A Pilot Program Evaluation for a Backcountry Search and Rescue Stress Injury Awareness Course

William Mundo MD, MPH [1], **Zachary Ryan** MS[2], **Paul Cook** PhD[3], & **Laura McGladrey** PMHNP, FAWM[4]

[1]Department of Emergency Medicine, Denver Health Medical Center, Denver, CO, USA

[2]Eldora Ski Patrol, Eldora Mountain Resort, Nederland, CO, USA

[3]College of Nursing, University of Colorado Anschutz Medical Campus, Aurora, CO, USA

Email: william.mundo@cuanschutz.edu

Abstract

- This project was designed to evaluate the effectiveness of a stress awareness pilot program in reducing stress and burnout among Backcountry search and rescue (BSAR) volunteers. BSAR volunteers in Colorado experience taxing work demands with routine exposures to stressors. There are limited interventions available for preventing and reducing burnout among BSAR volunteers. We conducted a program evaluation using secondary data from a Wellness and Stress Awareness Pilot course conducted between July 2021 and December 2021. The survey included 65 questions to assess participants' understanding of stress injuries and level of stress and burnout across Colorado BSAR groups including the Southern Rocky Mountains, Colorado Plateau, and Middle Rocky Mountains. BSAR volunteers reported increased capacity to cope with stress after participating in the program, improving on all target learning objectives ($P <$ .001). The percentage of BSAR volunteers who rated their current level of burnout as either high or very high dropped from 27% to 20% after participation in the course. Wellness and stress prevention programs may help raise awareness about chronic stress and reduce burnout among BSAR volunteers. These programs are needed to identify and prevent burnout and stress injuries among the BSAR community.

KEY WORDS: *mental health, burnout, operational stress injury, PTSD, Acute Stress Disorder, stress continuum*

Introduction

Preventing burnout and dealing with stress have increasingly been topics of interest for first-responders, clinicians, and allied health professionals due to the direct impact of burnout on health and work productivity. Backcountry search and rescue (BSAR) volunteers are exposed to traumatic events and scenes in their work, leading to increased risk of adverse mental health outcomes and burnout and stress injuries (Berger et al., 2012; Greinacher, Derezza-Greeven, Herzog, & Nikendei, 2019; Palgi, Ben-Ezra, Essar, Sofer, & Haber, 2009; van der Velden, van Loon, Benight, & Eckhardt, 2012). Stress injuries have been described as a broad range of psychological conditions resulting from duties performed that interfere with a person's professional and personal life (Antony et al., 2020). Although stress injuries are not a mental health diagnosis, they may be risk factors or precursors to the development of anxiety, depression, post traumatic stress, and substance use disorders.

Stress injuries and burnout are particularly important risk factors among first responder and BSAR groups that are vulnerable to chronic and traumatic stress. There is evidence that mental health conditions are significantly higher among first responders than in the general population (Berger et al., 2012; Dominguez-Gomez & Rutledge, 2009; Firew et al., 2020; Ratrout & Hamdan-Mansour, 2020; Shah, Garland, & Katz, 2007; Ward, Lombard, & Gwebushe, 2006). As a group, first responders are at higher risk than the general population for experiencing traumatic events, including life-threatening situations, grave injuries, and secondary trauma from deaths of colleagues and civilians. They experience taxing work demands with routine traumatic exposures to stressors that have been linked to the development of new mental health conditions or exacerbation of pre-existing conditions (Berger et al., 2012; Firew et al., 2020; Forman-Hoffman et al., 2016; Kshtriya, Kobezak, Popok, Lawrence, & Lowe, 2020; Palgi et al., 2009; Soffer, Wolf, & Ben-Ezra, 2011; Ward et al., 2006).

The literature is limited on stress injury awareness and prevention amongst austere first responders such as BSAR volunteers. The impact of stress and burnout is gaining recognition in the first responder community due to its implications for well-being and work productivity (Berger et al., 2012; Cieslak et al., 2014). There is data showing that 1/3 of BSAR volunteers have one or more symptoms of post-traumatic stress disorder (PTSD), and more than 50% report binge drinking which may lead to increased turnover rates (Alma A, 2022). With the probable loss of years of institutional knowledge in each burnout case, it is imperative that prophylactic measures be taken to enhance longevity and job satisfaction in BSAR communities. If such operations are to continue uninterrupted, the mental health of existing and incoming BSAR volunteers must be held preeminent to reduce attrition. A stronger focus on mental health could also help to recruit new volunteers into the BSAR pipeline and increase involvement in these communities of volunteers. Education programs may be used to achieve this goal.

Despite the existence of mental health disparities among BSAR volunteers, there are limited interventions for preventing and rehabilitating stress injuries among first responders, and none in the literature that are specifically focused on BSAR workers. Wellness and stress awareness programs are needed among BSAR volunteers. This program evaluation was designed to evaluate the effectiveness of a wellness and stress awareness pilot program to reduce stress and burnout levels and raise awareness about stress injuries among BSAR volunteers.

Method

Institutional approval

The General Assembly of the State of Colorado required a pilot stress injury prevention program under Senate Bill 21-245. Legislators created this program to address some of the immediate needs of BSAR organizations by offering mental health training to BSAR volunteers. This program evaluation was exempt from institutional review (not human subjects research) based on the Colorado Multiple Institutional Review Board (COMIRB)'s quality improvement and program evaluation guidelines.

Description of intervention

This is a program evaluation with secondary data analysis that is collected as part of the stress awareness pilot course. The pilot was an eight-hour training that included four modules, two hours each. The four course modules included psychological first aid, stress injury awareness for the rescuer, stress injury awareness for the team, and incident support for the rescuers and teams. Descriptions of each of the course modules are found in **Table** 1 (McGladrey, 2018) . Participants who agreed to participate in the course were enrolled between July 2021 and December 2021. There was a total of five cohorts and on average 25 participants in each cohort. The course was completed in two days and consisted of both virtual and asynchronous learning.

Table 1. Foundations of Stress Injury Course Description (McGladrey, 2018)

Module	Description
Psychological first response for rescue	This module is an asynchronous skill based online course to identify patients at risk for psychological injury, with or without physical injury. This module follows the medical first response model to support on-scene tools to recognize and mitigate distress to support the prevention of stress impact and post-traumatic stress injuries. This module takes a novel approach at self-reflection by the rescuer to identify exposure in themselves with awareness and mitigation techniques.
Stress injury awareness for the rescuer	This module is a two-hour live video conference and provides an overview of stress injury in search and rescue. The focus of this awareness level course is recognition of injury formation, the stress continuum, and supportive tools, such as the individual resiliency plan and green choices for resilience and stress mitigation for the rescuer. Predictive awareness of the interface between depletion stress, mission stress and traumatic stress is also discussed.
Stress injury awareness for the team	This module is a two-hour live video conference that provides an overview of stress impact on rescue teams following traumatic stress and loss, leadership injuries, depletion stress related to external pressures and the impact of wear and tear on team dynamics. This course explores depletion stress, mission stress and traumatic stress in the team framework, as well as tool-based approach for supportive practices and rituals for mitigating stress and planning for resilience.
Incident support for rescuers and teams	This is a two-hour live video conference that defines and addresses the impact of major incidents and potentially traumatizing events in rescue response. This module looks at best practices and tangible tools for trauma integration following major events, loss, and line of duty events.

Participants and setting

Participants who self-identified as volunteer first responders and members of nonprofit search teams were invited to participate in the pilot course voluntarily. The pool of participants consisted of not-for-profit search team members, as well as various Sheriff's Department assets. Responders are volunteer teams that work alongside fire, law enforcement, emergency medical personnel, the Colorado National Guard, and other government employees in disasters or emergencies. Program staff at the University of Colorado (CU) College of Nursing worked with the Colorado Search and Rescue Association (CSAR) and the Responder Alliance, two community groups that advocate for the needs of BSAR volunteers in the state, to identify target agencies with BSAR volunteers who could potentially benefit from a stress impact course. Several agencies were selected, representing a continuum of large and small agencies in urban and rural areas. These agencies then sent their members an invitation to participate. We had representation from various geographical regions of Colorado including the Southern and Middle Rocky Mountains, and the Colorado Plateau.

Outcome measures

Participants filled out surveys sent out via email after course completion, with two sets of items that asked about understanding of learning objectives, their experiences before taking the course, and then the same experiences after taking the course. All participants' responses were anonymous, with no identifying data collected, including IP addresses. No items that could be considered PHI, such as birth date or zip code, were included in the data collection tool, and respondents were assured that there was no way to link them to their responses. This level of anonymity was considered necessary when asking BSAR volunteers about mental health experiences that might be stigmatized in their work or community. The survey consisted of 65 questions composed to assess the overall understanding of stress injuries and the level of stress on the stress continuum. Outcome measures were rated on a Likert-type scale (1-5), where 5 was the highest and 1 was the lowest. Items on overall training satisfaction, achievement of learning objectives, and intention to make changes were drawn from the Kirkpatrick program evaluation framework used in many continuing professional education activities (Ulum, 2015). The specific items on the survey were adapted from course objectives that the University of Colorado School of Medicine Department of Psychiatry had previously identified for a stress impact course focused on health care providers' experiences with COVID-19. We calculated Cronbach's alpha score for reach of the survey question sets to assess for internal reliability, where each were assessed on a range of alpha coefficients: < 0.70 not adequate, 0.7-0.8 OK, 0.8-0.9 good for research, and > 0.9 good for clinical research (Heo, Kim, & Faith, 2015). Knowledge was measured with 9 items about participants' understanding of stress injuries, such as "I am able to recognize depletion in myself," (alpha = 0.92). Participants' current experiences of stress and coping were measured with 10 items such as "I feel overwhelmed," (alpha = 0.9). Participants' perceptions of their BSAR organization's culture around stress injuries were measured with 6 items such as "I am able to talk with coworkers about my own stress level," (alpha = 0.73). In addition, participants completed a single-item burnout measure that

has established validity based on correlations with the well-established Maslach Burnout Inventory and based on its ability to predict negative outcomes of stress among health care workers (West, Dyrbye, Sloan, & Shanafelt, 2009).

Data analysis

Descriptive analysis of quantitative data was conducted using SPSS version 28 (Armonk, NY: IBM Corporation), and graphics were prepared using GraphPad Prism v. 8.3.1 (GraphPad Software, Inc., La Jolla, CA). For continuous and normally distributed data, means with standard divisions were calculated, and numeric counts with a percent were calculated for categorical variables. The mean values or frequencies for variables were compared between groups using independent Student's t-test, chi-squared, or Mann-Whitney nonparametric statistics as appropriate. Data are expressed as means ± SD or the 95% CI for proportions in the text, tables, and figures. We conducted a retrospective pre-post analysis to assess for changes in learning objectives. A two-sided P-value < 0.05 was considered evidence of association or difference in sample means or frequencies, and trends were reported when $0.05 \leq P < 0.10$.

Results

A total of 136 participants were included in this program evaluation. The usefulness of the course was rated on a scale from 1-5, where 5 indicated it was excellent and 1 was poor. Most participants had a positive experience, where 89 (65%) said it was excellent, and 34 (25%) said it was very good. No participants rated the course as poor, and only 1 (1%) participant noted it was fair. The overall usefulness of the course was rated very high, with a mean score of 4.6 (SD ± 1).

The primary outcome for this program was a change in knowledge based on the learning objectives. As shown in **Figure 1**, we saw a significant increase in knowledge for all learning objectives. On average, most learning objectives increased by 1.5-2 points from before participating in the course to afterward. All pre-post changes in knowledge were statistically significant ($P < 0.001$). We saw the largest increase in the item that asked about trainees' ability to use a common language when discussing stress injury awareness and mitigation.
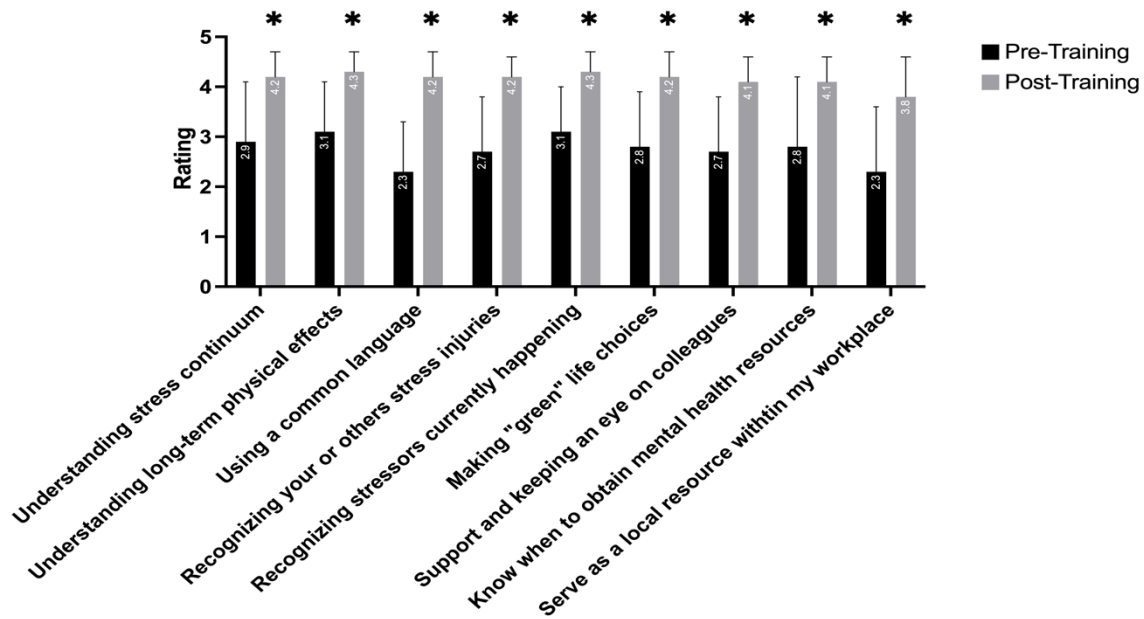
Figure 1. *Self-reported mean assessment of achievement of learning objectives for pre and post training. Rating scale was based on a 1-5 scale, where 1 = beginning level of knowledge, 3 = intermediate level of knowledge, and 5 = advanced level on knowledge. There was a statistically significant increase in all learning objectives among participants. Significance value for comparison is shown in the figure where * = P < 0.001 using a paired t-test.*

When participants were asked to what degree they were able to identify stress injuries in their personal and professional work environments, we saw a significant increase in all measures except for one statement (**Figure 2**). All pre-post changes were statistically significant ($P < 0.001$) except for the item, "My organization supports workers who develop stress injuries," where the results approached significance ($P = 0.06$). Most participants rated their pre-training experiences between 3.5 and 4, indicating that, in general, most participants either were neutral or agreed with the statements; however, after the training, all participants at least agreed or strongly agreed with the statements listed below in **Figure 2**.
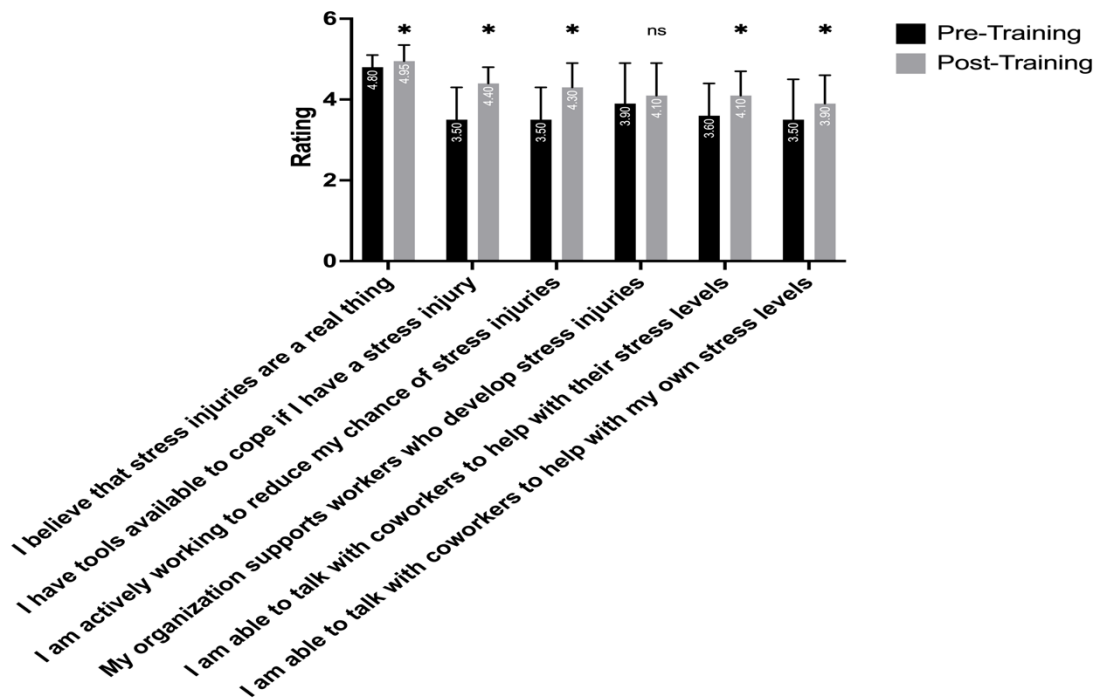
Figure 2. *Self-reported mean rating of current perspectives for pre and post training. Rating scale was based on a 1-5 scale, where 1 = strongly disagree, 2 = disagree, 3 = neither agree or disagree, 4 = agree, and 5 = strongly agree. Significance for comparison using a paired t-test is shown in the figure where * = P < 0.001 and ns = non-significant.*

There were no significant changes on most of the emotion-focused items about participants' typical experiences over the past 7 days. As shown in **Table 2**, when asked about their experiences, we saw positive changes on all items; however, these were not statistically significant in most cases. We saw significant differences on the items, "I feel overwhelmed" (3 vs. 2.8, *P* < 0.05), and "I feel prepared to manage stressors that I encounter at work" (3.8 vs. 4.1, *P* <0.01).

Table 2. Self-reported current experiences pre-post changes

Item Rated	Pre-Training M (SD), N = 136	Post-Training M (SD), N = 136	*P*-value
I feel calm	3.8 (1)	3.9 (0.9)	0.07
I feel connected to others	3.7 (0.8)	3.8 (0.9)	0.07
I can manage my worries	3.9 (0.9)	4 (0.8)	0.07
I feel capable of dealing with challenges that occur each day	4.2 (0.8)	4.2 (0.8)	0.11
I feel a sense of autonomy	3.9 (0.9)	4 (0.8)	0.15
I feel content	3.8 (1)	4 (1)	0.05
I feel a sense of hope	4 (0.9)	4.2 (0.9)	0.05
I feel overwhelmed	3 (1)	2.8 (0.9)	<0.05
I feel supported by my supervisor	3.8 (1)	3.7 (1)	0.2
I feel prepared to manage stressors that I encounter at my work	3.8 (0.8)	4.1 (0.9)	<0.01
I feel isolated	2.4 (1.1)	2.3 (1.1)	0.2

Satisfied in my work role	3.7 (0.9)	3.9 (0.9)	<0.05

Participants' pre-training level of burnout was 29% based on the highest 3 levels of the 5-level burnout item. This rate decreased to 20% after the training. The training program's effect in reducing current burnout level was OR = 0.40 (CI: 0.30 − .99, P = 0.04) by participating in the course (**Figure 3**). When asked about levels on the stress continuum, 64% (87) of participants noted some level of stress injury during the pre-training survey, compared to 46% (62) at post-training. By participating in the course, we found that the program's effect in reducing stress injury levels was OR = 0.50 (CI 0.30 - 0.80, P = 0.002) (**Figure 4**).
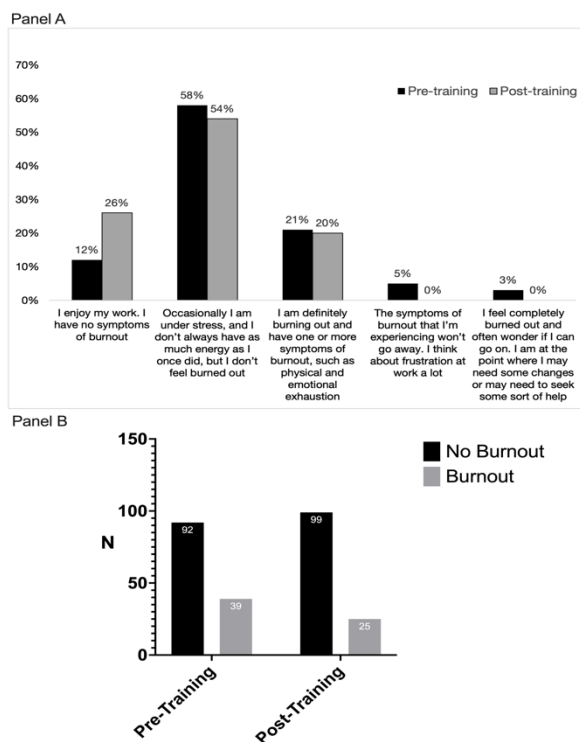

Figure 3. *Self-reported number of participants experiencing signs of burnout for pre and post training. Panel A shows total pre and post levels of burnout measures. Panel B showing pre-training burnout was 29% (39), while 70% (92) had no symptoms of burnout. Panel B showing post-training burnout was 20% (25), while 80% (99) reported no symptoms of burnout. The reduction of burnout by participating in this course was OR = 0.6 (CI: 0.3-1), P = 0.04 using Chi-squared difference.*
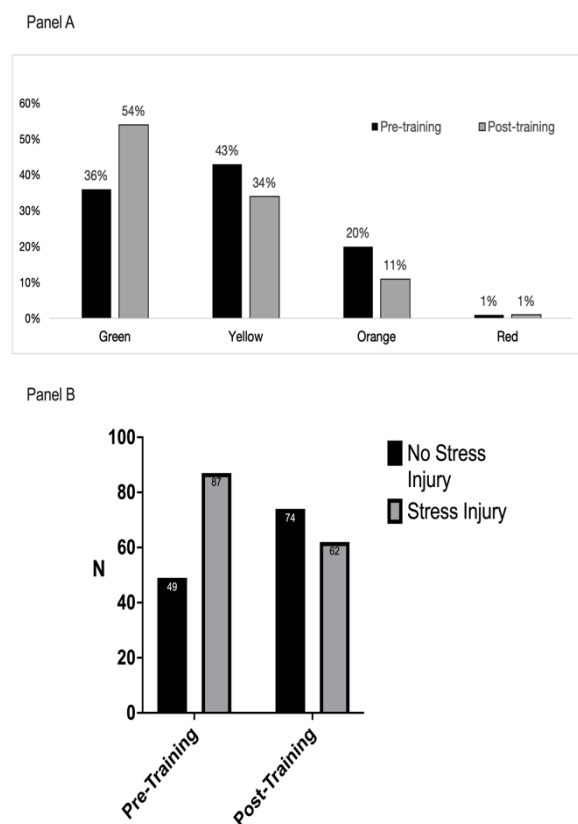
Figure 4. *Self-reported level of stress on the stress continuum for pre and post training. Panel A showing pre and post indicators on the stress continuum. Panel B showing pre-training level of no stress "green" was 36% (49), while 63% (87) had some level of stress injury ("yellow" + "orange" + "red"). Panel B showing post-training level of no stress was 54% (74), while 46% (62) had some level of stress injury. The reduction of stress injury by participating in the pilot course was OR = 0.5, CI 0.3-0.8, P = 0.002 using Chi-squared difference.*

Discussion

Summary of findings

We piloted an online stress injury prevention course and an online support group with BSAR volunteers. This group of participants included many BSAR volunteers with current burnout and/or stress injury. BSAR volunteers in this pilot program showed improvement on each of the learning objectives and said they had increased capacity to cope with stress and were less overwhelmed after participating in the program. They also reported improvement on most items related to the culture of their BSAR organization, suggesting that organizations whose members participated in this program became more responsive to their members' mental health concerns. Most participants found the course to be useful, and most importantly, fewer people reported high levels of burnout after the course. There was also a decrease in stress injuries based on participants' reported drop on the color-coded stress continuum for nearly all the participants.

The stress injury course used a structural framework relying on a color-coded, "Stress Continuum," an awareness tool first developed by William Nash and colleagues for use in combat operations and later adapted by Laura McGladrey at CU Anschutz for use in the first responder population and for team stress mitigation. The basic tenant of the tool allows responders to self-identify from a ready to critically injured state in relation to stress and depletion exposure, noting opportunities for recognition and early mitigation at each color change on the stress continuum. Given the known predictive nature of overwhelm and isolation on the formation of traumatic stress injuries such as PTSD, this awareness is useful and may be predictive of the development of traumatic stress in rescuers such as BSAR volunteers.

The high levels of burnout and stress injuries at baseline support the idea that BSAR volunteers experience a baseline level of stress as part of their work. Positive outcomes from the pilot program suggest that bringing awareness to that baseline state can facilitate decision-making to mitigate BSAR worker's stress. Similar to the current results, a longitudinal study of 869 employees in Australia found that awareness of stress-reduction interventions led to decreased psychological strain and higher job satisfaction than those among employees who were unaware of stress interventions (Pignata, Boyd, Gillespie, Provis, & Winefield, 2016). Similarly, there is evidence that workplace stress and mental health outcomes are directly related to the availability of stress management training and education (Fernandez et al., 2016; Parkyn & Wall, 2020a, 2020b). Among factors that help to mitigate the development of such mental health complications are "good team functioning, job satisfaction, and recognition,"(van der Velden et al., 2012) all of which were organizational factors targeted by the pilot course. Our findings corroborate the idea that stress injury education is an essential mitigation strategy for first responders, including BSAR workers.

Participants' initial rate of stress injuries was higher than their initial rate of burnout, which is consistent with the idea that stress injuries are sub-clinical symptoms that suggest increased risk for more severe

mental health problems. However, the stress injury item and the burnout item both improved to a similar degree, about 40% to 50% based on odds ratios. Individuals who reported being in the "orange" or "red" level of the stress injury continuum are likely already experiencing some degree of burnout, emotional exhaustion, or symptoms of posttraumatic stress (Bridgeman, Bridgeman, & Barone, 2018; Cieslak et al., 2014; Ford, 2019). In other studies, pre-hospital emergency medical service workers, a group whose work has significant overlap with BSAR workers' responsibilities, have a higher prevalence of burnout and PTSD than other first responders such as police officers or firefighters (Berger et al., 2012). BSAR volunteers are at higher risk for developing mental health issues due to facing injured or dead people, smelling the deceased, and unsuccessful operations, among other reasons (van der Velden et al., 2012). Such burnout and stress injuries are correlated to adverse mental health outcomes and can require different therapies and management to mitigate or resolve such conditions. If these conditions are not addressed in a timely and pointed manner, work productivity and longevity may be threatened. We did not evaluate formal diagnostic criteria for post-traumatic stress disorder or secondary traumatic stress in the current study, which might require formal mental health treatment.

Implications for practice

Prevention programs as in the current study can complement but not replace formal mental health care, but both components should be part of a comprehensive solution to meet BSAR volunteers' mental health needs. This pilot course sought to educate BSAR workers that stress injuries are also physical injury types and can be fatal when not recognized. This type of 'fair warning' of occupational exposure is the right of every professional and has been lacking in BSAR culture until present. If stress injuries are discovered early (in the "yellow" level) and prophylactic measures, such as medication or lifestyle changes can be initiated through stress injury education programs, clinicians can help patients blunt the progression of the disease. However, if a stress injury is not identified at the onset and is allowed to increase (moving from "yellow" to "red"), then the consequences could potentially become irreversible and even fatal. Based on a nationwide cohort study of traumatic stress, compelling data suggest that severe stress and trauma are associated with a higher rate of all-cause mortality and have strong associations with suicide even after controlling for confounding variables (Gradus et al., 2015). Stress injury education such as that in our pilot program can educate individuals on how to prevent the development of adverse mental health outcomes, how to implement mitigation strategies, or when to seek clinical help, thereby potentially reducing the immediate and long-term adverse health consequences associated with traumatic stress.

Implications for practice

Although the current results are promising, further research is needed on the BSAR stress injury prevention course using more rigorous experimental methods, such as a randomized controlled trial. Based on the success of a stress injury prevention course with BSAR volunteers, such education also could be tested in other arenas where stress injury occurs, such as in healthcare, specifically residents and medical/nursing students. These different populations might benefit from preventive training ahead

of any experience of burnout, which is a significant threat to healthcare professionals (Bridgeman et al., 2018). Such research also could examine similarities and differences in the type of stress injuries, coping mechanisms, or mitigation strategies across different types of first-responder work.

Finally, as this research continues to evolve and grow in the BSAR industry and beyond, it will be paramount to develop a formal definition of the term "stress injury". Because this is not a formal diagnostic term, it is difficult to quantify stress injuries and the degrees to which they affect the daily lives of those who suffer from them. By continuing this research and gathering supporting information, we can work towards producing a vocabulary that is in line with the type of injuries that individuals might see in their careers as BSAR volunteers and corresponding mitigation strategies to serve those who are most susceptible. Once a widely accepted definition is in place, organizations can seek to bring more awareness and provide further resources for their workers to stay ahead of and treat stress injuries.

Strengths and Limitations

This program evaluation had three major strengths. The first is that a large cohort of BSAR volunteers participated, which provided enough information to determine the effectiveness of this course. Second, participants' demographics mirrored those seen in a statewide survey of BSAR volunteers, which suggests that the pilot participants were a representative group. Third, we conducted a retrospective pre-post analysis for learning outcomes where participants rated themselves before and after training in a single collection event. Using a retrospective pre-post analysis has been shown to allow participants to determine their level of knowledge before and after an intervention more accurately and reduce response-shift bias (Geldhof et al., 2018; Thomas et al., 2019).

While we had some very supporting results, this program evaluation also had important limitations. First, there is a concern about confirmation bias from experienced BSAR volunteers who might have wanted to please the group leader by providing a positive evaluation. Second, the recruitment of volunteer participants means that the results might have been affected by selection bias, either because we recruited participants who were particularly receptive to the intervention, or because BSAR workers with more severe stress injuries were unwilling to partake in this optional training. The latter possibility is partially mitigated by the high level of stress injuries observed at baseline among our participants. History effects are also a possible confound, because some participants in the group had previously received stress injury training while others had not. Such differing levels of education on this topic may have led to bias in the survey answers in one way or another.

The nature of BSAR groups is that very few are paid personnel. Most responders are unpaid professionals who are otherwise employed as ski patrollers, doctors, nurses, firefighters, mountain guides, lawyers, accountants, IT consultants, etc. Given this wide range of education and technical training, further demographic information should be collected in future studies, and analyzed to determine whether there are differences in results for BSAR workers who are paid vs. unpaid, rural vs.

urban, career-related vs. non-career-related, men vs. women, or other sub-categories of participants. A final limitation of this study is that there was no comparison group, so we cannot rule out history, maturation, or other potential confounds based on the passage of time.

Conclusion

Findings from a stress injury pilot course for BSAR workers indicated that this program had a significant impact on participants' ability to identify stress injuries and mitigated the level of burnout and stress injuries among BSAR volunteers. We saw increased knowledge based on all learning objectives. We found that baseline stressors are prevalent among BSAR volunteers, and that these stressors can be reduced through a training program focused on the stress continuum and psychological first aid. The findings also suggest that BSAR organizations whose workers participated in this program became more open to conversations about stress injuries and perhaps better able to address these problems when they occur. Our findings suggest that a stress awareness course is a potentially useful intervention that could be scaled to reach a larger group of BSAR volunteers as well as groups outside the BSAR community.

Acknowledgements

Abbreviations

BSAR	Back-country Search and Rescue
CU	University of Colorado
CSAR	Colorado Search and Rescue
IT	Information technology
SB	Senate Bill
PTSD	Post-traumatic stress disorder

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