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ARTICLE

Barriers and Facilitators to Implementation of Mindfulness in Motion for Firefighters and Emergency Medical Service Providers

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ABSTRACT: Background: Community-based first responders face high levels of workplace stressors that can profoundly impact their physical and mental health. Mindfulness-based interventions have shown promise in decreasing stress and increasing psychological resilience; however, implementation is difficult due to unpredictability of the job, department culture, and generational preferences. The objective of this qualitative study was to identify and enhance understanding of the specific needs and potential barriers and facilitators for the implementation of mindfulness-based programming for community-based first responders. **Methods:** A phenomenological qualitative study design was used to gain insights into the lived experiences of first responders and elicit perceptions regarding barriers and facilitators for engaging in mindfulness activities. During virtual semi-structured interviews, eleven career firefighters and emergency medical service (EMS) providers offered feedback relative to worksite mindfulness practices, and the use of a stress reduction smartphone application. The Consolidated Framework for Implementation Research was used to guide the analysis relative to barriers and facilitators of implementation success and sustainability. **Results:** First responders expressed openness to mindfulness-based interventions and a smartphone app that would provide stress reduction content, however, they were adamant that programming needed to be accessible and easily integrated into their workday. They also reinforced that organizational culture and leadership support for their health and well-being were overarching factors essential for implementation success. **Conclusions:** First responders were supportive of evidence-based mindfulness practices, optimally developed and/or facilitated by someone with intimate knowledge of their unique work environments and challenges. Organizational culture and leadership support were essential for implementation success and sustainability.

KEYWORDS: Mindfulness; mental health; stress; firefighters; emergency medical service (EMS) providers; implementation; barriers and facilitators

1 Introduction

Exposure to chronic stress within the workplace increases risk for various negative health outcomes, including burnout, suicide, suppressed immunity, obesity, substance abuse, and heart disease [1–3]. Due to the nature of their jobs, firefighters and emergency medical service (EMS) providers face high levels of chronic and recurrent workplace stressors, which can profoundly impact their short- and long-term physical, mental, and emotional health [4–7]. Consequently, firefighters and EMS providers are at an increased risk of physical health issues, including high blood pressure, coronary heart disease, death due to heart attacks, and various forms of cancer as compared to the general population [8,9]. Moreover, firefighters/EMS providers

are also at a significantly increased risk of developing psychiatric issues, including depression, substance abuse, sleep disturbances, and post-traumatic stress disorder (PTSD) [10–12]. Concerns for physical, mental, and emotional harms as a result of workplace stress among firefighters and EMS providers have continued to escalate in the wake of the COVID-19 pandemic. As reported in a recent survey of firefighters and paramedics at nine emergency medical service agencies, nearly half of all respondents were identified as having compassion fatigue and/or had considered suicide [4,13–15]. Such alarming statistics reflect the urgent and growing need to address and mitigate chronic stress for firefighters and EMS personnel.

While occupational risks for stress-related disorders in firefighters and EMS providers are significant, individual characteristics and organizational initiatives can provide a protective effect that may limit or buffer negative health outcomes. The development of positive coping strategies, the ability to reframe perceptions of stressful events, and the establishment of a collaborative worksite community can be enhanced through evidence-based interventions that promote mental health and resilience among first responders [16,17]. Pragmatic, proactive interventions are an important next step to promote resilience and minimize the effects of the high mental and physical stress demands for those serving in a first responder role [18,19]. Historically, mindfulness-based interventions (MBIs) have been shown to be effective in reducing negative stress-related health outcomes and help mitigate burnout risks [20–23]. Simply defined, mindfulness is a non-judgmental awareness and acceptance of the present moment or circumstances. It is a practice of attention training that encourages introspection and appreciation that serves to shift one's perceptions and understanding of events [24]. A consistent mindfulness practice has been associated with decreased suicide risk, depression, and anxiety, as well as increased psychological well-being [25,26].

A growing body of evidence has shown that MBIs, ranging from traditional Mindfulness–Based Stress Reduction (MBSR) [24], to innovative mindfulness interventions that combine in-person, virtual, and/or app-based methods of delivery, can be implemented in various workplace environments [27,28]. Mindfulness-based interventions are relatively low-cost and can be adapted to accommodate the unpredictable nature of clinical environments and provider work schedules, which have led to them being increasingly embraced by healthcare organizations as an employee well-being intervention [29–32]. For example, workplace MBIs have been shown to improve psychological symptoms and physical manifestations of stress in nurses, physicians, and other inter-professional health care providers [33–37]. Mindfulness-based interventions have also been successfully implemented with law enforcement officers and military veterans to counter the negative physiological and psychological effects of the unpredictable stress and danger that are intrinsic to these professions [38,39]. Mindfulness interventions for these groups have specifically been shown to decrease states of "hyperarousal and emotional numbing" and improve social functioning and quality of life as well as mitigate anxiety, depression, and pain [40,41].

Studies that have implemented MBIs for firefighters and EMS providers have reported increased psychological resilience and ability to buffer traumatic stress reactivity and PTSD symptoms [42–45]. It is evident that MBIs could play a significant role in attenuating the health risks that firefighters are exposed to due to the occupational stressors they face on a daily basis. Although MBIs can potentiate positive health benefits in firefighters and EMS providers, such interventions may be particularly difficult to systematically implement due to factors including the unpredictability of the job, variable work shifts, department culture, and generational preferences. Similar to barriers reported by healthcare workers, first responders cited time constraints and workload as the key issues preventing participation in worksite mindfulness-based interventions [46,47]. In addition, Landry et al. [48] reported that first responders reported "difficulty sitting with feelings," a concept that is central to mindfulness practice. A variety of MBIs for first responders are represented in the research, targeted to a defined need, situation, focus, or available intervention. Implementation processes are also varied, dependent on intervention type, setting,

and context [43,44,48,49]. Development and implementation of suitable, compatible, and effective MBIs for the first responder workforce requires comprehensive strategies drawn from the implementation science field, but most importantly, input from those in the field. The purpose of this study was to identify and enhance understanding of the specific needs and potential barriers and facilitators for the successful implementation of an MBI program for firefighters and EMS providers. While research demonstrates that MBIs offer measurable benefits, there is limited literature examining how these benefits translate into real-world settings. Previous studies have often lacked direct input from first responders and have not fully explored the specific barriers and facilitators they encounter when participating in MBIs. This study addresses that gap by directly investigating the perceptions of firefighters and EMS personnel, using a ground-up approach to identify the practical challenges and supports that influence implementation within their unique work environments.

2 Methods

2.1 Study Design

A phenomenological qualitative study design with semi-structured interviews was used to gain insights into the lived experiences of firefighters and EMS providers regarding the potential barriers and facilitators for engaging in mindfulness activities. The phenomenological approach is a method focused on understanding human experience from the first-person perspective, exploring how people live and perceive their experiences without making preconceived assumptions. In this approach, we explore individuals' personal stories and ideas to discover the key features that make up their experiences. This approach was used for this study because it allowed for an in-depth exploration of first responders' personal experiences and perceptions regarding barriers and facilitators to implementing MBIs in their work environment. By listening to their lived experiences, we were able to understand how these individuals perceive and engage with MBIs [50]. The interview guide questions were designed to specifically consider the unique context of the workplace environments, where the uncertainty of an emergency call can limit how trainings or interventions are planned and delivered. This study protocol was approved by The Ohio State University Institutional Review Board, (Project # 2022B0254, Date of approval: 8 September 2022).

2.2 Sampling, Recruitment, and Consent of Participants

Purposeful sampling was used to obtain perceptions of firefighters and EMS providers with varying levels and years of experience. Eleven career firefighters and EMS providers with different ranks, ranging from front-line firefighters to fire chiefs, were recruited from fire stations across a midwestern U.S. state. Subjects were selected based on their ability to take part in an in-depth interview to discuss stress points related to their work as first responders. Informed consent was obtained from all subjects involved in the study. We did not keep records on personal factors such as age, gender, or specific workplace locations to ensure anonymity of subjects and improve our ability to recruit based on stakeholder input in the study planning processes. We did determine throughout the interviews that leadership for each station included a fire chief and an assistant fire chief. Three of the fire service agencies provided fire and emergency medical services to incorporated suburbs with additional coverage of less populated areas encompassed within associated townships. Coverage areas ranged from 20 to 27 square miles with annual call volumes ranging from 7500 to 12,000. Smaller in coverage area at nine and 16 square miles, two of the fire service agencies represented more densely populated suburbs with annual call volumes ranging from 5000 to 7000. Per discussions with participants, work requirements and staffing patterns appeared similar.

2.3 Procedures

Once recruited into the study, each subject participated in a semi-structured interview lasting approximately 45–60-min in length. The aim of the interview was to identify physical, mental, and/or emotional stressors associated with their job as first responders, as well as to gain insight into their attitudes towards mindfulness training, mindfulness practices, and the use of a stress reduction smartphone application that would incorporate mindfulness activities during work. The interviews were conducted over Microsoft Teams and audio was recorded for transcription.

Each interview started with occupational stress-based questions including, "What does occupational stress mean to you?" and "What would be helpful to you for stress reduction while on the job?" The next portion of the interview was designated for mindfulness-based questions and future app development including, "What are your thoughts regarding the incorporation of mindfulness practice into your daily work life?" and "What are your thoughts regarding the use of a stress-reduction app during work?" All questions were kept open-ended to reduce leading questions and biased answers. The last 5–10 min of each interview were left for any questions that had not been addressed and to follow up on important discussion points. Each recorded interview was transcribed verbatim to support the data analysis processes.

2.4 Data Analysis

The analysis was guided by the Consolidated Framework for Implementation Research (CFIR) [51]. The CFIR is a contemporary, comprehensive framework that provides a practical and structured method to assess multiple, interrelated factors that may offer insight into the barriers and facilitators to the implementation process for a given intervention. For this study, the CFIR provided a systematic way to determine factors that could enhance the adoption and integration of MBIs aimed at supporting the health and well-being of firefighters and EMS providers working within complex, dynamic fire service agencies.

The data analysis consisted of several coding phases applied to the interview transcripts. The first phase entailed open coding completed by two study team members who independently coded each interview using NVivo R1 (2020 version) software to identify general concepts, patterns, or potential phenomena identified through transcript review [52]. After initial coding of transcripts was completed, the research team met to review the transcripts for validation of concepts and patterns, review transcript coding, and revised the code book per team consensus. Initial thematic analysis was then completed by two independent researchers who aligned themes to the revised code book. This process was followed by discussion and consensus by the research team. The second phase of analysis entailed two coders working together to deductively code the data from the transcripts relative to the domains in the CFIR that included intervention characteristics, outer setting, inner setting, characteristics of the involved individuals, and the implementation process [51]. The research team met regularly throughout the data analysis to discuss overarching themes within the dataset and adjust coding structures and resulting themes to ensure consistency and continuity of the findings and determine the extent to which thematic saturation was achieved within the dataset. Conflicting perspectives and results were resolved through iterative discussions with the final thematic structure and presentation of results representing a consensus across the entire research team [52].

2.5 Researcher Positionality Statement

There are six authors for this qualitative study. The primary author is a tenured clinical and administrative nurse in an academic health care setting. She is a mindfulness practitioner and trained mindfulness instructor. Her research interests include the development and implementation of worksite interventions that promote mental health and well-being for health care workers. She has collaborated in research investigating the effects of mindfulness-based interventions on healthcare worker outcomes, and optimal implementation

methods for mindfulness-based interventions in complex healthcare systems. She collaborated on the study design, evaluated interview recordings during the interview process to assure interviewer fidelity, assisted with code book refinement, and review and validation of thematic analysis.

The second author is a research assistant at a large, midwestern public university. She has participated in research evaluating the effects of mindfulness-based interventions on health care workers and people with various chronic diseases, specifically recruitment and data collection. She provided feedback on study design, supported scheduling of the first responder interviews, collaborated on codebook development, and assisted with alignment of themes to the conceptual framework, and thematic analysis.

The study's third author is an expert in implementation science and qualitative methods. She provided insight for the study design, evaluated interview recordings during the interview process to assure interviewer fidelity, provided insight for use of the conceptual framework, supported codebook revisions, and assisted with validating the thematic analysis.

The fourth and fifth authors, student research assistants, validated the transcription of the recorded interviews, assisted with identifying overarching codebook designations, analyzed and identified study themes and designated themes into the conceptual framework's domains, and assisted with thematic analysis.

The sixth author developed an evidence-based mindfulness intervention that has been implemented in numerous health care facilities to support health care worker well-being. The intervention has also been provided to people with a variety of chronic diseases. The intervention has consistently shown improvements in perceived stress, resilience, work engagement, and burnout for these populations. The sixth author assisted with study design, evaluated interview recordings during the interview process to assure interviewer fidelity, assisted with codebook review and revisions, as well as the thematic analysis. The combined experiences of the authors, and their belief that health care workers and first responders experience similar stressors due to their work roles and environments, led to their interest in investigating the effects of mindfulness interventions and optimal implementation methods for first responders in a community setting.

All authors contributed to the study concept, supported and/or reviewed the data coding process, participated in the thematic analysis, and wrote substantial portions of the manuscript. This study benefited from the specific experiences and expertise of the authors relative to knowledge about and implementation of mindfulness-based interventions for health care workers. However, to limit bias during first responder interviews, the research team deliberately chose a colleague, skilled in qualitative interviewing, with no connection to this research to perform the semi-structured interviews with first responders. In addition, student research assistants with limited exposure to mindfulness interventions and previous research at this organization were used to validate the accuracy of the interview transcripts, initially code and categorize the qualitative data.

2.6 Researcher Positionality Statement

To ensure credibility, time was provided for clarification of any participant responses, for the participant to ask questions, and offer any additional comments on both the questions and the interview process at the end of each individual interview. The interviewer, while experienced in qualitative interviewing, was purposely not part of the study team and had no part in development of the semi-structured interview questions to limit bias. The interviewer did offer overall perspectives on the participant interviews prior to the coding and analysis process. While we did not provide the interview transcripts to the participants for their review and comment, the process of coding and analysis was performed in multiple, progressive phases by all members of the research team.

The research team has experience developing, implementing, and evaluating mindfulness-based interventions with healthcare workers. This study stemmed from an interest in assessing similar programming for first responders, who experience similar workplace stressors and negative health-related outcomes. Without direct knowledge or familiarity with first responder work roles and well-being interventions, qualitative inquiry was necessary to gain a better understanding of their work roles, workplace environment, culture, and leadership to determine feasibility, acceptability, and appropriateness. This study provides pertinent background, processes for participant recruitment and participation, as well as the data collection and analysis process to ensure transferability. The CFIR was used to categorize themes elicited from the analysis of the semi-structured interviews with first responders. Participant quotes were provided to enhance results and further illustrate the narrative.

The interviews were audio-recorded and transcribed verbatim to ensure consistency and transparency. Dependability was assured through a rigorous process that was used for transcript review, coding, and thematic analysis. In addition, all study processes and data has been made available in the Qualitative Data Repository to allow data review and study replication.

Confirmability of qualitative data was assured throughout the analysis process. The study team had no direct knowledge of the first responder role, work patterns or worksite culture. Coding and thematic analysis followed a defined process to limit bias. The initial transcript review and coding processes were initially completed by members of the research team, rechecked by alternate team members, then discussed by the team. This process was repeated throughout the analysis process and designation of themes into the CFIR [52].

3 Results

Thematic analysis of the semi-structured interviews is presented with quotes aligned to the CFIR domains and constructs relative to *Characteristics of Individuals, Intervention Characteristics, Inner Setting, Outer Setting, and Implementation Processes*. All categorized information is presented in Appendix A. The information gleaned from interviews provided an understanding of the facilitators and barriers to implementation of an evidence-based mindfulness intervention and stress-reduction smart phone application for community-based firefighters and EMS providers. Select quotes from these interviews are embedded within the narrative to highlight the themes relative to the CFIR domains.

3.1 Characteristics of Individuals

Interview responses from the first responders related to the CFIR domain, *Characteristics of Individuals*, provided insight relative to their knowledge and beliefs, past experiences, and personal attributes such as values, motivation, and learning style [51]. Participation in worksite mindfulness interventions may be influenced by individual characteristics, as well as preferences for other health and wellness interventions, preconceived ideas related to mindfulness practices, and even spiritual beliefs. For those who choose to participate, personal motivation may be difficult to distinguish if organizational support is lacking or personal circumstances prevent participation.

Firefighters and EMS providers must manage a multitude of occupational stressors, including staffing shortages, traumatic runs, and mandatory job rotations, while maintaining a confident and competent public image. The first responders easily identified the daily stressors they have experienced and acknowledged that coping mechanisms, such as using alcohol, engaging in dark humor, and avoiding discussions about traumatic situations, haven't always been healthy.

"You have to learn to deal, and we can't. We can't just brush it under the rug. I mean, these guys are hurting. It's not normal what we see."

While admitting to a general resistance to change or trying something new to help manage their work-related stress and anxiety, the first responders expressed an openness to mindfulness, even though it had not been something they participated in previously.

"...to be able to just like decompress and talk about stuff going on and kind of like uh, really evaluate and reflect on your feelings. It is so good for your mental well-being."

With yoga now offered at many of the fire stations, the first responders appeared to have a basic understanding of the benefits of movement, breathwork, and meditation. Because of their educational background, they also expressed an appreciation of the science that supports the physiological associations between the mindfulness practices, especially the breath practices, and the nervous system.

"The 'how Mindfulness can actually reduce your stress level,' not just like oh well, that's stupid breathing thing, but maybe because we are medical providers, the physiological responses, and that's kind of how I how I got really into it."

The first responders did reinforce that short practices that they can incorporate into regular activities would be most helpful. With downtime rare due to routine work responsibilities, the anticipation of a run or call prevented true rest during their work shifts. This constant state of hypervigilance often prevented participation in scheduled well-being activities. First responders stated that well-being practices and activities must become part of the work culture, encouraged and supported by fire service leadership and peers.

"I think the reality of it is, is that if your department doesn't prioritize that time for you to do that, then it doesn't really mean a whole lot for it. You know, it's one thing to say that you do it, but are you actually backing that up with like, this is our priority..."

Ideally, education and practices related to well-being would be integrated into firefighter/EMS education, during their introduction to the career, so healthy habits and attitudes are ingrained into the profession.

3.2 Intervention Characteristics

Intervention Characteristics include the "essential and indispensable elements of the intervention" [51]. Constructs encompassed within this domain include the intervention source, evidence strength and quality, adaptability, design, and cost. With mindfulness already a relatively low-cost intervention, first responders seemed to think that the fire service leadership would be accepting of the intervention.

It was frequently reinforced that the mindfulness intervention would require firefighter/EMS involvement to ensure appropriateness, suitability, and most importantly, acceptance.

"...so, having somebody who's talking about these things, who's like, 'dude, I've been there, I know,' rather than someone who's like, 'this, like yoga move will help with this muscle.' And it's like, OK, great. But how is that helping the fact that I had a 2-year-old child die? How? Like you don't understand. You'll never understand that."

Due to their education and training, they also expressed the need for the intervention to be backed by current scientific evidence. The science behind the intervention was necessary for first responders to better understand the impact on their own physiology and how it may affect them physically and mentally, both in the short and long term. Many of the first responders agreed that different well-being programs were helpful, however, personal preferences, beliefs, and experiences tended to influence their participation in individual interventions. However, breath practices and brief, easy ways to "calm" themselves were mentioned frequently.

> *"Even if somebody doesn't necessarily believe in the yoga and all that stuff, just the breathing and just the like, being able to take, you know, a couple minutes out and just kind of concentrate on you, I think that is, that's super huge. . ."*

Accessibility of the intervention and simple guided practices to help them relax during the workday were a priority. The idea of an app with on demand content, that could be used to supplement programming or be used on its own, appeared ideal.

> *". . .we can pick and choose the time that we're available to use it. You know what I mean, like whether it's right in the morning when we first get there, right before we go to bed or whatever it is, so I think having that option to kind of pick our own scheduled and you know, as long as it's not an hour and a half thing every day, I think it would be easy to implement."*

3.3 Inner Setting

Themes reflecting the *Inner Setting* of the CFIR included references to structural characteristics, networks and communications, culture, and implementation climate [51]. While the organizational structure of all fire stations is similar, there are distinct differences that influence implementation and participation in well-being programming related to culture, communication norms, available resources, and leadership engagement. Responses from first responders provided insight into their unique inner setting and more importantly, barriers and facilitators to implementation of MBIs and use of a stress-reduction app.

Many first responders relayed stories about co-workers who have struggled or are struggling with physical and mental health issues due to their work. Alcohol use, poor diet, injuries, anxiety, insomnia, and suicide were all significant concerns directly related to their occupational stress. They acknowledged that the need for programs and activities to support their physical and mental well-being are now being discussed and diverse worksite programming is being offered.

> *"I think it's going to be a little bit better perceived than it would have, you know, five or ten years ago because we are getting out of that era where you just sit there and hold it all in and you know, and a lot of the older guys that have been around for a while maybe aren't going to be as open to this, but especially in the fire department, we are so young now. We have so much turnover that I think now's probably going to be one of the better times to try to implement something like this. . ."*

However, participation in worksite mindfulness programming is dependent upon fire station culture and leadership support, factors that many first responders identified as barriers to their participation. As

noted during the interviews, current programming at many fire service agencies is primarily focused on physical activity and health.

> *"But it's an old culture thing. You know, the Chiefs are all older. They don't really, I don't think they really, truly bought into that idea of. I don't, I don't think a lot of people just understand mental health unless they, especially if they've never had it before."*

Other barriers included time constraints, staffing limitations, personal motivation, compatibility of programming with their workflow, and cost. Facilitators within the inner setting included supportive work supervisors and peers, overarching worksite policies that support well-being activities, and a variety of accessible well-being activities.

> *"So, the higher up's, the ones that aren't on the street anymore, they don't see how jam packed our day is and there's only 24 hours in a day and there's only so many hours of daylight. So, to find an hour of time per shift or even once a week when you're on the job to be able to sit downand decompress. It's going to be hard to get past the chief."*

3.4 Outer Setting

The *Outer Setting* domain was associated with the economic, political, and social context within which the first responders work and live [51]. Responses focused on organizational efforts and internal politics related to availability and participation in well-being interventions, as well as community perceptions of firefighters and their work.

First responders described the contrast between their daily work and public perceptions, stating that the public has little idea of their work-related stress and the amount of downtime they actually have during the workday. With fire services funded through local government sources, finances have to be to be carefully managed. If costs need be curtailed, first responders felt that well-being programs would be the first to be eliminated, despite the critical need for first responder wellness.

> *"It's hard to it's hard to educate the public to say, hey, you know, we pay for these items for these guys for this reason. As public servants we have, you know, we have a duty to minimize extraneous extemporaneous spending..."*

Community politics and external policies, especially those that were implemented during the COVID-19 pandemic, were described as sources of conflict for first responders. Those interviewed described being reprimanded when questioning policies that were not based on current evidence and put their physical health and safety in jeopardy. With personal protective equipment limited early in the pandemic, concerns about occupational exposure to the novel virus were high. Concerns escalated as first responders were required to receive the initial vaccine without consideration for underlying medical conditions and personal beliefs as effectiveness and side effects were still largely unknown.

> *"We're caught in a political nightmare now that is creating a whirlwind of trauma with these guys. Because they know the right thing to do. . . it wasn't politically correct. . ."*

3.5 Process of Implementation

Perspectives related to implementation of mindfulness interventions touched on the *Process of Implementation* constructs of planning, engaging, executing, reflecting, and evaluating [51]. While the interview questions were not specifically focused on implementation factors, themes that supported success and sustainability of mindfulness programming and a stress reduction app were deduced from responses to the various questions.

First responders were firm that any mindfulness programming and stress reduction app introduced would need to be condoned and prioritized by fire leadership. The firefighters currently have yoga, strength training, physical therapy, and counseling services available at their fire stations. The fire stations are also outfitted with treadmills, free weights, and other fitness equipment. However, the ability of the firefighters/EMS personnel to participate in these various activities was limited by work responsibilities, staffing, and at times, peer attitudes.

> *"I think it's easy to say, yeah, we give the people, you know, these programs, but I don't think they efficiently put it into our schedules where it's going to maximize the benefit. . ."*

The first responders stated that mindfulness programming would optimally be integrated into their workflows, offered in "bite size" audio and/or video-based practices, five to 10 min in length, that would include breathwork, meditations, and movements.

> *"I think the bite-size stuff is perfect because we don't know what our days look like. . ."*

Most offered that younger firefighters/EMS personnel would be more amenable to app-based content and more comfortable with mindfulness practices than more tenured first responders.

> *"I personally find it very, very helpful, like I have one of those, like mindfulness apps, like how it like leads you through like a directed meditation thing that you know if I'm feeling stressed out I'll find a quiet place and just sit for a second."*

They reinforced that first responders needed to be part of the program development, instruction, and promotion. A first responder with knowledge of the profession and connected to their work would be more respected and be able to "champion" the mindfulness intervention and stress reduction app.

4 Discussion

The negative effects of occupational stress on the health and well-being of firefighters and EMS providers are significant with consequences for the individual first responder, fire service organizations, and the communities they serve [6,53]. Worksite mindfulness interventions, with demonstrated benefits for other high stress professions, are now gaining acceptance and showing similar results with first responders [43,49,54]. With multiple iterations of mindfulness-based interventions available, interventions implemented for these critical community-based healthcare providers must offer appropriate, evidence-based content while accommodating chaotic work environments, as well as the fiscal responsibility that comes with community funding. Comprehensive strategies relative to intervention design, development, and implementation are necessary to minimize barriers, support effectiveness, and promote sustainability.

The results of this phenomenological qualitative study provided insight into the contextual factors that would support intervention effectiveness and implementation success relative to worksite mindfulness-based interventions for first responders. The sample of 11 firefighters and EMS providers offered details related to existing worksite well-being interventions, preferences for mindfulness content and delivery methods, as well as barriers and facilitators to implementation within their work environments. Thematic analysis, aligned to the CFIR domains, indicated that organizational culture and leadership support for first responder health and well-being were overarching factors essential for implementation success.

4.1 Perspectives on Occupational Stressors

Firefighters and EMS providers easily described the occupational stressors they experience during a workday. Physical strength and fitness, being fit for duty, were discussed as necessary requirements to meet the physical demands of firefighting, patient handling, and performing their jobs in scenes that may be unsafe. While specific physical complaints and symptoms were not identified during the interviews, pain, muscle soreness, and fatigue are common complaints that can be improved with exercise and weight training [55,56]. In firefighters and EMS providers, cardiovascular and musculoskeletal health are directly related to improved occupational performance, decreased musculoskeletal injuries, and decreased risk of chronic diseases [57,58]. While many of those interviewed stated that cardiovascular and weight training equipment was available in their fire stations, the ability to consistently use the equipment during work shifts was limited by work responsibilities and the chaotic nature of their work.

The mental and emotional stressors associated with their jobs appeared to be a significant point of concern for the first responders interviewed. Firefighters and EMS providers must be emotionally healthy and those we interviewed recognized they often do not don't often cope with work related stress in ways that benefit their health and well-being. While unhealthy coping is not uncommon in first responders, it is associated with an increased risk of stress induced conditions such as anxiety, depression, post-traumatic stress disorder, and suicide [19,59,60]. Stress, burnout, and the secondary trauma they face affected their personal health and sometimes, their relationships with family and friends. They reported that there is increasing support from counselors and chaplains, especially after difficult work situations. Several first responders also reported they sought out private counseling and used smartphone apps to help support their mental and emotional health. However, they acknowledged that the more tenured firefighters and EMS providers could be resistant to these approaches and potentially influence participation of less experienced first responders. They discussed that yoga programming had been implemented which has shown benefits in functional movement, body awareness, and reduction in post-traumatic stress symptoms for first responders [61,62]. However, while yoga was regularly available and many enjoyed the mind-body practices, participation was often disrupted by emergency calls and other work responsibilities. Mindfulness interventions had not been formally implemented but could support a reduction in the significant stress and trauma that first responders experience as a result of their work. Mindfulness interventions, including mindfulness-based stress reduction, mindfulness-based cognitive therapy, and metta mindfulness, can positively alter brain structure and function and are effective in reducing PTSD symptoms. A regular mindfulness practice has been shown to decrease amygdala activity, lessening reactivity to stress and fear. Mindfulness practices also enhance brain connectivity which can support improved attention and focus, enhanced emotional regulation, and an increased resilience to stress [63,64].

4.2 Perceptions about Worksite Mindfulness-Based Interventions

Firefighters and EMS providers expressed openness to worksite mindfulness-based interventions and a smartphone app that would provide stress reduction content. They indicated some familiarity with

mindfulness, specifically breath practices, through current worksite well-being interventions and personal use of various smartphone apps that offered relaxation-type practices. Meditation apps have become a popular and convenient way of sampling various practices that can enhance well-being. Allowing self-paced and practical integration into everyday activities, informal mindfulness practices guided by a smartphone app can offer similar benefits to traditional programming if the content and design are evidence-based and user centered, offers a variety of types and lengths of practices, and are accessible relative to technology and cost [44,46,65,66]. Ideally, both formal and informal mindfulness practices should be available to accommodate first responder learning preferences and sustain engagement. Their understanding of the physiological processes that can occur within the body provided insight into the need for intentionality and consistency of mindfulness practice. However, acceptance of mindfulness interventions was qualified, with several points made relative to content, credibility of instruction, and integration into their work and personal lives. Equally as important, a consideration of the usefulness, risks, and contraindications of mindfulness-based practices for first responders with a history of mental health diagnoses and past trauma is necessary. While the prevalence of adverse effects related to meditative practices is less than 10% and similar to other psychological treatments, traumatic re-experiencing, anxiety, and depression can occur [67–69].

Firefighters and EMS providers are critical public safety professionals that undergo rigorous education and training, a curriculum that encompasses physical fitness and agility, fire management protocols, and proficiency in basic aspects of emergency medicine [70,71]. Those interviewed reinforced that, due to their understanding of human physiology and exposure to stressful conditions and traumatic situations, the mindfulness programming would have to be based in science. Evidence would need to provide support for mindfulness' effects on their physical and psychological systems, as well as symptoms that they experienced as a result of their occupation. Guided by evidence, traditional mindfulness practice encompasses components of formal education and training reinforced with informal practice. Fidelity of instruction assures integrity of the practice and is essential when tailoring traditional mindfulness curriculum to specific settings and populations [72]. Credibility was another aspect of programming that was mentioned as important for acceptance and has been shown to influence participant expectations and engagement, as well as improved outcomes [73]. They reinforced that a respected first responder, "one of them" should provide input into design of the intervention's content and/or delivery or be integral to the delivery of the intervention. The use of current evidence to support intervention design, trained and experienced instructors for intervention delivery, and fidelity of the intervention are key considerations for the development of mindfulness-based interventions for specific professions. These aspects are also important for successful implementation with positive outcomes [74–76].

4.3 Barriers and Facilitators to Implementation of Mindfulness-Based Interventions

The first responders were clear that any mindfulness-based intervention would need to be able to be integrated into their workday, and optimally be able to be used during their off-work time as well. With workday routines often interrupted by emergency calls, smartphone app-based interventions were preferred for ease of use and convenience. Mindfulness interventions adapted to include smartphone app delivery are popular with other high stress professions and align to Proctor et al.'s definition of appropriateness and acceptability [77–79]. The first responders also advocated for mindfulness micro-practices, available via an app, a concept that has been used to incorporate coping strategies and healthy lifestyle behaviors into manageable activities that can evolve into healthy habits and behaviors, improve success and sustainability [80,81].

Fiscal responsibility to community funding sources for fire services was mentioned as a potential barrier to offering a mindfulness-based intervention for firefighters and EMS providers. Those interviewed

stated that wellness programs are most likely be eliminated if funding became as issue. While mindfulness interventions are relatively low cost, there is evidence supporting return on investment in terms of individual and organizational outcomes. Fire service administrators must understand that decreases in stress, burnout and improvements in work engagement and resilience can translate into less absenteeism and work-related injury, as well as improved teamwork and productivity [18,29,82,83]. The public must understand that first responders who are healthy and well can provide improved emergency care and services to the communities they serve.

Leadership engagement in developing a culture of well-being and genuinely supporting participation in well-being interventions was a defining characteristic that determined fire service department priorities, culture, and allocation of resources. It was noted that fire service leaders encouraged participation in existing well-being interventions, however there was no protected time designated to allow firefighters and EMS providers to participate. The inability to participate in available interventions on a regular basis was a significant point of frustration. It was also mentioned that fire service leaders were older, more engaged in administrative duties than the day to day demands of the first responders, and less inclined to recognize more contemporary well-being activities, such as mindfulness, that provides more psychological support. Several of those interviewed cited generational differences in recognizing the importance of interventions that were not deemed traditional well-being activities for first responders, namely physical activity and diet [84]. Genuine support from direct supervisors, mentioned several times during the interviews as lacking in most departments, has been shown to significantly influence employee participation in worksite wellness programs [85–87]. By expanding and prioritizing options for evidence-based well-being interventions, especially those that are accessible and easily integrated into the workday, fire service leaders could positively impact the unique needs of first responders and create a true culture of health and well-being for these essential providers.

5 Strengths and Limitations

This study offered valuable insight into how best to develop and implement worksite mindfulness programming for firefighters and EMS providers. The recruitment of first responders with a variety of experience levels, roles, and tenure was key in understanding daily work demands and workflows, fire station culture, and the impact of fire service leadership in prioritizing first responder well-being. The 11 firefighters and EMS providers represented five fire service stations across one U.S. state. This limited number of participants may not have comprehensively represented first responder perspectives locally, regionally, or nationally. While we did not document specific geographical locations or communities serviced by these first responders, similarities and differences between the worksites were determined during the interviews. Differences in locale and community funding for fire services can often influence workforce support and programming availability and may have been a source of bias. Several of the participating first responders discussed experience with and/or participation in different well-being interventions and use of smartphone applications to support their health and well-being. Bias may have been a factor for those responding to the survey and participating in the semi-structured interviews as these first responders were likely interested, more knowledgeable, and motivated to participate and offer their perceptions.

6 Implications for Practice

Providing access to worksite programming to support first responder health and well-being is essential. Including mindfulness-based interventions as part of an array of well-being interventions can complement existing traditional programming. However, due to the unique work environments and job-related stressors, it is imperative that mindfulness interventions are effective, acceptable, appropriate, feasible, and sustainable.

Results from this study suggest that interventions for first responders must consider the logistical issues, cultural barriers, and generational perspectives that affect successful and sustainable implementation. While focused on the development and implementation of mindfulness interventions for firefighters and EMS providers, the findings of this study may be relevant to other high stress professions that provide healthcare, education, social services, and protective services to the public.

7 Conclusions

The rationale for this study was to determine optimal content, delivery method, and implementation for a worksite mindfulness intervention that may offer support for firefighter and EMS provider health and well-being. Results indicated that evidence-based mindfulness practices, developed, provided and/or facilitated by someone with intimate knowledge of their work environment and challenges would be optimal. The first responders also stated that brief mindfulness practices that could be easily integrated into the chaotic workflow of their days was a necessary requirement. Most importantly, fire service leadership engagement and support were essential in supporting both organizational and individual interventions that contribute to a culture of well-being. Future qualitative and quantitative research should focus on how best to evaluate individual and organizational outcomes of mindfulness interventions as cost-effectiveness and return on investment for well-being interventions is critical for agencies and organizations dependent on public funding.

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Ethics Approval: This study was approved by The Ohio State University Institutional Review Board (Project# 2022B0254) on 8 September 2022. All participants provided written informed consent in accordance with institutional guidelines prior to participation.

Conflicts of Interest: The authors declare no conflicts of interest to report regarding the present study.

Appendix A

Table A1: CFIR Codebook

Construct	Definition	Relevant narrative from semi-structured interviews
I. Innovation characteristics		
A. Innovation source	Definition: Perception of key stakeholders about whether the innovation is externally or internally developed.	So, having somebody who who's talking to you about these things, who's like, "dude, I've been there, I know," rather than someone who's like, "This, like yoga move will help with this muscle." And it's like, OK, great. But how is that helping the fact that I had a 2-year-old child die? How? Like you don't understand. You'll never understand that.
B. Evidence strength & Quality	Definition: Stakeholders' perceptions of the quality and validity of evidence supporting the belief that the innovation will have desired outcomes.	Deep breathing triggers your parasympathetic nervous system rather than your sympathetic nervous system, and because we work in EMS, we work with that mind of "How is this going to help me medically?
C. Relative advantage	Definition: Stakeholders' perception of the advantage of implementing the innovation vs. an alternative solution.	But if you put off some type of occupational stress or even just like PTSD from work, it's just going to fester into something more over time. So, you just got to really understand how to just like mitigate that very early on and just get it solved. I think the bite-size stuff is perfect because we don't know what our days look like and regularly, like in between runs on the way from one to another, I'm looking at my phone just checking things and so if there's a very specific EMS, like mindfulness, bite-size like things that you could find in one specific area, that'd be awesome.
D. Adaptability	Definition: The degree to which an innovation can be adapted, tailored, refined, or reinvented to meet local needs.	We can pick and choose the time that we're available to use it, whether it's right in the morning when we first get there, right before we go to bed or whatever it is, so I think having that option to kind of pick our own schedule, as long as it's not an hour and a half thing every day, I think it would be easy to implement.
E. Trialability	Definition: The ability to test the innovation on a small scale in the organization, and to be able to reverse course (undo implementation) if warranted.	So, something that is that trial size would be perfect cause you don't know necessarily who you're going to be working with and who would be open to those ideas. So, something that's kind of simple is easier to break to somebody that's new to it.
F. Complexity	Definition: Perceived difficulty of the innovation, reflected by duration, scope, radicalness, disruptiveness, centrality, and intricacy and number of steps required to implement.	I just don't think that we have the buy in from the administration side of things. That they're like, oh hey, here's just a free 2 h of your day to just get your mind right. But it's an old culture thing. You know, the Chiefs are all older. I don't think they really, truly bought into that idea. I don't think a lot of people just understand mental health unless they, especially if they've never had it before.

(Continued)

Table A1 (continued)

Construct	Definition	Relevant narrative from semi-structured interviews
		So, the higher up's, the ones that aren't on the street anymore, they don't see how jam packed our day is. . .so, to find an hour of time per shift or even once a week when you're on the job to be able to sit down and decompress, it's going to be hard to. To get past the chief. Interruptions during the day would be a challenge.
G. Design quality & Packaging	Definition: Perceived excellence in how the innovation is bundled, presented, and assembled.	I think that there would be great times where you could do it as a team building and just kind of whole group stress thing. And then if you need extra, or you just have a bad day, do it at home or do it wherever you happen to be. So yeah, I think it's a great idea.
		Very succinct and not where you have to find everything you want.
		We want simple and repeatable like it needs to be a noncomplex thing, but it's repeatable every day and or every shift.
H. Cost	Definition: Costs of the innovation and costs associated with implementing the innovation including investment, supply, and opportunity costs.	We're always under money crunch and wellness programs are going to be the first thing to cut. If funding is fortunate, where I work we don't have that issue, but when it comes to that kind of stuff, it's a major barrier.
II. Outer setting		
A. Needs & resources of those served by the organization	Definition: The extent to which the needs of those served by the organization (e.g., patients), as well as barriers and facilitators to meet those needs, are accurately known and prioritized by the organization.	These and needing mental health resources, I think we could prevent that way before it even starts. It's like, yeah, great. We have an EAP, but what are we doing to prevent people from leaving the EAP? I don't think that we do and it's not just my department it's all over the whole entire country. It's definitely in [this state].
B. Cosmopolitanism	Definition: The degree to which an organization is networked with other external organizations.	
C. Peer pressure	Definition: Mimetic or competitive pressure to implement an innovation, typically because most or other key peer or competing organizations have already implemented or are in a bid for a competitive edge.	That's understandable, but if we could do something like that on a like, even just a weekly basis rather than every three weeks, I heard a department that neighbors us does it twice a week, those women come in and do theirs twice a week, I think that's beneficial. I would definitely, you know, love to see that incorporated into our daily routine.
		Whereas the [state health system]? Theirs was like intentional and like it forced me to do their breathing exercises and things like that. I just remember it working because whatever it was, it definitely brought that level of anxiety down.
		I think just the knowledge of it being out there and the awareness has helped.

(Continued)

Table A1 (continued)

Construct	Definition	Relevant narrative from semi-structured interviews
D. External policy & Incentives	Definition: A broad construct that includes external strategies to spread innovations including policy and regulations (governmental or other central entity), external mandates, recommendations and guidelines, pay-for-performance, collaboratives, and public or benchmark reporting.	It's hard to it's hard to educate the public to say, hey, you know. We pay for these items for these guys for this reason. As public servants we have, you know, we have a duty to minimize extraneous spending on whatever. So, I think that's one of the hard parts, at least in the public sector of things is that you were dealing with the opinions of the masses when it comes to how much funding and how much other things. So, education of the general populace for some of these items can be helpful at times.
III. Inner setting		
A. Structural characteristics	Definition: The social architecture, age, maturity, and size of an organization.	I think it's going to be a little bit better perceived than it would have, you know, five or ten years ago because we are getting out of that era where you just sit there and hold it all in and you know, and a lot of the older guys that have been around for a while maybe aren't going to be as open to this, but especially in the fire department, we are so young now. We have so much turnover that I think now's probably going to be one of the better times to try to implement something like this and really maybe help out some of the younger generation that doesn't have a lot of experience with that occupational stress. So, to be able to implement these good routines now. I think is going to be super helpful for sure.
B. Networks & Communications	Definition: The nature and quality of webs of social networks, and the nature and quality of formal and informal communications within an organization.	. . .especially with the fire department, I think that there's just a lot of like grade-A personalities where everyone's just kind of like a little bit, I don't know, buttheads the right way to say it, but everyone's kind of got their own idea of like what's right and what's wrong. And they just sometimes just people rub each other the wrong way. I think that stresses me personally out more than anything else. ...just having communications with maybe somebody else that I work with that's, you know feeling the same type of stressors I guess being able to have that line of communication has been helpful as well.
C. Culture	Definition: Norms, values, and basic assumptions of a given organization.	I mean, you wake up in the same building, you eat lunch, you eat dinner, you do everything, workout, take emergency runs, everything is like it's no different than just being at home with your family. Most of them are pretty open when you get them in on an individual basis, but you can get when you get our groups into group mindsets. Sometimes it can be challenging at the least to change opinions and to establish normalcies.

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Table A1 (continued)

Construct	Definition	Relevant narrative from semi-structured interviews
		Mental health wasn't really something that we talked about. It was kind of just something that you looked at and some of the older more seasoned guys, if you told them that you were having a problem, they would tell you to figure it out on your own . . .culture is the biggest barrier that you have to introducing stuff like especially like mental, mental well-being and mental health awareness. I think a lot of it is probably your traditional kind of like masculine "I don't need help" kind of culture. A huge stress reliever is having trust in your crew and having you know this just a little like I guess a family aspect of it.
D. Implementation climate	Definition: The absorptive capacity for change, shared receptivity of involved individuals to an innovation, and the extent to which use of that innovation will be rewarded, supported, and expected within their organization.	I think overall the concept of it has been received better than anticipated because when you think if you're taking a bunch of type A firefighters and thinking, you know, bringing yoga in when they're used to strength training and you know that approach, you never know how it's going to be received. But overall, from the department, I think it's been received very well. because our job is usually boom, boom, boom, high stress. You know, always something going on. So, if you're like, hey, you know, this is an opportunity for you to just chill out and decompress for a half an hour. That will be perceived well for sure.
1. Tension for change	Definition: The degree to which stakeholders perceive the current situation as intolerable or needing change.	I feel like we're always up here constantly up here. Even if you're, you know, just eating dinner. And we never know what the next run is going to be. We, you know, typically you don't sleep very well even when you're home. So you're always kind of up here and that kind of brings you down a little bit. And it's so nice to just have that calmness. And so, we'll just kind of, we joke about things. It all varies, but to be honest, like 99% of the time on any call that that is stressful, you just bury it down for a while and you move on to the next one because you got to go and do your job. I wish somebody would have educated me on the signs of. Of what was going on with me before I subjected my family to all these problems.

(Continued)

Table A1 (continued)

Construct	Definition	Relevant narrative from semi-structured interviews
2. Compatibility	Definition: The degree of tangible fit between meaning and values attached to the innovation by involved individuals, how those align with individuals' own norms, values, and perceived risks and needs, and how the innovation fits with existing workflows and systems.	Having the ability to discuss your stressors and your frustrations with your career, with other people that have been through it already is really dramatically helpful. For me it's putting stress on my physical body where it's working out, yoga, or things like that. I feel like that is a huge de-stressor for me because I'm able to put whatever stress I have into hurting my body in a good way to build it up. I think that there's a lot more familiarity and comfort with using an app based program for a lot of our 10-to-15-year veterans right now than there would be between our 25- and 35-year veterans. So, I think that would be effective.
3. Relative priority	Definition: Individuals' shared perception of the importance of the implementation within the organization.	We came in there and you know, set an oath that we would take care of the public. So obviously we have to train, we have to do these things that matter. But you got to have health and Wellness right in behind that because if people aren't healthy, they're not going to be able to do all that other stuff efficiently and effectively.
4. Organizational incentives & Rewards	Definition: Extrinsic incentives such as goal-sharing, awards, performance reviews, promotions, and raises in salary, and less tangible incentives such as increased stature or respect.	. . . we do have those resources available. You can call any of the officers and they'll kind of like hook you up with some resources and phone numbers to call and yeah, but that was definitely something I kind of realized for myself. That was it at a point where I personally realized I needed help. So, I sought that out myself.
5. Goals & feedback	Definition: The degree to which goals are clearly communicated, acted upon, and fed back to staff, and alignment of that feedback with goals.	When we were facing a lot of personnel moves and I was in in charge of a lot of really strong-willed people that while you know, and you know, in my mind everything had been going well. The Chiefs above me had other department goals and they were pretty much forcing the moves to be made. But it was up to me to do it.
6. Learning climate	Definition: A climate in which: 1. Leaders express their own fallibility and need for team members' assistance and input; 2. Team members feel that they are essential, valued, and knowledgeable partners in the change process; 3. Individuals feel psychologically safe to try new methods; and 4. There is sufficient time and space for reflective thinking and evaluation.	We do something that's called a hot wash, so a hot wash is you come back to the station and as you're restocking and once you're done, we all kind of just get together, whether it's sitting in the recliners or sitting out in the bay with you know with our office chairs and we talk about what happened, and what could have gone better. And it's our way to kind of like debrief from what just happened. And grow on it as a department.

(Continued)

Table A1 (continued)

Construct	Definition	Relevant narrative from semi-structured interviews
E. Readiness for implementation	Definition: Tangible and immediate indicators of organizational commitment to its decision to implement an innovation.	So my crew that I'm with specifically I think would be open to that, especially if we did it- If we could do it together. . .that's the time that we kind of all spend together. So, if we had the opportunity to also maybe incorporate, like, a mindfulness thing during that period, while we're all kind of together anyway. We know we have that hour of time where we can kind of just relax and kind of get into, OK. It's me, I'm OK, and you know kind of calm down a little bit, take some of that away.
1. Leadership engagement	Definition: Commitment, involvement, and accountability of leaders and managers with the implementation of the innovation.	Right now, I'm fortunate that at the department I'm at, we have the chief his focus since he came in eight years ago has been to try and do things to help improve the benefits of our department for Mental Health and Wellness. He understands the continuity in the team building concept with each other.
2. Available resources	Definition: The level of resources organizational dedicated for implementation and on-going operations including physical space and time.	I think it's easy for them to say, well, we offer everybody yoga and we offer everybody Wellness. I think it's easy to say, yeah, we give the people, you know, these programs, but I don't think they efficiently like put it into our schedule where it's going to maximize the benefit for both of those programs. Every other department that I worked at was just kind of like, hey, get your work done. . .but you know, take some time for yourself throughout the day if you want to. It is not like that where I'm at, I think you're pretty much expected to be on your feet moving for most of the day, and something is always going on.
3. Access to knowledge & Information	Definition: Ease of access to digestible information and knowledge about the innovation and how to incorporate it into work tasks.	The "how mindfulness can actually reduce your stress level", not just like oh well, that's stupid breathing thing, but maybe because we are medical providers, the physiological responses, and that's kind of how I how I got really into it. You know, just take time to either settle your mind or clear your mind and you know just I think just tips or, yeah, a little bit of coaching through that would be pretty important.
IV. Characteristics of individuals		
1. Knowledge & beliefs about the innovation	Definition: Individuals' attitudes toward and value placed on the innovation, as well as familiarity with facts, truths, and principles related to the innovation.	. . .it's so nice to just have that calmness for a minute and have somebody talk you through breathing and talk you through being calm and it's a lot of stretching, which obviously we all need that. And that really helps. And then we can kind of do that on our own then throughout the week, kind of remember some of those things.

(Continued)

Table A1 (continued)

Construct	Definition	Relevant narrative from semi-structured interviews
		So, it'd be nice to kind of hopefully breakthrough the stigma that it's OK to not be OK and it's OK to say so on the job.
2. Self-efficacy	Definition: Individual belief in their own capabilities to execute courses of action to achieve implementation goals.	But if you put off some type of occupational stress or even just like PTSD from work, it's just going to fester into something more over time. So, you just got to really understand how to just like mitigate that very early on and just get it solved. . . I feel like you have to establish that early and often, rather than just let it just kind of go away.
		Taking the time to do some stretching and doing those little things does seem to work, but again, consistency I think is the hardest part.
		So, I think that you have to be intentional about recognizing the down time that you have and then you know, putting that, you know, understanding the benefit, seeing it, recognizing the downtime and then putting that into practice when you can.
3. Individual stage of change	Definition: Characterization of the phase an individual is in, as s/he progresses toward skilled, enthusiastic, and sustained use of the innovation.	You have to learn to deal and we can't. We can't just brush it under the rug. I mean, these guys are hurting. It's not normal what we see (Traumatic Runs).
		Yeah, you know what? This has negatively impacted not only me at work, but me at home and me and life in general. And I think that's the other portion of it that really gets the education is. Is that not doing these things will dramatically change your personal life and your home life if you don't take care of it.
		We want help. We want help. We need help. We need it. I mean, if you want, if you want your Fire Protection, your first responders to excel.
4. Individual identification with organization	Definition: A broad construct related to how individuals perceive the organization, and their relationship and degree of commitment with that organization.	Whatever you need to do until that becomes a priority, they're just going to keep slamming more stuff on our schedule. We're so overbooked right now.
		I think the reality of it is, is that if you're department doesn't prioritize that time for you to do that, then it doesn't really mean a whole lot for it.
5. Other personal attributes	Definition: A broad construct to include other personal traits such as tolerance of ambiguity, intellectual ability, motivation, values, competence, capacity, and learning style.	Which, if you've ever talk to a fireman, we are creatures of habit and we don't like change. But we deal with change all day long.
		We're the same that we have to succeed. There's not an option I have to fix your problem.
		EMS have very bad sense of humor and can kind of brush it off, but I think it stays in the back of our heads like, yeah, I did everything I could, but that person still died in the end.
		I might do my best to keep up with the biggest guys at work. So with that and trying to stay in shape so that I don't get broken on the job.

(Continued)

Table A1 (continued)

Construct	Definition	Relevant narrative from semi-structured interviews
V. Process		
A. Planning	Definition: The degree to which a scheme or method of behavior and tasks for implementing an innovation are developed in advance, and the quality of those schemes or methods.	I think it's easy to say, yeah, we give the people, you know, these programs, but I don't think they efficiently like put it into our schedule where it's going to maximize the benefit for both of those programs.
B. Engaging	Definition: Attracting and involving appropriate individuals in the implementation and use of the innovation through a combined strategy of social marketing, education, role modeling, training, and other similar activities.	Your Lieutenant, and like your other, like peer coworkers talking about it, I feel like that that adds a lot of credence to what they're saying. And like, you're more likely to listen.
1. Opinion leaders	Definition: Individuals in an organization that have formal or informal influence on the attitudes and beliefs of their colleagues with respect to implementing the innovation.	I think it would be best received by company level officers and even probably somewhere between some more senior firefighters and like and like the first step, which is of officer, which are lieutenants because I feel like if you get any higher up depending on the person, some people might respect them. But a lot of people might think that they're just out of touch with what the line, what like what the common line firefighters are dealing with.
2. Formally appointed internal implementation leaders	Definition: Individuals from within the organization who have been formally appointed with responsibility for implementing an innovation as coordinator, project manager, team leader, or other similar role.	But I think it's got to be handled at a company officer level. If your guys aren't working out and you know, I think that that's on the company officer to say, hey, look, this is what we need to be doing every day. Focus on you being a priority and staying in shape because that's going to help everybody else, you know, and it's going to help the way we do things And didn't you know if it was supported by the upper echelon, the, you know supported? I think you could do a lot more with these guys.
3. Champions	Definition: "Individuals who dedicate themselves to supporting, marketing, and 'driving through' an [implementation]", overcoming indifference or resistance that the innovation may provoke in an organization.	I personally find it very, very helpful, like I have a one of those, like mindfulness apps, like how it leads you through like a directed meditation thing that you know if I'm feeling stressed out, I'll find a quiet place and just sit for a second.
4. External change agents	Definition: Individuals who are affiliated with an outside entity who formally influence or facilitate innovation decisions in a desirable direction.	

(Continued)

Table A1 (continued)

Construct	Definition	Relevant narrative from semi-structured interviews
5. Key stakeholders	Definition: Individuals from within the organization that are directly impacted by the innovation, e.g., staff responsible for making referrals to a new program or using a new work process.	
6. Innovation participants	Definition: Individuals served by the organization that participate in the innovation, e.g., patients in a prevention program in a hospital.	
C. Executing	Definition: Carrying out or accomplishing the implementation according to plan.	You know, even if it's like 10 minutes before your shift starts or within 1/2 hour before your shift starts, it really, I think that's a good time frame to make things happen. And I think having that time to like be able to just take 5 minutes to relax, maybe do like a breathing exercise or something to have that as a norm rather than just going and going to the next one.
D. Reflecting & evaluating	Definition: Quantitative and qualitative feedback about progress and quality of implementation; regular personal and team debriefing about progress and experience.	

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