



Assessment of relationships between work stress, work-family conflict, burnout and firefighter safety behavior outcomes



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ABSTRACT

Introduction: Burnout, in the context of emotional exhaustion, cynicism and depersonalization, has resulted in detrimental effects to workers. The relationship with safety outcomes, however, has not been fully explored, particularly in the American fire service. The main focus of this study is to delineate the relationships between work stress, work-family conflict, burnout and firefighter safety behavior outcomes.

Methods: Data were collected from career firefighters in the southeastern United States ($n = 208$). Path analysis, which allows for the simultaneous modeling of regression relationships, was completed to assess the relationships between work stress, work-family conflict and burnout and the relationships between burnout and multiple firefighter safety behavior outcomes including compliance with personal protective equipment procedures, safe work practices and safety reporting and communication behavior.

Results: Analyses indicated that both work stress and work-family conflict predicted burnout and burnout negatively influenced personal protective equipment compliance, adherence to safety work practices, and safety reporting and communication.

Conclusions: Firefighter burnout significantly impacts firefighter safety performance. Firefighters are less likely to exhibit compliance oriented and self-protective behaviors, which may have implications on overall firefighter safety, health and wellbeing.

1. Introduction

Approximately one million firefighters in the United States risk their lives daily for the benefit of society. These firefighters extinguish fires, function as emergency responders, respond to disaster situations and perform numerous other duties requested of them by their organizations, municipalities, business organizations and the public. These work roles and responsibilities are some of the most hazardous encountered by any workforce and are both psychologically and physically demanding (DeJoy et al., 2017). In this context and environment, proper safety practices and behaviors are critical to minimize risks of injury, illness or death, especially since we have not witnessed sustained reductions in fatalities and injuries over the past few decades. Despite limited progress over a few years, recent trends again illustrate that approximately 100 firefighters die from line-of-duty operations each year and around 70,000 or more are injured each year (Haynes and Molis, 2016; USFA, 2002, 2016).

To control hazards and minimize inevitable risks associated with

line-of-duty operations to acceptable levels, firefighters must properly utilize and maintain needed personal protective equipment (PPE), follow established standard operating procedures and safe work practices and communicate and report identified safety concerns. This communication is essential so that hazardous situations can be abated or avoided and so that supervisors or fellow firefighters can take the necessary precautions to avoid uncontrollable hazardous exposures, environments and situations. Although there is evidence that these types of firefighter safety behaviors can be maintained and enhanced by a positive safety climate (Prati and Pietrantonio, 2012; Smith and DeJoy, 2014) and through transformational leaders that focus on safety (Smith et al., 2016), it is believed that stress-related factors or affective reactions to ongoing stress such as burnout (Shirom, 2011), may diminish these safety outcomes.

Burnout is multi-faceted, but is generally comprised of three components including exhaustion, depersonalization and cynicism (ten Brummelhuis et al., 2011). Exhaustion is exemplified as a decrease in energy to perform work; depersonalization is a state in which an

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emotional distance is created where workers disengage or withdraw from their work, workplace, and co-workers (Basinska and Wiciak, 2012); and, cynicism is expressed through the development of impersonal and unsympathetic attitudes toward the recipients of one's service or work (Lewig et al., 2007). In contrast to engagement, burnout diminishes the desire to participate in work activities, meet goals, support co-workers and is negatively associated with job performance (Shirom, 2011). This negative relationship may be explained by a reduced capacity to cope and lower levels of motivation to perform (Halbesleben and Bowler, 2007; Shirom, 2011). Further, burnout, when conceptualized as emotional exhaustion, has been associated with diminished job satisfaction, organizational commitment, and ultimately organizational deviance (Mulki et al., 2006), which is characterized by a lack of compliance with established norms and expectations. Work-related stress, and particularly burnout, have been associated with a variety of diminished outcomes including health behaviors, medical errors, musculoskeletal disease and injury in a variety of work groups (Halbesleben et al., 2008; Honkonen et al. 2006; Moustou et al., 2010; Nahrgang et al., 2011; Shanafelt et al., 2010). Given this evidence that burnout may diminish safety outcomes, along with health outcomes, and based on the fact that burnout has been associated with diminished performance and compliance in the context of organizational deviance, we hypothesize that firefighters, who are exhausted, cynical and detached, in the form of burnout, will be less likely to follow required safe work practices (Hypothesis 1), to prepare, maintain and use PPE as required (Hypothesis 2), and will be less likely to communicate and report safety concerns (Hypothesis 3).

The overall purpose of the present research is to build and test a model that examines these associations. Further, we intend to assess the direct effects of work stress and work-family conflict on burnout in our sample of firefighters. Several models of the stress-burnout relationship have argued that burnout is a consequence or affective response of one's exposure to chronic job stress (Halbesleben and Buckley, 2004; Shirom, 2011). Thus, we hypothesize that work stress will be positively associated with burnout (Hypothesis 4) in our sample. Beyond its impact on burnout, we expect that work stress will have an impact on work-family conflict within our sample of firefighters. Evidence from multiple studies, including meta-analyses and reviews show work stress as an antecedent and strong predictor of work-family conflict (Byron, 2005; Greenhaus and Allen, 2011; Michel et al., 2011). Although there is adequate literature to support the positive relationship between stress and work-family conflict in multiple industries, this relationship has only been minimally explored in fire service members. Of the limited research in this area, Shreffler and colleagues, in a study focused on firefighting and fathering, found that occupational stress was associated with work-family conflict in a sample of male firefighters that were fathers (Shreffler et al., 2011). We expect a similar finding in our sample of career firefighters and hypothesize that work stress will be positively associated with work-family conflict (Hypothesis 5). Lastly, we hypothesize that work-family conflict will positively predict burnout in our sample of firefighters (Hypothesis 6). There is some limited evidence denoting work-family conflict as an antecedent and predictor of burnout within various occupations (Allen et al., 2000; Amstad et al., 2011). More specialized studies further support this relationship in fields such as law enforcement (Haines et al., 2013), nursing (Burke and Greenglass, 2001) and in some aspects the fire service. Halbesleben (2009) illustrated the positive association between work-family conflict and emotional exhaustion, an aspect of burnout, within a sample of fire service members.

Should our posited hypotheses prove factual, the present study will provide novel evidence of burnout and its impact on safety-related outcomes in the fire service, particularly firefighter safety performance. The inclusion of work stress and work-family conflict within the model is novel as well, as these antecedents are expected to influence firefighter burnout, but not necessarily directly impact the safety performance outcomes. Burnout is expected to be a mediating factor as

burnout is portrayed as an outcome comprised of exhaustion, depersonalization, and cynicism. It is this outcome, which is predicted to influence safety performance.

Ultimately, if proven factual, the present study will illustrate that burnout, as a stress-related process, does negatively impact safety performance. This is important within the fire service as a declination in performance could result in firefighter injuries during line-of-duty operations. Further, the inclusion of antecedents in the model, if found to be predictors of burnout, may provide targets for interventions within the fire service to curtail burnout and its effects.

2. Methods

2.1. Participants

Cross-sectional data were collected from 208 professional firefighters from a city fire and rescue department located in the south-eastern United States. Prior to collecting data, Institutional Review Board approvals were obtained by the researchers involved in the study and their respective universities at the time of the study. Also, additional approval was granted, following a review procedure, from the Department of Homeland Security Regulatory Compliance Office. Prior to data collection, consent was obtained from all participants. Cross-sectional data were collected online via a Qualtrics survey tool. The overall participation rate was 60%. Firefighters ranged in age from 22 to 60, with a mean age 40.34 ($SD = 9.29$).

Of the respondents, 95% were male. Most of the participants identified their race as White (71%). Others identified their race as Black or African American (20%) Asian (1%), American Indian or Alaskan Native (< 1%) or Other (7.6%). With regard to ethnicity, 4.8% reported their ethnicity as Hispanic or Latino. From this group identifying as Hispanic or Latino, one reported their race as White, two reported their race as Asian and six reported their race as Other. Many of the respondents reported their marital status as married or living with a partner (72%). Others were single (15%), divorced or separated (12%) or widowed (1%). Many of the firefighter participants had completed a college degree. Seventy-two (36.7%) of the members completed an Associate's degree and 21.9% completed a bachelor's degree. A small number of members had completed some post-graduate work (4.1%). Several members completed some college or technical/vocational training beyond high school (31.6%) and several of the members completed high school or earned a GED (31.6%). With regard to tenure in the fire service, the majority have been in the fire service between 4 and 9 years (28%) and 10 to 15 years (25.5%). Less than two percent have been with the department less than one year. Nine percent have been with the department between 1 and 3 years and 16% have been with the department between 16 and 20 years. Slightly less than 15% have been with the department between 21 and 25 years and 11 members (5.5%) have been in the fire service for more than 25 years. Lastly, with regard to rank, the majority of the respondents were frontline firefighters (~49%). Others included company officers (~36%), senior officers (~7%) and those that reported their rank as paramedic (7%).

The department that participated in the present study does fairly well represent the national fire department sample within the United States (Haynes and Stein, 2014). Most firefighters (52%) in the United States are between the age of 30 and 49 (Haynes and Stein, 2014). Our mean age was 40.34 ($SD = 9.29$). With regard to operations and structure, our sample is representative of career fire departments in the United States with regard to the number of stations, number of personnel and operations, particularly for those serving a population between 100,000 and 249,999. The department we surveyed conducts basic and advanced life support, which is similar to most career fire departments. Approximately 62% of career departments in the United States provide basic and/or advanced life support (Haynes and Stein, 2014). With regard to stations and personnel, the department in the

Table 1
Descriptive statistics, alphas and correlation matrix.

	Work stress	Work-family conflict	Burnout	Personal protective equipment	Safe work practices	Reporting & communication
Items (#)	6	3	10	6	5	6
Cronbach's α	0.93	0.96	0.91	0.85	0.79	0.87
Mean	1.73	1.81	1.65	4.78	4.39	4.41
SD	0.79	0.91	0.64	0.41	0.55	0.60
Skewness	1.09	0.91	1.03	-2.49	-0.67	-0.83
Kurtosis	0.92	-0.20	0.32	6.63	-0.31	-0.16
Work stress	1.00					
Work-family conflict	0.65 ⁺	1.00				
Burnout	0.77 ⁺	0.75 ⁺	1.00			
Personal protective equipment	-0.26 ⁺	-0.25 ⁺	-0.34 ⁺	1.00		
Safe work practices	-0.26 ⁺	-0.25 ⁺	-0.33 ⁺	0.58 ⁺	1.00	
Reporting & communication	-0.21 ⁺	-0.20 ⁺	-0.27 ⁺	0.51 ⁺	0.55 ⁺	1.00

* $p < .01$.

study has 14 stations accounting for a rate of 0.07 stations per 1000 population served. This is equivalent to the average number for national fire departments that serve populations between 100,000 and 249,999 (Haynes and Stein, 2014). With regard to fire service personnel, the department we surveyed has 1.80 career firefighters per 1000 population served. This is slightly greater than the median rate of 1.28 for the United States and the median rate of 1.35 for the southern region (Haynes and Stein, 2014). In general, it is evident that the department surveyed is representative of most career fire departments throughout the southeastern United States and the continental United States.

2.2. Measures

Six constructs were included within the hypothesized model and the analyses. Relationships were assessed in this study via path analysis using Mplus version 7.2. Cronbach's alphas for each of the six constructs are included in Table 1 along with their correlations and descriptive statistics.

Two antecedent factors to burnout were included in the model. These two factors included work stress and work-family conflict. Perceived work stress was assessed using a six item scale derived from the work of DeJoy and his colleagues (DeJoy et al., 2010). The items were assessed using a 5-point Likert-type scale ranging from almost never to almost always. The items for this scale included items such as "in the last month, how often have you felt nervous and stressed because of work" and "in the last month, how often have you felt you were unable to control the important things at work." Cronbach's alpha for this scale was 0.93. Work-family conflict was assessed using a three item scale adapted from Carlson et al. (2000). Items included "When I get home from work I am often too frazzled to participate in family activities/responsibilities," "I am often so emotionally drained when I get home from work that it prevents me from contributing to my family" and "Due to all the pressures at work, sometimes when I come home, I am too stressed to do the things I enjoy." Items were assessed on a 5-point Likert-type scale ranging from strongly disagree to strongly agree. Cronbach's alpha for this scale was 0.96.

Firefighter burnout, an important outcome and predictor in the proposed model, was assessed using Malach-Pines' 10-item scale (Malach-Pines, 2005). The Cronbach's alpha for this scale was 0.91. Some of the items included "When you think about work overall, how often do you feel disappointed with people" and "When you think about your work overall, how often do you feel hopeless." These items were assessed on a 5-point Likert-type scale ranging from almost never to almost always.

Three safety behavior measures were included in the model as outcomes. These included the following: use of personal protective equipment, safe work practices and reporting and communication.

Items related to personal protective equipment and safe work practices were derived from suggested safety practices presented in NFPA 1500: Standard on Fire Department Occupational Safety and Health Program (National Fire Protection Association, 2013). The utilization of personal protective equipment was assessed using a six item scale, with each item assessed on a 5-point Likert-type scale ranging from almost never to almost always. Cronbach's alpha for this scale was 0.85. Sample items from this measure include "I correctly inspect all my PPE on a regular basis," "I personally check my SCBA at the start of each shift" and "I correctly use appropriate PPE during firefighting operations." Safe work practices was assessed using a five item scale, with each item assessed on a 5-point Likert-type scale ranging from almost never to almost always. Cronbach's alpha for this scale was 0.79. Sample items from this measure include "I follow applicable standard operating procedures (SOP's) during all emergency operations" and "When I find defective firefighting equipment, I recommend it be repaired or removed from service." Lastly, reporting and communication was assessed using a six item scale, with each item assessed on a 5-point Likert-type scale ranging from almost never to almost always. These items were derived from measures related to reporting and communication (Burke et al., 2002) and items related to communication and safety voice (Tucker et al., 2008). Cronbach's alpha for this scale was 0.87. Sample items from this measure include "I speak up and encourage others to get involved in safety issues" and "I communicate potential hazards and exposures to firefighter personnel."

2.3. Preliminary analyses

Prior to completing the path analysis to examine hypotheses, data screening procedures were completed using SPSS v.22. Descriptive statistics for the path analysis measures are presented in Table 1. Preliminary analyses, including bivariate analyses and psychometric analyses were also completed. Bivariate analyses were completed to examine whether associations existed between control variables, including age, race, marital status, education and rank, and the six constructs within the study.

As illustrated in Table 1, data were mostly normal, albeit kurtosis was somewhat higher with personal protective equipment, as the majority of respondents indicated high levels of use of personal protective equipment. With regard to psychometrics, Cronbach's alphas for the measures were very good with all levels greater than 0.80, except for safe work practices, which was 0.79. A general assessment of the correlation matrix illustrates the predictive validity of our antecedents to burnout, given their significant positive relationships and the predictive validity of burnout as the relationships with safety performance outcomes were significant and negatively associated.

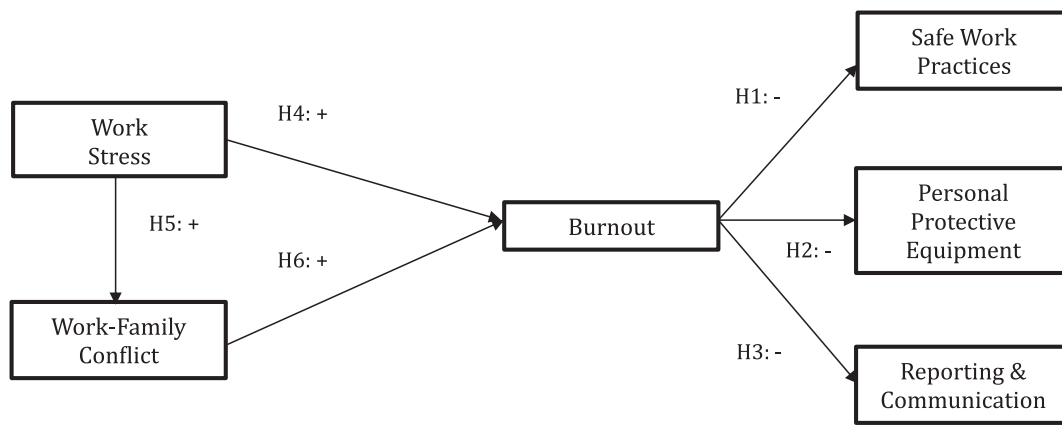


Fig. 1. Proposed model.

2.4. Model analysis

A path analysis, which allows for the simultaneous modeling of regression relationships, was completed using Mplus version 7.2 (Muthen and Muthen, 2015). There was little missing data. The default in Mplus, which uses all available data to estimate the model using full information maximum likelihood was utilized. The path analysis examined relationships between two antecedents, including work stress and work-family conflict and burnout and the relationships between burnout and multiple firefighter safety behavior outcomes including use of personal protective equipment, safe work practices and reporting and communication. Overall model fit was assessed against criteria established by Hu and Bentler (1999). Hypotheses were assessed by examining the statistics for each of the hypothesized pathways. The hypothesized model is presented in Fig. 1.

3. Results

Prior to assessing the proposed model, bivariate analyses were completed. There were no significant relationships ($p < .05$) between the five control variables (age, race, marital status, education and rank) and the six constructs included in the model. With regard to the assessment of the proposed model (see Fig. 1), the overall fit was excellent as indicated by the following fit statistics: $\chi^2 = 7.43$, $df = 6$, $p = .283$, RMSEA = 0.038, SRMSR = 0.025, TLI = 0.992 and CFI = 0.997. An examination of all fit indices indicate the model is better than criteria established for acceptable model fit (Hu and Bentler, 1999).

The hypothesized relationships were examined by evaluating unstandardized path coefficients, standard errors and significance values. These outcomes are presented in Table 2. We determined that both work stress ($B = 0.40$, $p < .001$) and work-family conflict ($B = 0.30$,

$p < .001$) were positively associated with firefighter burnout outcomes. In addition, we determined that work stress was positively associated with work-family conflict ($B = 0.75$, $p < .001$).

One major objective of the present study was to examine the impact of burnout on firefighter safety behavior outcomes. We posited that emotional exhaustion, cynicism and depersonalization, manifested as burnout, would be negatively associated with firefighter safety behaviors (Hypotheses 1–3). As posited, burnout negatively influenced all three safety behavior outcomes. Burnout was negatively associated with the performance of safe work practices ($B = -0.30$, $p < .001$), personal protective equipment compliance ($B = -0.22$, $p < .001$) and reporting and communication ($B = -0.25$, $p < .001$).

In review, it was determined that all hypothesized pathways were significant and in the posited direction. Thus, all hypotheses were confirmed for the present study. Beyond this, we analyzed an alternate model, which assessed direct paths between work stress and the behavior outcomes and work-family conflict and the behavior outcomes. This model, a just-identified model, was not substantially different, but reiterated that the effects of work stress and work-family conflict were mostly indirect. There were no significant pathways between work stress and the behavior outcomes and no significant pathways between work-family conflict and the behavior outcomes, except between work-family conflict and reporting and communication ($B = -0.18$, $p < .05$). The fact that work-family conflict was not associated with personal protective equipment compliance and safety work practices is not completely surprising. Cullen and Hammer (2007) found that work-family conflict was not associated with safety compliance in healthcare workers and the influence on safety is generally associated with family-work conflict where conditions and relationships within the family interfere with work.

4. Discussion

Numerous safety initiatives and control programs have been implemented over the past 20 to 30 years to improve firefighter safety and health. Although some of these initiatives have been beneficial, far too many injuries, illnesses and fatalities still occur during fire service operations and line-of-duty tasks. As such, there has been no sustained reduction in firefighter injuries and fatalities for more than two decades (USFA, 2002, 2016). During this period, we have seen an increased emphasis on assessing the relationships between organizational and psychosocial factors and occupational safety and health outcomes, including safety behaviors. Unfortunately, little of this work has been completed in the fire service. Today, fire service stakeholders continue to contend that psychosocial and organizational factors associated with firefighter safety should be explored and addressed by researchers and practitioners (National Fallen Firefighters Foundation, 2015; USFA, 2015). Further, given that fire service operations significantly differ

Table 2 Model relationships.

Path	Unstandardized path coefficient	SE	t	p
Work stress to:				
Burnout	0.40	0.05	8.73	0.00
Work-family conflict	0.30	0.04	7.63	0.00
Work-family conflict to burnout	0.75	0.07	10.71	0.00
Burnout to:				
Personal protective equipment	-0.22	0.05	-4.51	0.00
Safe work practices	-0.30	0.07	-4.49	0.00
Reporting & communication	-0.25	0.07	-3.49	0.00

from many job roles and responsibilities, especially with regard to exposures and work in high-risk environments and situations, more research needs to be completed to fully understand the relationships between unexplored psychosocial and organizational factors and safety outcomes in the fire service. This includes the examination of relationships between work stress, work-family conflict, burnout and safety behavior outcomes.

The present study provides insights into the relationships between work stress, work-family conflict and burnout. Likely more importantly, the present study provides confirmation that burnout, as a stress-related process, does negatively impact safety performance in the fire service. When firefighters are burnt out, they do not effectively communicate or voice their safety concerns, they are less likely to use personal protective equipment properly and are less likely to follow standard operating procedures or perform standard work practices in a safe manner, which could ultimately result in firefighter injuries during line-of-duty operations.

Although stress and work-family conflict were associated with burnout, these factors did not necessarily predict safety behavior outcomes in our sample of firefighters. Stress and work-family conflict were antecedents to burnout, but burnout was determined to be the major predictor of diminished safe work practices. As with many other studies, the exact reasoning for this diminished safety performance associated with burnout is not fully known at this juncture and would be an appropriate aim of future research. Possible explanations though may potentially be attributed to diminished physical health and ability (Shirom, 2011; Honkonen et al., 2006; Melamed, 2009; Melamed et al., 2006), impaired coping abilities (Shirom, 2011), reduced motivation to perform (Halbesleben and Bowler, 2007; Shirom, 2011), organizational deviance (Mulki et al., 2006), cognitive impairment and diminished information processing (He et al., 2017; Krystyna et al., 2017), diminished levels of job and organizational commitment (Maslach et al., 2001) or other consequences of burnout that may mediate the relationship between burnout and safety behavior. Despite the reasoning for these associations, the best and most effective interventions aimed at enhancing safety performance associated with burnout, should likely be focused on curtailing and eliminating burnout within fire service members, by particularly addressing upstream psychosocial and organizational factors including job demands that have been associated with burnout in the fire service (Lourel et al., 2008). By targeting these demands, stressors, resultant work-family conflict and ultimately burnout can be reduced.

Many of the demands encountered by firefighters are intrinsic aspects of the job. Often these demands cannot be fully abated; however, they may potentially be countered through safety resources (Smith and Dyal, 2016). There is particular support and theoretical justification for this safety-oriented approach to the job-demands resources model in multiple industries (Nahrgang et al., 2011) and an argument for this approach within the fire service (Smith and Dyal, 2016). In this approach, it is believed that an emphasis on safety resources, including support for safety, safety-specific transformational leadership and safety climate will counter the effects of demands on stressors and burnout (Kanste, 2008; Li, Jiang, Yaho and Li, 2013; Nahrgang et al., 2011; Smith and Dyal, 2016). Given the structure of fire service organizations, efforts to address these resources should likely be at the work group level, which is at the “company” level within American fire departments. Immediate supervisors in these groups would be able to incorporate safety-specific transformational leadership strategies relevant to the fire service to achieve safety, health and wellness goals and to foster a positive safety climate (Smith et al., 2016). Further, these immediate supervisors could facilitate programs and processes to ensure support for safety and to provide recovery from job demands to include adequate rest and rehabilitation during firefighting operations and adequate post-event rest and recovery. Limited or no recovery may result in burnout and reduced performance outcomes (Horn et al., 2011).

Beyond this safety-oriented approach, others support broader organizational approaches to reducing burnout in workplace settings by addressing factors such as fairness and equity and by building engagement (Maslach et al., 2001). Addressing organizational factors and creating organizational change is not easily accomplished. However, some guidance is offered by Halbesleben and colleagues (Halbesleben et al., 2006) as they utilized an action research framework approach to minimize some stressors and burnout in a sample of federal fire service members. This framework is stated to be a more holistic and tailored approach, as it involves multiple participants from throughout the organization and is focused on organization-specific issues, causal factors and interventions (Halbesleben et al., 2006).

Although the findings of this study are significant and have resulted in an important contribution to the literature, some limitations have to be considered when interpreting the overall conclusions associated with the results of this study. Cross-sectional data were collected, which limits causal inferences made within the study. Further, cross-sectional data were collected from one city fire department in the southeastern United States. Although the department and sample are clearly representative of the American fire service, as presented in the Methods section, concluding generalizations are somewhat limited, including making generalizations to non-career fire service members. Along with this, the use of a broader and larger sample across the United States would be beneficial. Lastly, it should be understood that the data collected in the present study included only self-report data, which presents some potential biases.

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