

Sounding the Alarm: A Matter of Life or Death for Firefighters

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Abstract

Introduction: The relationship between occupational exposure to traumatic situations and an increase in mental health concerns for firefighters has only recently begun to be studied. The literature shows first responders have a high incidence of job burn out, relationship problems, and suicide (Haddock et al., 2016). The suicidal ideation rate for the general population is between 6-14%; however, the average suicidal ideation rate of first responders is 47%, with almost two times the number of completed suicides compared with the general population. Following the suicide of a peer support specialist fire fighter, the Rio Rancho, New Mexico Fire Department signed an MOU with Cummings Graduate Institute for Behavioral Health Studies to create an integrated curriculum for firefighters regarding their own mental health.

Aim, Objectives, Theory or Methods: In creating an online curriculum utilizing evidence-based behavioral health education and treatment, we aim to increase firefighters' knowledge concerning suicide, developmental and event trauma, and self-care and resiliency. The overall objective is to teach first responders to change the mentality of "suck it up," to identify unhealthy responses/symptoms early, and to reach out for help. First responders' insights into their own mental health struggles will improve, as well as their awareness of their peers' mental health. Additionally, first responders will gain knowledge of how/when to access mental health treatment while reducing the associated stigma.

Highlights: Our training is structured after Rio Rancho Fire Department's four graduated levels of certification used for all department knowledge-based-promotions: Awareness, Operational, Technician, and Specialist. Each certification level increases in

knowledge and intensity of information and skills. Within each certification level are modules regarding Suicidology, Trauma, and Self-Care/Resiliency. We include a pre and post survey to capture first responders' perceptions regarding their understanding of suicide, trauma, self-care, and resiliency. Because of the graduated levels, the student is motivated to move up the levels of education, which are designed to encourage the student to take responsibility for their own wellbeing.

Conclusions: Our training curriculum is taking a unique approach in teaching first responders about how childhood trauma/developmental trauma contributes to current stress reactions and relationship problems, and it connects the dots for unhealthy habits. Ultimately, the goal is to teach first responders how to make changes that are sustainable throughout their lifetime.

Implications: This low-cost training is computer based, and as video meetings (Zoom, etc.) are now commonplace due to the COVID-19 pandemic, our curriculum is easily transferable, sustainable, and applicable to other fire departments. Furthermore, we believe this program can be expanded to include additional first responder professions (911 operators, etc.).

Literature Review

The National Institute for Occupational Safety and Health (NIOSH) Division of Safety Research compiles yearly data on occupational injuries for emergency medical services (EMS) workers. EMS personnel include firefighters, emergency medical technicians, and paramedics. The Occupational Injury and Illness Classification System (OIICS) categorizes injury incidents on the nature, source, and event or exposure of the injury/illness and the body part affected (CDC, 2021). Unfortunately, the information collected does not include occupational “stress” injuries (OSI) such as anxiety, depression, insomnia, substance misuse, moral distress/injury, or PTSD. Likewise, there is limited data gathered on OSI despite their direct relation to physical illnesses, such as cardiovascular disease, the leading cause of death for firefighters, or motor vehicle accidents, their second leading cause of death (Barger et al., 2015).

One theory for the increase in OSIs is the surge in fire department calls for non-fire-related assistance. For example, according to the 2022 ESO Fire Service Index, during the year 2021, they reviewed over 3.2 million calls for fire department support. ESO found that 69% were rescue and EMS incidents, 29% were other types of calls (i.e., service, good-intent, false alarm), and only 2% were fire-related calls. This data is consistent with what Cannuscio et al. (2016) found; in 2013, over 31 million 9-1-1 emergency calls were made, with 68% for medical assistance and only 4% requesting fire-related support. Furthermore, 89% of the time, fire departments arrive at an accident or emergency scene before other first responders.

Firefighters, paramedics, and EMS personnel have an elevated risk of occupational stress injuries (Antony et al., 2020). This paper explores both the

connection between occupational exposure to traumatic events and the physical and mental health of firefighters and possible prevention and management strategies.

Trauma

The idea of emotional trauma is first seen in literature by the studies of Jean Martin Charcot, a French neurologist in the late 19th century (van der Kolk et al., 1996). Charcot's studies developed the label of traumatized women being "hysterical" and requiring treatment by hysterectomies (Ringel & Brandell, 2012). In 1893 to 1896, Freud's studies reported a suggested antecedent for the "traumatic dissociation hysteria" which led to additional work, coining the term "psychological trauma" (Herman, 1992). World War I brought the term "shell shock," which was described as a person being overwhelmed with symptoms we now associate with PTSD. Work by Abram Kardiner after World War I introduced the more modern concept "trauma construct" of today, in which the trauma survivor reacts as if their experience is occurring now (Ringle & Brandell, 2012). This early work set the stage for the groundbreaking study connecting physical health outcomes to ten specific childhood adverse events (Felitti et al., 1998).

The firefighter occupation has been studied generally to improve understanding of why firefighters in relatively good physical condition have a higher rate of heart disease than the general population. One of the first articles published by Barnard & Duncan (1975) found that, within one minute of the "alarm sounding" until the fire suppression ended, firefighters had an unusually prolonged time of increased heart rates. The 1975 study determined that firefighting generates situations of high stress, producing anxiety, and resulting in tachycardia (Rosenfield, 2019). Since 1975,

research on firefighters' physical health and mental health is abundant. A significant publication by the National Fire Protection Association (NFPA) in 2005 identified the leading cause of death for firefighters as a sudden cardiovascular event (NIOSH, 2007). The CDC shortly followed suit in 2007 with the publication by the National Institute for Occupational Safety and Health (NIOSH) establishing an alert with recommendations to Fire Departments on reducing and preventing heart disease. The call for action focused primarily on Fire Departments establishing exercise facilities within the fire houses (NIOSH, 2007).

In studies following the identification of sudden cardiac death in the firefighter occupation, researchers started focusing their efforts on what was causing the cardiovascular disparity in firefighters. The literature brought clarity to the reality that firefighting as a profession was viewed by the public as being heroic, but without understanding how deadly it is. Firefighters work in an occupation that is physically dangerous and rife with toxic chronic stress due to continual exposure to trauma (DeMoulin et al., 2022).

Trauma is defined by the CDC as: "Exposure to a traumatic event or set of circumstances [which] can negatively affect a person's mental, physical, social, emotional or spiritual well-being for a long time after the initial incident" (Wolken, 2018). Wolken (2018) goes on to say:

We know that not all individuals respond to trauma in the same way, and we know that individuals with a history of trauma, especially childhood trauma, are more likely to experience psychological distress and are at increased risk for the

development of post-traumatic stress disorder (PTSD) with future exposure to trauma (Wolken, 2018, para, 1).

Gulliver et al. (2021) reported a promising study related to firefighters' entering the occupation with a high stress tolerance that correlates with a lowered trajectory of symptomology that may converted to a PTSD diagnosis. Two studies, Paulus et al. (2018) and Park et al. (2018), support the 2021 study which concludes that lower anxiety sensitivity is a better predictor of a firefighter developing PTSD. This research supports the idea of "dose-response." An individual firefighter entering the occupation could be identified with a lower "anxiety sensitivity," and receive therapeutic intervention to mitigate continued occupational trauma exposures, that is, to increase "anxiety sensitivity" tolerance. These conclusions are promising and support the idea that knowledge of childhood trauma helps in finding interventions that could mitigate development of PTSD.

The challenge for any type of intervention related to firefighter mental health is the "machismo" culture. The attitude of "suck it up and keep going" is rampant. In 2007 the National Institute for Occupational Safety and Health (NIOSH) established wellness program expectations for fire department implementation. Eastlake et al. (2015) found a reduction in cardiac related deaths for firefighters since 2007; however, improvement specifically targeting diet and exercise is still needed to reduce CVD in firefighters. Currently, fire departments are not mandated to have specific training requirements related to physical and emotional health. Most fire departments, if their budget allows, have exercise rooms in their fire houses. Again, there is not a requirement for use. Fire Academies are now including some education on physical fitness, lifestyle, and

emotional well-being. However, little is done for reinforcement after the initial introduction of the topics. In a recent interview conducted with a Lieutenant at a local fire department, he responded to the question asked about training. A. Cooper responded, “You mean, do we tell new recruits that when you become a firefighter your life expectancy will be 15-years less than the rest of the population?” The answer is, no, and illustrates how little there is to help change this “machismo” culture and toxic effects on firefighters’ health.

Bastug et al. (2019) reports 55% of firefighters endorse symptoms of PTSD. This is an example of why understanding the effects of trauma and psychological outcomes for firefighters is essential in development of prevention interventions. The literature is sparse in relation to interventions for firefighters except for preventing cardiovascular disease. Staley et al. (2011) provides a well-organized study with recommendations for physical fitness, in relation to CVD. Their study made a good point of addressing the “cultural” meaning of physical fitness, since there is not a mandatory standard established. Cultural relevancy comes to bear when a firefighter cannot perform job duties; then their fitness level is evaluated by their “chain of command” (Staley et al., 2011). Every firefighter knows they need to “work out” to maintain the ability to adequately perform their job. What every firefighter does not know is the reason to “work out” goes way beyond job performance, to include cardiac health and management of stress. Staley et al. (2011) further outlines the “crew and captain level fitness norms” directly relate to the physical and emotional health of a fire department. This finding is key, as the firefighter occupation is close-knit and cohesive, as they spend many hours together in close quarters, and experience extreme physically and

psychologically stressful and traumatic events together. Thus, the crew and department norms become the reality of how firefighters live their lives while on duty and off. These norms need to change, and this is very difficult to achieve.

The literature has proven that firefighters are exposed to chronic traumatic stress, which has caused firefighters to develop an unhealthy culture that extends from the fire house to their home and affects all their relationships (Haddock et al., 2016). A culture of “suck it up” is commonplace amongst the “brotherhood,” and coping behaviors including substance use, smoking, risky behavior, and poor dietary habits, all of which can prove detrimental to the firefighter’s life expectancy (Eastlake et al., 2013).

Suicide

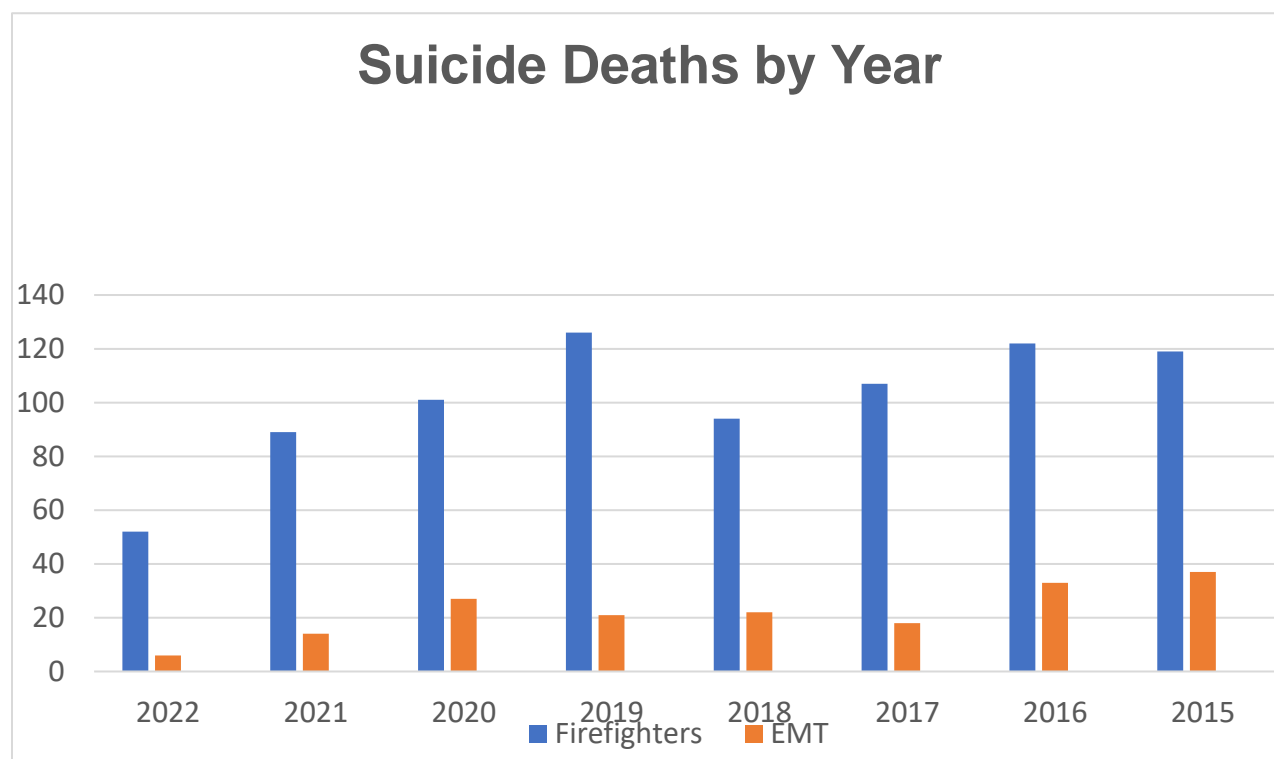
Suicide is the 10th leading cause of death in the United States, with an estimated 5-14% of the general population having suicidal ideation, and 2-9% having attempted to end their life by suicide. However, for first responders, those numbers increase significantly to 47% having suicidal ideations and 16% having attempted suicide (Wolford-Clevenger et al., 2020).

Risk factors for the general population include prior attempts to end their life by suicide, mental illness, substance misuse, family history, relationship stressors, chronic pain, medical diseases, and adverse childhood experiences (NIMH, 2021). Specific EMS risk factors related to suicide include repeated exposure to emergency and traumatic incidents, responding to calls for suicide attempts and deaths, extended shift work, disrupted sleep, paid vs. volunteer status, urban vs. rural, and knowledge and access to lethal means (Jones et al., 2018). Not surprisingly, Stanley et al. (2016) found that the risk of a suicide attempt increased by a factor of six for EMS personnel with

dual medical and firefighting duties. See Table 1 below related to suicide deaths by calendar year.

Table 1

Firefighters' Deaths by Suicide per Calendar Year



In their systematic review of first responder's suicidal thoughts, behaviors, and suicide, Stanley et al. (2015) reviewed 63 quantitative studies. The authors noted the plethora of recent research showing first responders' susceptibility to PTSD, but a paucity of related research for suicidal ideation, attempts, and fatalities. Of the 63 studies reviewed, only nine focused on firefighters and two on EMS.

One article showed that out of 1027 firefighters, 47% had suicidal ideation, 19% had a suicidal plan, and 16% had suicidal attempts. Those numbers are 14%, 4%, and 5% among the general population. Four studies were specific to firefighter suicide

deaths; all four studies revealed lower rates of suicide for firefighters compared to the general population. However, the authors also highlight that these four studies are from major metropolitan cities compared to other studies showing a higher suicide rate in rural and volunteer fire departments. Additionally, the Stanley et al. (2015) review reported a six-fold increased risk for suicide attempts when firefighters also respond to emergency medical service calls.

Carpenter et al. (2015) theorized the role of social support in the rate of suicide among firefighters. The authors reviewed 334 firefighters' responses to the Sources of Occupational Stress Scale (SOOS-14). Social support was measured through the Firefighter Social Support Scale (SSS-FF) and the Interpersonal Support Evaluation List. In addition, the Beck Depression Inventory for Primary Care was utilized to assess suicidal ideation. Results showed suicidal ideation and occupational stress as risks, but when social support was high, the suicide risk was lower. Additionally, the authors found that a positive association of suicide correlated with lower levels of social support, significantly when stress levels were elevated.

Lawn et al. (2020) reviewed 39 research articles published from 2000-2018 regarding the experience of Australian medical first responders and the subsequent effect on their health. The authors found that the workplace contributed to health issues in addition to traumatic events. Poor leadership, shift work, failure to acknowledge the stressful environment, and lack of support were crucial factors. For example, when a first responder is out due to an illness (physical or mental health) or during post-retirement, the lack of support was noted as detrimental to the employee's health.

Two recommendations emerged from the Lawn et al. (2020) review: one suggesting a program to address the psychological health of first responders, and the second, strategies to improve organizational issues.

The primary theories of suicide include the Interpersonal Psychological Theory (IPT) and Integrated Motivational Volitional (IMV). IPT posits that perceived burdensomeness (feeling a burden to others) and thwarted belongingness (feeling disconnected from others) contribute significantly to suicidal thoughts (Chu et al., 2017). In contrast, IMV proposes that the leading causes of suicidal thoughts are feelings of defeat (brought down or humiliation) and entrapment (no escape), with the transition from ideation to attempt driven by access of means, exposure to suicidal behavior, and fearlessness of death (O'Connor et al., 2018). However, De Beurs et al. (2019) ascertained that entrapment (from the IMV model) and perceived burdensomeness (from the IPT model) are the key contributing factors to suicidal ideation.

These authors could not locate any research articles on how retirement affects suicidal thoughts for first responders or firefighters. However, one could extrapolate that retiring from the fire department automatically decreases a person's social support, thereby increasing the risk of dying by suicide. Jeff Dill, CEO/Founder of the Firefighter Behavioral Health Alliance (FBHA), noted that of the 282 retired firefighters who died by suicide, 37 deaths occurred in their first week of retirement.

Carpenter et al. (2015) and Lawn et al. (2020) both note that social support plays a role in suicidal thoughts. Could the definition of thwarted belongingness entail feelings of lack of social support? Does the IPT notion of perceived burdensomeness or IMV's entrapment contribute to firefighters' mentality of "suck it up?" Does routine exposure to

suicidal behavior and the innate knowledge of lethal means of suicide increase the suicidal risk for first responders?

These authors recommend further research into how exposure to suicidal behavior, knowledge of lethal means, retirement, social support, and rural vs. urban play roles in firefighter suicide.

Sleep

In an active and high-stress occupation, firefighters frequently work extended shifts and long workweeks. Undiagnosed and untreated sleep disorders can negatively impact job performance. Work schedule and occupational stressors contribute to issues with sleep, which can lead to depression or other mental health concerns, as well as physical issues such as cardiovascular disease, diabetes and other metabolic diseases, and increase the risk of vehicle crashes (Barger, 2015; Rajagopalan, 2011). Because firefighters and paramedics have sleeping quarters at the workplace, they experience a unique sleep environment with less control over light, noise, and bedding. In addition, they are often interrupted to rush to an emergency. Part of this literature review examined studies to determine the main factors in firefighters' sleep deficiencies and to propose initiatives for improvement.

Mehrdad et al. (2013) analyzed sleep quality among Iranian firefighters. Three hundred and seventy (370) of four hundred and twenty-seven (427) firefighters agreed to participate in the study. The authors conducted a face-face interview utilizing the Persian version of the Pittsburgh Sleep Quality Index (PSQI) and a demographic and occupational data questionnaire. Results showed that 69.9% of respondents were poor sleepers, with sleep latency as the most significant concern.

The authors then compared the result of the PSQI to the following variables: age, length of service, education level, marital status, number of children, frequency of tea and coffee use, exercise occurrence, smoking status, disease status, medication usage, and second job status. The comparison findings showed that the most significant characteristics related to poor sleep were smoking, having a second job, and years of firefighter experience. The authors also note that years as a firefighter were a higher predictor than age for poor sleep. Mehrdad et al. (2013) concluded that this was due to the increase in experiencing traumatic events.

Peterson et al. (2019) posited that sleep and mental health disorders in firefighters are associated with burnout. The authors examined 6,307 North American firefighters' answers on the Maslach Burnout Inventory (MBI), Athens Insomnia Scale, Berlin Questionnaire, Restless Leg Syndrome Questionnaire, and the Epworth Sleepiness Scale (ESS). Firefighters self-reported if they had a current diagnosis of depression, anxiety, or PTSD. Those participants with a sleep disorder or mental health diagnosis had a significantly (2-4x) increased risk of burnout.

Mehrdad et al. (2013) concluded from their experiment that shift work was not a significant factor in the poor sleep of firefighters. This outcome of shiftwork not having a significant impact on sleep was supported by Jan et al. (2019).

One intervention has shown an improvement in firefighters' sleep. Sullivan et al. (2017) analyzed the mandatory use of a 30-minute, in-person sleep health program (SHP) with firefighters in Ohio. They tested their hypothesis that an SHP would increase firefighter health and decrease safety incidents over twelve months. The authors compared firefighter health, as the number of "sick time" and "injury/disability" coded

during 24-hour pay periods, and firefighter safety, as accidents and injuries resulting in submitting an accident report. Additionally, intervention participants completed a baseline and end-of-year survey to determine any improved sleep and general health. After the twelve-month intervention, results showed that the control group of firefighters reported almost twice the number of injury and disability payroll codes as the intervention group had.

Furthermore, firefighters in the intervention group were 24% less likely to submit an official injury report than the control group. However, there was no significant difference in the number of reported sick days or reported fleet vehicle accidents. The authors concluded that an SHP could reduce firefighter injuries and time lost to disability by almost 46%.

Sleep disorders are overwhelmingly common in firefighters and are linked to an increased rate of motor vehicle crashes, cardiovascular disease, diabetes, anxiety, and depression (Barger et al., 2015; Mehrdad et al., 2013, Peterson et al, 2019; Sullivan et al., 2017). Therefore, it is routinely recommended to adjust shift schedules to maximize the opportunity for sleep during and after shifts (Peterson et al., 2019). However, as shown in numerous research studies, shiftwork has less to do with sleep disorders and adverse health conditions than the number of emergency calls during shifts or a second job.

Physical Health

The stressful nature of firefighting produces risks to emotional and physical health. *Kales et al. (2007) categorized duties of firefighters by task to include “fire suppression, alarm response, alarm return, physical training, emergency medical*

services, rescues, and other non-emergency duties.” Time spent on a particular task was evaluated for analysis to correlate heart attack to an occupational duty (Kales et al., 2007). Findings were unexpected and showed that fire suppression accounts for only 1 to 5% of time spent by firefighters performing their jobs (Kales et al., 2007). However, nation-wide, 32% of firefighter heart attacks occurred during fire suppression, which is explained by the increased cardiovascular demand during fire suppression (Kales et al., 2007). Schlicht et al. (2018) discuss the firefighter equipment, which is necessary to keep firefighters safe but is burdensome due to weight and causation of heat production by the layers of equipment. Symptoms of dehydration, physical exhaustion, and lack of heat dissipation in the design of the safety equipment are contributing factors in high cardiovascular demand (Schlicht et al., 2018).

Americans most at risk for cardiovascular disease are people from non-white racial and ethnic groups. The CDC (2018) described cardiovascular disease as plaque buildup in arteries causing narrowing. The narrowing reduces blood flow, but plaque can also “break off,” causing a blood clot. A blood clot can also cause reduction of blood flow as well as move into the heart, lungs, or brain. Cardiovascular disease can be hereditary or developed through poor eating habits, smoking, lack of physical exercise, and stress. Co-morbid conditions of diabetes, overweight or obesity, and excessive alcohol use can contribute to development of CVD (CDC, 2018).

Cardiovascular disease in firefighters has been found to be due to a combination of personal and occupational factors. Personal factors are the same as the general population related to lifestyle habits (Yook, 2019; Haveranek et al., 2015). Long term exposure to fire smoke has cardiovascular effects (ESO, 2019). In 2022 the leading

cause of death for firefighters changed from a sudden cardiovascular event, which now takes second place, to cancer being the leading cause of death for firefighters. The literature has supported mentioning cancer risk and firefighting for the last decade. The National Institute for Occupational Safety and Health (NIOSH), which is a division of the CDC, has posted that “cancer is a leading cause of death among firefighters, and research suggests firefighters are at higher risk of certain types of cancers when compared to the general population.” Mesothelioma and bladder cancers have the highest rates for firefighters as shown in recent literature, with other types of cancers being studied closely (Harrison et al., 2022).

This announcement is another health disparity for the occupation of firefighter. The carcinogens are not only present at the fire suppression site, but firefighters bring particulates back in the fire house on the very fire suppression equipment that is designed to keep them safe (Casjens et al., 2020). Future Firefighters (2022) reports firefighters have a higher risk of certain types of cancer. These are shown in Table 2.

Table 2

Cancers of Higher Risk Associated with the Occupation of Firefighter

Type of Cancer	Firefighter Risk Percentage
Testicular Cancer	102%
Multiple myeloma	53%
Non-Hodgkin Lymphoma	51%
Skin Cancer	39%
Prostate Cancer	2*%

Stomach Cancer	22%
Intestinal Tract Cancer	21%

The United States Congress passed the Protecting Firefighters from Adverse Substances (PFAS) Act on December 1, 2022, and now awaits signature by President Biden (IAFF, 2022). The International Association of Fire Fighters (IAFF) (2022) is sending out education to its members with recommendations for handling Personal Protective Equipment (PPE), which includes fire suppression clothing, equipment, and breathing apparatuses which are termed by the industry as “turn out gear.” Carcinogens on turn out gear during fire suppression were found not to be cleaned appropriately between calls. The carcinogen particulates are carried into the fire trucks and fire houses and breathing equipment that has not been cleaned properly is dangerous (Casjens et al., 2020). In July 2022, the International Agency for Cancer Research recognized that cancer in firefighting is linked to occupational exposure, increasing the rating to level 1 from a level 2B rating (Harrison et al., 2022). This means that at an international level of occupational exposure for firefighters is now “carcinogenic” instead of “possibly carcinogenic.”

The health disparity is predominant: an individual who chooses the occupation of firefighter is more likely to die of cancer, a sudden cardiac event, or a motor vehicle accident than the general population. The disparity has been identified. It is time to research, develop, and implement prevention programs to stop this disparity.

Mental Health

First responders work in a fast-paced, highly stressful, and risky environment. This whirlwind tempo can lead to difficulty processing stressful events. For example, Bentley et al. (2013) report that almost 70 percent of EMS personnel are not allocated enough time to process a traumatic event before encountering the next one. As a result, first responders frequently experience anxiety, depression, insomnia, stress and posttraumatic stress symptoms, moral distress, suicidal ideation, physical complaints and illnesses, and many other biopsychosocial conditions.

Heyman et al. (2018) released a white paper to raise awareness regarding first responders' mental health and decrease the stigma of seeking services. The authors reviewed multiple studies showing exposure to critical incidents, and the correlation between increased alcohol use and symptoms of PTSD, and the 48% suicidal ideation rate for firefighters. The authors also highlight that, although first responders are portrayed as heroic in times of "big events," the repeated exposure to traumatic events is either downplayed or forgotten by the public.

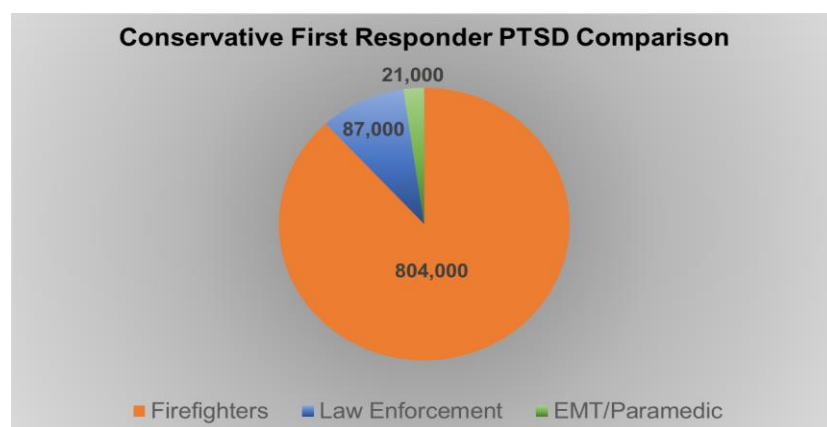
Firefighters have a high professional risk due both physically injury and psychological injury because of the dangers of their job. Every time the alarm sounds, firefighters don their equipment and rush into an unknown situation that could potentially be life threatening for them. When the alarm sounds, it initiates the natural physiological response of the autonomic nervous system, the sympathetic nervous system, to prepare the firefighter to "run into fire." Firefighters train for that danger and prepare for the alarm to sound every day they work, but most calls are not fire related. Bendersky (2018) reported 64% of fire department calls were medical related. Fire departments

across the country have become the de-facto community service that is called to provide any service from rescuing the proverbial cat from a tree to fighting fires.

The literature is full of fire Chiefs reporting the concern for the growing demands of calls that are not true emergencies as the “unit and crew” are taken out of service for a non-emergent call and not available when a true disaster or emergency call comes in (Blount, 2019). Medical emergency calls expose firefighters to increased job-related stressors which are traumatic. Park et al. (2018) studied the “emotional labor” involved by firefighters in answering daily calls for service. A 2018 study (Lewis-Schroeder et al.) corroborates the “emotional labor” involved by concluding that firefighters have an 80% increased risk of developing PTSD over any other first responder professional group. Figure 1 demonstrates the large disparity in trauma exposure for developing PTSD than other first responder professions.

Figure 1

First Responder PTSD Comparison



Note: Figure 1 reference: (Lewis-Schroeder et al., 2018)

Jones et al. (2018) studied 220 firefighters and emergency medical technicians/paramedics in Arkansas and assessed mental health needs and associated risk factors. The study was a voluntary online questionnaire consisting of the GHQ-28, PHQ-9, GAD-7, PCL-C, AUDIT, PSQI, and SBQ-R. Of the 220 participants, 147 were active firefighters, 96 were active EMTs, 12 were retired firefighters, and 5 were retired EMTs. The authors noted that 50% of the responses indicated a need for further mental health assessment. Sleep was the highest-rated concern, with 93% answering positively for disturbances. In addition, 28% reported substantial anxiety, 14% for significant depression, 20% indicated harmful alcohol use, while another 10% qualified as alcohol dependent. The study also showed that department size could be correlated with the risk for suicide, with smaller and larger-sized departments having a higher risk. Interestingly, this study also showed that participants' working 48-hour shifts (as compared to 12 or 24 hours) was significantly associated with increased depression and PTSD.

The CDC (2018) reports 1 in every 6 adults will experience depression and anxiety in their lifetime. The COVID-19 pandemic is expected to increase that statistic to almost every adult. Anxiety and depression have a similar etiology as discussed with CVD. These mental health conditions can be familiar and or come from environmental factors. Prolonged stress exposure as experienced by firefighters has important implications for physical health and emotional health (Harvey et al. 2016). Wolkow et al. (2015) connected the firefighter circadian rhythm disturbance as causal to an acute inflammatory stress response. This supports Barger (2015) findings that sleep

disturbance due to firefighter's disruptive occupational sleep over 48 to 72-hour shifts contribute to higher anxiety levels overall.

Due to their training, occupational injuries or death from performing their job in dangerous situations are not the leading cause or secondary cause of death for firefighters. Rather, it is cancer and heart attacks. A sudden cardiovascular event is directly correlated to occupational stress and the unique lifestyle choices of firefighters (Barger et al., 2015). Unstable sleep patterns disrupt normal circadian rhythms and are found to be the leading cause of motor vehicle accidents (MVA's) involving firefighters (Barger et al., 2015). Factors leading to a firefighter's death are numerous, but lie heavily with the occupation and lifestyle. The literature is clear about the physical rigor of the occupation, intense stress in performing duties, diet, alcohol consumption, tobacco use, and concomitant trauma and toxic stress are directly connected to the first and second leading cause of death for career and voluntary firefighters. Both causes of death are preventable.

Bastug et al. (2018) and Paulus et al. (2018) concur that emotional dysregulation due to PTSD is a common problem in firefighters. The chronic exposure to trauma is creating depression and anxiety symptoms which affect the mental health and physical health of firefighters. Both articles outline the symptoms, and both call for more research on evidence-based interventions specifically for firefighters (Bastug et al., 2018; Paulus et al., 2018).

The high incidence of heavy drinking in the firefighter profession is linked to the increase in depression and PTSD and continued trauma exposure (Harvey, 2015). Again, the common link in all findings is continued trauma exposure. The use of alcohol

is the most common substance misused by the fire service. A recent survey showed that 85 percent of career firefighters drank alcohol and 42.5 percent of male respondents and 60 percent of female respondents reported binge drinking episodes in the past 30 days (IAFF, n.d.).

Harvey (2015) calls for a change in policy related to the mental health of firefighters. Kaurin et al. (2018) studied 123 male firefighters, assessing their ability for self-compassion. Findings were positive that firefighters who demonstrated self-compassion were able to “buffer” negative effects of trauma exposure; thus, they had fewer depressive symptoms and higher resiliency (Kaurin, et al, 2018). This study is significant in measuring an outcome that intervention strategies can be developed to support. All articles related to anxiety and cardiac health touched on firefighter sleep disturbance. Billings & Focht (2016) summed up sleep disturbance in their study aimed at determining the prevalence of sleep quality across shift schedules. Another factor the study pointed out is that numerous firefighters have second jobs due to low pay and the amount of time off since shifts are typically 48 consecutive hours on per week. As expected, the results found poor sleep quality due to circadian rhythm disturbance, which contributes to physical and mental health problems (Billings & Focht, 2016).

Firefighters are constantly exposed to traumatic and stressful situations, with an estimated 90% of firefighters being exposed to trauma (Paulus et al., 2018). The level of stressful and traumatic situations, physical exertion during fire suppression, sleep deprivation, and lifestyle habits, including poor diet and lack of exercise, all contribute to CVD. These statistics relate directly to a quote by the first Director-General of the World

Health Organization (WHO), Dr. Brock Chisholm stating in 1948, “Without mental health there can be no true physical health” (Kolappa et al., 2013).

Barriers to mental health treatment include convenience, stigma, shame, and cost (Heyman et al. (2018). The authors recommend a complete culture change to ensure first responders are supported and encouraged to seek mental health treatment.

Discussion

From the fifty-three articles reviewed for inclusion in this paper, along with numerous other articles not included, it is clear that change is needed within fire departments to implement stronger preventive measures for the physical and emotional health of firefighters. The cost of care for this population is in the billions of dollars, suggesting changes may need to move from recommendations to mandatory, and ultimately to policy change. Our communities rely on the service these men and women perform in saving lives every day. The literature is eye-opening in that not only is the firefighting profession dangerous, but the occupational lifestyle that goes with this profession is the deadliest.

The National Institute of Standards and Technology (NIST) (2019) estimates the annual cost of firefighter injury and death is between \$1.6 and \$5.9 billion. Actual fire calls have trended down, being replaced by calls for medical aid that have increased. Injuries due to fire related calls are down, while non-fatal injuries have been increasing (NIST, 2019). Non-fatal injuries have not been studied in depth for cost of care, per NIST (2019). What is known is that firefighter injury, cardiovascular events, post-traumatic stress disorder (PTSD), high incidence of relational problems, physical fatigue, and suicide attempts contribute to the \$1.6 to \$5.9 billion in cost of care.

The most recent Needs Assessment of almost 3,000 fire departments in the United States reveals that 72% of fire departments do not have firefighter fitness and health programs, and only 61% of fire departments' medical and physical evaluations comply with the National Fire Protection Association (NFPA) standard. In addition, many do not engage in cancer prevention best practices. Sadly, 73% of all fire departments do not provide a behavioral health program. However, this is a slight improvement from 80% in 2015. In 2021, of the 27% of fire departments with a behavioral health program, 90% offer support for PTSD, 50% include suicide prevention education, 45% have trained behavioral peer support, and 34% have a relationship with a behavioral specialist (NFPA, 2021).

An analysis of the Needs Assessment data indicates that the larger the fire department, the more available resources and interventions are. For example, 96% of fire departments serving communities with over 500,000 people have a behavioral health program, compared to only 14% of departments protecting less than 2,500 residents. (NFPA, 2021). The inequality of behavioral health resources is related to funding. These findings support a call to action for policy change, with mandatory requirements to address much needed reform to provide necessary interventions, resources, funding, and protocols for improving the lives of firefighters.

Of the articles utilized, only two discussed interventions. Although the profession of firefighting is heavily researched, more research is needed to develop evidence-based interventions to save the lives of firefighters who serve and protect our communities.

The challenge for any type of intervention in a first responder population is the “machismo” culture. The attitude of “suck it up” and “keep going” is rampant. In 2007 the National Institute for Occupational Safety and Health (NIOSH) established wellness program expectations for fire department implementation. Eastlake et al. (2015) found a reduction in cardiac related deaths for firefighters since 2007; however, improvement is still needed to reduce CVD in firefighters specifically targeting diet and exercise. Currently, fire departments are not mandated to have specific training requirements related to physical and emotional health. Most fire departments, if their budget allows, have exercise rooms in their fire houses. Again, there is not a requirement for use. Fire Academies are now including some education on physical fitness, lifestyle, and emotional well-being. However, little is done for reinforcement of the initial introduction of the topics. In a recent interview conducted with a Lieutenant at a local fire department, he responded to the question asked about training. A. Cooper responded, “You mean do we tell new recruits when you become a firefighter your life expectancy will be 15-years less than the rest of the population?”

Conclusion

The literature is extensive on identifying the causes for the decreased life expectancy and poor mental health of firefighters. What is missing is evidenced-based findings for interventions to successfully mitigate firefighters’ constant exposure to stressful and traumatic events that cannot be avoided due to occupational duties. The cost to firefighters, fire departments, and the community are immense when firefighters are unhealthy physically and mentally. We rely on these individuals to save lives every day. Therefore, developing an educational program focused on firefighters making

healthier lifestyle choices would be significant. One step in that development would be to study possible changes in a small fire department and document the outcomes.

Statement of Research Question and Hypothesis

The authors' research project originated from a collaborative effort between the Rio Rancho Fire Department and the Cummings Graduate Institute for Behavioral Health Studies. The initial objective was to develop and implement a training program aimed at increasing firefighters' and emergency medical services' knowledge concerning suicide, trauma, peer support, and self-care, and to subsequently assess the implementation from the perspective of expanding the firefighters' comprehension and skills in their management of stressful events. Utilizing feedback from participants of the initial project, these authors revised the educational intervention to better meet the needs of the firefighter and emergency medical service. The project aims to develop a viable educational program that fire departments may use to improve the possibility of firefighters making changes to affect their physical and mental health positively. It is hypothesized that, following the educational intervention, the firefighters and emergency medical services will show an improvement of their knowledge of suicide, trauma, peer support, and self-care. Additionally, it is hypothesized that the firefighters and emergency medical services will report improvement in managing stressful events. Finally, aggregate data from the initial training will provide a platform for developing the direction of future research related to this project.

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Methods

Introduction

The relationship between occupational exposure to traumatic situations and an increase in mental health concerns for firefighters/EMTs/paramedics has only recently begun to be studied (Aldrich, 2020). The suicidal ideation rate for the general population is between 6-14%; however, the average suicidal ideation rate of first responders is 47% with almost two times the number of completed suicides compared with the general population (Wolford-Clevenger et al., 2020).

Most first responder training is developed by first responders focusing on the jobs' traumatizing events. In contrast, our curriculum was designed by behavioral health professionals working collaboratively with first responders. Ultimately, the goal is for first responders to understand the impact developmental and event traumas have on their personal and professional lives.

Pilot

Following the suicide of a peer support firefighter, the Rio Rancho, New Mexico Fire Rescue (RRFR) signed an MOU with Cummings Graduate Institute (CGI) to create an integrated curriculum for firefighters regarding their mental health. In the spring of 2021, CGI invited students interested in developing a training program for first responders to meet regarding a potential project. Dr. Cara English hosted a meeting on February 9, 2021, and as a result, the authors' met with representatives from CGI and the RRFR and agreed to develop an online health and well-being educational program grounded in a strong foundation of trauma-informed principles, inclusive of both developmental and event trauma.

In creating an online curriculum utilizing evidence-based behavioral health education and treatment, the authors aimed to increase firefighters'/EMTs/paramedics' knowledge concerning suicide, developmental and event trauma, and self-care. Primary objectives were to teach first responders to change from the "suck it up" mentality to a trauma-informed mentality, to identify and replace unhealthy trauma responses/symptoms early, and to reach out for help as needed to heal from event and developmental traumas.

"Sounding the Alarm" is the result of this pilot partnership. It is a four-module online course series hosted on the CGI Thinkific platform, developed to increase awareness among first responders (firefighters, paramedics, and emergency responders) of the impacts of trauma on health and mental health for this population. Specific learning outcomes included an increased understanding of trauma and the connection between untreated trauma and poor health outcomes for first responders; an increased understanding of the increased risk of poor coping skills, suicidal ideation, and lethality for first responders; and increased adaptive coping mechanisms for addressing trauma through help-seeking behavior, goal setting, and confidence building in giving and receiving peer support. Completing the four-module course series requires four (4) contact hours of continuing online education and results in a Trauma Informed First Responder Certificate.

Level I: Trauma

Module Description

Sounding the Alarm, Module I, presented definitions of developmental and event-related trauma, signs and symptoms of acute trauma responses, and the long-term

behavioral and physical consequences of untreated/unresolved trauma in adults.

Learners were presented with the symptoms and examples of Post-Traumatic Stress Disorder (PTSD) in first responders and learned what to do if they believe they might have PTSD. Participants reviewed the key points from the landmark Adverse Childhood Experiences Study and calculated their ACE scores. Trauma-informed care from neurological and biological perspectives was discussed so that learners understood the impact of stress on physical and mental health.

Learning Objectives

1. Learn the definitions of event and developmental trauma (ACEs) and understand the connection between the experience of trauma and long-term behavioral and physical health.
2. Be able to differentiate healthy from unhealthy coping mechanisms for dealing with trauma.
3. Apply this learning to prevent and address PTSD symptoms in oneself and others.

Level II: Suicide

Module Description

Sounding the Alarm, Module II, presented risk factors and statistics for first responders related to suicide. Primary risk factors for firefighters nationally and those employed in New Mexico were discussed and compared to risks in the rest of the population. Additive factors contributing to increased suicide risk were presented, as well as specific indicators or warning signs of being aware of in others. The learner experienced helpful conversation prompts and entry points for having a courageous

conversation with someone who might be suicidal. Strategies for increasing protective factors and reaching out for help were also presented.

Learning Objectives

1. Learn the risk factors and statistics related to suicide among first responders.
2. Understand the generally increased risk of suicide among firefighters, the additive risks and indicators for suicide, and protective factors that can reduce harmful risks.
3. Be prepared and feel confident talking with someone who may be suicidal and reaching out for help using local or national resources.

Level III: Peer Support

Module Description

Sounding the Alarm, Module III, presented a Peer Support model to address and mitigate everyday stressors involved in day-to-day work life for first responders.

Statistics related to suicide deaths for first responders and the way the risk of suicide changes over time from new hire to active duty to retirement. The Peer Support module included a breakdown of cognitive, mental, and behavioral results of unrecognized mental health at work, particularly for first responders in a high-stress, crisis-oriented profession. What peer support is and isn't, and how it works was explicitly discussed, and specific peer support skills that can be implemented immediately and daily were offered to the learner. Additionally, roles of the company officer, yellow and red flags, and how to refer to the peer support program were reviewed.

Learning Objectives

1. Be able to describe “stinkin thinkin” and recognize the causes of this unhelpful cognitive style.
2. Understand what peer support is and isn’t and know how to make a referral to the program.
3. Confidently apply peer support skills daily at work.

Level IV: Goal Setting***Module Description***

Sounding the Alarm, Module IV, presented the learner with an exploration of what contributes to intrinsic and extrinsic motivation as it relates to pursuing a life of meaning, value, and purpose. The module reviewed best practices in setting goals and presented scientific guidelines related to behaviors that can optimize nutrition, physical activity, sleep, self-care, and retirement planning to assist the learner in making the most of their career and lifestyle.

Learning Objectives

1. Learn how to set a SMART goal and apply that to any area of life the learner would like to improve.
2. Understand the evidence-based guidelines for behavior change in nutrition, physical activity, sleep, self-care, and planning for retirement.
3. Be confident reaching out for help using resources specific to first responders.

Subjects

Firefighters were recruited from the Rio Rancho Fire and Rescue to participate in the “Sound the Alarm” educational training program. All 110 members of the RRFR,

including firefighters, paramedics, and emergency medical staff, were invited.

Participants in the program included people at least 18 years old, of any gender, various ethnicities, and socioeconomic status, and currently employed as either a paid or volunteer firefighter at RRFR.

Screening Tools and Knowledge Checks

ACEs

The need to address trauma is increasingly viewed as an essential component of effective service delivery for the patient/client and employee. The Adverse Childhood Experience screening (ACEs) is recommended as a baseline to identify individuals at high risk of developing chronic illnesses, substance use disorders, mental health conditions, and a higher risk for suicide (Felitti et al., 1998). Since the groundbreaking ACEs study by Kaiser Permanente in the late 1990's research continues to prove the correlations between social determinants of health (SDOH), trauma, and long-term health outcomes (CDC, n.d.). Therefore, the authors included the 10-question ACEs as a screening tool to reinforce the learners the connection between trauma, SDOH, and health effects.

PC-PTSD

First responders are exposed to traumatic events while on the job at significantly higher rates than most civilian professionals. The authors opted to include the Primary Care PTSD (PC-PTSD) screening tool because the increased frequency and severity of traumatic exposure give firefighters an elevated risk of developing post-traumatic stress disorder (PTSD). This four-question tool is designed to assess whether an in-depth clinical assessment is warranted (Trauma Dissociation, n.d.).

Knowledge Checks

Knowledge checks (KC) were utilized for each educational module. KCs are a valuable tool that helps participants, trainers, or content developers understand how well the learners grasp the content (UC Berkeley, n.d.).

Results

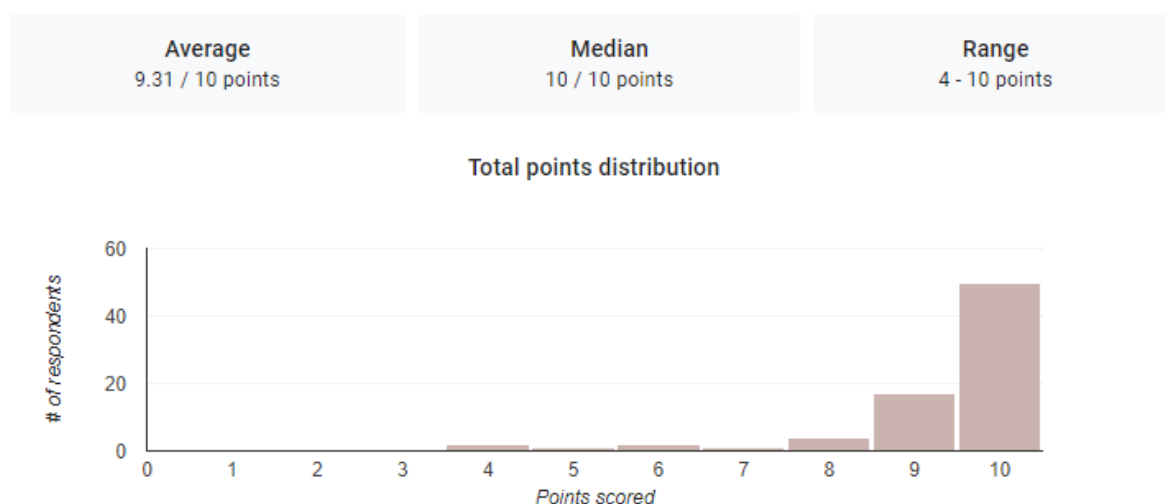
Of the 110 invited participants, 93 (84.5% of department staff) completed all or a portion of the four training modules. 86 participants completed all four modules, 2 completed three modules, 1 completed two modules, and 4 completed only one module.

Module 1: Trauma

92 learners completed this module and 77 (83.7%) responded to Knowledge Check Number 1 (see figure 1). See Appendix A for KC questions.

Figure 1

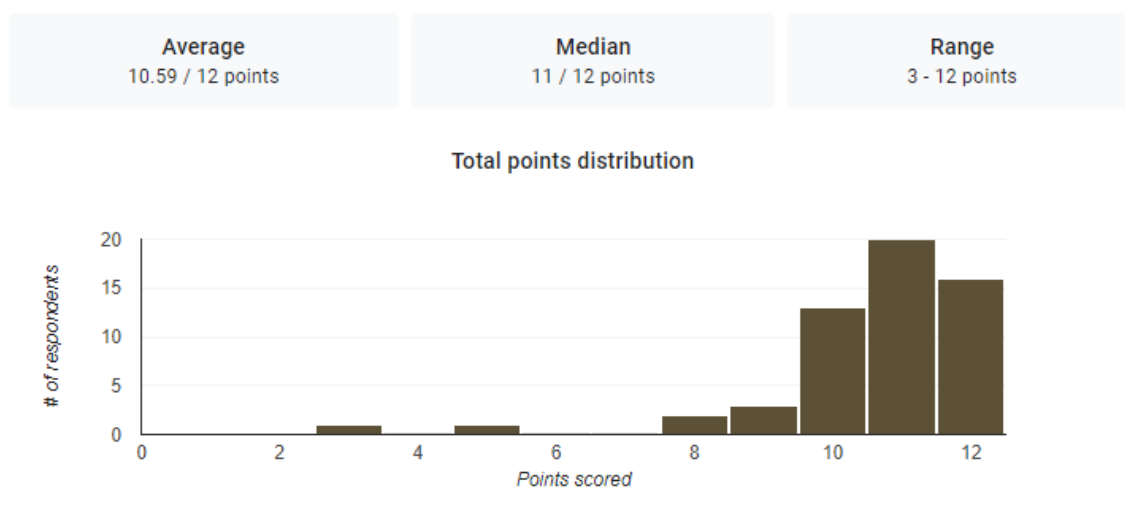
Module 1 Developmental and Event Trauma Knowledge Check Number 1



56 (60.1%) learners completed Knowledge Check Number 2, a drop of 21 respondents (see figure 2). See Appendix B for KC questions.

Figure 2

Module 1 Developmental and Event Trauma Knowledge Check Number 2



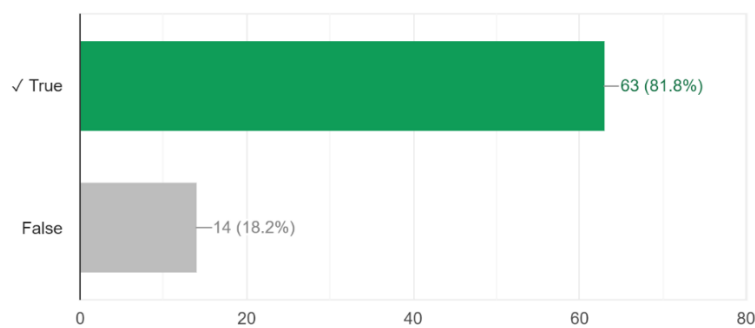
The two questions in this section that respondents struggled to answer correctly were related to ACEs research (see Figure 2).

As shown in Figure 3, on average, 93% of the respondents correctly answered questions on trauma; However, only 82% answered correctly regarding firefighters and risk of developing PTSD.

Figure 3*Module 1 Firefighters and PTSD*

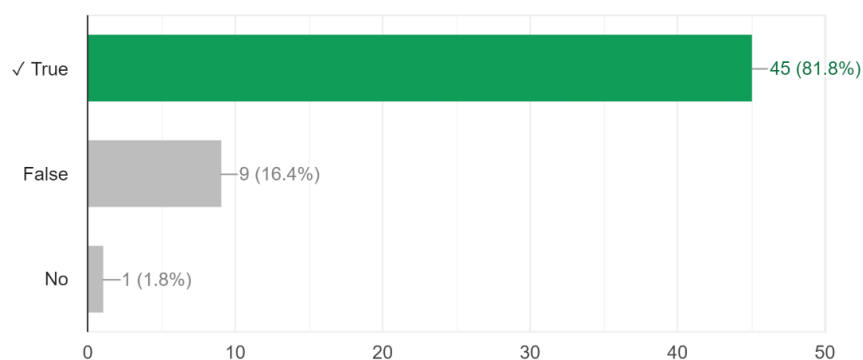
Firefighters have a higher risk of developing PTSD than any other first responder group.

63 / 77 correct responses

**Figure 4***Module 1 ACEs Score and Life Expectancy*

What statements are TRUE about ACE research? Check TRUE if it is correct and FALSE if it is not.

45 / 55 correct responses



Row 3: An ACE score of 6 > may decrease life expectancy by 19 years.

As part of Module 1, learners were asked to complete the ACEs Screening Tool. Of the 92 respondents who completed Module 1, 53.2% (49) completed the screening. Of the 49 participants who completed the ACE screening tool, the average ACE score

was 2.14, with 11 participants reporting an ACE score of 4+, indicating a significantly increased risk for mental health and chronic health difficulties (see ACE Screening Tool Results in table 1). In addition, one of the respondents reported an ACE score of 10, and two others reported scores of 8.

Table 1

Module 1 ACE Screening Tool: 49 responses

	ACE Category	N=+	%+
Q1	verbal/emotional abuse	15	31
Q2	physical abuse	9	18
Q3	sexual abuse	7	14
Q4	poor relationship quality within family	9	18
Q5	not enough to eat/wear	5	10
Q6	parents separated or divorced	21	43
Q7	mom/stepmother abused	4	8
Q8	alcoholism/drugs in home	20	41
Q9	mental illness or suicide in home	13	27
Q10	family member in prison	2	4

In addition, 44 (47.8%) participants completed the PC-PTSD, and the average score was 1.3 (negative); however, 9 participants had a score of 3 or 4. Despite a lower percentage of participants showing a positive screen on the PC-PTSD, 74% of participants indicated that they had experienced a traumatic event (see figure 5).

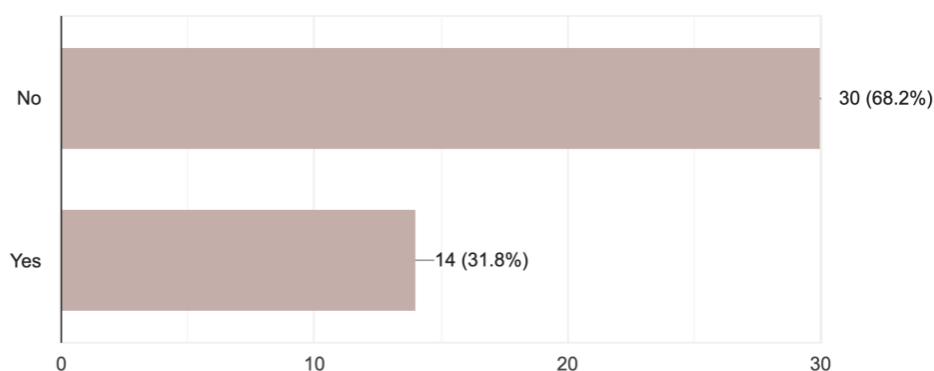
Figure 5

Module 1 PC-PTSD Questions and Results (44 responses)

1. Have had nightmares about it or thought about it when you did not want to? Try it yourself:

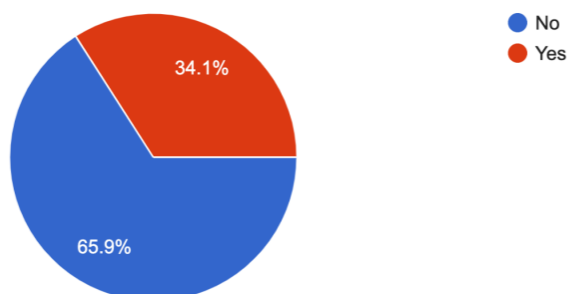
<http://traumadissociation.com/pc-ptsd>

44 responses



2. Tried hard not to think about it or went out of your way to avoid situations that reminded you of it? Try it yourself: <http://traumadissociation.com/pc-ptsd>

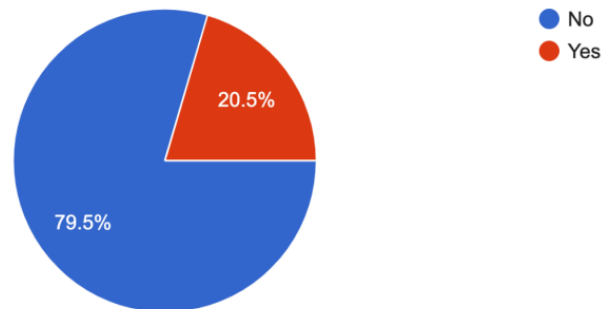
44 responses



3. Were constantly on guard, watchful, or easily startled? Try it yourself:

<http://traumadissociation.com/pc-ptsd>

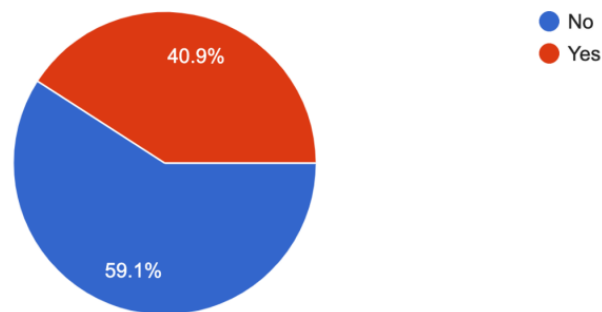
44 responses



4. Felt numb or detached from others, activities, or your surroundings? Try it yourself:

<http://traumadissociation.com/pc-ptsd>

44 responses



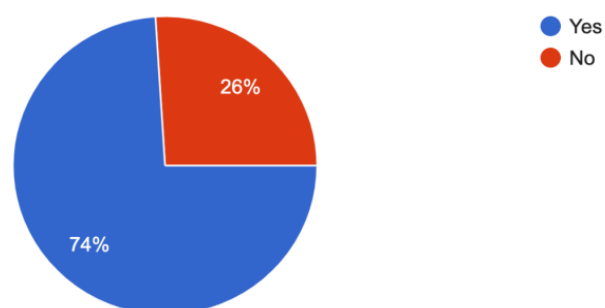
As figure 6 shows, most participants endorsed that they are experiencing or have experienced common symptoms of event trauma stress reaction since becoming a firefighter, including anxiety, low mood, irritability, poor sleep/insomnia, and wanting to isolate.

Figure 6

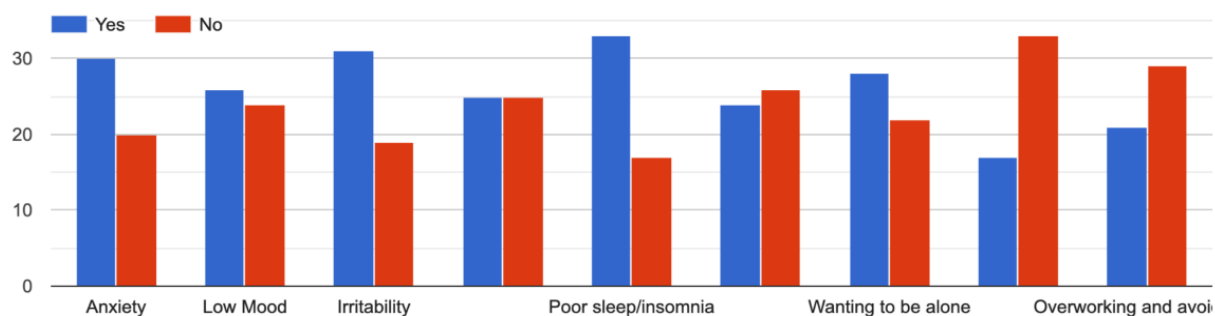
Noteworthy Unhealthy Coping Strategies and Event Traumatic Stress Results (50 responses)

Have you ever experienced this kind of event?

50 responses



Have you experienced any “common” symptoms of an event trauma stress reaction since becoming a firefighter?

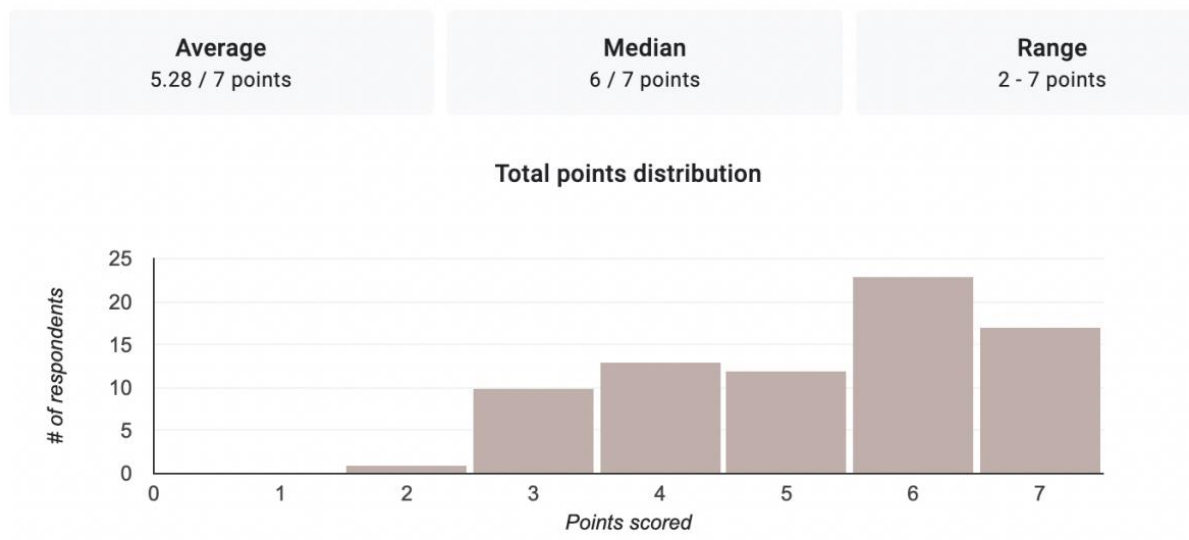


Module 2. Suicide

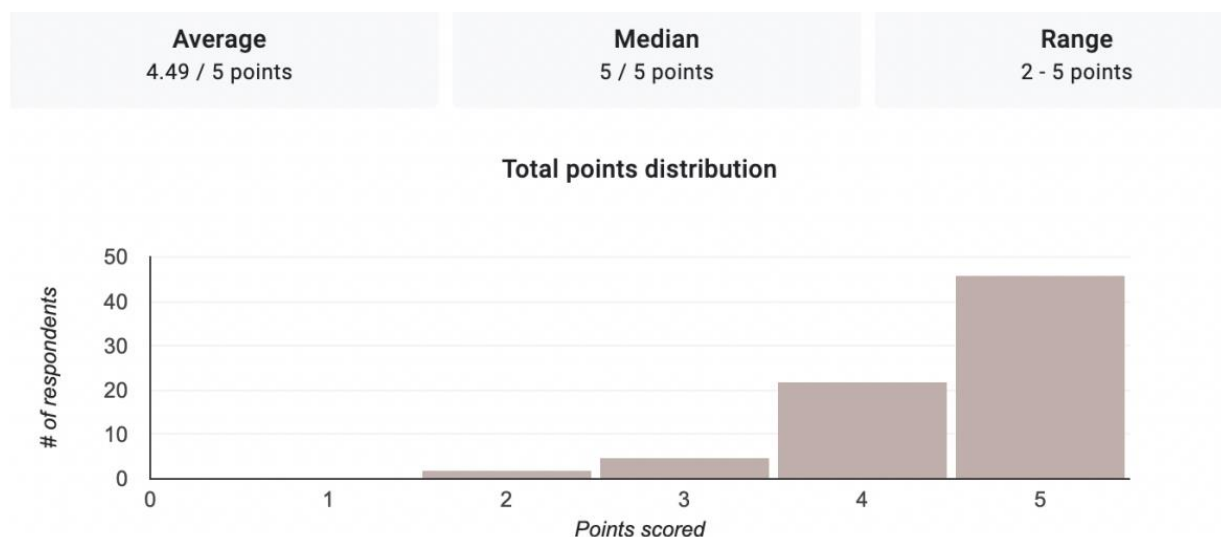
Eighty-nine learners completed this module, with 75 (84.3%) responding to Knowledge Check Number 1 (see figure 7) and 76 (85.4%) responding to Knowledge Check Number 2 (see figure 8). See Appendix C and D for KC questions.

Figure 7

Module 2 Suicide Awareness KC1 (75 responses)

**Figure 8**

Module 2 Suicide Awareness KC2 (76 responses)

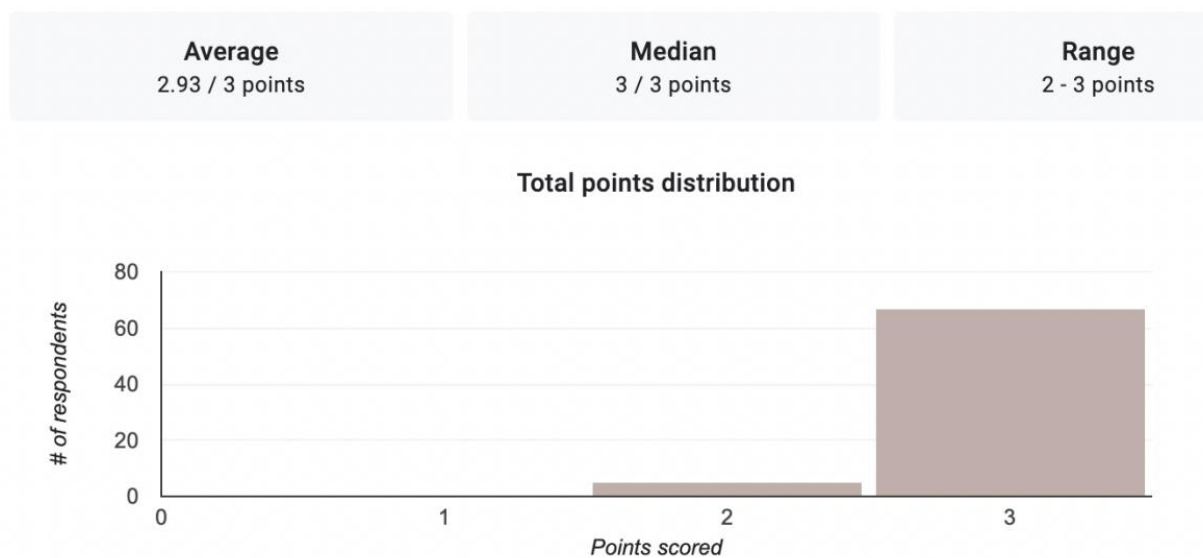


Module 3 Peer Support

Figure 9 shows that 88 learners completed this module, with 72 (81.8%) responding to Knowledge Check Number 1. See Appendix for E for KC questions.

Figure 9

Module 3 Peer Support KC (72 responses)



Module 4 Self-Care

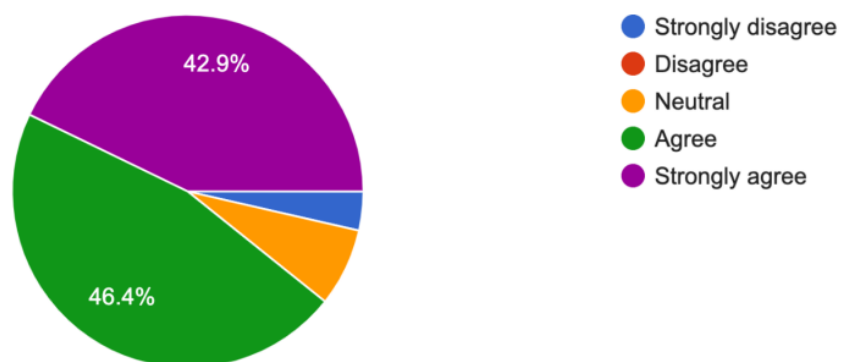
Eighty-five learners completed this module, with 56 (65.9%) responding to Knowledge Check Number 1 (see figure 10) and 58 (68.2%) responding to Knowledge Check Number 2 (see figure 11).

Figure 10

Module 4 Self-Care and Wellness KC1 (56 responses)

I know how to get the support I need if I'm struggling.

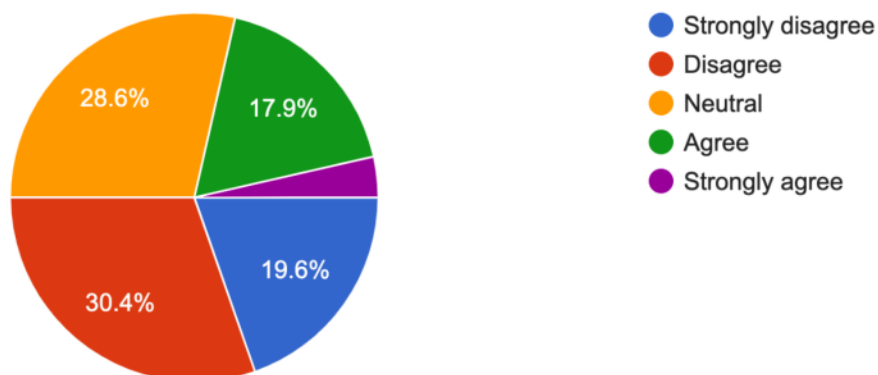
56 responses

**Figure 11**

Module 4 Self-Care and Wellness KC2 (58 responses)

I'm satisfied with my current sleep pattern.

56 responses



As shown in figures 12 and 13, many participants recognized their unhealthy thinking styles and the small steps they could take to improve their physical and mental well-being.

Figure 12

Module 4 Self-Care (58 responses)

I recognize that I tend to use these thinking styles when I'm stressed:

58 responses

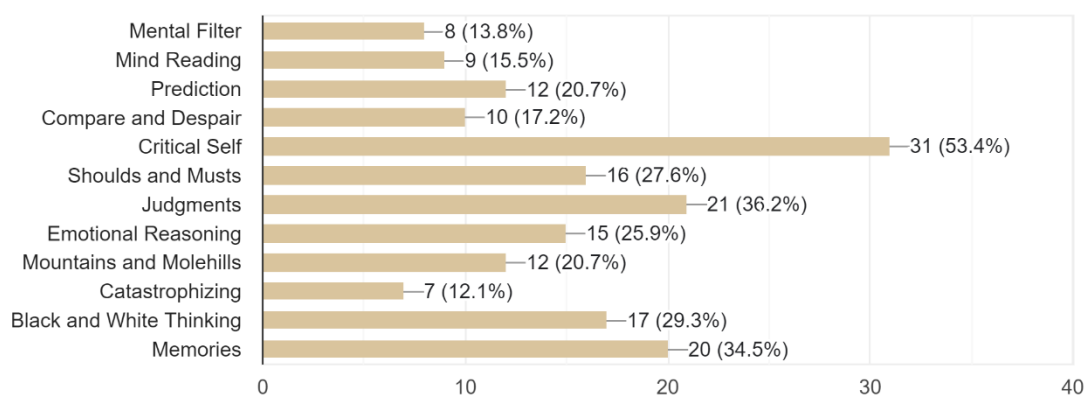
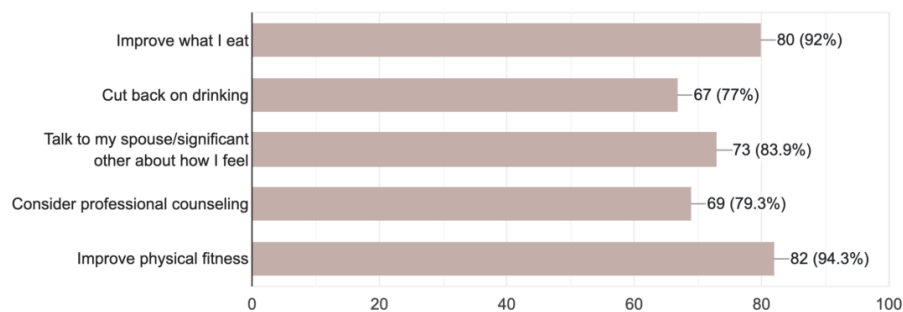


Figure 13

Overall Wellbeing (87 responses)

What small steps can you take today to improve your physical and emotional wellbeing? Check all that apply.

87 responses



Discussion

These results highlight the improvement needed in educational training with first responders. Participants endorsed concerns regarding their sleep quality, alcohol intake, and improving their physical and mental fitness. Follow-up for the learners who scored positive on the PC-PTSD and ACEs was recommended. It was noted in the training that if learners scored “positive,” they should follow up with a RRFR Peer Support Specialist or mental health professional; however, given the anonymity of our screenings, it was not possible to ensure compliance. Even though numerous resources were included in Module 2: Suicide, the lack of a direct person to speak with is why the authors felt it was wrong to screen for questions related to the participant’s possible thoughts of suicide.

Feedback following the successful pilot implementation included that the RRFR members felt the training was worthwhile and applicable. However, feedback included concerns that some of the subject matter was “heavy,” confidentiality issues arose about the modules being completed while at work, and the educational language level utilized in the training was too advanced.

Future considerations include an in-person facilitated training or hybrid model and specialized educational modules on retirement and specific trainings for family members of first responders, as the learners repeatedly mentioned these as recommendations. The suggested next step would be to conduct an IRB-approved study while utilizing the Jack Phillips & Kirkpatrick ROI Methodology for evaluating the training program (Phillips, 2003). The outcome of the pilot confirms the results of the comprehensive literature review conducted for this project; that an educational program

designed to improve first responders' mental and physical health is not only necessary but imperative.

Additional Opportunities

Based on the authors' literature review of first responders and their physical and mental well-being and the positive feedback we received from RRFR, there are ample opportunities to provide educational training for this population. The authors' plan includes refining the online training modules, creating an in-person training for first responders, and a specialized module for family members.

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