Customizing the BattlePeer App: Connecting First Responders with Peer Support to Manage Mental Health Crises

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ABSTRACT

The prevalence and severity of mental health disorders are high among first responders. Routine exposure to trauma, unique work patterns and the social stigma of seeking care exacerbate their challenges. While there are many mHealth applications for effective interventions, they primarily focus on support, education, and symptom identification and management. Our research uses empirical data to inform the customization of the BattlePeer

application, previously tested among US veterans. Through focus groups with first responders, we identify specific barriers to help in this population. Our work highlights the potential benefits of adapting an app to create effective peer support strategies. We suggest the modification of BattlePeer to help first responders meet their mental health needs through peer support with tailored feedback and notifications. This will help negotiate the pervasive social isolation and hesitance in articulating emotions described in focus groups that lend to negative mental health outcomes.

Keywords First Responders (FRs), Mental Health (MH), Mental Health Crisis, Mental Illness, Mobile Mental Health, Automated Crisis Detection

INTRODUCTION

Mental health (MH) struggles among first responders (FRs) are unrecognized as a "crisis within a crisis." This is because first responders are exposed to numerous hazards, which include potentially traumatizing events (Cubbison, 2017). While professional psychological treatment is available, many FRs are reluctant to seek care for various reasons. Care refusal is due to perceived or real negative consequences to professional standing, social stigma, and occupational cultural standards. One alternative is peer-to-peer social support from within FR communities. While evidence from multiple studies shows this is an effective method of MH support, numerous practical barriers hinder successful uptake by FRs (Horan et al. 2021). Such barriers include but are not limited to, leadership buy-in and recognizing MH as an issue. Cultural issues surrounding masculinity are also a problem (Addis et al. 2003; Jones et al. 2019). Smartphone-enabled MH crisis peer support may offer a solution to augment traditional peer support programs, reduce MH burden, and improve force readiness to respond to future crises.

This paper explores FRs needs around MH through focus groups on firefighters, police, dispatchers, and paramedics. Data collection and analysis were informed by a rapid "small stories" approach to derive findings. We discuss results in the context of a smartphone app called BattlePeer. The BattlePeer app was developed in collaboration with Dryhootch for US military veteran peer mentor programs to help with PTSD and civilian reintegration problems. It consists of two apps, one for veterans and another for peer mentors. The veteran app allows for quick MH check-ins and basic communication, while the peer mentor app provides an overview of all veterans and visual cueing for those with worse symptoms or who have missed a check-in. The app has been released commercially and can be used by any MH peer-to-peer support program. Our aim is to explore the specific needs of first responders to ensure user needs inform the design of the app as it is ported to the FR context.

We plan to modify BattlePeer using key findings to suit the app to the specific MH needs of first responders.

Prevalence & Symptoms of Mental Health Illness/ Disorders Among First Responders

There are alarming MH trends linked to first-response work. It has been reported that depression and PTSD are five times higher among first responders than in the general population, for example, Police officers (9-31%) and Firefighters (11%) experience greater percentages of depression compared to the general population (6.7%) (Heyman et al. 2018). Jones et al. (2018), reported high numbers of firefighters and emergency medical technicians/paramedics in Arkansas experienced moderate to severe MH concerns ranging from depression and anxiety to suicidality. Stanley et al. (2015) found current and retired firefighters have high rates of self-harm, suicidal ideation, planning, and attempts. These trends imply profound MH impacts on FR work culture. Research specific to the intangible hazards of first response work, such as trauma-related impacts, and effective ways to address them that consider peculiarities of culture, are needed.

Occupational & Non-Occupational Factors Impacting First Responders' Mental Health

Fire department operational models vary widely in their scope of responsibilities, but many are dually tasked with providing fire suppression and EMS services (whether first-response only or transport-capable). This may entail dedicated crews that are permanently and separately assigned to suppression and EMS units, separate crews that rotate between suppression and EMS units at a determined interval of work shifts, or single crews that respond on the most appropriate unit for every incident within each work shift. Understanding interactions of occupational and non-occupational factors is crucial in developing effective MH care strategies. Queiros, et al. (2020) identified two categories of occupational stressors in police work, operational and organizational. Violanti, et al. (2017) showed operational stressors, such as long and variable work hours, physical danger, and exposure to trauma, lead to depression and suicidal ideation or actions. Simmons-Beauchamps et al. (2022) argued ineffective leadership including low emotional intelligence, self-aggrandizing practices, and

reinforcement of masculine stereotypes affects the MH resilience of FRs. Additionally, the obedience-driven structure of the police force forces junior ranking officers into compliance, where they risk being ridiculed or humiliated by superiors if they deviate from cultural standards.

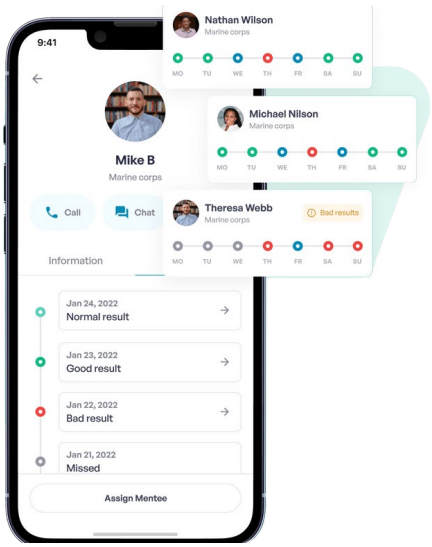
Non-occupational factors also impact FRs MH in important ways. Lewis-Schroder et al. (2018) identified three domains of non-occupational risk factors that increase the likelihood of PTSD symptoms: historical, peri-traumatic, and post-traumatic. Historical factors include a family history of psychiatric disorders, early childhood adversity, abuse, and educational difficulties. In the peri-traumatic domain, the severity of a traumatic event, dissociation during, and a perception an event was life-threatening contribute to PTSD symptoms. Post-traumatic risk factors include poor coping skills, little access to MH services, and lack of social support along with other life stressors combine to cause greater PTSD symptoms. All of these problems are exacerbated by social stigmas arising from organizational cultures.

Stigma & Occupational Culture

First responders often fear seeking help due to the stigma surrounding MH and related issues such as substance abuse. According to Thompson et al. (2020), stigma is a significant barrier to treatment-seeking among FRs. Identification of a person as having MH struggles can negatively impact their career (Macpherson et al. 2020). Many FRs also believe public and law enforcement agencies do not fully understand the stress of their work. Misconceptions about MH needs are worsened by aspects of work culture and expectations (Thompson et al. 2020). Namely, the perception that MH struggles are a sign of weakness or failure works to deter treatment-seeking behaviors. First responders tend to believe their unique circumstances and work structures are not easily understood by MH professionals, rendering conventional treatments ineffective (Bowers et al. 2022). For FRs, misconceptions around getting assistance through conventional means equate to allowing “outsiders" into their culture and also limit care seeking (Jones et al. 2019). Hesitancy to access treatment underscores a need for unconventional ways to navigate the burden of stigma among responders (Horan et al. 2021; Royle et al. 2009). The need to identify other gaps in MH service provision for FRs is crucial to better address their specific struggles.

Peer Support as a Crisis Prevention Strategy

The benefits of peer support in healthcare are informed by social cognitive theory. This suggests individuals learn by observing the behaviors of others in their social context (Nabavi, 2012). Peers who provide MH care support are effective due to shared experiences and health conditions (O’Leary et al. 2017). For instance, an intradepartmental peer support initiative helped police in Ontario Province become more aware of the MH impacts of personal and occupational stressors, while also combating stigma through commiseration (Milliard, 2020). Research led by Kshtriya et al (2020) demonstrated that social support mediates the mental health effects of occupational stressors in FRs such that lower social support correlates with greater levels of PTSD, major depression, and generalized anxiety symptoms. Our study was designed to understand how to better engage FRs in negotiating their specific needs and cultures with respect to MH struggles associated with their work. BattlePeer was designed for US military veterans who have shared trauma, and who need peer support programs post-service. First responders are similar to veterans in that they deal with shared trauma and lack support for MH struggles while on active duty (Haugen, 2017). We used focus groups to inform an empirically informed intervention with the perspectives of FRs embedded into its design. Several studies suggest apps effectively connect those who need MH services with trained peer mentors (Annapureddy, 2021; Franco, 2021; Franco, 2016). Thus, the BattlePeer app has great potential for **preventing and reducing the number of MH disorders occurring** in the FR community, with specific adaptations.



BattlePeer Smartphone Application for use with First Responders

The BattlePeer app was initially released for use with US military veteran peer mentor programs, focusing on issues like deployment-related PTSD and civilian reintegration problems. Community collaborative design approaches were used to develop the application (originally referred to as Quick Reaction Force) in close collaboration with Dryhootch (for development history, see (Franco et al. 2021; Rizia et al. 2014; Franco et al. 2016; Franco et al. 2018). The system consists of two apps - one for veterans that allows for quick MH check-ins and basic communication, and another for peer mentors. The peer mentor app provides a quick overview of all veterans, with symptom change visualizations as sparklines, and visual cueing for veterans who have significantly worse recent symptoms or who have missed a check-in. The purpose of the Battlepeer app is to promote peer-based intervention in a more convenient and accessible way. Mentees and mentors have a one-touch option to communicate with each other both virtually (via phone call and text message) and in person. This application encourages engagement in communication between mentors and mentees rather than replacing in-person interactions. The apps have been released commercially through university tech transfer and are available for Apple and Android systems. A number of the features associated with the app are generic enough to be used with any MH peer-to-peer support program and first responder groups have expressed interest in using it. However, in keeping with our community collaborative design approach we wanted to explore the specific needs of this community and carefully conceptualize design features that might differ from military to first responder groups, even though these two populations have much in common. The research performed here can inform first responder research more broadly but is specifically targeted at ensuring user needs inform information and interface design features as we begin to port this app to the FR context.

METHODS

Appropriate approval for the study was obtained from the Institutional Review Board (IRB) at the Medical College of Wisconsin, and participants consented to the study through an informational letter. Approval was given to audio-record focus groups, but we did not do this in practice in order to maintain trust and further strengthen the relationship between the facilitator and the first responder representatives. We needed a "rapid technique" allowing for some preprocessing of data during the focus groups to manage data collection and analysis given time, geographic, and financial constraints of this project (Vindrola-Padros et al. 2020). Data collection consisted of small focus group sessions with different types of first responders (e.g., police, fire, and paramedics) to gain insights into their lived experiences. Perspectives on adopting a MH peer support model used for military veterans were also collected. Each focus group lasted approximately 90 minutes, and we used an open-ended interview approach. Small stories informed the framing of questions asked during focus groups to elicit the telling of narratives by respondents (Georgakopoulou 2007; Sools 2012). First responders were asked about gaps in peer support provision in their departments to identify factors affecting peer support uptake among first responders. All three departments identified confidentiality as a common issue, with FRs expressing reluctance to share their MH concerns due to a lack of trust in their colleagues.

Notes were taken on the impact of work experiences and activities on MH, as well as the availability of MH support. These were written on poster boards to foster a co-creative approach to knowledge building (Agrawal, 2013; Heimburg et al. 2020). The researcher/facilitator periodically summarized statements as a form of dynamic member checking (Buchbinder, 2010; Koelsch, 2013). Clarification on concepts was obtained when necessary, and notes, as data, were categorized during the discussion with the input of respondents. Agency specificity was emphasized by comments from different responders when they reported information such as, "it's different for us." Comments would also demonstrate cross-agency agreement (e.g., nodding of heads, or statements like, "it's the same for us"), the facilitator asked if confirmation concepts discussed were indeed cross-agency issues, emphasizing a bottom-up approach to research that has been advocated in the context of radically collaborative scholarship with emergency responders at the table (Landgren, 2010). Notes were transcribed within a few hours of the focus group to ensure the thoughts offered by FRs were reflected as accurately as possible. The researcher/facilitator also wrote down impressions from the focus groups on the same day as field notes.

As mentioned, the results are informed by the analysis of data using the small story approach. Small stories research consists of collecting and analyzing portions of conversation to mine for stories, "which tell of past, current, imagined, or hypothetical events." (Georgakopoulou and De Fina, 2015: 100) This allowed us to use narrative elements in data to lead to a more nuanced understanding about the nature of trauma in ways that both

converged and diverged in different FR cultures. Here, we analyzed focus group data both collectively and separately for all responder groups. Elements of narrative forms were pulled out of the data, created into codes, and then collapsed into the larger findings discussed in the conclusion.

RESULTS

Focus Group Sessions & Participant Characteristics

Two focus groups were conducted about one month apart. The focus groups had a total of thirteen participants: five females, and eight males. Of the thirteen participants, six were from fire departments (one urban, and one rural/sparse suburban), four were dispatchers (again with urban and suburban representatives), two were from ambulance services, and one was from a police department. We emphasized the inclusion of dispatchers in our focus group as they are often not included in research, and we consider them a key element in the first responder community. The group was largely stable across both events, although we asked the representatives present in the first focus group to assist with including more women FRs and more dispatchers for the second round. A few individuals present in the first focus group were not able to attend the second because of operational needs at their agencies.

FRs were recruited through purposive sampling, working through firefighters initially interested in this work to expand the group to other agencies through their own pre-existing cross-agency relationships. An agency department chief was instrumental in providing approvals, and space, and emphasizing the importance of this work to rank and file. However, to ensure rank and file from all agencies felt comfortable discussing complex issues, leadership from the agencies were asked to not attend the focus groups themselves. From the focus group data, we engaged in data analysis using the small story approach. However, some key aspects of each focus group organized by FR type are discussed first as a way to stage more nuanced findings that emerged in deeper analysis. The headings and subheadings used in the following sections correspond to our rapid analysis, with headings serving to group themes by agency type, and italicized subheadings serving as code labels, followed by a richer description and illustrative quotes were appropriate (Vindrola-Padros & Johnson, 2020).

Police & Sheriffs

Morale and Confidentiality. FR representatives emphasized morale as a significant concern, with low morale particularly problematic. There was little trust in peer support programs already run within departments because of concerns about confidentiality. Even with assurances of confidentiality, honest disclosure was threatened by fears of how they might be perceived by command staff and fellow officers. Ultimately, the stigma of possible mental illness revealed through disclosure would affect their capability for duty readiness. These concerns resulted in a hesitancy to open up to peers about any struggles, indicating trust is a barrier to treatment and even basic relief from some of the major stressors of their work.

Unique Police Work Contexts. In these focus groups and pilot work, police officers and Sheriff's deputies emphasized that the solitary nature of their work often results in an attitude of self-reliance based on having to take care of all eventualities on their own. This is especially the case for officers who work solo, operating in a police vehicle separated from the rest of their force. Even when working with a partner in a police car, being assigned a partner does not make it any easier for them to disclose personal issues with their colleague. In fact, the officers in a two-officer car may not want to talk about personal matters with their partner.

Police Work Tasks. Police work tasks were identified as unique sources of stress and potential trauma, different from those encountered by other FRs. EMS deals with dying or dead victims briefly, while the police might watch over a dead body for an extended time. They conduct investigations that involve a close examination, recovering evidence, and physically moving bodies. Police often comfort loved ones at the scene of a death, sometimes for hours or even days. The extended and often visceral contact with the deceased and bereaved individuals stood out as tasks in police work that frequently caused trauma.

Mandatory Peer Support. High-intensity emergency response events create the mandatory activation of a police peer support team, a psychologist, and a chaplain. Meetings to debrief after an event as a group are also required to occur over an extended period of time. Representatives from all of the other FR respondent agencies noted that this is an important model that could be incorporated into practice and then widely adopted.

Fire Departments

Acknowledging the need for care. Fire department respondents acknowledged the need for MH care in focus

groups. They also reported this as a major challenge for many in this profession, due to an emphasis on downplaying negative and hurtful experiences, as well as the sentiment that any work-related trauma is "normal" and "part of the job". Additionally, respondents intimated the awareness of a need for MH care often manifests long after a traumatic event has occurred. As one respondent says, *"[I] might say I'm fine right after – and I might be fine – but then 6 months or a year later, [I'm] stuck on a particular event. It's awkward to bring it up after all that time has passed*" This hesitancy often leads to no action in seeking care.

Tailored care interventions. Firefighters desired MH professionals who comprehend their work and peer support within their responder context, making it easier to seek care. More than other responder groups, firefighters noted the necessity for mental healthcare provision in an all-firefighter group, or among other FRs, rather than civilians. A respondent explained, "I don't want to be in an open MH group at [local hospital name] or whatever, where I may have narcanned [administered Narcan to an overdose patient] the guy sitting next to me the day before" These sentiments also highlight firefighting work as a highly public and community embedded role. Thus, risks around privacy considerations may be particularly acute.

Work schedule. The work of firefighters can be quite spontaneous. Respondents in fire departments reported they often have limited to no time to reflect on a traumatic event(s) as they happen because they often respond to multiple emergencies within a single shift. Continuous exposure and accumulation of stressful events often result in mental stress, fatigue, and burnout.

Work context. The work contexts of firefighters as contributing to potential stressors and the need for interventions were particularly rich. Firefighter respondents discussed the differences between volunteer and career work, and the importance this plays in building trust and support. One's status as a firefighter can create barriers to a meaningful relationship in that it can hinder the trust needed to share. For instance, career firefighters spend extended amounts of time together, allowing them to monitor signs of trouble and then intervene if appropriate. One respondent explained, "[Each firehouse has a kitchen] you can see if the guy is acting differently, you don't have to make a big deal out of it at the meal, but maybe invite him out to the bay to talk in private." Often, firefighters have spent many years together, and are attuned to each other in deep ways, where even minor changes are noticed.

Volunteers differ from career firefighters, with more ephemeral relationships and experiences. They may form connections with career firefighters, and also with each other during a specific incident, but never interact again. Respondents intimated career firefighters might rotate with volunteers, experience the same traumatic situation, and never come in contact with one another again, making it even more difficult to "find" someone to relate with. During a particularly traumatic incident, a sense of isolation for the volunteer firefighter is compounded by an inability to debrief with peers exposed to the same context. Volunteer response to an event is also quite different, as they often drive personal vehicles, and not a standard fire truck, to a scene. When a response event is complete, volunteers tend to drive home or back to their regular jobs. The shock of moving from the responder to a civilian role in a short space of time can be jarring. Quick transitions from traumatic events to normal life in the same instance offer them little time to process. In contrast, career firefighters typically return to a firehouse and collectively debrief, even if not formally. Volunteers in rural locations are burdened when they are solely responsible for all crises due to a lack of personnel. As a respondent discusses, "[We] likely know the house or the family where the incident has occurred." Possible intimate knowledge of victims compromises professional distance common in urban contexts.

Ambulance Services

Work-related Trauma & Gaps in MH care. FRs working in the ambulance service department reported trauma to be a major issue. Due to the lack of adequate MH care within ambulance service departments, many workers tend to experience continuous bouts of trauma that hinder their ability to work.

Work Context. Respondents in ambulance services also discussed the spontaneous nature of their job, which provides them with little time to reflect on events. This factor, like firefighters, leads to an accumulation of mental stress.

All Agency Types

Variation in work experience. There was considerable variation in mental health experiences and concerns among responders working in the three service departments. These differences seemed to impact overall mental health in nuanced ways, underscoring a need for tailored support across first responder service departments. However, despite cultural differences between FR groups, there were important similarities that should inform the design of appropriate and effective MH interventions.

Family & Interpersonal Relationships. Responders in focus groups mentioned that spouses and/or loved ones have great difficulty in relating to the experiences of FRs, in general. Respondents find it challenging to express MH needs or overall struggles in their outside relationships. Those with children discussed great strain during or after response where they have been involved with children subjected to various traumas.

Underlying Narrative of Isolation

The results discussed by the group were further analyzed along common storylines that shed light on the lived experience of first responders. Cultural and personal experiences both constrain and enable MH crises as both distinct by the culture of the responder group, but also as a common phenomenon among the profession of response, in general.

Digging deeper into the data, certain uniting findings emerged in terms of the overall experience of trauma. Even though cultures and work roles are different, the experience of trauma or crisis is not necessarily the event itself, but rather the extent of social isolation and the ways in which emotions are repressed because of societal norms and constraints. Social isolation and repression are further exacerbated by a culture of needing to constantly enact the experience of trauma into being 'ok.' Profound disconnection from their loved ones and society outside of their work further isolates them. This creates a need for ways to connect FRs to people who can relate with and validate their emotions and experiences and a way to negotiate the negative aspects of trauma.

Implications for BattlePeer App Design for First Responders

Focus group sessions highlighted gaps in current mental health care access, delivery, and care-seeking behavior for FRs. Given the nature of their work, there is a need for better-adapted systems that support mental healthcare services. Adaptation of the BattlePeer application is one potentially highly effective approach for FR populations. BattlePeer (or its prior versions) is a mobile phone application previously tested and used by US military veterans to detect possible PTSD and facilitate peer support (Franco, 2016; Rizia, 2015). Given the nature of FR work, such as the disruptive balance of shift work with the unpredictable nature of emergencies, the technology can be tailored to the unique needs of FR work.

Implications for Privacy and Trust: Our results suggest FRs have great concern about potential marginalization by superiors if MH struggles are discovered. This leads to anxiety about loss of employment and stigmatization. Furthermore, FRs articulated a preference for being connected to peers from the same profession in most cases - although there are exceptions. This is because peer support appears to be enhanced by shared interests and identity. Pairing mentees with peer mentors may be best served tailored to their preferences. However, matching with mentees and mentors at the same firehouse or police station, or even the same overall department or region can be problematic due to confidentiality concerns. Thus, in many cases, mentees should be mentored by someone from a different station or by someone entirely outside of their department. In the current iteration of the BattlePeer app for military veterans, this sort of cross-organization mentorship matching to preserve confidentiality is not a built-in feature. For FR groups, displaying a mentor's current post would assist in ensuring transparency, and the mentee's ability to best select which mentor to match with to manage confidentiality concerns.

Maintenance of confidentiality for mentees is also crucial for trust, but anonymity can be difficult to manage. Prior research suggests revealing one's identity in steps, which can help mitigate issues of confidentiality, and also help foster trust (Andalibi, 2021). Our research also suggests other ways to assure confidentiality given the need for mentees to identify their own appropriate mentors. The use of pseudonyms or first names and avatars help in this effort (notably, we are observing military veterans using pseudonyms or code names in the BattlePeer app in other contexts, despite high levels of trust with the veteran services agency). These options are available in the current iteration of the BattlePeer app, however, can be adjusted to the different needs of first responders versus military veterans.

Implications for Persuasive Technology: The findings of our research on first responders suggest key adaptations in the design for the BattlePeer application around tailored reminders and texts targeted to the needs of these unique communities. In the digital MH domain, *Persuasive Technologies*, such as sending personalized reminders and texts within an app, are effective in promoting healthy habits and improving adherence rates to care interventions (Ibeneme, 2021; Hutchesson, 2016). One needed adaptation of the BattlePeer app for first responders orients around the shift work that is a common feature of the daily lives of FRs. Maintenance of regular communication with mentors would be a challenge for this reason. Relatedly, FRs report avoidance of negative emotions, and an inability to relate to or rely on friends and family members for support. This issue is exacerbated by shift work. First responders can also experience multiple traumas in a single shift, with little time to respond. Not only do they negotiate difficulties with working odd hours, but they also have little time to process potentially traumatic experiences and connect to their peers. In light of these findings, two types of personalized reminders and texts can help manage these issues. First, text messages can be sent that encourage self-care and offer support. Second, tailored reminders designed to motivate FRs to connect with a peer mentor can bridge social isolation.

Prior research suggests short self-care exercises and related texts help relieve anxiety and other MH-related concerns (Haque, 2022). Individualized motivating texts can provide temporary relief and remind mentees to connect with mentors who offer support in negotiating potential traumas.

CONCLUSION

Conflict reporter Frank Smythe (2002) discusses how the nature of work in traumatic environments affects those who engage in these contexts.

> "Recognizing the need for debriefing or the opportunity to articulate emotions in the aftermath, for example, of a school-yard massacre is not a sign of weakness…Instead, when done successfully, debriefing fosters strength. The act of articulation, writing, drawing, painting, talking, or crying seems to change the way a traumatic memory is stored in the brain as if it somehow moves the memory from one part of the hard drive to another…Especially when the act is coupled with the opportunity to grieve, articulation often provides a release of the emotions associated with the event that leaves its author able to recall the memory in the future with less or no pain. If not, the emotions may remain bottled up in a way that can spill over."

While Smythe is a journalist, not a first responder, he experienced significant trauma given the nature of his work. His piece underscores a need to share experiences with those one can relate to, "...cops or emergency crews…are more comfortable opening up before peers than a stranger." (Smythe, 2002) His statements echo the spirit of findings from discussions with first responders.

Short self-care exercises and motivational texts have been reported to provide temporary relief from anxiety and other negative emotions that after building up, can lead to significant MH concerns. Some additional important considerations regarding user uptake revolve around anonymity, trust, in-app crisis alerting strategies, and stigma reduction. Some important theoretical considerations also have been identified in our past work and through these recent focus groups around the question of what constitutes the minimum technological infrastructure needed to support or augment the human, client-centered process of peer support (Gorman & Fischer, 2009). One key limitation of the focus groups was that we only had one police officer representative. Although some themes that came up in a pre-pilot discussion with a Sheriff's department are mentioned here for additional context, future work should ensure more robust representation from these agencies. Future work should begin to examine emergent peer communication strategies within first responder groups, including the use of commercial apps like Whatsapp, self-organized SMS Text group conversations, how FRs are putting in place their own governance strategies for these groups, and cases where these groups have actually not worked or caused problems within their agencies (e.g. causing rather than reducing rumors, sharing of screenshots that break confidentiality expectations, etc.) – has implications for uptake /implementation science considerations.

Our proposed intervention, BattlePeer fosters a safe space for disclosure and allows FRs to circumvent social isolation and relate to those who understand their struggles the most.

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REFERENCES

Addis, M. E., & Mahalik, J. R. (2003). Men, masculinity, and the contexts of help seeking. *American Psychologist*, *58*(1), 5–14. https://doi.org/10.1037/0003-066x.58.1.5

Agrawal, A. (2013). Co-Construction of Experiences During Co-Creation: A Conceptual Framework and a Research Agenda. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.2447491

Andalibi, N., & Flood, M. K. (2021). Considerations in designing digital peer support for mental health: Interview study among users of a digital support system (Buddy Project). *JMIR mental health*, *8*(1), e21819.

Annapureddy, P., Franco, Z., Madiraju, P., Ahamed, S. I., Flower, M., Hossain, M. F., ... & Winstead, O. (2021, December). Identifying Precursors to Long-Term Crisis in Veterans Using Associative Classifier. In 2021 IEEE International Conference on Big Data (Big Data) (pp. 4633-4642). IEEE Computer Society.

Beaton, R., Murphy, S., Johnson, C., Pike, K., & Corneil, W. (1998). Exposure to duty-related incident stressors in urban firefighters and paramedics. *Journal of Traumatic Stress*, *11*(4), 821–828. https://doi.org/10.1023/a:1024461920456

Benedek, D. M., Fullerton, C., & Ursano, R. J. (2007). First Responders: Mental Health Consequences of Natural and Human-Made Disasters for Public Health and Public Safety Workers. *Annual Review of Public Health*, *28*(1), 55–68. https://doi.org/10.1146/annurev.publhealth.28.021406.144037

Bowers, C. A., Beidel, D. C., & Marks, M. R. (2022). Obstacles to mental health treatment: Similarities and differences among first responder groups. *Journal of Community Safety and Well-Being*, *7*(2), 42–46. https://doi.org/10.35502/jcswb.248

Buchbinder, E. (2010). Beyond Checking. Qualitative Social Work: Research and Practice, 10(1), 106–122. https://doi.org/10.1177/1473325010370189

Cubbison, G. (2017, April 19). Mental Health Survey Shows Trauma Among First Responders. NBC 7 San Diego. https://www.nbcsandiego.com/news/local/mental-health-survey-shows-trauma-among-first-responders/12807/

Franco, Z., Hooyer, K., Rizia, R., Patwary, A. B. M. K., Armstrong, M., Semaan, B., Kuziemsky, C., Curry, B., & Ahamed, S. I. (2016). Crisis warning signs in mHealth for military veterans: A collaborative design approach. In P. Antunes, V. A. Banuls Silvera, J. Porto de Albuquerque, K. A. Moore, & A. H. Tapia (Eds.), *ISCRAM 2016 Conference Proceedings - 13th International Conference on Information Systems for Crisis Response and Management* (Proceedings of the International ISCRAM Conference). Information Systems for Crisis Response and Management, ISCRAM.

Franco, Z., Ahamed, S. I., Hooyer, K. C., O', C., Brien, Smith-Watson, N., Tasse, J., Watson, W., Roushan, T., & Flower, M. (2018). Detecting & Visualizing Crisis Events in Human Systems: an mHealth Approach with High Risk Veterans. Www.academia.edu. https://www.academia.edu/37130683/Detecting_and_Visualizing_Crisis_Events_in_Human_Systems_an_mHealth_Approach_with_High_Risk_Veterans

Franco, Z., Hooyer, K., Ruffalo, L., & Frey-Ho Fung, R. A. (2021). Veterans Health and Well-Being—Collaborative Research Approaches: Toward Veteran Community Engagement. Journal of Humanistic Psychology, 61(3), 287–312. https://doi.org/10.1177/0022167820919268

Georgakopoulou, A. (2007). Small stories, interaction and identities, John Benjamins Publishing.

Georgakopoulou, A. & D.F, Anna. (2015). *Handbook of narrative analysis.* Wiley-Blackwell.

Gorman, A., & Fischer, G. (2009, June). Toward an analytic framework for understanding and fostering peer-support communities in using and evolving software products. In *Proceedings of the fourth international conference on Communities and Technologies* (pp. 1-10).

Gray, S. E., & Collie, A. (2017). The nature and burden of occupational injury among first responder occupations: A retrospective cohort study in Australian workers. *Injury*, *48*(11), 2470–2477. https://doi.org/10.1016/j.injury.2017.09.019

Haugen, P. T., McCrillis, A. M., Smid, G. E., & Nijdam, M. J. (2017). Mental health stigma and barriers to mental health care for first responders: A systematic review and meta-analysis. *Journal of psychiatric research*, *94*, 218-229. https://doi.org/10.1016/j.jpsychires.2017.08.001

Haque, M. R., & Rubya, S. (2022). " For an App Supposed to Make Its Users Feel Better, It Sure is a Joke"-An Analysis of User Reviews of Mobile Mental Health Applications. *Proceedings of the ACM on Human-Computer Interaction*, *6* (CSCW2), 1-29.

Heyman, M., Dill, J., Ma, R., & Douglas. (2018). *The Ruderman White Paper on Mental Health and Suicide of First Responders*. https://www.firefightermentalhealth.org/system/files/First%20Responder%20White%20Paper_Final.pdf

Horan, K. A., Madeline, M., Jessica, R., Clint, B., & Annelise, C. (2021). Here for My Peer: The Future of First Responder Mental Health. *International Journal of Environmental Research and Public Health*, *18*(21, (2021): 11097), 11097. https://doi.org/10.3390/ijerph182111097

Heimburg, D. von, & Cluley, V. (2020). OUP accepted manuscript. Health Promotion International, 1-20. https://doi.org/10.1093/heapro/daaa063

Hutchesson, M. J., Tan, C. Y., Morgan, P., Callister, R., & Collins, C. (2016). Enhancement of self-monitoring in a web-based weight loss program by extra individualized feedback and reminders: randomized trial. *Journal of medical Internet research*, *18*(4), e4100.

Ibeneme, S.C., Ndukwu, S.C., Myezwa, H. (2021). Effectiveness of mobile text reminder in improving adherence to medication, physical exercise, and quality of life in patients living with HIV: a systematic review. *BMC Infect Dis* 21, 859. https://doi.org/10.1186/s12879-021-06563-0

Jones, S. (2017). Describing the Mental Health Profile of First Responders: A Systematic Review. Journal of the American Psychiatric Nurses Association, 23(3), 200–214. https://doi.org/10.1177/1078390317695266

Jones, S., Agud, K., & McSweeney, J. (2019). Barriers and Facilitators to Seeking Mental Health Care Among First Responders: "Removing the Darkness." Journal of the American Psychiatric Nurses Association, 26(1), 107839031987199. https://doi.org/10.1177/1078390319871997

Jones, S., Nagel, C., McSweeney, J., & Curran, G. (2018). Prevalence and correlates of psychiatric symptoms among first responders in a Southern State. *Archives of Psychiatric Nursing*, *32*(6), 828–835. https://doi.org/10.1016/j.apnu.2018.06.007

Koelsch, L. E. (2013). Reconceptualizing the Member Check Interview. International Journal of Qualitative Methods, 12(1), 168–179. https://doi.org/10.1177/160940691301200105

Koenig, H. G., & Al Zaben, F. (2021). Moral Injury: An Increasingly Recognized and Widespread Syndrome. *Journal of Religion and Health*, *60*(2989–3011(2021)). https://doi.org/10.1007/s10943-021-01328-0

Landgren, J. (2010). Principles of radical research in the area of information systems for crisis response. Paper presented at the Proceedings of the 7th ISCRAM Conference. http://idl.iscram.org/files/landgren/2010/673_Landgren2010.pdf

Lewis-Schroeder, N. F., Kieran, K., Murphy, B. L., Wolff, J. D., Robinson, M. A., & Kaufman, M. L. (2018). Conceptualization, Assessment, and Treatment of Traumatic Stress in First Responders. *Harvard Review of Psychiatry*, *26*(4), 216–227. https://doi.org/10.1097/hrp.0000000000000176

Macpherson, R. I. S., & Burkle, F. M. (2020). Humanitarian Aid Workers: The Forgotten First Responders. Prehospital and Disaster Medicine, 1–4. https://doi.org/10.1017/s1049023x20001326

Marmar, C. R., Weiss, D. S., Metzler, T. J., Delucchi, K. L., Best, S. R., & Wentworth, K. A. (1999). Longitudinal Course and Predictors of Continuing Distress Following Critical Incident Exposure in Emergency Services Personnel. *The Journal of Nervous and Mental Disease*, *187*(1), 15. https://journals.lww.com/jonmd/Fulltext/1999/01000/Longitudinal_Course_and_Predictors_of_Continuing.4.aspx?casa_token=dB4Ix5_tAGYAAAAA:aCvbRSuzAr33rlY26heBWI2VinOD2lJDbDBlN1bfdvACjuPMRwYYeCAQmcRShmZbp-kb0jq_NtRO3d1psMXAHtTqKg

Meckes, S. J., McDonald, M. A., & Lancaster, C. L. (2020). Association between physical activity and mental health among first responders with different service roles. *Psychological Trauma: Theory, Research, Practice, and Policy*, *13*(1). https://doi.org/10.1037/tra0000971

Milliard,B., "Utilization and impact of peer-support programs on police officers' mental health," Frontiers in Psychology, vol. 11, 2020. https://www.frontiersin.org/articles/10.3389/fpsyg.2020.01686 DOI=10.3389/fpsyg.2020.01686

Nabavi, R. T. (2012). Bandura's social learning theory & social cognitive learning theory. ResearchGate. https://www.researchgate.net/publication/267750204_Bandura%27s_Social_Learning_Theory_Social_Cognitive_Learning_Theory

O'Leary, K., Bhattacharya, A., Munson, S. A., Wobbrock, J. O., & Pratt, W. (2017). Design Opportunities for Mental Health Peer Support Technologies. Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing. https://doi.org/10.1145/2998181.2998349

Queirós, C, Passos, F, Bártolo, A, Faria, S., Fonseca, S.M., Marques, A.J., Silva, C.F., and Pereira, A. "Job stress, Burnout and coping in police officers: Relationships and psychometric properties of the Organizational Police Stress Questionnaire," International journal of environmental research and public health, 15-Sep-2020. [Online]. Available: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7557776/. doi: 10.3390/ijerph17186718.

Rizia, R., Johnson, N., Patwary, A. B. M. K., Ahsan, G. M. T., Ahamed, S. I., Franco, Z., Hooyer, K., Curry, B., & Flower, M. (2014). Mobile Peer-Mentoring: An Approach to Make Veterans Seek Mental Health-Care Support a Normality. Proceedings of the 10th IEEE International Conference on Collaborative Computing: Networking, Applications and Worksharing, 2015(437-441). https://doi.org/10.4108/icst.collaboratecom.2014.257844

Rizia, R., Franco, Z., Hooyer, K., Johnson, N., Patwary, A. K., Ahsan, G. M. T., ... & Ahamed, S. I. (2015, December). ipeer: A sociotechnical systems approach for helping veterans with civilian reintegration. In *Proceedings of the 2015 Annual Symposium on Computing for Development* (pp. 85-93).

Royle, L., Keenan, P., & Farrell, D. (2009). Issues of Stigma for First Responders Accessing Support for Post Traumatic Stress. *International Journal of Emergency Mental Health, 11*(2), xxx-xxxx. Chevron Publishing ISSN 1522-4821.

Shubert, J., Cameron Ritchie, Col. E., Everly Jr., G. S., Fiedler, N., Williams, M. B., & Mitchell, C. S. (2008). Behavioral Health Surveillance for First Responders. *International Journal of Emergency Mental Health*, *9(3)*(Chevron Publishing ISSN 1522-4821), pp. 201-214. https://www.researchgate.net/profile/Lee-Mccabe/publication/5479272_The_tower_of_ivory_meets_the_house_of_worship_Psychological_first_aid_training_for_the_faith_community/links/545e35000cf2c1a63bfc1ace/The-tower-of-ivory-meets-the-house-of-worship-Psychological-first-aid-training-for-the-faith-community.pdf?_sg%5B0%5D=started_experiment_milestone&origin=journWilliams, R. J. (2021). Spirituality and its contribution to increasing psychological resilience and decreasing burnout amongst first responders in the City of Johannesburg. Scholar.ufs.ac.za. http://hdl.handle.net/11660/11585alDetail#page=35

Simmons-Beauchamp and H. Sharpe, "The moral injury of ineffective police leadership: A perspective," *Frontiers in psychology*, 15-Apr-2022. [Online]. Available: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9051365/ doi: 10.3389/fpsyg.2022.766237

Smyth, F. (2002), "The Chance to Cry." https://franksmyth.com/united-nations/the-chance-to-cry/

Stanley, I. H., Hom, M. A., Hagan, C. R., & Joiner, T. E. (2015). Career prevalence and correlates of suicidal thoughts and behaviors among firefighters. Journal of Affective Disorders, 187, 163–171. https://doi.org/10.1016/j.jad.2015.08.007

Sools, A. (2012). Narrative health research: Exploring big and small stories as analytical tools. Health: An Interdisciplinary Journal for the Social Study of Health, Illness and Medicine, 17(1), 93–110. https://doi.org/10.1177/1363459312447259

Thompson, J., & Drew, J. M. (2020). Warr;or21: A 21-Day Program to Enhance First Responder Resilience and Mental Health. *Frontiers in Psychology*, *11*. https://doi.org/10.3389/fpsyg.2020.02078

Vindrola-Padros C, Johnson GA.(2020). Rapid techniques in qualitative research: A critical review of the literature. Qualitative Health Research.30(10):1596-1604. doi:10.1177/1049732320921835

Violanti JM;Charles LE;McCanlies E;Hartley TA;Baughman P;Andrew ME;Fekedulegn D;Ma CC;Mnatsakanova A;Burchfiel CM; "Police stressors and health: A state-of-the-art review," *Policing (Bradford, England)*. [Online]. Available: https://pubmed.ncbi.nlm.nih.gov/30846905/ DOI: 10.1108/PIJPSM-06-2016-0097