# MILITARY VETERAN STATUS AND PTSD SYMPTOMATOLOGY AMONG URBAN FIREFIGHTERS: THE MODERATING ROLE OF EMOTION REGULATION DIFFICULTIES

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A Thesis

Presented to

The Faculty of the Department

of Psychology

University of Houston

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In Partial Fulfillment

Of the Requirements for the Degree of

Master of Arts

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By

Brooke A. Bartlett

May, 2018

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## ABSTRACT

Firefighters and veterans experience high rates of trauma and posttraumatic stress disorder (PTSD) symptomatology. The current study examined the moderating role of emotion regulation difficulties in the association between military veteran status and PTSD symptom severity in firefighters. Covariates included trauma load, number of years in the fire department, and depressive symptom severity. The sample was comprised of 839 (93.9% male; *M*age= 38.4, *SD*= 8.5) trauma-exposed firefighters who completed a web-based questionnaire battery. Structural equation modeling was employed. Results demonstrated no significant main effect for military veteran status with regard to PTSD symptom severity. Emotion regulation difficulties were significantly, positively associated with PTSD symptom severity. Significant interactive effects were noted; firefighters who endorsed military veteran status and higher levels of emotion regulation difficulties had the highest levels of PTSD symptom severity. Post-hoc analyses revealed that endorsing military veteran status was significantly associated with higher PTSD arousal symptoms. Further, greater emotion regulation difficulties were associated with greater levels of PTSD intrusion, PTSD avoidance, PTSD negative alterations in cognition and mood (NACM), and PTSD arousal symptoms. Significant interactions between military veteran status and emotion regulation difficulties in relation to PTSD NACM and PTSD arousal symptoms were noted, such that firefighters who endorsed military veteran status and higher levels of emotion regulation difficulties had the highest levels of PTSD NACM and PTSD arousal symptoms. Clinical and research implications are discussed.



Keywords: firefighters; PTSD; emotion regulation; military veteran

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# Introduction

## Trauma Exposure and PTSD among Firefighters

Firefighting is commonly acknowledged as a highly stressful and dangerous career. Along with intensive occupational stressors, such as over-night shifts that extend beyond 24 hours on the job (Saijo, Ueno, & Hashimoto, 2008), firefighters' duties involve life-threatening situations (Fullerton, McCarroll, Ursano, & Wright, 1992; Wagner, Heinrichs, & Ehlert, 1998). For example, firefighters often are exposed to incidents such as natural disasters, car accidents, terrorist attacks, explosions, fires, and hazardous materials (McCammon, 1996). Thus, they are often first-hand witnesses to mass-destruction, injury, mutilated bodies, grief, and death (Wagner et al., 1998). As a result, firefighters represent a uniquely vulnerable population repeatedly exposed to traumatic life events, as defined by the *Diagnostic and Statistical Manual of Mental Disorders- Fifth Edition* (DSM-5) posttraumatic stress disorder (PTSD) Criterion A (American Psychiatric Association [APA], 2013). Indeed, rates of trauma exposure are estimated to be approximately 91.5% among firefighters, with almost one-third reporting three or more traumatic event exposures (Meyer et al., 2012).

As a result of repeated exposures to trauma, firefighters are at high risk for the development of PTSD (Berger et al., 2011; Fullerton et al., 1992; Haslam & Mallon, 2003). It is estimated that the prevalence of PTSD among firefighters may be as high as 22.2% (Corneil, Beaton, Murphy, Johnson, & Pike, 1999). Several studies also have documented that firefighters report high rates of subclinical PTSD symptoms (Corrigan et al., 2009; Fullerton et al., 1992; Haslam & Mallon, 2003), which are associated with similar levels of impairment as a PTSD diagnosis (Pietrzak, Goldstein, Southwick, & Grant, 2011; Zlotnick, Franklin, & Zimmerman, 2002). Thus, it is important to better understand factors related to

varying levels of PTSD symptomatology among firefighters, an understudied and especially vulnerable population.

**Trauma Exposure, PTSD, and Occupational Stress among Military Veterans**

Military veteran status (MVS) is one factor of potential importance to better understanding PTSD symptomatology among firefighters. Although there is a dearth of research examining veteran subsamples among firefighter populations, previous studies have suggested that nearly half (44%) of U.S. firefighters are military veterans (Meyer et al., 2012). Similar to firefighters, veterans may experience repeated exposure to traumatic events during their military service. These traumatic events might include: military sexual trauma; witnessing or being exposed to death, dying, or harm to others or self; and killing during combat (Kimerling, Gima, Smith, Street, & Frayne, 2007; Maguen et al., 2011). A vast literature has documented that military veterans are at significantly increased risk for the development of PTSD and subclinical PTSD symptoms (Bremner, Southwick, Darnell, & Charney, 1996; Seal et al., 2009; Weiss et al., 1992), as compared to the general population (Kilpatrick et al., 2013). However, PTSD prevalence estimates among non-treatment seeking military personnel vary widely throughout the literature; and studies among representative samples suggest that approximately 13%-19.9% of military veterans meet diagnostic criteria for PTSD (Hoge et al., 2004; Seal, Bertenthal, Miner, Sen, & Marmar, 2007). Among treatment-seeking veterans, PTSD prevalence estimates are nearly 50% (Ramchand et al., 2010).

Aside from trauma, military veterans may experience increased levels of stress due to several types of unique duty-related experiences. Such experiences include deployment, strict physical fitness requirements, weight regulations, repeated relocations, frequent separation

from families, and intense work hours (Carlton, Manos, & Van Slyke, 2005; Drummet, Coleman, & Cable, 2003; Jacobson et al., 2009; Pflanz, 2002). For example, in a study examining occupational stress among military personnel unrelated to deployment and combat-related trauma (N = 472), 26% of the sample reported suffering from significant work stress, 15% reported that work stress was causing them significant emotional distress, and 8% reported experiencing work stress that was severe enough to damage their emotional health (Pflanz, 2002). Such findings indicate that along with unique military-related traumatic experiences, such as combat, other stressful characteristics of military culture may account for significant occupational stress among military veterans (Pflanz, 2002).

**Stress Sensitization Model**

Military status is conceptualized as a theoretical 'risk marker' for PTSD symptomatology in firefighters, above and beyond trauma load (i.e., total number of traumatic event types experienced). Notably, it is not MVS *per se* but rather the potentially stressful and traumatic events experienced by military veterans that may theoretically predispose firefighters to higher levels of PTSD symptomatology, as a result of progressively increased responsivity to additional traumas or stressors they endure as firefighters. This idea is supported by the stress sensitization model of PTSD (Hammen et al., 2000; Smid et al., 2012). Sensitization to stress is defined as an individual's enhanced reactivity to stressors as a result of prior exposure to extreme stressors (Hammen et al., 2000; Smid et al., 2012). Stress sensitization is thought to stem from a non-associative learning process, in which progressive amplifications of a response are produced via repeated administrations of an aversive stimulus (Hammen, Henry, & Daley, 2000; Post & Weiss, 1998). Several studies have supported the model by documenting that individuals with prior exposure to trauma,

adversity, or chronic stress are more likely to develop PTSD following subsequent exposures to traumatic or stressful events (Breslau, Chilcoat, Kessler, & Davis, 1999; Brewin, Andrews, & Gotlib, 1993; Smid et al., 2012). Among veteran populations, studies have shown that combat veterans with a higher number of traumatic experiences prior to their military service are more likely to suffer from worsened PTSD symptomatology when experiencing post-deployment or military service stressors (Bremner, Southwick, Johnson, Yehuda, & Charney, 1993; Smid, Kleber, Rademaker, Zuiden, & Vermetten, 2013). Similarly, combat veterans are more likely to develop PTSD if faced with post-deployment stressors (Bremner et al., 1993; Smid et al., 2013). Thus, individuals who begin a firefighter career with prior exposure to unique, military-related stressors and trauma (i.e., combat, deployment, intense work hours) may be particularly vulnerable to developing PTSD once exposed to the stressors of firefighting (i.e., responding to car accidents, natural disasters, terrorist attacks). However, no studies to date have tested this model among firefighters, specifically. Given the high rates of trauma exposure, chronic stress, and PTSD symptomatology among military veterans and the significant proportion of firefighters who served in the U.S. military, it is important to understand cognitive-affective processes – targetable via cognitive behavioral intervention -- that may exacerbate or amplify the association between MVS and PTSD symptoms among firefighters.

**Emotion Regulation Difficulties: Definition and Theory**

Emotion regulation (ER), broadly defined as one's ability to monitor, evaluate, and modulate emotional reactions in the face of ongoing demands or emotional stressors (Gratz & Roemer, 2004), is a cognitive-affective process pertinent to the development and maintenance of PTSD. ER is a broad-based construct that can be assessed using diverse

methodologies that encompass various ways of relating to and reacting to emotions (Seligowski, Lee, Bardeen, & Orcutt, 2015; Sloan & Kring, 2007). For purposes of this study, we will conceptualize ER according to a well-established operationalization that defines the construct as including: 1) the awareness and understanding of emotions, 2) the acceptance of emotions, 3) the ability to control impulsive behaviors and engage in goal-congruent behaviors in the context of distressing emotional experiences, and 4) accessible and flexible use of situationally appropriate ER strategies (Gratz & Roemer, 2004).

Exposure to traumatic events may evoke a variety of intense emotional responses (e.g., Rothbaum, Foa, Riggs, Murdock, & Walsh, 1992), such as fear, guilt, anger, and anxiety. As such, individuals exposed to trauma may therefore experience increased demands to regulate heightened negative emotions (Seligowski et al., 2015). Consequently, deficits in the ability to regulate emotions following exposure to a traumatic stressor may likely lead to greater appraisals of threat, reduced coping resources, and more intense emotional responding, all of which may increase the risk of PTSD onset and maintenance (Bardeen, Kumpula, & Orcutt, 2013). Further, by perceiving emotions as being uncontrollable (Frewen & Lanius, 2006), individuals may subsequently learn to fear internal and external cues that elicit emotional reactions (Bardeen et al., 2013), which may then induce avoidance of trauma-related experiences (Bardeen et al., 2013). Empirical models of PTSD propose that ER aimed at avoidance of trauma-related thoughts and memories increases the risk for greater PTSD symptom severity (Shipherd & Salters-Pedneault, 2008).

**Emotion Regulation Difficulties and PTSD**

Greater difficulties in ER have been associated with higher levels of PTSD symptom severity in trauma-exposed samples as documented in self-report, cross-sectional studies

(e.g., Ehring & Quack, 2010; Mazloom, Yaghubi, & Mohammadkhani, 2016; Tull, Barrett, McMillan, & Roemer, 2007), experimental laboratory paradigms (e.g., Badour & Feldner, 2013; Wagner, Roemer, Orsillo, & Litz, 2003; Weiss, Tull, & Gratz, 2014), and longitudinal designs (e.g., Bardeen et al., 2013; Ehring & Quack, 2010; Tull et al., 2007). Similar trends regarding the role of ER and PTSD have emerged across multiple research designs. Results based on longitudinal research suggest that poorer ER prior to and following exposure to a traumatic event is a significant predictor of worsened PTSD symptomatology among trauma-exposed samples (e.g., Bardeen et al., 2013; Orcutt, Bonanno, Hannan, & Miron, 2014). For example, difficulties in ER significantly predicted higher levels of PTSD symptomatology over a 2-year period among university students at a college campus affected by a mass shooting (Bardeen et al., 2013). In cross-sectional studies, PTSD has been associated with over-utilization of expressive suppression (e.g., the active prevention of or inhibiting of negative emotions) and under-utilization of cognitive reappraisal (e.g., actively changing maladaptive cognitions so as to change one's emotional responses; Eftekhari, Zoellner, & Vigil, 2009; Ehring & Quack, 2010; Moore, Zoellner, & Mollenholt, 2008). Taken together, research suggests that overall ER difficulties appear to have the strongest direct and indirect associations on PTSD, regardless of trauma type (e.g., interpersonal assault, natural disaster, motor vehicle accident, sexual assault) or sample (e.g., undergraduate, community, inpatient), even when controlling for variables such as negative affect (Badour & Feldner, 2013; Mazloom et al., 2016; Seligowski et al., 2015; Tull et al., 2007). These findings suggest that general ER difficulties, rather than specific facets of ER, may have the largest impact on those suffering from PTSD symptoms (Seligowski et al., 2015).

**Emotion Regulation Difficulties and PTSD among Military Veterans and Firefighters**

The majority of ER-PTSD research has been conducted among community-based and undergraduate samples. There is a relative dearth of literature investigating ER and PTSD relations among veteran and firefighter populations. Similar to non-veteran samples, over-utilization of expressive suppression and under-utilization of cognitive reappraisal have been shown to be significantly associated with PTSD symptom severity among veterans (Boden et al., 2013; Fitzgerald et al., 2016; Reber et al., 2013; Sippel, Roy, Southwick, & Fichtenholtz, 2016). Similarly, more frequent and intense withholding of emotional responses was significantly higher among combat veterans with PTSD in comparison to combat veterans without PTSD (Roemer, Litz, Orsillo, & Wagner, 2001). Further, ER difficulties were found to fully account for the relationship between PTSD and impulsive aggression among veterans seeking treatment for trauma-related sequelae (Miles, Menefee, Wanner, Teten Tharp, & Kent, 2016). In an experimental design comparing veterans with PTSD to a control group of veterans without PTSD, those with PTSD exhibited a greater likelihood of experiencing negative emotion and higher arousal, both when recalling traumatic memories and in response to trauma-unrelated emotional stimuli (Litz, Orsillo, Kaloupek, & Weathers, 2000). Further, a recent study (Kashdan, Breen, & Julian, 2010) found that greater emotional avoidance was significantly higher among veterans with PTSD compared to veterans without PTSD, and higher avoidance was related to lower overall well-being (i.e., feeling good about oneself, optimistic beliefs, and general joyfulness).

In a cross-sectional study of firefighters, fear of emotion, conceptualized as the anticipation of losing behavioral and emotional control during intense emotional states and indexed by the Affective Control Scale (Williams, Chambless, & Ahrens, 1997), was found

to be the strongest correlate of PTSD (Farnsworth & Sewell, 2011). Also among firefighters, limited access to ER strategies significantly mediated associations between insomnia and depression as well as nightmares and depression (Hom et al., 2016). Further, higher levels of emotional intelligence, defined as the ability to motivate oneself, regulate one's moods, and persist in the face of frustrations and distress (Goleman, 1998), was significantly negatively associated with PTSD symptomatology among firefighters, serving as a potential protective factor (Wagner & Martin, 2012). More recently, Levy-Gigi et al. (2016) found that among 69 firefighters, low but not high regulatory choice flexibility (i.e., the ability to choose regulatory options that suit contextual demands) showed a significant positive correlation between trauma exposure and PTSD symptomatology. Taken together, among both firefighter and veteran populations, greater ER difficulties are associated with higher PTSD symptomatology and associated outcomes (e.g., depressive symptoms). Hence, ER may be an important psychological process underlying the association between veteran status and PTSD among firefighters.

**Theoretical Model and Synthesis**

Theoretically, firefighters who served in the U.S. armed forces will enter the firefighting profession with higher levels of trauma exposure (e.g., combat) and longer periods of chronic stress (e.g., deployment, family separations, living in a war zone, military training) as a result of their military service. In accordance with the stress sensitization model (Bremner et al., 1993; Smid et al., 2013), firefighters' MVS will thus likely be associated with higher levels of PTSD symptom severity, since they will experience increasingly amplified responses to consequent traumas or stressors. In addition, firefighters with greater difficulties regulating emotions will be expected to report higher levels of PTSD symptom

severity, as consistent with past research (Farnsworth & Sewell, 2011; Wagner & Martin, 2012). MVS and ER difficulties therefore may serve a multiplicative effect with regard to PTSD symptoms, whereby firefighters with a history of military service who report higher levels of ER difficulties should theoretically report especially heightened PTSD symptom severity. That is, ER difficulties should exacerbate – or moderate – the association between history of military service (i.e., veteran status) and PTSD symptomatology. As compared to firefighters without a history of military service, MVS among firefighters is expected to be associated with greater PTSD symptom severity, especially at heightened levels of ER difficulties.

**Gaps in the Literature**

Several notable gaps in the literature have been noted. First, no studies to date have examined psychological correlates of MVS among firefighters. This is unfortunate since it is estimated that up to 44% of U.S. firefighters are military veterans (Meyer et al., 2012). Relatedly, no studies to date have examined associations between MVS and PTSD symptom severity or PTSD symptom cluster severity among firefighters. Given the high rates of PTSD among veteran and firefighter samples, awareness of pertinent correlates of PTSD among individuals who endorse both military veteran and firefighter status might effectively inform prevention efforts. Second, only two studies to date (Levy-Gigi et al., 2016; Wagner & Martin, 2012) have examined associations between ER difficulties and PTSD symptomatology among firefighters, despite the well-established associations in the larger traumatic stress literature. Examining psychological processes targetable via intervention, such as ER, has great potential to inform specialized cognitive-behavioral interventions for firefighters. Finally, no studies have examined the interplay of MVS and ER difficulties with

regard to PTSD symptoms among firefighters. Given that available research indicates a positive association between ER difficulties and PTSD symptom severity among veterans and firefighters, knowledge of a significant interplay between MVS and ER difficulties with regard to elevated PTSD symptoms among firefighters could serve as an important indicator for screening and intervention efforts.

**Study Aims and Hypotheses**

Therefore, the current study aimed to examine: (1) whether MVS among firefighters was significantly associated with PTSD symptomatology; (2) whether ER difficulties among firefighters were significantly associated with higher levels of PTSD symptom severity; and (3) whether greater ER difficulties moderated the association between MVS and PTSD symptom severity among firefighters. Specifically, it was hypothesized that endorsing MVS would be associated with higher PTSD symptom severity. Second, it was hypothesized that ER difficulties would be associated positively with PTSD symptom severity. Finally, it was hypothesized that higher levels of ER difficulties would moderate the association between MVS and PTSD symptom severity among firefighters. That is, it was expected that firefighters with MVS who also reported higher levels of ER difficulties would manifest the highest levels of PTSD symptom severity. All effects were expected above and beyond theoretically-relevant covariates, including trauma load (i.e., total number of traumatic event types experienced, including military combat), number of years in the fire department, and depressive symptom severity. Covariates were selected based on their well-established associations with PTSD symptomatology among firefighters (Berninger et al., 2010; Martin et al., 2017; Paulus, Vujanovic, Schumann, Smith, & Tran, 2017; Shalev et al., 1998; Suliman et al., 2009). These covariates were included to ensure that any observed effects of

MVS or ER difficulties were not better accounted for by these well-established correlates of PTSD symptomatology. Exploratory analyses were conducted to examine PTSD symptom cluster severity (i.e., PTSD intrusions, PTSD avoidance, PTSD negative alterations in cognitions and mood [NACM], and PTSD arousal symptoms) as independent outcomes in the model proposed above.

## Method

### Participants

This study was based upon a subset of data from a larger ongoing project examining stress and health-related behaviors among firefighters. Participants were comprised 839 firefighters. Participants were full-time or part-time firefighters at the Houston Fire Department (HFD); all firefighters at HFD perform emergency medical services. To be included in the study, participants must have: been 18 years of age or older, been current firefighters in the HFD, endorsed at least one PTSD Criterion A traumatic life event (APA, 2013), and consented to participating in the completion of all online questionnaires. Exclusionary criteria were comprised of inability to or unwillingness to provide informed consent for the completion of the online questionnaires. Please see Procedures section for more information.

### Measures

***Service demographics.*** The service demographics questionnaire is a measure created for the purposes of this study to collect information about the personnel in our sample. It consists of 17 self-report items about firefighter/EMS service, veteran status, and time served in the military (e.g., "How many years have you served as a firefighter or EMS?" and "Have you ever served on active duty in the U.S. Armed Forces?"). In the current study, MVS was

utilized as an observed variable, defined dichotomously as "0= non-military veteran/1= military veteran"; and this variable was utilized as a covariate in the current analyses.

***Difficulties in Emotion Regulation Scale- 16 Item Version*** *(DERS-16; Bjureberg et al., 2016)***.** The DERS-16 is a self-report measure, modified from the original 36-itemed DERS (Gratz & Roemer, 2004), which consists of 16 items measuring difficulties in ER. Respondents indicated how often each item applies to them (e.g., "When I'm upset, I feel ashamed with myself for feeling that way" and "When I'm upset, I feel out of control"), using a 5-point scale (1 = *almost never* to 5 = *almost always*). Total DERS-16 scores range from 16-80 with higher scores indicating greater difficulties in ER. The DERS-16 is a multidimensional assessment that includes five subscales that, when combined, yield a total score: (1) Lack of Emotional Clarity, (2) Difficulties Engaging in Goal-Directed Behavior, (3) Impulse Control Difficulties, (4) Limited Access to Effective ER Strategies, and (5) Nonacceptance of Emotional Responses. The DERS-16 has demonstrated high internal consistency ($\alpha$= .92) and test-retest reliability ($\rho_1$= 0.85; $p < .001$). The DERS-16 has demonstrated good convergent validity with measures of depression and anxiety (Henry & Crawford, 2005), self-harm (Gratz, 2001), and borderline personality disorder symptomatology (Bohus et al., 2001) scales, and good discriminant validity from affect intensity (Larsen & Diener, 1987), mindfulness (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006), and other emotion measures (Hamilton et al., 2009). Consistent with extant literature, the DERS-16 total score was used for the purposes of the current project to index global difficulties in ER (Banducci, Hoffman, Lejuez, & Koenen, 2014; Long Felton, Lilienfeld, & Lejuez, 2014; van Rheenen, Murray, & Rossell, 2015). In the current sample, internal consistency for DERS-16 total score was excellent ($\alpha$ = .95). A latent variable of the

DERS-16 was specified by utilizing all five subscales as indicators of the latent DERS total score; this variable was utilized as a predictor and moderator variable in the current analyses.

***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., 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 endorsed "happened to me", "witnessed it", or "part of my job" for a given item, the item was coded as positive exposure to the particular traumatic event type. The total number of exposures was summed to produce a variable indicating the total number of traumatic life event types each participant experienced (i.e., trauma load), which was included as a covariate (observed variable) in the proposed analyses. In the current sample, internal consistency for the trauma load experienced was excellent ($\alpha = .90$).

***PTSD Checklist-Civilian Version-5*** *(PCL-5; Blevins, Weathers, Davis, Witte, & Domino, 2015)*. 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 according to the *DSM-5*. Respondents were asked to rate each item on a 5-point 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 0-80, with higher scores indicating higher symptom severity. The current

literature recommends a PTSD diagnostic cut-off score of 33 (κ(.5) = .58; e.g., Bovin et al., 2015). The PCL-5 has demonstrated good internal consistency (α= .96), test-retest reliability (*r* = .84). The PCL-5 also has demonstrated good convergent validity with other PTSD symptom measures (e.g., Foa, Cashman, Jaycox, & Perry, 1997) and good discriminant validity with relevant measures, including the Personality Assessment Inventory (Morey, 2007). Internal consistency of PTSD symptom severity (PCL-5 total score) in the current sample was excellent (α = .97). As specified by the DSM-5 and assessed by the PCL-5, the symptom clusters of PTSD include: PTSD intrusions (α = .94; parcel 1: item 1; parcel 2: items 2, 3; parcel 4: items 4, 5), PTSD avoidance (α = .93; parcel 1: item 6; parcel 2: item 7), PTSD NACM (α =. 94; parcel 1: items 8, 9; parcel 2: items 10, 11; parcel 3: items 12, 13, 14), and PTSD arousal and reactivity (α = .91; parcel 1: items 15, 16; parcel 2: items 17, 18; parcel 3: items 19, 20; APA, 2013), all of which were utilized as latent variables modeled by item-specific indicators in exploratory analyses. A latent PTSD symptom severity variable from the PCL-5 was specified by utilizing these four symptom clusters as indicators in the main analyses. PTSD symptom severity and PTSD symptom cluster severity (four symptom clusters) were included as outcome variables in the current analyses.

***Center for Epidemiological Studies Depression Scale*** *(CES-D; Radloff, 1977)*. The CES-D is a 20-item self-report measure used to assess depressive symptom severity. Items are scored on a four-point scale ranging from 0 ("rarely or none of the time / less than 1 day") to 3 ("most or all of the time / 5 to 7 days") in regard to the frequency in which individuals have been bothered by the symptom in the past week. Total symptom severity scores range from 0-60, with higher scores indicating higher depressive symptom severity. The CES-D has demonstrated high internal consistency in the general (α = .85) and patient

($\alpha$ = .90) population, moderate test-rest reliability (*r*'s = .45 - .70), and good convergent and discriminant validity. In the current sample, internal consistency of the CES-D was good ($\alpha$ = .89). The current study utilized the CES-D total symptom severity score as an observed variable; and this variable was included as a covariate in the present analyses.

**Procedures**

This study was based upon ongoing data collection on stress and health behaviors in firefighters. All firefighters were recruited for participation in the parent study 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. Prizes included $50 - $100 restaurant gift cards, iPic Theaters movie passes, and Yeti Tumblers. Monthly reminders regarding the survey were sent via the HFD department-wide email notification system. All 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 continuing education 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 delineates all aspects of the study. Those who did not wish to participate and consent to the study are given the option to indicate (by clicking 'no') that they did not wish to participate. Participants who indicated that they were interested in participating (by clicking 'yes') were directed to the informed consent form. Once they electronically signed off on the consent form, they were asked to select the time and place for completion of all online survey questionnaires in Qualtrics. The total amount of time required for participation in this study is estimated to be

45-60 minutes. Firefighters could discontinue participation at any time without penalty. The study was approved by the University of Houston Institutional Review Board and the HFD.

**Data Analytic Plan**

Preliminary analyses were conducted using IBM SPSS version 24.0. Preliminary analyses evaluated descriptive statistics and bivariate correlations among all study variables. In addition, independent samples t-tests were utilized to evaluate differences between military veterans and non-veterans on variables of interest, including trauma-related variables (e.g., number of trauma exposure types), depressive symptoms, and number of years in the fire department.

Main and exploratory analyses were conducted using structural equation modeling (SEM) in Mplus version 8.0 (Muthén & Muthén, 2017). First, the measurement model with two latent variables (ER difficulties, PTSD symptom severity) was evaluated using confirmatory factor analysis (CFA). Second, the effects of chosen covariates (trauma load, years with the fire department, depressive symptom severity) on PTSD symptom severity were examined. Third, incremental main effects of MVS (0 = non-military veteran, 1 = military veteran) and ER difficulties on PTSD symptom severity were evaluated in a SEM framework, over and above covariates; paths between covariates, MVS, and ER difficulties were also evaluated. Fourth, interactive associations of MVS and ER difficulties on PTSD symptom severity were evaluated. Finally, a series of exploratory analyses was conducted substituting the four PTSD symptom clusters in the models as outcomes, in lieu of global PTSD symptom severity. To do so, the measurement model with four additional latent variables (PTSD intrusions, PTSD avoidance, PTSD NACM, PTSD arousal) was evaluated

using CFA. Then, SEM was used to evaluate the models proposed above, using the same covariates.

Model fit was assessed using root mean square error (RMSEA), Comparative Fit Index (CFI), and Tucker-Lewis Index (TLI). RMSEA values of .05 or lower indicate close fit with values of .05-.08 indicating acceptable fit. RMSEA should ideally be between .02-.07 (Browne & Cudeck, 1992). CFI and TLI should be > .90 (Marsh & Hau, 1996). Significance of effects were determined using 95% confidence intervals (CI), although *p*-values are also provided for each analysis.

## Results

For descriptive statistics and bivariate correlations among all study variables, see Tables 1 and 2. MVS was significantly, positively associated with depressive symptom severity (small magnitude correlation; $r$ =.08, $p$< .05), ER difficulties (small magnitude correlation; $r$ =.14, $p$< .001), and PTSD symptom severity (small magnitude correlation; $r$ = .13, $p$< .001). ER difficulties were significantly, positively associated with depressive symptom severity (large magnitude correlation; $r$ = .51, $p$<.001), trauma load (small magnitude correlation; $r$ = .12, $p$=.001), and PTSD symptom severity (large magnitude correlation; $r$ = .54, $p$<.001). Descriptive statistics and bivariate correlations among covariates and indicators are available in Supplementary Table A. Independent samples t-tests were conducted among all study variables (see Table 3). Significant between-group differences for military veterans and non-veterans were found for depressive symptoms severity t(837) = -2.24, $p$= .03; trauma load t(385.21) = -2.12, $p$= .04; ER difficulties t(275.269) = -3.67, $p$< .001; and PTSD symptom severity t(286.327) = -3.31, $p$= .00. No

between group differences were found for years in the fire department t(462.743) = 0.69, $p$= .49.

**Main Analyses: PTSD Symptom Severity**

Unstandardized parameter estimates from the path analysis are provided in Table 4. Standardized estimates are presented in the text below.

***Measurement model.*** The measurement model demonstrated good fit to the data: [ $\chi^2(26) = 98.342$, $p < .001$; RMSEA = .058; CFI = .971; TLI = .960, SRMR=.027]. All indicators loaded well onto respective latent variables with standardized factor loadings ranging from .706 to .943 (see Figure 1). The correlation between PTSD symptom severity and ER difficulties was statistically significant and positive.

***Covariate effects model.*** The model demonstrated good fit to the data: [ $\chi^2(11) = 84.173$, $p < .001$; RMSEA = .089; CFI = .961; TLI = .936, SRMR=.019]. Trauma load (small magnitude effect; $\beta$=.06, CI [.00, .12], $p$=.038) and depressive symptom severity (large magnitude effect; $\beta$=.66, CI [.61, .72], $p$<.001) were significantly associated with PTSD symptom severity, with depressive symptom severity providing a higher degree of magnitude association, as compared to trauma load. Years in the fire department ($\beta$=.03, CI [-.00, .07], $p$=.271) was not statistically significantly related to PTSD symptom severity. Together, covariates accounted for 44.8% of variance in PTSD symptom severity.

***Main effects of military veteran status and emotion regulation difficulties.*** The model demonstrated good fit to the data: [ $\chi^2(55) = 198.189$, $p < .001$; RMSEA = .056; CFI = .962; TLI = .950, SRMR=.032]. Greater difficulties in ER (large magnitude effect; $\beta$=.30, CI [.20, .41], $p$<.001) were related to greater PTSD symptom severity, above and beyond covariates, while no main effect was observed for MVS (small magnitude effect; $\beta$=.04, CI [-

.01, .09], $p$=.151). Among the covariates, only depressive symptom severity remained related to greater PTSD symptom severity with main effects in the model (large magnitude effect; $\beta$=.50, CI [.41, .58], $p$<.001), while years in the fire department (small magnitude effect$\beta$=.03, CI [-.02, .07], $p$=.199) and trauma load were not significantly related (small magnitude effect; $\beta$=.03, CI [-.02, .09], $p$=.254); the magnitude of the effect for depressive symptom severity was relatively unchanged by addition of other variables into the model. After accounting for covariates, military veteran status and ER difficulties jointly accounted for an additional 6.7% variance in PTSD symptom severity.

***Interactive effects of military veteran status and emotion regulation difficulties.*** The interaction term between MVS and ER difficulties in step 3 of the moderation model was also positively related to PTSD symptom severity (small magnitude effect; $\beta$=.07, CI [.01, .14], $p$=.020). Upon further probing of the interaction, the relation of MVS and ER difficulties was strongest at high levels of ER difficulties and weakened as ER difficulties decreased (see Figure 2). Greater difficulties in ER ($\beta$=.25, CI [.13, .37], $p$<.001) remained significantly related to greater PTSD symptom severity in step 3 of the model, while no main effect was observed for MVS ($\beta$=-.04, CI [-.11, .03], $p$=.284); the magnitude of effect of ER difficulties was relatively unchanged with the addition of the interaction term in the model. Among covariates, depressive symptom severity was related to PTSD symptom severity (large magnitude effect; $\beta$=.50, CI [.42, .56], $p$<.001), while years in the fire department (small magnitude effect; $\beta$=.03, CI [-.02, .07], $p$=.219) and trauma load (small magnitude effect; $\beta$=.03, CI [-.02, .09], $p$=.234) were not significantly related. The variance was relatively unchanged by addition of the interaction term in the model ($R^{2=}$ .511).

**Exploratory Analyses: PTSD Intrusion Symptoms**

Unstandardized parameter estimates from the path analysis are provided in Table 5. Standardized estimates are presented in the text below.

***Measurement model.*** The measurement model demonstrated good fit to the data: [ $\chi^2(94) = 290.987$, $p < .001$; RMSEA = .050; CFI = .962; TLI = .951, SRMR=.030]. All indicators loaded well onto respective latent variables with standardized factor loadings ranging from .706 to .932 (see Figure 3).

***Covariate effects.*** The model demonstrated good fit to the data: [ $\chi^2(59) = 227.500$, $p < .001$; RMSEA = .058; CFI = .963; TLI = .944, SRMR=.022]. Depressive symptom severity (large magnitude effect; $\beta$=.57, CI [.50, .64], $p$<.001) and trauma load (small magnitude effect; $\beta$=.06, CI [.00, .13], $p$=.051) were significantly related to PTSD intrusion symptoms, while years in the fire department were not significantly related (small magnitude effect; $\beta$=.03, CI [-.02, .08], $p$=.234); depressive symptom severity provided a higher degree of magnitude association, in comparison to trauma load, with PTSD intrusion symptoms. Together, covariates accounted for 33.9% of variance in PTSD intrusion symptoms

***Main effects of military veteran status and emotion regulation difficulties.*** The model demonstrated good fit to the data: [ $\chi^2(139) = 417.968$, $p < .001$; RMSEA = .049; CFI = .959; TLI = .946, SRMR=.030]. Greater ER difficulties (large magnitude effect; $\beta$=.27, CI [.16, .38], $p$<.001) were related to PTSD intrusion symptoms, above and beyond covariates, while MVS was not significantly related (small magnitude effect; $\beta$=.04, CI [-.02, .10], $p$=.152). Depressive symptom severity ($\beta$=.43, CI [.33, .52], $p$<.001) remained significantly related to PTSD intrusion symptoms, while years in the fire department ($\beta$=.03, CI [-.02, .08], $p$=.188) and trauma load ($\beta$=.04, CI [-.03, .10], $p$=.234) were not significantly related; the magnitude of the effect for depressive symptom severity was relatively unchanged by

addition of other variables into the model. After accounting for covariates, MVS and ER difficulties jointly accounted for an additional 5.3% variance in PTSD intrusion symptoms.

***Interactive effects of military veteran status and emotion regulation difficulties.*** The interaction of MVS and ER difficulties in step 3 of the model was not significantly related to PTSD intrusion symptoms ($\beta$=.08, CI [-.02, .16], $p$=.057). Greater ER difficulties remained significantly related to PTSD intrusion symptoms in step 3 of the model ($\beta$=.21, CI [.08, .33], $p$=.001), while MVS did not ($\beta$=-.04, CI [-.13, .04], $p$=.330); the magnitude of effect for ER difficulties remained relatively unchanged with addition of the interaction term in the model. Depressive symptom severity remained significantly related to PTSD intrusion symptoms in step 3 of the model (large magnitude effect; $\beta$=.43, CI [.33, .52], $p$<.001), while years in the fire department (small magnitude effect; $\beta$=.03, CI [-.02, .08], $p$=.204) and trauma load (small magnitude effect; $\beta$=.04, CI [-.02, .10], $p$=.216) were not significantly related. The variance was relatively unchanged by addition of the interaction term in the model ($R^{2=}$ .387).

**Exploratory Analyses – PTSD Avoidance Symptoms**

***Measurement Model.*** The measurement model demonstrated good fit to the data: [ $\chi^2(94) = 290.987$, $p < .001$; RMSEA = .050; CFI = .962; TLI = .951, SRMR=.030]. All indicators loaded well onto respective latent variables with standardized factor loadings ranging from .706 to .959 (see Figure 3).

***Covariate effects.*** The model demonstrated good fit to the data: [ $\chi^2(59) = 227.500$, $p < .001$; RMSEA = .058; CFI = .963; TLI = .944, SRMR=.022]. Trauma load (small magnitude effect; $\beta$=.06, CI [.01, .13], $p$=.051) and depressive symptom severity (large magnitude effect; $\beta$=.57, CI [.46, .59], $p$<.001), but not years in the fire department (small magnitude effect; $\beta$=.00, CI [-.05, .05], $p$=.966), were significantly related to PTSD

avoidance symptoms, with depression symptom severity providing a greater degree of magnitude in relation to PTSD avoidance symptoms. Together, covariates account for 28.3% of variance in PTSD avoidance symptoms.

***Main effects of military veteran status and emotion regulation difficulties.*** The model demonstrated good fit to the data: [ $\chi^2(139) = 417.968$, $p < .001$; RMSEA = .049; CFI = .959; TLI = .946, SRMR=.030]. ER difficulties (large magnitude effect; $\beta$=.31, CI [.20, .42], $p$<.001), but not MVS (small magnitude effect; $\beta$=.03, CI [-.03, .08], $p$=.376), were related to PTSD avoidance symptoms. Years in the fire department (small magnitude effect; $\beta$=.00, CI [-.05, .06], $p$=.890) and trauma load (small magnitude effect; $\beta$=.04, CI [-.01, .01], $p$=.136) were not significantly related to PTSD avoidance symptoms in step 2 of the model, while depressive symptom severity remained significantly associated ($\beta$=.36, CI [.27, .45], $p$<.001). After accounting for covariates, MVS and ER difficulties jointly accounted for an additional 6.8% variance in PTSD avoidance symptoms.

***Interactive effects of military veteran status and emotion regulation difficulties.*** The interaction effect was not significantly related to PTSD avoidance symptoms in step 3 of the model (small magnitude effect; $\beta$=.08, CI [-.01, .16], $p$=.070), nor were years in the fire department (small magnitude effect; $\beta$=.00, CI [-.05, .05], $p$=.934) or trauma load (small magnitude effect; $\beta$=.04, CI [-.01, .10], $p$=.124). Depressive symptom severity remained positively related to PTSD avoidance symptoms in step 3 of the model ($\beta$=.36, CI [.27, .45], $p$<.001), with the magnitude of the effect for depressive symptom severity remaining relatively unchanged by addition of other variables into the model. ER difficulties ($\beta$=.25, CI [.12, .39], $p$<.001), but not MVS ($\beta$=-.05, CI [-.14, .03], $p$=.200), remained significantly associated with PTSD avoidance symptoms in step 3 of the model; the magnitude of the

effect of ER difficulties was relatively unchanged by the addition of the interaction term in the model. The variance was relatively unchanged by addition of the interaction term in the model ($R^{2=}$ .345).

**Exploratory Analyses – PTSD NACM Symptoms**

***Measurement Model.*** The measurement model demonstrated good fit to the data: [ $\chi^2(94) = 290.987$, $p < .001$; RMSEA = .050; CFI = .962; TLI = .951, SRMR=.030]. All indicators loaded well onto respective latent variables with standardized factor loadings ranging from .706 to .902 (see figure 3).

***Covariate effects.*** The model demonstrated good fit to the data: [ $\chi^2(59) = 227.500$, $p < .001$; RMSEA = .058; CFI = .963; TLI = .944, SRMR=.022]. Depressive symptom severity was significantly related to PTSD NACM (large magnitude effect; $\beta$=.70, CI [.64, .75], $p$<.001), while years in the fire department (small magnitude effect; $\beta$=.03, CI [-.01, .08], $p$=.197) and trauma load (large magnitude effect; $\beta$=.05, CI [-.01, .10], $p$=.118) were not significantly related. Together, covariates accounted for 49.2% of variance in PTSD NACM symptoms.

***Main effects of military veteran status and emotion regulation difficulties.*** The model demonstrated good fit to the data: [ $\chi^2(139) = 417.968$, $p < .001$; RMSEA = .049; CFI = .959; TLI = .946, SRMR=.030]. ER difficulties (large magnitude effect; $\beta$=.30, CI [.20, .41], $p$<.001) were positively related to PTSD NACM, above and beyond covariates, while MVS was not significantly related (small magnitude effect; $\beta$=.02, CI [-.03, .08], $p$=.414). Depressive symptom severity remained significantly related to PTSD NACM in step 2 of the model (large magnitude effect; $\beta$=.53, CI [.45, .62], $p$<.001), while years in the fire department (small magnitude effect; $\beta$=.03, CI [-.01, .08], $p$=.141) and trauma load (small

magnitude effect; $\beta$=.02, CI [-.04, .07], $p$=.529) were not significantly related; the magnitude of the effect for depressive symptom severity was relatively unchanged by addition of other variables into the model. After accounting for covariates, MVS and ER difficulties jointly accounted for an additional 6.6% of variance in PTSD NACM symptoms.

***Interactive effects of military veteran status and emotion regulation difficulties.*** The interaction effect of MVS and ER difficulties was related to PTSD NACM (small magnitude effect; $\beta$=.06, CI [.00, - .12], $p$=.047), in that greater levels of ER difficulties were related to a greater PTSD NACM (see figure 4). ER difficulties (large magnitude effect; $\beta$=.26, CI [.14, .38], $p$<.001) and depressive symptom severity remained significantly related to PTSD NACM in step 3 of the model ($\beta$=.54, CI [.46, .62], $p$<.001), while MVS (small magnitude effect; $\beta$=-.04, CI [-.11, .03], $p$=.260), years in the fire department (small magnitude effect; $\beta$=.03, CI [-.01, .08], $p$=.153) and trauma load (small magnitude effect; $\beta$=.02, CI [-.04, .08], $p$=.503) remained not significantly related. The magnitude of effect for ER difficulties remained relatively unchanged with the addition of the interaction term in the model. Covariates accounted for 55% of variance in PTSD NACM in step 3 of the model. The variance was relatively unchanged by addition of the interaction term in the model ($R^{2=}$ .554).

**Exploratory Analyses – PTSD Arousal Symptoms**

***Measurement Model.*** The measurement model demonstrated good fit to the data: [ $\chi^2(94) = 290.987$, $p < .001$; RMSEA = .050; CFI = .962; TLI = .951, SRMR=.030]. All indicators loaded well onto respective latent variables with standardized factor loadings ranging from .706 to .913 (see figure 3).

***Covariate effects.*** The model demonstrated good fit to the data: [ $\chi^2(59) = 227.500$, $p < .001$; RMSEA = .058; CFI = .963; TLI = .944, SRMR=.022]. Trauma load (small

magnitude effect; $\beta$=.07, CI [.01, .12], $p$=.022) and depressive symptom severity (large magnitude effect; $\beta$=.64, CI [.58, .70], $p$<.001) were significantly positively related to PTSD arousal symptoms, while years in the fire department was not significantly related ($\beta$=.02, CI [-.03, .07], $p$=.450); depressive symptom severity was more strongly associated with PTSD arousal symptoms in comparison to trauma load. Together, covariates accounted for 42.3% of variance in PTSD arousal symptoms.

***Main effects of military veteran status and emotion regulation difficulties.*** The model demonstrated good fit to the data: [ $\chi^2(139) = 417.968$, $p < .001$; RMSEA = .049; CFI = .959; TLI = .946, SRMR=.030]. ER difficulties (large magnitude effect; $\beta$=.26, CI [.15, .37], $p$<.001) and MVS (small magnitude effect; $\beta$=.08, CI [.02, .14], $p$=.007) were related to PTSD arousal symptoms, above and beyond covariates. Depressive symptom severity (large magnitude effect; $\beta$=.50, CI [.41, .59], $p$<.001) remained significantly, positively related to PTSD arousal symptoms in step 2 of the model, while years in the fire department (small magnitude effect; $\beta$=.02, CI [-.02, .07], $p$=.350) and trauma load (small magnitude effect; $\beta$=.04, CI [-.02, .09], $p$=.175) were not significantly related; the magnitude of the effect for depressive symptom severity was relatively unchanged by addition of other variables into the model. After accounting for covariates, MVS and ER difficulties jointly accounted for an additional 5.6% of variance in PTSD arousal symptoms.

***Interactive effects of military veteran status and emotion regulation difficulties.*** The interaction of MVS and ER difficulties was significantly associated with PTSD arousal symptoms (small magnitude effect; $\beta$=.08, CI [.01, .15], $p$=.026), in that being a military veteran with greater ER difficulties led to greater PTSD arousal symptoms (see Figure 5). Depressive symptom severity (large magnitude effect; $\beta$=.50, CI [.42, .59], $p$<.001) and ER

difficulties ($\beta$=.20, CI [.07, .33], $p$=.002) remained significant in relation to PTSD arousal symptoms in step 3 of the model; the magnitude of effect for depressive symptom severity and ER difficulties remained relatively unchanged with the addition of the interaction term in the model. MVS ($\beta$=-.01, CI [-.09, .08], $p$=.906), years in the fire department ($\beta$=.02, CI [-.03, .07], $p$=.381) and trauma load ($\beta$=.04, CI [-.02, .10], $p$=.158) were remained not significantly related. The variance was relatively unchanged by addition of the interaction term in the model ($R^{2=}$ .475).

## Discussion

The current study aimed to examine the main and interactive effects of MVS and ER difficulties with regard to PTSD symptom severity among firefighters. Hypotheses were largely supported by the data. Results and future implications are discussed below.

### PTSD Symptom Severity: Main Analyses

***Military veteran status.*** First, inconsistent with our hypothesis, a significant main effect was not found with regard to MVS and PTSD symptom severity ($\beta$=.04, CI [-.09, .04],). Notably, however, MVS was significantly associated (small magnitude correlation) with PTSD symptom severity at the bivariate level ($r$ = .13, $p$< .001). This is inconsistent with prior, albeit scarce, research which found that firefighters who endorsed serving in the armed forces did not have significantly higher levels of PTSD symptomatology in comparison to firefighters who did not serve in the armed forces at the bivariate level (Martin et al., 2017; Paulus, Vujanovic, Schuhmann, Smith, & Tran, 2017). It is important to note, however, that the main effect was non-significant and the magnitude of effect based on the significant correlation is rather small. Therefore, despite statistical significance of bivariate associations, the correlation magnitude indicates that differences in PTSD symptom severity

among military veteran as compared to non-veteran firefighters may actually be negligible, highlighting similarities in the findings of the current study and prior examinations.

Theoretically, it is possible that by virtue of their interest in pursuing intrinsically stressful careers marked by chronic exposure to trauma and unpredictability, military veterans who self-select into the fire service may be especially resilient to the development of certain adverse psychopathology, such as PTSD symptomatology. If true, these findings highlight the importance of future research examining resilience characteristics among military veterans who pursue a career in firefighting. Further, we did not utilize specific information regarding characteristics of military service (e.g., number of deployments, combat exposure) that might increase the potential for a greater number of exposures to traumatic events. Thus, for the purposes of this study, we cannot deduce how many individuals in our military veteran firefighter subsample may have experienced stressors unique to the military (e.g., killing during combat; witnessing dead, dying, or wounded bodies) during their service that could potentially lead to increased PTSD symptom severity. Given these findings and the scarcity of literature focused upon this extremely unique population, it is imperative that future research continue to explore how prior service in the military may impact psychological functioning correlates such as PTSD symptomatology.

***Emotion regulation difficulties.*** Second, a significant main effect ($\beta$=.30; CI [.20, .41]) was found with regard to ER difficulties and PTSD symptom severity. ER difficulties were also significantly related to PTSD symptom severity at the bivariate level ($r$ = .54, $p$< .001), both findings providing large magnitudes of effect. Thus, firefighters with greater difficulties regulating emotion may be more likely to experience higher levels of PTSD symptom severity (and vice versa). These results are consistent with prior research that has

found positive associations between ER difficulties and PTSD symptom severity among trauma-exposed populations in cross-sectional studies (e.g., (Ehring & Quack, 2010; Mazloom et al., 2016; Tull, Bardeen, DiLillo, Messman-Moore, & Gratz, 2015), experimental laboratory paradigms (e.g., Badour & Feldner, 2013; Wagner, Roemer, Orsillo, & Litz, 2003; Weiss, Tull, & Gratz, 2014), and longitudinal designs (e.g., Bardeen et al., 2013; Tull et al., 2007). Our findings are also consistent with existing research conducted among firefighters that found significant negative associations between specific adaptive facets of ER (e.g., emotional intelligence, regulatory choice flexibility) and PTSD/trauma exposure (Levy-Gigi et al., 2016; Wagner & Martin, 2012). Indeed, our findings build upon the current literature by supporting the notion that, among firefighters, ER difficulties may have a large impact on those suffering from PTSD symptoms (Seligowski et al., 2015). Future research should further examine ER difficulties and their association with PTSD symptomatology among firefighters, as cognitive-behavioral interventions designed for firefighters that specifically target ER may prove beneficial for preventing and treating PTSD symptomology among firefighters.

***Interaction of military veteran status and emotion regulation difficulties.*** Third, there was a significant interaction between MVS and ER in relation to PTSD symptom severity ($\beta$=.07, CI [.01, .14]). However, it is important to note that this finding provided a rather small magnitude of effect. As hypothesized, the association between MVS and PTSD symptom severity was strongest at the highest levels of ER difficulties. Thus, although MVS was not significantly related to PTSD symptom severity, the multiplicative effect of MVS and ER difficulties conferred a significant association with PTSD symptom severity. Firefighters who were military veterans and who reported heightened ER difficulties

manifested the highest levels of PTSD symptom severity. Results highlight the potential for developing PTSD symptomatology among firefighters who once served in the military by showcasing relevant associations with MVS and relevant psychological mechanisms, such as ER. Indeed, the additive strain placed on veterans entering a firefighter career via occupational stressors and potential chronic exposures to traumatic events, either by prior military service or current fire service, may place them at an increased risk for the development of PTSD symptomatology. What is more, firefighters who perceive themselves less capable of regulating their emotions when distressed may be more likely to develop heightened PTSD symptomatology. As such, our findings highlight clinically-relevant implications, in that firefighters who present with a history of military service and higher levels of PTSD symptomatology may benefit from receiving treatment that incorporates ER-enhancement skills. To date, this is the first study to examine the multiplicative effect of MVS and ER difficulties in relation to PTSD symptom severity among firefighters. It is imperative that future work examine the association between MVS and relevant cognitive mechanisms so as to potentially decrease risk for the development of PTSD symptomatology via effective screening, intervention and prevention programs.

***Covariates.*** First, trauma load was significantly related ($\beta$=.06, CI [.00, .12]), with a small magnitude of effect, to greater levels of PTSD symptom severity, as consistent with extant literature. For example, trauma load, commonly defined as the number of potentially traumatic event exposures, has been found to be a strong risk factor for the development of PTSD symptomatology in meta-analyses conducted among trauma-exposed samples (Brewin, Andrews, & Valentine, 2000; Ozer, Best, Lipsey, & Weiss, 2003) as well as

firefighters (Bartlett et al., 2018). Of note, trauma load did not remain significantly related to PTSD symptom severity when examining all variables in the model.

Second, depressive symptom severity was also significantly related ($\beta$=.66, CI [.61, .72]) to greater levels of PTSD symptom severity, and continued to be significantly related ($\beta$=.50, CI [.41, .58]) when examining all variables in the model. Further, it is important to note that the magnitude of effect for depressive symptom severity was considerably larger than that of trauma load. The association between depression and PTSD symptomatology has been well-documented among veteran (Luxton, Skopp, & Maguen, 2010), trauma-exposed community (Shalev et al., 1998), Holocaust survivor (Yehuda et al., 1995), and firefighter samples (Martin et al., 2017; Paulus et al., 2017).

Lastly, years in the fire department (small magnitude effect; $\beta$=.03, CI [-.00, .07]) was not significantly related to PTSD symptom severity. The available research on the association between number of years in the fire department and PTSD symptomatology is mixed, with several past studies finding a significant positive relationship between years of fire service and PTSD symptoms (Chang et al., 2003; Corneil et al., 1999; Wagner, Heinrichs, & Ehlert, 1998b), and more recent studies finding a non-significant, negative association between years of service in the fire department and PTSD symptom severity (Martin et al., 2017; Paulus et al., 2017). As such, further exploration of the association between the number of years served in the fire department and PTSD symptom severity is warranted.

**Exploratory Analyses**

***Military veteran status.*** First, post-hoc analyses revealed a significant relationship ($\beta$=.08, CI [.02, .14]) between MVS and PTSD arousal symptoms, albeit with a small

magnitude of effect. Findings suggest that firefighters who once served in the military may manifest greater levels of PTSD arousal symptoms in comparison firefighters who did not serve in the military. There was no significant relationship between MVS and PTSD intrusion ($\beta$=.04, CI [.02, .10]), PTSD avoidance ($\beta$=.03, CI [-.03, .08]), or PTSD NACM symptoms ($\beta$=.02, CI [-.03, .08]); all of which also provided small magnitude of effects. It is possible that a significant main effect of MVS was only found in relation to PTSD arousal symptoms due to the constellation of symptoms that the PTSD arousal cluster consists of (e.g., "being 'superalert' or watchful or on guard"; "taking too many risks or doing things that could cause you harm"; "trouble falling or staying asleep"). The inherent nature of a military and firefighting profession constitutes the potential of putting oneself at risk or doing things that could cause one harm (e.g., combat, running into a burning building). Further, both professions may require, for adaptive purposes, one to develop heightened levels of alertness, irregular sleep patterns (e.g., sleep disturbances), or tendencies to remain "on guard" resulting in being "jumpy" or easily startled. As such, firefighters with a history of service in the military may possess heightened levels of PTSD arousal-based symptomatology due to the demands of both professions. Other possible explanations include that firefighters might have underreported PTSD symptoms, that firefighters misunderstood the PTSD arousal items of the PCL-5, or that firefighters who consented to completing the study survey manifested lower levels of PTSD symptomatology (clustering in the arousal symptoms) than those who did not participate in the study, resulting in self-selection bias. Of note, this is the first examination of the relationship between MVS and specific PTSD clusters among firefighters. Thus, it is pertinent that future research continues to explore how

prior service in the military may impact specific PTSD symptom clusters, such as arousal, more strongly than others.

***Emotion regulation difficulties.*** Second, post hoc analyses revealed that greater ER difficulties were robustly, significantly related to greater levels of PTSD intrusion ($\beta$=.27, CI [.16, .38]), PTSD avoidance ($\beta$=.31, CI [.28, .93]), PTSD NACM ($\beta$=.30, CI [.20, .41]), and PTSD arousal symptoms ($\beta$=.26, CI [.15, .37]); all of which provided large magnitude of effects. These findings suggest that firefighters who have greater difficulties regulating their emotions may experience higher levels of PTSD intrusion, PTSD avoidance, PTSD NACM, and PTSD arousal symptoms. In contrast, firefighters who have less difficulty with ER may exhibit lower levels of PTSD symptom clusters. These post hoc findings further elucidate the utility of intervention, prevention, and treatment programs that specifically incorporate modules targeting ER. This is the first study to date to examine the relationship between ER difficulties and specific PTSD symptom clusters in firefighters. As such, our research highlights the important role of ER as both a possible protective and/or maintenance factor in relation to PTSD among firefighters. Further research examining how greater difficulties in ER may exacerbate PTSD symptom clusters, specifically, is of utmost importance.

***Interaction of military veteran status and emotion regulation difficulties.*** Third, post hoc analyses revealed a positive, significant interactive association between MVS and ER in relation to PTSD NACM ($\beta$=.06, CI [.00, .12], $p$=.047; see Figure 4) and PTSD arousal symptoms ($\beta$=.08, CI [.01, .15], $p$=.026); see Figure 5), such that firefighters endorsing MVS had significantly higher levels of PTSD NACM and PTSD arousal symptoms. Of note, however, both significant interactions produced small magnitude effects. The association between MVS and PTSD NACM and PTSD arousal symptoms was strongest

at the highest levels of ER difficulties, highlighting a possible vulnerability to the development of PTSD-related NACM and arousal symptoms among military veteran firefighters with greater ER difficulties. It is possible that firefighters with a history of service in the military and increased difficulties regulating their emotions may manifest greater levels of PTSD NACM and PTSD arousal symptoms, specifically. As previously discussed, specific PTSD arousal symptoms such as hypervigilance, exaggerated startle response, and sleep disturbance are rather inherent to military and firefighting professions. Further, specific PTSD NACM symptoms, such as negative beliefs about others or the world (e.g., "No one can be trusted", "The world is completely dangerous"), trouble experiencing positive feelings, and a tendency to blame oneself or someone else for the stressful experience or what happened after it (e.g., a fellow solider dying in combat; responding to a 911 call involving the death of a child), may result from chronic exposure to dangerous and distressing experiences on the job as a military member or firefighter. Other PTSD NACM symptoms, such as feeling distant or cut off from other people, may be common among military members who have deployed one or more times and must adjust back to "normal" life once their deployment has ended, or a firefighter who is forced to be "on" during their shifts and subsequently be "off" when off duty and at home with their family. Thus, firefighters and/or military veterans may possess increased arousal-based characteristics that are necessary to function and survive in the respective professions, and increased NACM-based thoughts due to repeated exposures to dangerous or distressing events, often where one or more persons are in distress and/or harmed. Military veterans with greater difficulties in ER who then self-select into a firefighting career that consists of chronic exposure to stress and trauma may then further kindle these PTSD arousal symptoms that once served them

adaptively to clinically significant levels. Their PTSD NACM symptoms may also be further kindled given the additive exposures to danger and human suffering. Given that this is the first study to examine these interactive effects, further research is necessary to elucidate these associations.

***Covariates.*** Trauma load was significantly related to PTSD intrusion, PTSD avoidance, and PTSD arousal symptoms ($\beta$'s =. 06-.07), with albeit small magnitude of effects. These findings suggest that firefighters with a greater number of exposures to traumatic events may exhibit greater PTSD intrusion, PTSD avoidance, and PTSD arousal symptoms. Notably, trauma load was not significantly related to PTSD NACM symptoms (small magnitude effect; $\beta$=.05, CI [-.01, .10]). The lack of significance may be because firefighters experience trauma as a part of their job, but they may be less likely to endorse negative changes in cognition and mood as a result -- as compared to other symptoms of PTSD -- possibly due to stigma or low levels of emotional awareness. More work examining the associations between traumatic event exposures and specific PTSD symptom clusters is needed in the future.

Depressive symptom severity was significantly related to PTSD intrusion ($\beta$=.57, CI [.50, .64]), PTSD avoidance ($\beta$=.57, CI [.46, .59]), PTSD NACM ($\beta$=.70, CI [.64, .75]), and PTSD arousal symptoms ($\beta$=.64, CI [.58, .70]) and remained significantly related to all four aforementioned PTSD symptom clusters when examining all variables in the model; the degree of magnitude effect of depressive symptom severity remained relatively unchanged with all variables in the model. In other words, firefighters who experience higher levels of depressive symptomatology may also exhibit greater levels of all four PTSD symptom clusters. Of note, depression contributed a considerably larger magnitude of effect ($\beta$'s = .57-

.64) in relation to all PTSD intrusion, PTSD avoidance, and PTSD arousal symptom clusters in comparison to trauma load ($\beta$'s = .06-.07). In extant literature, depression has been found to be significantly related to PTSD re-experiencing, PTSD intrusion, PTSD avoidance, and PTSD arousal symptoms (using DSM-IV and DSM-5 PTSD criteria) among police officers (Asmundson & Stapleton, 2008) and military veterans (Hellmuth, Stappenbeck, Hoerster, & Jakupcak, 2012; Tsai et al., 2014). Years in the fire department was not significantly related to any of the four PTSD symptom clusters. As previously mentioned, research examining the association between years in the fire department and PTSD symptomatology is mixed (e.g., Chang et al., 2003; Corneil et al., 1999; Martin et al., 2017; Paulus et al., 2017), and no studies to date have examined the association between years in the fire department and specific PTSD symptom clusters. As such, future research examining years in the fire department are needed. Notably, this is also the first study to examine cumulative trauma and its relation to specific PTSD symptom clusters in firefighters.

**Additional Findings**

Although not primary aims of the study, there were additional findings worthy of mention. Approximately 10.1% of firefighters met clinical cut-off levels for probable PTSD and 23.7% of firefighters endorsed prior service in the military. Of note, the prevalence of firefighters who met diagnostic criteria for PTSD in this sample was higher in comparison to other samples of firefighters as well as the general population (Berninger et al., 2010; Corneil et al., 1999; Haslam & Mallon, 2003; Kessler, Chiu, Demler, Merikangas, & Walters, 2005). However, the prevalence of those endorsing MVS was lower in comparison to other samples of firefighters (e.g., 44%; Meyer et al., 2012). It is important to note, however, that the higher proportion of military veterans in that sample was due, in part, to higher-priority hiring

policies for veterans in that particular department (Meyer et al., 2012). In regard to ER, our sample reported lower levels of ER difficulties as measured by the DERS-16 (*M*= 21.3; SD = 8.1) in comparison to adults in the general U.S. population (*M*= 33.57; SD= 13.14; Bjureberg et al., 2016). Notably, however, few studies to date have utilized the DERS-16 and these results are only descriptive, warranting further exploration. If such differences replicate within nationally representative samples, this may indicate that firefighters manifest greater ability to regulate emotions compared to other populations or that they may under-report ER difficulties due to a heightened fear of stigma or fear of breaches in confidentiality, which has been documented among firefighter populations (Henderson, Van Hasselt, LeDuc, & Couwels, 2016; Kleim & Westphal, 2011). Taken together, these results represent an important line of inquiry for future research for the purposes of better understanding ER abilities of firefighters.

**Limitations and Strengths**

Several limitations of the present study are worthy of note. First, as previously mentioned, we did not examine variables regarding specific characteristics of military service (e.g., number of deployments, combat exposure), and therefore our results do not reflect data of military- vs. non-military related traumas that may have impacted PTSD symptom severity. It is imperative that future work include assessment of traumatic events experienced during military service among firefighters endorsing MVS to contextualize any potential PTSD-related associations. Second, this study relied exclusively on self-report, and therefore the effects of method variance and reporting biases cannot be ruled out. While a self-report methodology allowed for a large sample of firefighters, it is important for future work to implement interview-based and experimental measures assessing cognitive mechanisms and

PTSD to both increase our understanding of these associations and to reduce under-reporting trends. Third, this study utilized a cross-sectional design, therefore no inferences about causality among variables can be inferred. Prospective, longitudinal studies are needed, tracking firefighters' stress and health over time to better understand relationships among pertinent variables. Such findings may better illuminate whether individuals with greater abilities to regulate their emotions might self-select into the fire service despite its inherent risk or whether levels of ER may increase or decrease based on duration of employment in the fire service. These considerations highlight the need for more research utilizing rigorous methodologies and study designs to be conducted among firefighters, a population in great need of better understanding. Fourth, this study was based on a large sample of primarily white/Caucasian male firefighters, highlighting the importance of better understanding the unique experiences and needs of female firefighters and those of diverse racial and ethnic backgrounds. Moreover, to improve generalizability of findings, future work should include nationally representative samples of firefighters from multiple departments and geographic regions, as our sample of firefighters work in a large, urban fire department. Lastly, firefighters in the present sample were all active duty and therefore they may have underreported psychiatric symptoms due to the aforementioned fear of breaches in confidentiality which may lead to negative job ramifications (Kleim & Westphal, 2011; Kronenberg et al., 2008).

Despite these limitations, this study had several strengths, including its focus on a large sample of firefighters, a relatively understudied population with regard to PTSD symptomatology and related psychological correlates. Moreover, this was the first study to provide a focused examination on the association between MVS and psychological correlates

among firefighters. As such, this study underscores the importance of considering prior service in the military and underlying cognitive mechanisms, such as ER, in better understanding PTSD symptomatology among firefighters.

**Conclusions**

Future research should build upon this preliminary work by comparatively investigating mental health outcomes between military veteran firefighters and non-veteran firefighters. The importance of this line of inquiry is twofold; it can improve our understanding of risk and resilience factors for firefighters who have served in the military, and it can provide important clinical implications for mental health intervention and prevention efforts. It is also important to also highlight that our findings revealed non-significant direct associations (with the exception of PTSD arousal symptoms) and small magnitude effects between MVS and PTSD symptomatology, indicating that military veterans who self-select into a firefighting career may possess an inherent resilience to the development of certain adverse psychopathology. Thus, our findings challenge stigma in relation to hiring veterans in the fire service for fear of worsened mental health. It is imperative that future research examines both risk *and* resilience characteristics among this understudied population that continues to provide invaluable service to our country and communities.

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Table 1. *Participant characteristics* (*n* = 839)

| ***Variable*** | *M/n (SD/%)* |
|---|---|
| **Gender**[1] | |
| Male | 788 (93.9%) |
| Female | 45 (5.4%) |
| Transgender | 6 (0.7%) |
| **Race/Ethnicity**[1] | |
| White | 631 (75.2%) |
| Hispanic/Latino | 214 (25.5%) |
| Black/African American | 112 (13.3%) |
| 'Other' | 69 (8.2%) |
| Asian | 13 (1.5%) |
| Native Hawaiian/Pacific Islander | 1 (0.1%) |
| American Indian/Alaskan Native | 13 (1.5%) |
| **Age**[1] | 38.4 (8.5) |
| **Education**[1] | |
| 8th Grade | 5 (0.6%) |
| GED (or equivalent) | 8 (1.0%) |
| High School | 65 (7.7%) |
| Some College | 390 (46.5%) |
| Bachelor's Degree | 371 (44.2%) |
| **Years of Service in Department**[1] | 13.1 (8.8) |
| **Military Veterans** | 199 (23.7%) |
| **Marital Status**[1] | |
| Married | 567 (67.6%) |
| Divorced | 64 (7.6%) |
| Living with Partner | 41 (4.9%) |
| Single | 165 (19.7%) |
| Widowed | 2 (0.2%) |
| **PTSD Diagnostic Criteria**[2] | 85 (10.1%) |
| **Trauma Exposure**[3] **(happened to me, witnessed it, and/or part of my job)** | |
| Natural disaster | 10 (1.2%) |
| Fire or explosion | 12 (1.4%) |
| Transportation accident | 17 (2.0%) |
| Serious accident | 19 (2.3%) |
| Exposure to toxic substance | 20 (2.4%) |
| Physical assault | 23 (2.7%) |
| Assault with a weapon | 26 (3.1%) |
| Sexual assault | 23 (2.7%) |
| Other unwanted or uncomfortable sexual experience | 28 (3.3%) |
| Combat or exposure to a war-zone | 40 (4.8%) |
| Captivity | 43 (5.1%) |
| Life-threatening illness or injury | 65 (7.7%) |
| Severe human suffering | 84 (10.0%) |
| Sudden violence death | 112 (13.3%) |
| Sudden accidental death | 91 (10.8%) |
| Serious injury, harm, or death you caused to someone else | 92 (11.0%) |
| Any other stressful event or experience | 134 (16.0%) |

*Note:* 1 = Demographics questionnaire; 2 = PTSD Checklist for DSM-5 (PCL-5; diagnostic cut-off of 33); 3 = Life Events Checklist for DSM-5 (LEC-5)

Table 2: *Descriptive statistics and bivariate correlations for study variables (n=839)*.

| Variable | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| 1. Years | - | | | | | |
| 2. VetStat | -.02 | - | | | | |
| 3. CESD-T | .02 | .08* | - | | | |
| 4. LEC-T | .01 | .07 | .06 | - | | |
| 5. DERS-T | -.00 | .14** | .51** | .12** | - | |
| 6. PCL-T | .04 | .13** | .65** | .10** | .54** | - |
| Mean/n | 13.1 | 199 | 10.6 | 12.4 | 21.3 | 10.1 |
| SD/% | 8.8 | 23.7 | 8.2 | 4.1 | 8.1 | 14.6 |

*Note*: Years = Years in the fire department; VetStat = military veteran status (1= military veteran, 0= non-veteran); CESD-T= Center for Epidemiological Studies Depression Scale total score (Radloff, 1977); LEC-T = Life Events Checklist for the DSM-5 total score (Weathers et al., 2013); DERS-T = Difficulties in Emotion Regulation Scale-16 item version total score (Bjureberg et al., 2016); PCL-T = PTSD Checklist for DSM-5 total score (Blevins, Weathers, Davis, Witte, & Domino, 2015)

Table 3: *Independent samples t-tests for study variables (n=839).*

| | ***M*(/n) SD(/%)** | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **Military Veterans** | **Non-Veterans** | | | **T-test** | | | |
| **Variable** | | | **F-value** | **T-value** | ***Df*** | **CI(95%)** | ***p-value*** | **Cohen** |
| Years[1] | 12.82 (6.65) | 13.23 (9.36) | 36.68 | 0.69 | 462.74 | (-0.77, 1.59) | ns | 0.05 |
| CESD-T[2] | 11.70 (8.83) | 10.21 (8.00) | 1.94 | -2.24 | 837 | (-2.80, -0.19) | .03 | 0.1 |
| LEC-T[3] | 12.94 (3.61) | 12.29 (4.27) | 6.99 | -2.12 | 385.208 | (-1.25, -0.05) | .04 | 0.1 |
| DERS-T[4] | 23.35 (9.69) | 20.60 (7.48) | 22.58 | -3.67 | 275.269 | (-4.21, -1.27) | <.001 | 0.3 |
| PCL-T[5] | 13.42 (16.70) | 9.11 (13.75) | 18.52 | -3.31 | 286.33 | (-6.87, -1.74) | .00 | 0.2 |

*Note*: 1 = Years in the fire department; 2= Center for Epidemiological Studies Depression Scale total score (Radloff, 1977); 3 = Life Events Checklist for the DSM-5 total score (Weathers et al., 2013); 4 = Difficulties in Emotion Regulation Scale-16 item version total score (Bjureberg et al., 2016); 5 = Posttraumatic Stress Disorder Checklist for DSM-5 total score (Blevins, Weathers, Davis, Witte, & Domino, 2015)

Table 4. *Unstandardized path analysis results: Main analyses*

| | Step 1: covariate effects model | | | | | Step 2: main effects model | | | | | Step 3: interaction effect model | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PTSD Symptom Severity** | **B** | **SE** | **Lower CI** | **Upper CI** | **$R^2$** | **B** | **SE** | **Lower CI** | **Upper CI** | **$R^2$** | **B** | **SE** | **Lower CI** | **Upper CI** | **$R^2$** |
| **Years** | 0.01 | 0.01 | -0.01 | 0.03 | - | 0.01 | 0.01 | -0.01 | 0.03 | - | 0.01 | 0.01 | -0.01 | 0.03 | - |
| **LEC-T** | 0.05* | 0.02 | 0.00 | 0.01 | - | 0.03 | 0.02 | -0.02 | 0.07 | - | 0.03 | 0.02 | -0.02 | 0.08 | - |
| **CESD-T** | 0.28** | 0.02 | 0.25 | 0.31 | - | 0.21** | 0.02 | 0.17 | 0.25 | - | 0.21** | 0.02 | 0.17 | 0.25 | - |
| **VetStat** | - | - | - | - | - | 0.32 | 0.22 | -0.11 | 0.75 | - | -0.32 | 0.30 | -0.90 | 0.27 | - |
| **DERS-T** | - | - | - | - | - | 1.33** | 0.27 | 0.80 | 1.86 | - | 1.07** | 0.30 | 0.48 | 1.66 | - |
| **Interaction** | - | - | - | - | - | - | - | - | - | - | 0.75* | 0.30 | .17 | 1.34 | - |
| **$R^2$** | - | - | - | - | .45 | - | - | - | - | .52 | - | - | - | - | .51 |

*Note*: Years = Years in the fire department; LEC-T = Life Events Checklist for the DSM-5 total (Weathers et al., 2013); CESD-T= Center for Epidemiological Studies Depression Scale total score (Radloff, 1977); VetStat = military veteran status (1= military veteran, 0= non-military veteran); DERS-T = Difficulties in Emotion Regulation Scale-16 item version total score (Bjureberg et al., 2016). Confidence intervals are presented for 95% level of confidence.
*$p < .05$, **$p < .01$.

Table 5. *Unstandardized path analysis results: Exploratory analyses*

| | Step 1: covariate effects model | | | | | Step 2: main effects model | | | | | Step 3: interaction effect model | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Intrusions** | **B** | **SE** | **Lower CI** | **Upper CI** | **$R^2$** | **B** | **SE** | **Lower CI** | **Upper CI** | **$R^2$** | **B** | **SE** | **Lower CI** | **Upper CI** | **$R^2$** |
| **Years** | 0.00 | 0.00 | -0.00 | 0.01 | | 0.00 | 0.00 | -0.00 | 0.01 | | 0.00 | 0.00 | -0.00 | 0.01 | |
| **LEC-T** | 0.01* | 0.01 | 0.00 | 0.03 | | 0.01 | 0.01 | -0.01 | 0.02 | | 0.01 | 0.01 | -0.00 | 0.02 | |
| **CESD-T** | 0.06** | 0.00 | 0.05 | 0.07 | | 0.04** | 0.01 | 0.03 | 0.05 | | 0.04** | 0.01 | 0.03 | 0.05 | |
| **VetStat** | - | - | - | - | | 0.08 | 0.06 | -0.03 | 0.19 | | -0.08 | 0.08 | -0.24 | 0.08 | |
| **DERS-T** | - | - | - | - | | 0.28** | 0.07 | 0.15 | 0.40 | | 0.21* | 0.07 | 0.07 | 0.35 | |
| **Interaction** | - | - | - | - | | - | - | | | | 0.19* | 0.10 | -0.00 | 0.38 | |
| **$R^2$** | | | | | .34 | | | | | .39 | | | | | .39 |
| | **Step 1: covariate effects model** | | | | | **Step 2: main effects model** | | | | | **Step 3: interaction effect model** | | | | |
| **Avoidance** | **B** | **SE** | **Lower CI** | **Upper CI** | **$R^2$** | **B** | **SE** | **Lower CI** | **Upper CI** | **$R^2$** | **B** | **SE** | **Lower CI** | **Upper CI** | **$R^2$** |
| **Years** | 0.00 | 0.00 | -0.01 | 0.01 | | 0.00 | 0.00 | -0.01 | 0.01 | | 0.00 | 0.00 | -0.01 | 0.01 | |
| **LEC-T** | 0.02* | 0.01 | 0.00 | 0.03 | | 0.01 | 0.01 | -0.00 | 0.02 | | 0.01 | 0.01 | -0.00 | 0.02 | |
| **CESD-T** | 0.06** | 0.00 | 0.05 | 0.07 | | 0.04** | 0.01 | 0.03 | 0.05 | | 0.04** | 0.01 | 0.03 | 0.05 | |
| **VetStat** | - | - | - | - | | 0.06 | 0.06 | 0.07 | 0.18 | | -0.11 | 0.09 | -0.29 | 0.06 | |
| **DERS-T** | - | - | - | - | | 0.35** | 0.08 | 0.20 | 0.51 | | 0.28** | 0.09 | 0.11 | 0.46 | |
| **Interaction** | - | - | - | - | | - | - | - | - | | 0.20 | 0.10 | -0.01 | 0.40 | |
| **$R^2$** | | | | | .28 | | | | | .35 | | | | | .35 |
| | **Step 1: covariate effects model** | | | | | **Step 2: main effects model** | | | | | **Step 3: interaction effect model** | | | | |
| **NACM** | **B** | **SE** | **Lower CI** | **Upper CI** | **$R^2$** | **B** | **SE** | **Lower CI** | **Upper CI** | **$R^2$** | **B** | **SE** | **Lower CI** | **Upper CI** | **$R^2$** |
| **Years** | 0.00 | 0.00 | -0.00 | 0.01 | | 0.01 | 0.00 | -0.00 | 0.01 | | 0.01 | 0.00 | -0.00 | 0.01 | |
| **LEC-T** | 0.01 | 0.01 | -0.00 | 0.03 | | 0.01 | 0.01 | -0.01 | 0.02 | | 0.01 | 0.01 | -0.01 | 0.02 | |
| **CESD-T** | 0.11** | 0.01 | 0.09 | 0.12 | | 0.08** | 0.01 | 0.07 | 0.10 | | 0.08** | 0.01 | 0.07 | 0.10 | |
| **VetStat** | - | - | - | - | | 0.06 | 0.08 | -0.09 | 0.22 | | -0.12 | 0.11 | -0.33 | 0.09 | |
| **DERS-T** | - | - | - | - | | 0.48** | 0.09 | 0.29 | 0.66 | | 0.40** | 0.11 | 0.19 | 0.61 | |
| **Interaction** | - | - | - | - | | - | - | - | - | | 0.22* | 0.10 | 0.02 | 0.41 | |
| **$R^2$** | | | | | .49 | | | | | .56 | | | | | .55 |

| | Step 1: covariate effects model | | | | | Step 2: main effects model | | | | | Step 3: interaction effect model | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Arousal** | **B** | **SE** | **Lower CI** | **Upper CI** | **$R^2$** | **B** | **SE** | **Lower CI** | **Upper CI** | **$R^2$** | **B** | **SE** | **Lower CI** | **Upper CI** | **$R^2$** |
| **Years** | 0.00 | 0.00 | -0.01 | 0.01 | | 0.00 | 0.00 | -0.00 | 0.01 | | 0.00 | 0.00 | -0.00 | 0.01 | |
| **LEC-T** | 0.02* | 0.01 | 0.00 | 0.04 | | 0.01 | 0.01 | -0.01 | 0.03 | | 0.01 | 0.01 | -0.01 | 0.03 | |
| **CESD-T** | 0.11** | 0.01 | 0.10 | 0.13 | | 0.09** | 0.01 | 0.07 | 0.10 | | 0.09** | 0.01 | 0.07 | 0.10 | |
| **VetStat** | - | - | - | - | | 0.27* | 0.10 | 0.07 | 0.47 | | -0.02 | 0.14 | -0.28 | 0.25 | |
| **DERS-T** | - | - | - | - | | 0.47** | 0.11 | 0.24 | 0.69 | | 0.35* | 0.13 | 0.10 | 0.60 | |
| **Interaction** | - | - | - | - | | - | - | - | - | | 0.34* | 0.14 | 0.06 | 0.62 | |
| **$R^2$** | | | | | .42 | | | | | .48 | | | | | .48 |

*Note*: Years = Years in the fire department; LEC-T = Life Events Checklist for the DSM-5 total (Weathers et al., 2013); CESD-T= Center for Epidemiological Studies Depression Scale total score (Radloff, 1977); VetStat = military veteran status (1= military veteran, 0= non-military veteran); DERS-T = Difficulties in Emotion Regulation Scale-16 item version total score (Bjureberg et al., 2016). Confidence intervals are presented for 95% level of confidence.
*$p < .05$, **$p < .01$.

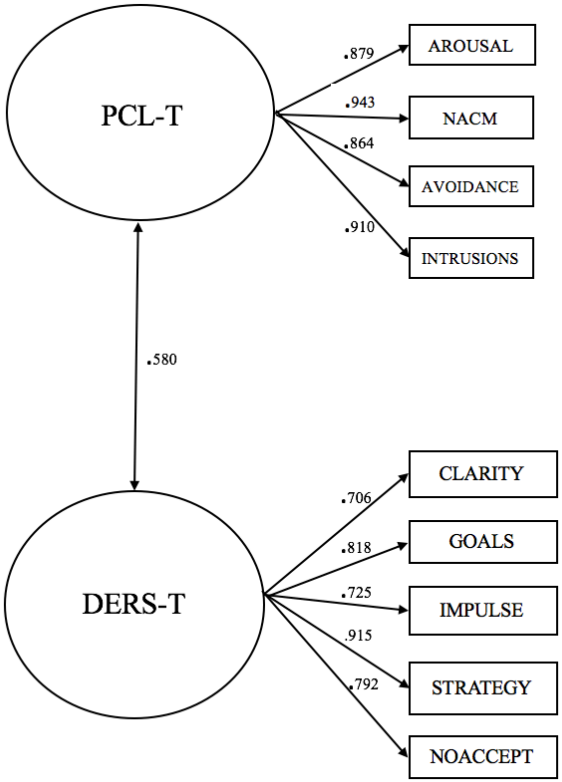


*Figure 1.* Measurement model with standardized factor loadings for main analyses. PCL-T = Posttraumatic Stress Disorder Checklist for DSM-5 total score (PCL-5; Blevins et al., 2015); Intrusions = PCL-5 intrusions subscale; Avoidance = PCL-5 avoidance subscale; NACM = PCL-5 negative alterations in cognitions and mood subscale; Arousal = PCL-5 arousal subscale; DERS-T = Difficulties in Emotion Regulation Scale-16 item version total score (DERS-16; Bjureberg et al., 2016); Clarity = DERS-16 clarity subscale; Goals = DERS-16 goals subscale; Impulse = DERS-16 impulse subscale; Strategy = DERS-16 strategy subscale; Noaccept = DERS-16 non-acceptance subscale

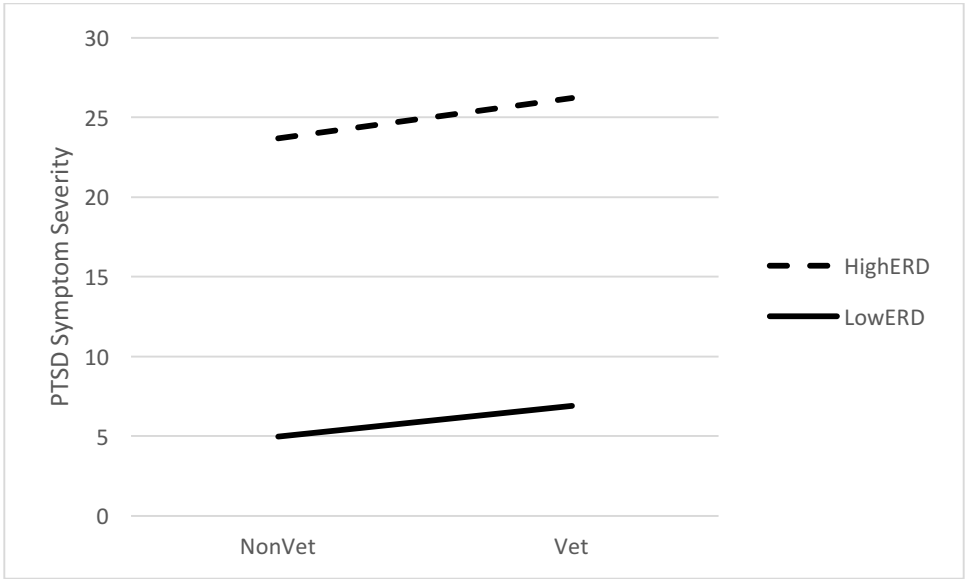


*Figure 2.* The interactive effect of military veteran status and emotion regulation difficulties in predicting PTSD symptom severity. LowERD represents 0.5 standard deviation below the mean of emotion regulation difficulties. HighERD severity represents 0.5 standard deviation above the mean of emotion regulation difficulties. Nonvet = non-military veteran; Vet = military veteran; HighERD = high emotion regulation difficulties; LowERD = low emotion regulation difficulties.

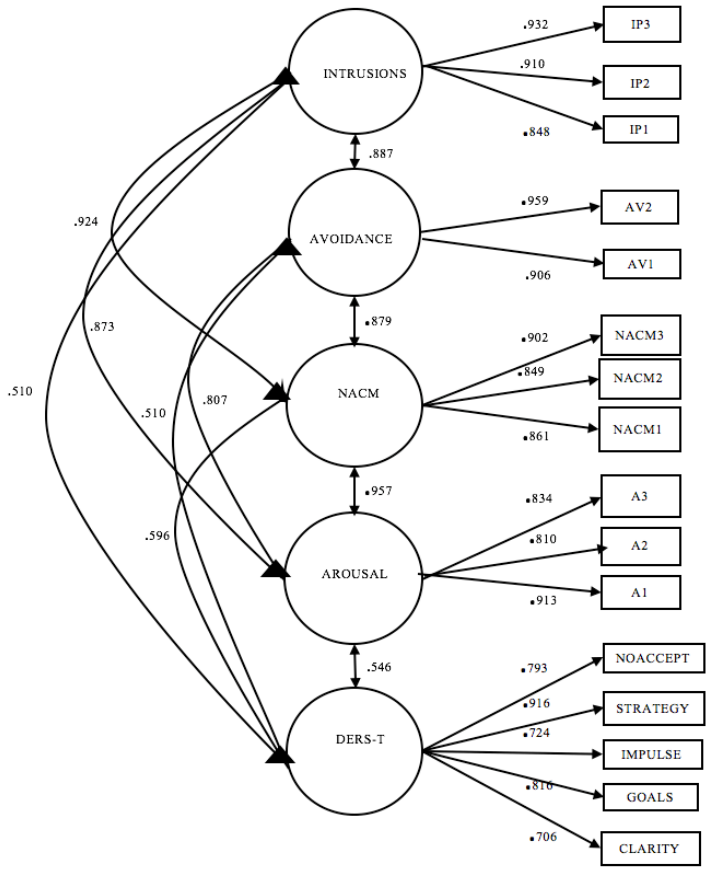


*Figure 3.* Measurement model with standardized factor loadings for exploratory analyses. Intrusions = Posttraumatic Stress Disorder Checklist for DSM-5 (PCL-5; Blevins et al., 2015) intrusions subscale; Avoidance = PCL-5 avoidance subscale; NACM = PCL-5 negative alterations in cognitions and mood subscale; Arousal = PCL-5 arousal subscale; DERS-T = Difficulties in Emotion Regulation Scale-16 item version total score (DERS-16 Bjureberg et al., 2016); Clarity = DERS-16 clarity subscale; Goals = DERS-16 goals subscale; Impulse = DERS-16 impulse subscale; Strategy = DERS-16 strategy subscale; Noaccept = DERS-16 non-acceptance subscale.

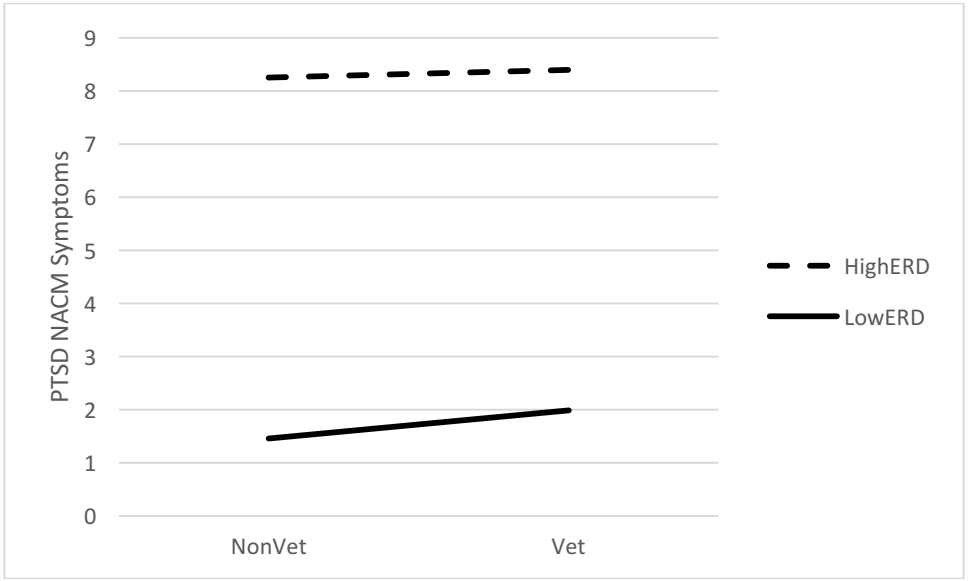


*Figure 4.* The interactive effect of military veteran status and emotion regulation difficulties in predicting PTSD negative alterations in cognitions and mood symptoms. LowERD represents .5 standard deviation below the mean of emotion regulation difficulties. HighERD severity represents .5 standard deviation above the mean of emotion regulation difficulties. Nonvet = non-military veteran; Vet = military veteran; HighERD = high emotion regulation difficulties; LowERD = low emotion regulation difficulties.

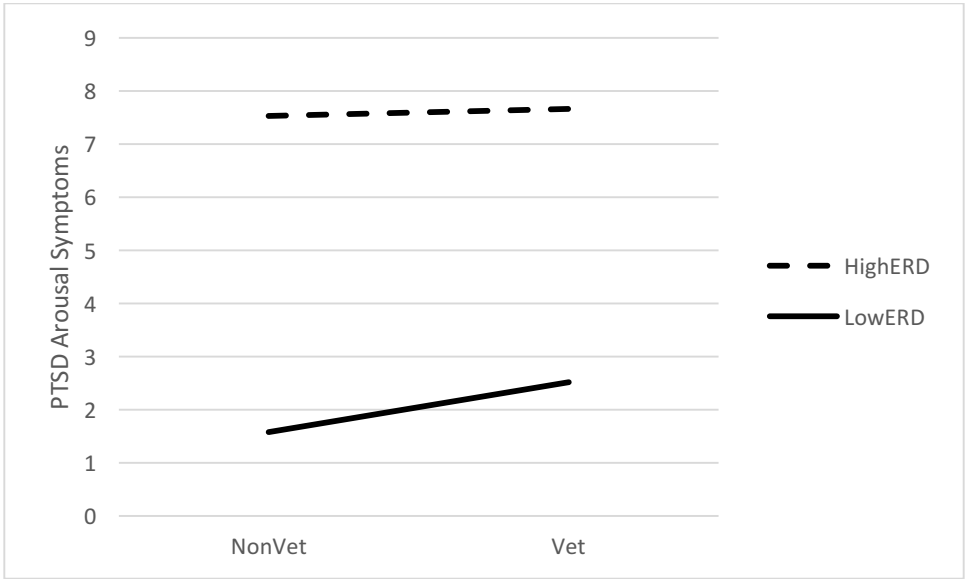


*Figure 5.* The interactive effect of military veteran status and emotion regulation difficulties in predicting PTSD arousal symptoms. LowERD represents .5 standard deviation below the mean of emotion regulation difficulties. HighERD severity represents .5 standard deviation above the mean of emotion regulatin difficulties. Nonvet = non-military veteran; Vet = military veteran; HighERD = high emotion regulation difficulties; LowERD = low emotion regulation difficulties.

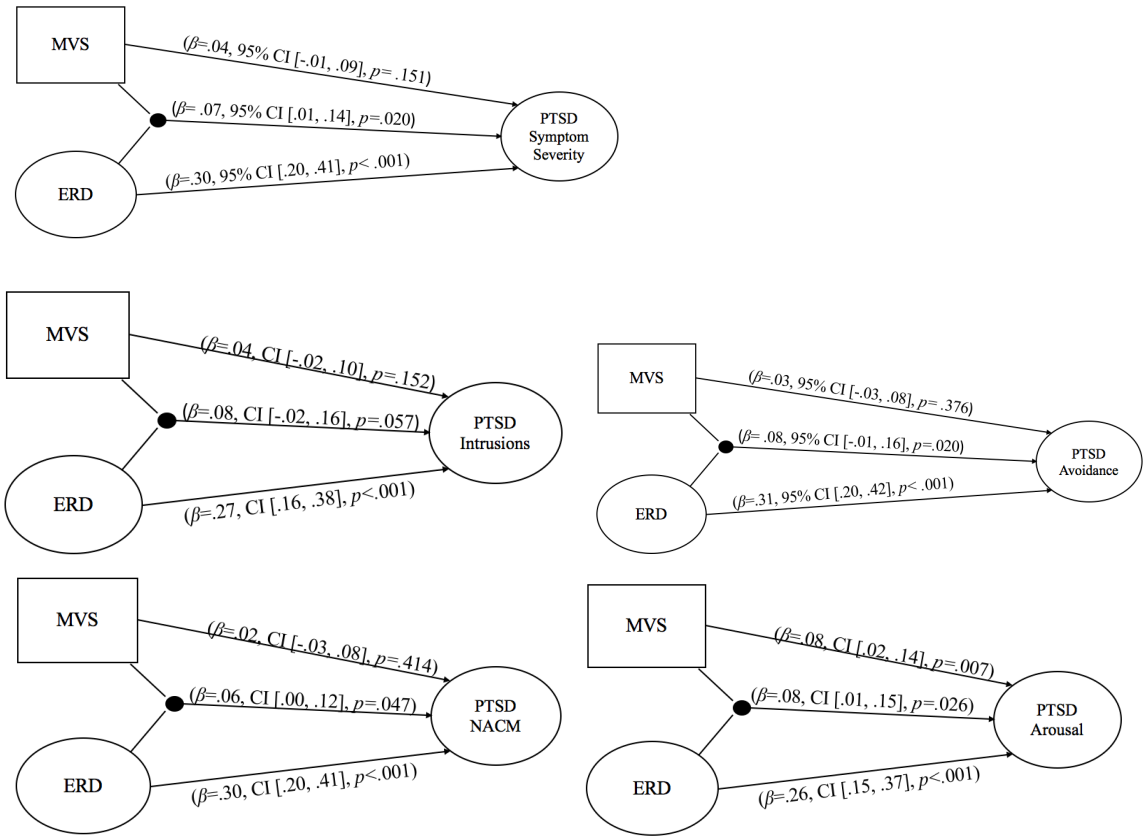


*Figure 6.* Interactive path analyses for main and exploratory analyses. MVS = military veteran status ; PTSD Symptom Severity = Posttraumatic Stress Disorder Checklist for DSM-5 total score (PCL-5; Blevins et al., 2015); PTSD Intrusions = PCL-5 intrusions subscale; PTSD Avoidance = PCL-5 avoidance subscale; PTSD NACM = PCL-5 negative alterations in cognitions and mood subscale; PTSD Arousal = PCL-5 arousal subscale; ERD = Emotion regulation difficulties measured by the Difficulties in Emotion Regulation Scale-16 item version total score (Bjureberg et al., 2016).

Supplementary Table A: Descriptive Statistics and bivariate correlations for covariates and indicator variables ($n$=839).

| Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Years | - | | | | | | | | | | | | | | | | | | | | | | |
| 2. CESD-T | .02 | - | | | | | | | | | | | | | | | | | | | | | |
| 3. LEC-T | .01 | .06 | - | | | | | | | | | | | | | | | | | | | | |
| 4. Clarity | .02 | .47** | .01** | - | | | | | | | | | | | | | | | | | | | |
| 5. Goals | .02 | .40** | .10** | .60** | - | | | | | | | | | | | | | | | | | | |
| 6. Impulse | -.01 | .34** | .10** | .51** | .64** | - | | | | | | | | | | | | | | | | | |
| 7. Strategy | .01 | .51** | .10** | .63** | .73** | .68** | - | | | | | | | | | | | | | | | | |
| 8. Noaccept | -.02 | .43** | .10** | .54** | .64** | .53** | .75** | - | | | | | | | | | | | | | | | |
| 9. Intrusion | .04 | .56** | .10** | .42** | .41** | .35** | .44** | .35** | - | | | | | | | | | | | | | | |
| 10. Avoid | .00 | .51** | .11** | .40** | .40** | .31** | .45** | .37** | .83* | - | | | | | | | | | | | | | |
| 11. NACM | .04 | .67** | .08** | .49** | .45** | .38** | .52** | .43** | .85* | .81** | - | | | | | | | | | | | | |
| 12. Arousal | .03 | .61** | .10** | .43** | .44** | .37** | .44** | .41** | .80* | .72** | .85** | - | | | | | | | | | | | |
| 13. Intru_P1 | .06 | .49** | .10** | .39** | .41** | .32** | .42** | .35** | .89** | .74** | .73** | .71** | - | | | | | | | | | | |
| 14. Intru_P2 | .02 | .53** | .08** | .39** | .36** | .32** | .39** | .31** | .95* | .76** | .80** | .76** | .79** | - | | | | | | | | | |
| 15. Intru_P3 | .04 | .54** | .09** | .39** | .39** | .32** | .43** | .34** | .95* | .81** | .83** | .75** | .78** | .85** | - | | | | | | | | |
| 16. Avo_P1 | -.01 | .48** | .11** | .36** | .37** | .29** | .42** | .35** | .78* | .97** | .76** | .69** | .71** | .71** | .76** | - | | | | | | | |
| 17. Avo_P2 | .02 | .51** | .09** | .42** | .39** | .32** | .45 | .36** | .82* | .96** | .81** | .71** | .71** | .75** | .81** | .87** | - | | | | | | |
| 18. NACM_P1 | .02 | .58** | .09** | .42** | .40** | .34** | .46** | .38** | .79* | .74** | .90** | .74** | .67** | .77** | .75** | .68** | .74** | - | | | | | |
| 19. NACM_P2 | .03 | .55** | .09** | .40** | .38** | .34** | .45** | .34** | .45* | .40** | .79** | .76** | .90** | .71** | .79** | .72** | .76** | .76** | - | | | | |
| 20. NACM_P3 | .06 | .68** | .06* | .49** | .44** | .36** | .51** | .41** | .78* | .73** | .95** | .84** | .68** | .73** | .75** | .69** | .73** | .78** | .75** | - | | | |
| 21. Aro_P1 | .02 | .58** | .09** | .40** | .39** | .39** | .43** | .39** | .76* | .72** | .85** | .90** | .65** | .72** | .75** | .67** | .72** | .73** | .74** | .84** | - | | |
| 22. Aro_P2 | .03 | .47** | .09** | .35** | .36** | .31** | .34** | .34** | .68* | .62** | .71** | .91** | .63** | .65** | .64** | .59** | .61** | .63** | .58** | .71** | .75** | - | |
| 23. Aro_P3 | .04 | .61** | .10** | .41** | .43** | .32** | .42** | .38** | .72* | .64** | .76** | .91** | .66** | .68** | .68** | .63** | .62** | .67** | .62** | .76** | .73** | .73** | - |
| Mean/n | 13.4 | 10.6 | 12.4 | 2.5 | 4.6 | 3.7 | 5.0 | 4.1 | 2.5 | 1.2 | 3.2 | 3.3 | .70 | .82 | .99 | .63 | .52 | .79 | .91 | 1.5 | .86 | 1.2 | 1.3 |
| SD/% | 8.8 | 8.2 | 4.1 | 1.1 | 2.2 | 1.6 | 2.2 | 2.0 | 3.8 | 1.8 | 5.2 | 4.8 | .96 | 1.5 | 1.6 | 1.0 | 0.9 | 1.4 | 1.6 | 2.6 | 1.5 | 1.8 | 1.9 |

*Note:* Years = Years in the fire department; CESD-T = Center for Epidemiological Studies Depression Scale total score (CES-D; Radloff, 1977); LEC-T = Life Events Checklist for the DSM-5 total (Weathers et al., 2013); Clarity = Difficulties in Emotion Regulation Scale-16 item version (DERS-16) clarity subscale; Goals = DERS-16 goals subscale; Impulse = DERS-16 impulse subscale; Strategy = DERS-16 strategy subscale; Noaccept = DERS-16 non-acceptance subscale; Intrusions = Posttraumatic Stress Disorder Checklist for DSM-5 (PCL-5; Blevins et al., 2015) intrusions subscale; Avoidance = PCL-5 avoidance subscale; NACM = PCL-5 negative alterations in cognitions and mood subscale; Arousal = PCL-5 arousal subscale; Intru_P1 = Parcel 1 (item 1) from the PCL-5 intrusions subscale; Intru_P2 = Parcel 2 (items 2, 3) from the PCL-5 intrusions subscale; Intru_P3 = Parcel 3 (items 4, 5) from the PCL-5 intrusions subscale; Avo_P1 = Parcel 1 (item 6) from the PCL-5 avoidance subscale; Avo_P2 = Parcel 2 (item 7) from the PCL-5 avoidance subscale; ; NACM_P1 = Parcel 1 (items 8, 9) from the PCL-5 negative alterations in cognitions and mood subscale; NACM_P2 = Parcel 2 (items 10, 11) from the PCL-5 negative alterations in cognitions and mood subscale; NACM_P3 = Parcel 3 (items 12, 13, 14) from the PCL-5 negative alterations in cognitions and mood subscale; Aro_P1 = Parcel 1 (items 15, 16) from the PCL-5 arousal subscale; Aro_P2 = Parcel 2 (items 17, 18) from the PCL-5 arousal subscale; Aro_P3 = Parcel 3 (items 19, 20) from the PCL-5 arousal subscale

*$p$ < .05, **$p$ < .01.