110
3	PCL-5 → AS (a)	.23*	.326	<.001	.278	.374
	AS → DMQ-Enhancement (b)	.09*	.015	.018	.003	.027
	PCL-5 → DMQ-Enhancement (c)	.08*	.025	<.001	.017	.033
	PCL-5 → DMQ-Enhancement (c')		.020	<.001	.012	.029
	PCL-5 → AS → DMQ-Enhancement (a*b)		.047		-.002	.105
4	PCL-5 → AS (a)	.23*	.326	<.001	.278	.374
	AS → DMQ-Social (b)	.08*	.021	.007	.006	.037
	PCL-5 → DMQ-Social (c)	.07*	.028	<.001	.018	.038
	PCL-5 → DMQ-Social (c')		.021	<.001	.010	.032
	PCL-5 → AS → DMQ-Social (a*b)		.054		.008	.109
5	PCL-5 → AS (a)	.23*	.326	<.001	.278	.374
	AS → DMQ-Conformity (b)	.14*	.021	<.001	.021	.029

PCL-5 → DMQ-Conformity (c)	.10*	.021	<.001	.016	.026
PCL-5 → DMQ-Conformity (c')		.014	<.001	.008	.020
PCL-5 → AS → DMQ-Conformity (a*b)		.095		.034	.161

Note. * $p < .001$. The standard error and 95% CI for a*b is obtained via bootstrapping with 10,000 resamples. PCL-5 (PTSD symptom severity) is the predictor in all models. AS (anxiety sensitivity) is the mediator in all models. AUDIT (alcohol use severity) is the outcome variable in model 1. DMQ-Coping (alcohol use coping motives) is the outcome variable in model 2. DMQ-Enhancement (alcohol use enhancement motives) is the outcome variable in model 3. DMQ-Social (alcohol use social motives) is the outcome variable in model 4. DMQ-Conformity (alcohol use conformity motives) is the outcome variable in model 5. CI (lower) is the lower bound of a 95% CI; CI (upper) is the upper bound of a 95% CI. Path a indicates effect of X on M; b, effect of M on Y; c, effect of X on Y; c', direct effect of X on Y, controlling for M. All total, direct, and indirect paths are noted after controlling for the variance accounted for by theoretically relevant covariates, including years of fire service and trauma load.

Table 4

Standardized Regression Coefficients: Alternative Mediation Models

Y	Model	Model R²	β	<i>p</i>	Bootstrapped 95% CI	
1	AS → PCL-5 (a)	.23*	.661	<.001	.564	.758
	PCL-5 → DMQ-Coping (b)	.27*	.045	<.001	.037	.052
	AS → DMQ-Coping (c)	.11*	.046	<.001	.036	.056
	AS → DMQ-Coping (c')		.016	.002	.006	.027
	AS → PCL-5 → DMQ-Coping (a*b)		.211		.154	.274
2	PCL-5 → DMQ-Coping (a)	.26*	.050	<.001	.044	.057
	DMQ-Coping → AS (b)	.24*	.868	.002	.310	1.43
	PCL-5 → AS (c)	.23*	.326	<.001	.278	.374
	PCL-5 → AS (c')		.283	<.001	.228	.338
	PCL-5 → DMQ-Coping → AS (a*b)		.062		.007	.120
3	AS → PCL-5 (a)	.23*	.661	<.001	.564	.758
	PCL-5 → DMQ-Social (b)	.08*	.021	<.001	.010	.032
	AS → DMQ-Social (c)	.06*	.035	<.001	.022	.049
	AS → DMQ-Social (c')		.021	.007	.006	.037
	AS → PCL-5 → DMQ-Social (a*b)		.076		.033	.122
4	PCL-5 → DMQ-Social (a)	.07*	.028	<.001	.018	.038
	DMQ-Social → AS (b)	.24*	.532	.007	.149	.914
	PCL-5 → AS (c)	.23*	.326	<.001	.278	.374
	PCL-5 → AS (c')		.311	<.001	.262	.360
	PCL-5 → DMQ-Social → AS (a*b)		.021		.003	.043
5	AS → PCL-5 (a)	.23*	.661	<.001	.564	.758
	PCL-5 → DMQ-Conformity (b)	.14*	.014	<.001	.008	.020

	AS → DMQ-Conformity (c)	.10*	.030	<.001	.023	.038
	AS → DMQ-Conformity (c')		.021	<.001	.012	.029
	AS → PCL-5 → DMQ-Conformity (a*b)		.093		.042	.148
6	PCL-5 → DMQ-Conformity (a)	.10*	.021	<.001	.016	.026
	DMQ-Conformity → AS (b)	.26*	1.73	<.001	1.04	2.43
	PCL-5 → AS (c)	.23*	.326	<.001	.278	.374
	PCL-5 → AS (c')		.290	<.001	.240	.339
	PCL-5 → DMQ-Conformity → AS (a*b)		.052		.019	.092

Note. * $p < .001$. The standard error and 95% CI for a*b is obtained via bootstrapping with 10,000 resamples. PCL-5 (PTSD symptom severity) is the predictor in model 2, 4, and 6 and the mediator in model 1, 3, and 5. AS (anxiety sensitivity) is the predictor in model 1, 3, and 5 and the outcome variable in model 2, 4, and 6. DMQ-Coping (alcohol use coping motives) is the outcome mediator in model 1 and the mediator in model 2. DMQ-Social (alcohol use social motives) is the outcome mediator in model 3 and the mediator in model 4. DMQ-Conformity (alcohol use conformity motives) is the outcome mediator in model 5 and the mediator in model 6. CI (lower) is the lower bound of a 95% CI; CI (upper) is the upper bound of a 95% CI. Path a indicates effect of X on M; b, effect of M on Y; c, effect of X on Y; c', direct effect of X on Y, controlling for M. All total, direct, and indirect paths are noted after controlling for the variance accounted for by theoretically relevant covariates, including years of fire service and trauma load.

Table 5

Standardized Regression Coefficients: Mediation Models for Post Hoc Exploratory Analyses

Y	Model	Model R²	β	<i>p</i>	Bootstrapped 95% CI	
1	PCL-5 → AS-Physical (a)	.12*	.079	<.001	.062	.096
	AS-Physical → DMQ-Coping (b)	.26*	.015	.307	-.014	.045
	PCL-5 → DMQ-Coping (c)	.26*	.050	<.001	.044	.057
	PCL-5 → DMQ-Coping (c')		.049	<.001	.042	.056
	PCL-5 → AS-Physical → DMQ-Coping (a*b)		.012		-.022	.050
2	PCL-5 → AS-Physical (a)	.12*	.079	<.001	.062	.096
	AS-Physical → DMQ-Social (b)	.07*	.022	.322	-.021	.065
	PCL-5 → DMQ-Social (c)	.07*	.028	<.001	.018	.038
	PCL-5 → DMQ-Social (c')		.026	<.001	.016	.037
	PCL-5 → AS-Physical → DMQ-Social (a*b)		.013		-.016	.049
3	PCL-5 → AS-Physical (a)	.12*	.079	<.001	.062	.096
	AS-Physical → DMQ-Conformity (b)	.12*	.048	<.001	.024	.071
	PCL-5 → DMQ-Conformity (c)	.10*	.021	<.001	.016	.026
	PCL-5 → DMQ-Conformity (c')		.017	<.001	.012	.023
	PCL-5 → AS-Physical → DMQ-Conformity (a*b)		.053		.012	.102
4	PCL-5 → AS-Cognitive (a)	.26*	.127	<.001	.110	.143
	AS-Cognitive → DMQ-Coping (b)	.27*	.048	.002	.018	.078
	PCL-5 → DMQ-Coping (c)	.26*	.050	<.001	.044	.057
	PCL-5 → DMQ-Coping (c')		.044	<.001	.036	.052
	PCL-5 → AS-Cognitive → DMQ-Coping (a*b)		.061		.004	.128
5	PCL-5 → AS-Cognitive (a)	.26*	.127	<.001	.110	.143
	AS-Cognitive → DMQ-Social (b)	.07*	.020	.370	-.024	.064

	PCL-5 → DMQ-Social (c)	.07*	.028	<.001	.018	.038
	PCL-5 → DMQ-Social (c')		.025	<.001	.014	.037
	PCL-5 → AS-Cognitive → DMQ-Social (a*b)		.020		-.032	.075
6	PCL-5 → AS-Cognitive (a)	.26*	.127	<.001	.110	.143
	AS-Cognitive → DMQ-Conformity (b)	.12*	.048	<.001	.024	.071
	PCL-5 → DMQ-Conformity (c)	.10*	.021	<.001	.016	.026
	PCL-5 → DMQ-Conformity (c')		.015	<.001	.009	.021
	PCL-5 → AS-Cognitive → DMQ-Conformity (a*b)		.084		.011	.163
7	PCL-5 → AS-Social (a)	.17*	.121	<.001	.098	.143
	AS-Social → DMQ-Coping (b)	.27*	.038	.001	.016	.060
	PCL-5 → DMQ-Coping (c)	.26*	.050	<.001	.044	.057
	PCL-5 → DMQ-Coping (c')		.046	<.001	.038	.053
	PCL-5 → AS-Social → DMQ-Coping (a*b)		.047		.015	.084
8	PCL-5 → AS-Social (a)	.17*	.121	<.001	.098	.143
	AS-Social → DMQ-Social (b)	.10*	.072	<.001	.040	.104
	PCL-5 → DMQ-Social (c)	.07*	.028	<.001	.018	.038
	PCL-5 → DMQ-Social (c')		.019	<.001	.009	.030
	PCL-5 → AS-Social → DMQ-Social (a*b)		.068		.032	.109
9	PCL-5 → AS-Social (a)	.17*	.121	<.001	.098	.143
	AS-Social → DMQ-Conformity (b)	.13*	.039	<.001	.022	.057
	PCL-5 → DMQ-Conformity (c)	.10*	.021	<.001	.016	.026
	PCL-5 → DMQ-Conformity (c')		.016	<.001	.011	.022
	PCL-5 → AS-Social → DMQ-Conformity (a*b)		.066		.025	.111

Note. * $p < .001$. The standard error and 95% CI for a*b is obtained via bootstrapping with 10,000 resamples. PCL-5 (PTSD symptom severity) is the predictor in all models. AS-Physical (anxiety sensitivity physical concerns subscale) is the mediator in model 1, 2 and 3. AS-Cognitive (anxiety sensitivity cognitive concerns subscale) is the mediator in model 4, 5 and 6. AS-Social (anxiety sensitivity social

concerns subscale) is the mediator in model 7, 8 and 9. DMQ-Coping (alcohol use coping motives) is the outcome variable in model 1, 4 and 7. DMQ-Social (alcohol use social motives) is the outcome variable in model 2, 5, and 8. DMQ-Conformity (alcohol use conformity motives) is the outcome variable in model 3, 6, 9. CI (lower) is the lower bound of a 95% CI; CI (upper) is the upper bound of a 95% CI. Path a indicates effect of X on M; b, effect of M on Y; c, effect of X on Y; c', direct effect of X on Y, controlling for M. All total, direct, and indirect paths are noted after controlling for the variance accounted for by theoretically relevant covariates, including years of fire service and trauma load.

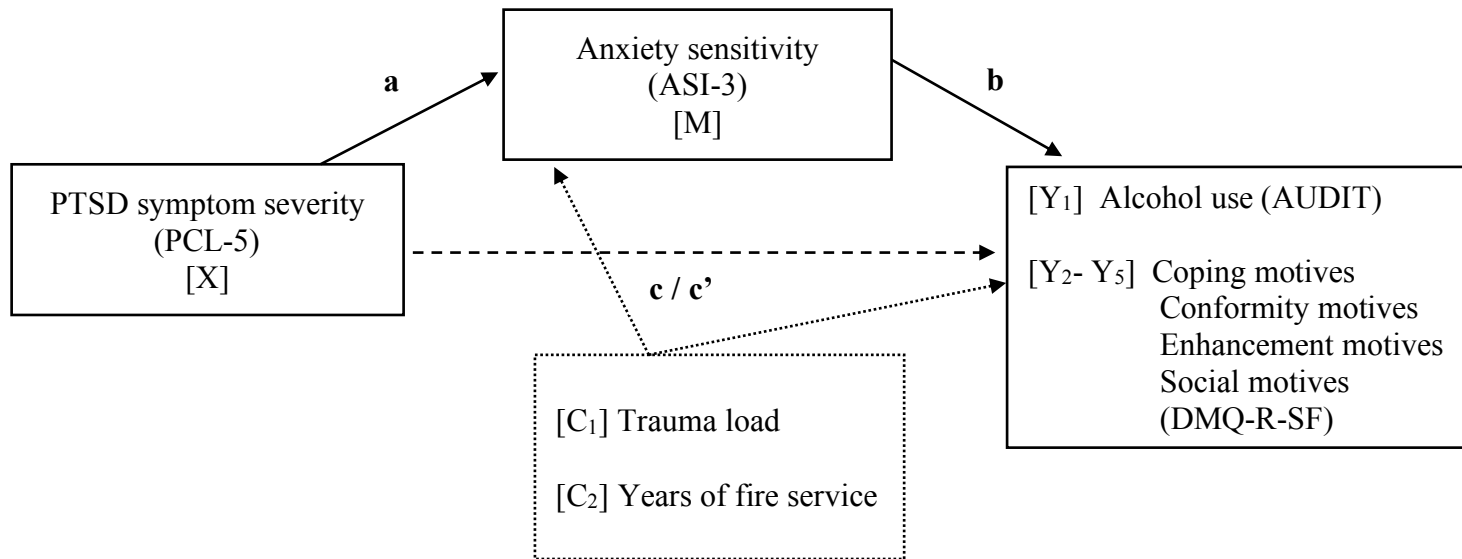


Figure 1. Theoretical model, whereby PTSD symptom severity is associated with alcohol use and coping-orientated alcohol use motives indirectly via anxiety sensitivity. No effects were expected for other alcohol use motives, including enhancement, conformity, and social motives. Covariates included number of traumatic event types (C_1) and number of years of service in the fire department (C_2). Note: a, direct effect of X on M; b, direct effect of M on Y; c, total effect of X on Y; c', direct effect of X on Y controlling for M; $a*b$, indirect effect of M.