ORIGINAL ARTICLE

Weathering the Storm: Stress Management of Filipino First Responders Using the "Mi Salud" Stress Check App

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ABSTRACT

Background and Objective. First responders must be physically and mentally healthy to ensure effective emergency response. However, literature showed that Filipino first responders continue to have elevated levels of stress and increased risk for post-traumatic stress and other mental health problems months after their deployment. The "Mi Salud" app was created to help Filipino first responders, their team leaders, and their agencies monitor and manage the responders' real-time stress levels before, during, and after their deployment more effectively.

Methods. The "Mi Salud" app was pretested with Filipino first responders (n=30) to establish convergent validity using existing validated scales measuring the same construct. Participants also completed a Likert scale and questionnaire to assess user experience and app recommendations. During the rollout, first responders (n=32) tested the app and completed a survey on user experience and app recommendations. A focus group discussion (n=11; FGD) was conducted to further explore their experiences with the app. Survey data were analyzed using descriptive statistical methods, while FGD data were examined through thematic analysis.

Results. Results from the online survey showed that the app was generally found to be helpful and that the recommendations within the app were useful. The emerging themes from the FGD corroborated many of the themes from the survey, particularly the benefits of using the app and the app's ease of use. Positive effects were observed both on the responders and on the responders' team leader and teammates, which further established the value of the "Mi Salud" app.

Conclusion. The findings show that the "Mi Salud" stress check-app may serve as a useful tool for monitoring and managing the stress levels, a critical aspect for Filipino first responders to maintain optimal functioning during deployments and daily activities.

Keywords: emergency responders, mental health, stress management, mobile application, Philippines

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INTRODUCTION

Disasters could have adverse effects on the psychological wellness of not only survivors but first responders as well. In a qualitative study using nominal group technique that focused on the first responders' stress levels as well as facilitative and hindering factors of their response to Typhoon Haiyan, first responders exhibited elevated levels of stress.[1] More specifically, 80% of the responders continued to manifest high levels of post-traumatic stress even one year after their return from deployment. Furthermore, a survey focusing on field experiences and Post-Traumatic Stress Disorder Checklist (PCL), responses of first responders who responded to the 2016 Taiwan earthquake also suggested that stressful rescue missions were linked to increased risk for post-traumatic stress.[2] In addition, a systematic review of the Post-Traumatic Stress Disorder (PTSD) treatment literature found that first responders had higher risk for post-traumatic stress than other occupations.[3] Increased levels of stress in first responders may also lead to more serious problems, including fatigue, burnout, and substance use.[4,5] These studies' findings underscore the need for an effective program that would aid first responders in managing their stress, so they could optimally function in their deployment and day-to-day life.

Several studies had been conducted to explore possible tools and strategies for first responders' stress management and fatigue risk management. Frazer et al. investigated indicators of burnout and psychological distress using an online health survey among Australian female first responders, and found that work-related stressors have more impact on female FRs psychological well-being, even compared to lifetime traumatic exposures.[6] Yung et al. reviewed first responder fatigue literature guiding the development of fatigue risk management standard for Canadian first responders.[7,8] This study examined the measures and tools used to assess fatigue-related risks, and organized these measures and tools into SOBANE risk management categories: screening, observation, analysis and expertise, to assist organizations and occupational health and safety practitioners in selecting appropriate measures and tools. These international studies contributed to understanding stress management strategies for first responders; however, there remains a need for local research focusing on Filipino first responders.

Local initiatives have been implemented to address occupational health and safety in various sectors, although these efforts often exclude first responders. A study on Filipino employees in private service institutions in Bahrain identified frequent stressors among these employees, such as customer behavior, working environment, and workload, and commonly used coping strategies like physical exercise, relaxation practices, time management, organizational intervention, and social support to manage workplace stress effectively.[9] Another study by Rilveria developed the Filipino Coping Strategies scale, a four-point Likert scale which would assess coping strategies for stress and then generate a coping dispositional profile which could help assess coping behaviors.[10] Several web and mobile applications had also been launched for improving Filipinos' well-being by providing self-help tools and materials such as stress management videos, daily mood trackers, and worksheets.[11-13]

While these studies enriched the local literature on stress management strategies, these initiatives lacked the specific focus required to effectively support first responders, who faced unique challenges and stressors in their line of work. This gap in specialized support highlighted the need for a locally-developed application designed particularly for first responders. Such an application would not only enhance the effectiveness of first responders but may also contribute to their overall well-being.

One of the commonly employed methodologies for stress management and evaluation is ecological momentary assessment (EMA)[14-16], which entails repeated measurement of participants' variables in their natural environments in order to minimize recall bias and maximize ecological validity[17,18]. Compared with experience sampling method (ESM)[19], which focuses on the representative state or experiences randomly sampled over time, the focus of EMA is more appropriate for stress management and fatigue risk management since EMA focuses on the momentary state rather than the representative state of individuals.

One innovation in the domain of EMA utilizes a mobile app that occasionally prompts the user to complete assessment questions and provides the results to the user and to their evaluator, enabling them to monitor variables real-time.[20] Inspired to capitalize on the benefits of such a novel approach, the "Mi Salud" app was created to support Filipino first responders, their team leaders, and their agencies in monitoring and managing the responders' real-time stress levels before, during, and after their deployment more effectively. With the "Mi Salud" app, team leaders can check the stress levels of their team members and respond immediately instead of waiting for post-deployment, which is the current practice.

The "Mi Salud" App

Based on the findings of the 2015 study on Typhoon Haiyan responders, they ascertained five main aspects central to responders' psychosocial well-being: sleep, food, family's safety and well-being, exposure to disturbing conditions, and social support.[1] These aspects were the rationale for the stress check items and the resulting recommendations in the "Mi Salud" app.

Sleep

Sleep is an activity essential to health and well-being.[21] Gundran et al. found that Typhoon Haiyan responders had more difficulty in doing their jobs when they had less than 7 hours of sleep.[1] This finding is supported by a consensus statement of the American Academy of Sleep Medicine and the Sleep Research Society which asserted that adults

should regularly sleep at least 7 hours per night for optimal health.[22] Sleeping less than 7 hours per night was found to be associated with impaired performance, increase in accidents, impaired immune function, depression, and other adverse health outcomes. Notably, poor sleep hygiene is detrimental to the mental health of emergency responders. Feldman et al. established from a quantitative study on 135 American emergency medical service (EMS) providers that sleep factors have longitudinal effects on their risk for psychopathology.[23] Using measures on sleep, social support, emotional stability, stress, PTSD, depression, and anxiety; the researchers determined that poor sleep led to elevated symptoms of depression, anxiety, and PTSD from baseline assessment to 3-month follow-up.

Food

Inadequate food supplies was another hindering factor identified in relation to the delivery of services of Typhoon Haiyan responders.[1] Eating food is imperative to human function as food provides our bodies with enough energy to perform physical tasks.[24] Insufficient intake of food and nutrients may result in well-being consequences in the long run. Experiencing hunger or food insecurity could also have an impact on stress.[25,26] A survey study by Siefert et al. found that persistent food insufficiency was associated with poor health and increased likelihood of major depression diagnosis.[27] Moreover, Ulrich-Lai et al. found that eating palatable food was associated with reduced stress responses and improved mood.[28] There should be no more than 5 hours between each meal.[29,30]

Family's safety and well-being

Gundran et al. also found that first responders were concerned about their family's safety and well-being while they were deployed, and some first responders were frustrated about not being able to prioritize their family's needs because of their work.[1] In the Philippine culture, family is the most valued social group to the extent that Filipinos' lives revolve around their families[31], so it comes natural that their families' safety and well-being becomes a primary concern. More so for disaster responders, knowing that their loved ones might be within the area affected by the disaster while they have to perform their work duties can be stressful. One of the factors of anticipatory traumatic reaction found in the survey conducted by Hopwoord et al. was preparatory thoughts and actions designed to protect self and others, suggesting that thoughts that others, including their family, might be in danger may lead to higher risk of stress.[32] Results from an online survey of homeland security personnel[33] as well as focus group discussions with police officers[34] also supported that one of the factors that were considered by first responders in their willingness and preparedness to report for an assignment is the safety and well-being of their loved ones. As explained by Demme, many police officers expected that their agency would care for their families if they responded to incidents.[34]

Exposure to disturbing conditions

Higher variety of exposure to disturbing conditions were found to be correlated with higher levels of post-traumatic stress.[1] Exposure to devastating and graphic situations like disasters and their aftermath can be considered as potentially traumatic events[35] that can lead to various mental health consequences. Many studies showed that exposure to disturbing conditions was associated with increased stress and even higher rates of acute stress disorder, anxiety, and depression.[36,37] Fullerton et al. compared health care utilization and symptoms of acute stress disorder, PTSD, depression, and early dissociative symptoms of disaster workers who responded to the September 11, 2001 attacks and of disaster workers from a similar community who did not respond to the incident.[36] The assessments were conducted two, seven, and 13 months after the accident. Their analysis found higher risk for acute stress disorder, depression, or PTSD in the disaster workers exposed to the September 11, 2001 attacks compared with the unexposed disaster workers, and these exposed disaster workers also sought care for emotional problems at an increased rate. Brooks et al. also studied the relationship of exposure to disturbing conditions and mental health through a quantitative study on 235 emergency responders in the United States.[37] After collecting data using a series of questionnaires, their analysis revealed that those who were exposed to disturbing conditions had higher risk for PTSD than those who were not.

Social support

Gundran et al. asserted that first responders who lacked social support may be more vulnerable to post-traumatic stress.[1] Social support was one of the most researched factors that help prevent stress-related issues. Social support had a significant positive influence on the first responders' mental health.[38] A meta-analytic review of 37 empirical studies focusing on the role of received and perceived social support in promoting mental health among first responders revealed a medium overall weighted mean effect size ($r = 0.27$), with the effect size of perceived social support ($r = 0.31$) significantly larger than the effect size of received social support ($r = 0.22$).[38] On the other hand, the previously cited study on EMS providers also identified low social support as a predictive factor of increased PTSD, anxiety, and depression symptoms even three months after baseline assessment.[23] Interestingly, an analysis of cross-sectional data from a large-scale national survey suggested that adjustment to stressful life events was more influenced by perceived social support than actually received support.[39] Wethington and Kessler also found evidence that perceived social support mediated the influence of life events on psychological distress.[39]

The findings of extant literature reinforced the importance of the aspects on the physical and mental wellness of emergency responders, which may influence not only their work-related performance, but also their day-to-day functioning. Emergency response, being a demanding

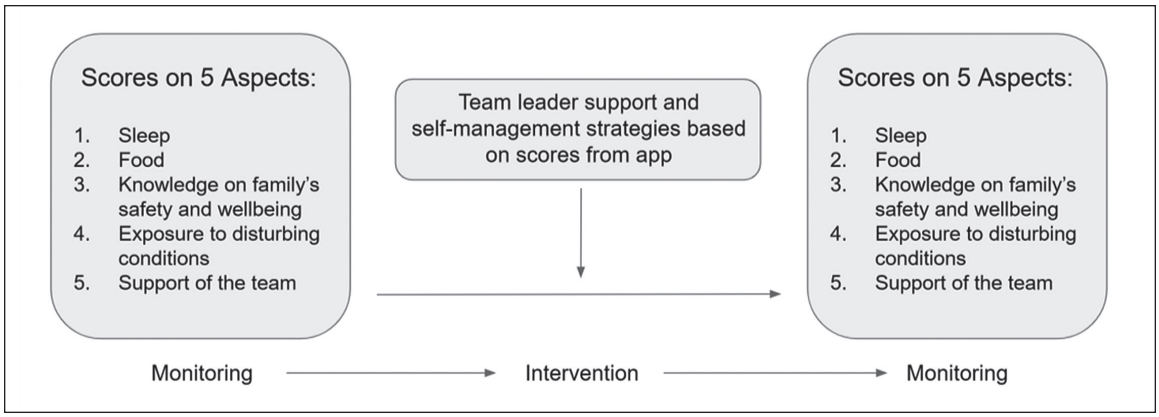

Figure 1. Conceptual framework.

and high-risk field, would require service providers to be optimally healthy in all facets of their lives to ensure sound decision-making, proper execution of crucial tasks, and minimization of mistakes that could cost lives.

Conceptual Framework

Considering the related literature and the objectives of this study, a diagram showing how the app and stress management interventions plan to lower stress levels can be seen in Figure 1.

As discussed in the needs assessment section, the five major aspects identified from the needs assessment phase in relation to stress of Filipino first responders were sleep, food, exposure to disturbing conditions, knowledge on family's safety and well-being, and support of the team.[1] Various articles and studies support the idea that these five factors may affect stress levels.[22,25,26,28,29,32-34,36-39] More specifically, lack of sleep, not enough food intake, not enough knowledge on family's safety and well-being, exposure to disturbing conditions, and not enough social support from the team were linked with higher risk of stress, particularly for Filipino first responders.

In order to mitigate the possible negative effects of these risk factors on the responders' stress levels, the app will assist the responders and their team leaders in monitoring their risk level for the five identified aspects. The app will also provide recommendations based on the app's assessment of their risk for stress, which will be given to the responder and their team leader, so that they may take steps to maintain wellness and perform stress management interventions if necessary. Maintaining wellness and managing the factors associated with stress may also help avoid more serious problems that may be caused by increased stress.

METHODS

Participants

A total of 32 Filipino first responders, ages 22 to 54 years old, from various organizations used the "Mi Salud" app and participated in the online survey via Google Forms. There were 21 (65.6%) male respondents, 10 (31.3%) female respondents, and one (3.1%) who preferred not to say, with years of experience ranging from one year to 20 years. These participants were associated with agencies such as Philippine Red Cross, Civil Defense Action Group, Inc. (CDAG), Local Disaster Risk Reduction & Management Office (LDRRMO), Bureau of Fire Protection (BFP) and fire brigades, hospitals and emergency medical services units, and a school.

Out of the 32 participants in the survey, 11 first responders, ages 22 to 54 years old, also participated in the focus group discussion (FGD).

Eligibility Criteria

Potential participants were contacted by coordinating with teams through their agencies. Participants must have been involved in at least one emergency response, regardless of the nature of the emergency. Eligible participants include full-time and part-time first responders, volunteers, and trainees.

Recruiting participants was made challenging by the busyness of many first responders and the restrictions implemented during the COVID-19 pandemic.

Informed Consent

Prior to study participation, participants were asked to provide their informed consent to participate in the study and have their responses recorded using the "Mi Salud" app system and Google Forms response database. The research objectives, potential risks and benefits of their participation in the study, the voluntary nature of their participation, and other pertinent information were explained to the participants before requesting their informed consent. Participants may also withdraw informed consent at any point without penalty.

The items in the "Mi Salud" app were nonpsychiatric and nondiagnostic in nature, primarily focusing on self-care rather than psychiatric assessment. However, given that the study explored experiences related to disaster response, a potentially challenging and distressing topic to recall and

disclose, participants were reassured that they were under no obligation to answer any questions that made them feel uncomfortable. In case of extreme discomfort, participants could also inform the researchers so that they may readily address and manage any pressing concerns.

Data Security and Confidentiality

The "Mi Salud" app adhered to standard industry practices for encryption and data security to ensure the protection of all information. The researchers maintained the confidentiality of participant data at all times. The data was stored in a secure folder, accessible only to the research team, and the resulting recommendations from the app were visible only to the respective team member, their assigned team leader, and the researchers.

The items in the app were nonpsychiatric, focusing on aspects such as sleep, eating schedule, support, exposure to disturbing conditions, and knowledge of their family's safety and well-being. These factors were common among first responders; hence, participants were unlikely to be discriminated against based on their responses.

Furthermore, the app's training modules emphasized that screening results should only be used to provide appropriate support for team members, not for discrimination or termination from work. The modules also reminded users of relevant laws, including the Mental Health Act (RA 11036), the Occupational Safety and Health Standards Act (RA 11058), and the Magna Carta for Persons with Disability (RA 10754), to which employers must adhere.

Procedures

During the rollout phase of the study, first responders tested the app at least once. Afterwards, the first responders were asked to answer a survey and were invited to participate in a FGD. These participants were asked to rate the app's ease of use, ease of understanding and following recommendations, usefulness, and helpfulness on a Likert scale from 1 (strongly disagree) to 7 (strongly agree) based on their experience in using the app. They were also asked whether they were able to follow or implement the recommendations received from the app, the reasons for not being able to or not wanting to follow the recommendations, and whether they would wish to use the app in future deployments.

The participants of the survey who also opted to participate in the FGD discussed their experiences in more detail. They tackled the app's ease of use, factors that helped them or prevented them from following the recommendations, their comfort with their results being visible to their team leaders, the usefulness and helpfulness of the app, and the effect of the app in monitoring stress levels and acting accordingly.

Materials

The materials used in the study are the "Mi Salud" application, which is a mobile app currently developed for Android, and surveys conducted via Google Forms. The surveys included questions regarding the participants' demographic information; ratings scales from 1 to 7 regarding ease of use, ease of understanding and following recommendations, usefulness, and helpfulness in monitoring stress levels; and a series of close- and open-ended questions regarding what made the participants want to or not want to follow recommendations, whether there were recommendations they wanted but could not follow, what they liked or did not like about the app, whether they would use the app in future deployments, whether they would be willing to participate in the interview or FGD, and other comments on the app.

Development of the "Mi Salud" App

A previous study conducted in 2015 explored the quality of coordination and response of EMS responders in areas acutely affected by Typhoon Haiyan.[1] Participants answered a series of surveys and questionnaires. Post-traumatic stress levels of Filipino first responders were found to still be elevated even one year after the typhoon, which further established the significance of this study.

The 2015 study, which served as the needs assessment phase for the present study, distinguished that sleep, food, exposure to disturbing conditions, knowledge on family's safety and well-being, and support of the team were vital to the responders' psychosocial well-being.[1] The items in "Mi Salud" were constructed based on the identified aspects from the needs assessment, with one item for each identified aspect (Table 1). This denotes that the stress and wellness check contains only five items for quick and easy measurement, which ensures that answering the tool will cause minimal disruptions to the responders' work and personal routines. The three response options for each item were determined from the recommendations of the related literature regarding the aspects. Each option would entail a corresponding action that would necessitate a certain level of urgency: 0 – no action required, 1 – action recommended but not urgent, and 2 – action urgently required. Since the stress and wellness check is not a diagnostic tool but a tool to aid in team planning and intervention, the responses would not be summated to produce a score. Rather, the responses would act as the foundation for the app's recommendations for action, which meant that the recommendations produced by the app after the user had answered would depend on the options selected for each item.

Pretesting of the "Mi Salud" App

To establish the convergent validity of the stress and wellness check in the "Mi Salud" app, the items were pretested against existing validated scales that measure the same constructs. In particular, the items were pretested against the following scales: (a) Patient Health Questionnaire-9[40] (PHQ-9) for the food and sleep items, (b) Traumatic Exposure Severity Scale (TESS) - Concern for Significant Others[41] subscale for the family safety and well-being item,

Table 1. Questions, Options, and Recommendations of the "Mi Salud" App

Aspect	Question	Responder User Answer	Category	Remark	Recommendations for Responder User
Sleep	How much have you slept within the last 24 hours?	I had 7 or more hours of sleep.	Green	*(Pre- and during deployment):* **You are set and ready to do response work.** / *(Post-deployment):* **You managed to be well-conditioned throughout your response work.**	To maintain wellness, keep these in mind: • **Get at least 7 hours of sleep** • Eat enough food and fill your body with nutrients • Drink water frequently • Exercise when able • Practice breathing and relaxation techniques. Here are examples of exercises you can try: ▪ Paced breathing - Inhale slowly through your nose for 2-4 seconds, and then exhale for 4-6 seconds. You can say or think "in" and "out" with each breath. ▪ Draw your elbows back slightly to allow your chest to expand. Inhale through your nose, hold your breath for 5 seconds, then exhale slowly through your nose. ▪ Take 10 slow breaths. ▪ Take a pause if you can. • Always communicate with your loved ones, teammates, and team leaders
		I had less than 7 hours of sleep.	Yellow	*(Pre- and during deployment):* **It may benefit you to do these to be set and ready for your response work:** / *(Post-deployment):* **It may benefit you to do these to maintain wellness for your next response work:**	• Get more sleep (at least 7 hours is recommended)
		I had no sleep at all.	Red	*(Pre- and during deployment):* **It is best for you to do these to be set and ready for your response work:** / *(Post-deployment):* **It is best for you to do these to maintain wellness for your next response work:**	• Get enough sleep (at least 7 hours is recommended)
Food	When was your last meal?	I had eaten a meal less than 5 hours ago.	Green	*(Pre- and during deployment):* **You are set and ready to do response work.** / *(Post-deployment):* **You managed to be well-conditioned throughout your response work.**	To maintain wellness, keep these in mind: • Get at least 7 hours of sleep • **Eat enough food and fill your body with nutrients** • **Drink water frequently** • Exercise when able • Practice breathing and relaxation techniques • Always communicate with your loved ones, teammates, and team leaders
		I had eaten a meal within 24 hours.	Yellow	*(Pre- and during deployment):* **It may benefit you to do these to be set and ready for your response work:** / *(Post-deployment):* **It may benefit you to do these to maintain wellness for your next response work:**	• Eat a full and nutritious meal
		I had not eaten a meal within 24 hours or more.	Red	*(Pre- and during deployment):* **It is best for you to do these to be set and ready for your response work:** / *(Post-deployment):* **It is best for you to do these to maintain wellness for your next response work:**	• Eat full and nutritious meals
Knowledge on family's safety and well-being	How much do you know about your family's safety and well-being?	I know that my family is safe and out of the danger zone.	Green	*(Pre- and during deployment):* **You are set and ready to do response work.** / *(Post-deployment):* **You managed to be well-conditioned throughout your response work.**	To maintain wellness, keep these in mind: • Get at least 7 hours of sleep • Eat enough food and fill your body with nutrients • Drink water frequently • Exercise when able • Practice breathing and relaxation techniques • **Always communicate with your loved ones, teammates, and team leaders**
		I know that my family is within the danger zone but I was informed that they are fine.	Yellow	*(Pre- and during deployment):* **It may benefit you to do these to be set and ready for your response work:** / *(Post-deployment):* **It may benefit you to do these to maintain wellness for your next response work:**	• *(Pre- and during deployment)* **Contact your family, loved ones, and/or friends to make sure they are safe** • *(During deployment)* **Request for family welfare check from your organization**
		I know that my family is within the danger zone and I was informed that they were harmed/ I have no information about them.	Red	*(Pre- and during deployment):* **It is best for you to do these to be set and ready for your response work:** / *(Post-deployment):* **It is best for you to do these to maintain wellness for your next response work:**	• *(Pre-deployment)* **Contact your family, loved ones, and/or friends to make sure they are safe** • *(During deployment)* **Request for family welfare check from your organization**

Table 1. Questions, Options, and Recommendations of the "Mi Salud" App *(continued)*

Aspect	Question	Responder User Answer	Category	Remark	Recommendations for Responder User
Exposure to disturbing conditions	Pre-deployment: Have you experienced disturbing conditions in your previous deployment? During and post-deployment: Have you experienced disturbing conditions in the field?	Pre-deployment: I have not experienced disturbing conditions in my previous deployment. During and post-deployment: I have not experienced disturbing conditions in the field.	Green	*(Pre- and during deployment):* **You are set and ready to do response work.** / *(Post-deployment):* **You managed to be well-conditioned throughout your response work.**	To maintain wellness, keep these in mind: • Get at least 7 hours of sleep • Eat enough food and fill your body with nutrients • Drink water frequently • Exercise when able • **Practice breathing and relaxation techniques** • Always communicate with your loved ones, teammates and team leaders
		Pre-deployment: I have experienced disturbing conditions in my previous deployment but I am not upset by it. During and post-deployment: I have experienced disturbing conditions in the field but I am not upset by it.	Yellow	*(Pre- and during deployment):* **It may benefit you to do these to be set and ready for your response work:** / *(Post-deployment):* **It may benefit you to do these to maintain wellness for your next response work:**	• Ask for rotation of tasks from team leader if possible • Talk to a trusted person about your feelings and experiences • Practice breathing and relaxation techniques ▪ Try to put your hand in water or hold something cold (e.g., ice). ▪ 54321 grounding technique - In your head, list: ◦ 5 things you can see ◦ 4 things you can touch: How does your shirt feel? Is there anything you can touch? ◦ 3 things you can hear: Do you hear birds chirping? ◦ 2 things you can smell: What does the area smell like? ◦ 1 thing you can taste: Did you just brush your teeth? Can you still taste your last meal?
		Pre-deployment: I have experienced disturbing conditions in my previous deployment and I am upset by it. During and post-deployment: I have experienced disturbing conditions in the field and I am upset by it.	Red	*(Pre- and during deployment):* **It is best for you to do these to be set and ready for your response work:** / *(Post-deployment):* **It is best for you to do these to maintain wellness for your next response work:**	• Ask for rotation of tasks from team leader if possible • Talk to a trusted person about your feelings and experiences • Practice breathing and relaxation techniques ▪ Try to put your hand in water or hold something cold (e.g., ice). ▪ 54321 grounding technique - In your head, list: ◦ 5 things you can see ◦ 4 things you can touch: How does your shirt feel? Is there anything you can touch? ◦ 3 things you can hear: Do you hear birds chirping? ◦ 2 things you can smell: What does the area smell like? ◦ 1 thing you can taste: Did you just brush your teeth? Can you still taste your last meal? • **Seek help from a psychosocial support service provider if needed**
Support of the team	Do you feel supported by your team or your team leader?	I feel very much supported.	Green	*(Pre- and during deployment):* **You are set and ready to do response work.** / *(Post-deployment):* **You managed to be well-conditioned throughout your response work.**	To maintain wellness, keep these in mind: • Get at least 7 hours of sleep • Eat enough food and fill your body with nutrients • Drink water frequently • Exercise when able • Practice breathing and relaxation techniques • **Always communicate with your loved ones, teammates, and team leaders**
		I feel supported but not much.	Yellow	*(Pre- and during deployment):* **It may benefit you to do these to be set and ready for your response work:** / *(Post-deployment):* **It may benefit you to do these to maintain wellness for your next response work:**	• **Inform your team leader and/or teammates of the support you need**
		I feel little to no support.	Red	*(Pre- and during deployment):* **It is best for you to do these to be set and ready for your response work:** / *(Post-deployment):* **It is best for you to do these to maintain wellness for your next response work:**	• Inform your team leader and/or teammates of the support you need

(c) Secondary Traumatic Stress Scale[42] (STSS) for exposure to disturbing conditions item, and (d) Berlin Social Support Scales (BSSS) - Perceived Available Support, Need for Support, Support Seeking, and Actually Received Support[43] for the social support item.

During the pretest, 30 emergency and disaster responders from Zamboanga were briefed about the "Mi Salud" app. Afterwards, they were asked to answer the stress and wellness check in the "Mi Salud" app and a Google Form containing the series of related scales listed above. Aside from the scales, the participants also answered the pretest questions on the aptness, extensiveness, clarity, comprehensibility, and conciseness of the app's items, response options, and recommendations. Their responses were then recorded and analyzed, and the scales were scored for each participant. While the stress and wellness check does not yield scores, the response options were coded from 0 to 3 based on the urgency of the action required. These codes were then correlated with the scores generated by the related scales.

The initial validation showed the correlation of some items from "Mi Salud" with other scales such as STSS[42] and Occurrence Scale of TESS[41] (Table 2).

Moreover, the item on family was strongly correlated with the total scores in TESS, $r(28) = .785$, $p < .000$. The question and the options for the "Mi Salud" item on family were simple and straightforward, with no specific time indicated. Similarly, the items in TESS were simple yes-or-no questions. A strong correlation between the two shows that concern for family is indeed a major factor that determines the first responders' readiness to report to work.

The item on impact of exposure was moderately correlated with the avoidance subscale of STSS, $r(28) = .363$, $p < .05$; as well as with the arousal subscale of STSS, $r(28) = .392$, $p < .05$. Moreover, the item on impact of exposure was also moderately correlated with the total score in STSS, $r(28) = .365$, $p < .05$. Although the items differed in the times specified in the questions, the 1-week period of the "Mi Salud" item and the 2-week period of STSS may be comparable, hence the significant results.

Whereas the item on impact of exposure was significantly correlated with some subscales and the total score of STSS, this item was not significantly correlated with the intrusion subscale of STSS, $r(28) = .300$, $p = .107$. It must be noted, however, that the item on impact of exposure significantly correlated with one item under the intrusion subscale which referred to disturbing dreams about their work with clients, $r(28) = .424$, $p = .020$.

On the other hand, the correlation of "Mi Salud"'s items on sleep, food, support, as well as one item on impact of exposure were not significant. The item on sleep was not significantly correlated with the sleep question of the Patient Health Questionnaire (PHQ), $r(28) = .127$, $p = .502$, and was also not significantly correlated with the total scores in PHQ, $r(28) = .269$, $p = .150$.[40] Similarly, the item on food was not significantly correlated with the food question of PHQ, $r(28) = .205$, $p = .277$, as well as with the total scores in PHQ, $r(28) = .259$, $p = .167$.

The results for the food and sleep items of "Mi Salud" may not have been significant because of the difference in time specified in the questions. "Mi Salud"'s items obtain information for the most recent meals or amount of sleep within the last 4 hours, whereas PHQ considers the sleep and food intake for the past two weeks. Since sleep and food are factors that may change in a short period of time, an ecological momentary assessment such as "Mi Salud" will likely reveal results that differ from the results from a diagnostic tool that focuses on two-week periods. Moreover, it is important to note that PHQ is a diagnostic tool[40], whereas "Mi Salud" is a stress check application. The non-significant correlations for food and sleep confirm that "Mi Salud" should not be used as a diagnostic tool.

Nevertheless, although not statistically significant, there is at least a weak correlation between Mi Salud's item on sleep and the PHQ item on sleep as well as the total score in PHQ. Similarly, there is also a weak correlation between Mi Salud's item on food and the PHQ item on food as well as the total score in PHQ.

The item on support was also not significantly correlated with the scores in BSSS, $r(28) = -.183$, $p = .334$; or its subscales: Perceived Available Support, $r(28) = -.093$, $p = .625$; Need for Support, $r(28) = .038$, $p = .841$; Support Seeking, $r(28) = .272$, $p = .146$; and Actually Received Support, $r(28) = -.248$, $p = .187$. Although the thematic analysis was also conducted on the open-ended questions of the survey. Results showed that the direction and the questions of "Mi Salud" were clear. However, possible limitations of gathering data online included unstable signal and internet connection which were often experienced during disasters.

Table 2. Correlations of "Mi Salud" Items with Existing Validated Scales Measuring Same Constructs

"Mi Salud" Item	Validated Scale (Total Score)	Pearson's *r*	Significance (*p*-value)
Sleep	PHQ	.269	.150
Food	PHQ	.259	.167
Exposure to disturbing conditions	STSS	.365	.047*
Family	TESS	.785	.000*
Support	BSSS	-.183	.334

RESULTS

Survey

Descriptive statistics were used to provide an overview of the data, as the sample size was low, and the primary goal was to establish a proof of concept rather than to perform inferential statistical analysis.

The average ratings for the aspects of the app were all relatively high (Table 3). The average rating for ease of use of the app was 6.03, with a standard deviation of 1.204. The average ratings for ease of understanding recommendations and ease of following recommendations were 6.13 (SD = 1.185) and 6.19 (SD = 1.203), respectively. The usefulness of the app was rated on an average of 6.13, with a standard deviation of 1.238. Lastly, the average rating of the helpfulness of the app was 5.97, with a standard deviation of 1.282.

Furthermore, 27 out of 32 participants, or 84.4%, were able to follow the recommendations of the app (Table 4). There was 1 out of 32 participants, or 3.1%, who stated that there was a recommendation that they did not want to follow, which was to sleep for more than seven hours. On the other hand, four participants, or 12.5% of the 32 participants, reported that there were recommendations that they wanted to but could not follow due to lack of time and having no permanent roster. More specifically, some of them explained that they could not follow the recommended number of hours of sleep and time of eating due to time-related issues. One of the participants also mentioned that it was difficult for their team to help them follow the recommendations because they were not assigned to a team permanently.

Moreover, there were 31 out of 32 participants, or 96.9%, responded that they would wish to use the app in future deployments. Only one of the participants answered that they would not wish to use the app in future deployments. This participant explained that they believed it was better to talk in person than to use the app. On the other hand, the 31 participants cited the app's ease of use, usefulness, and helpful recommendations as reasons for wanting to use the app in future deployments.

Using inductive thematic analysis, four themes were found in the survey responses: (1) helpfulness of the app, (2) ease of use, (3) practical issues of the responder, and (4) technical opportunities for improvement. The themes and subthemes that emerged from the survey on app user experience can be seen in Figure 2.

The First Theme: Helpfulness of the App

The first theme is the helpfulness of the app as defined in this study as the positive or desired effects of the app on the user and the user's team. To illustrate, many responders answered that the app has "good recommendations." One of the participants also mentioned that the app "provides feedback needed." Another participant emphasized that the app was useful for the needs of first responders, stating that

Table 3. Descriptive Statistics

	N	Minimum	Maximum	Mean	SD
Ease of Use	32	1	7	6.03	1.204
Ease of Understanding Recommendations	32	1	7	6.13	1.185
Ease of Following Recommendations	32	1	7	6.19	1.203
Usefulness	32	1	7	6.13	1.238
Helpfulness	32	1	7	5.97	1.282

Table 4. Results of the Survey on App User Experience

		Frequency	Percent	Cumulative Percent
Able to follow recommendations	Yes	27	84.4	84.4
	No	5	15.6	100.0
	Total	32	100.0	
Did not want to follow recommendations	Yes	1	3.1	3.1
	No	31	96.9	100.0
	Total	32	100.0	
Wanted to but could not follow recommendations	Yes	4	12.5	12.5
	No	28	87.5	100.0
	Total	32	100.0	
Wished to use app in future deployments	Yes	31	96.9	96.9
	No	1	3.1	100.0
	Total	32	100.0	

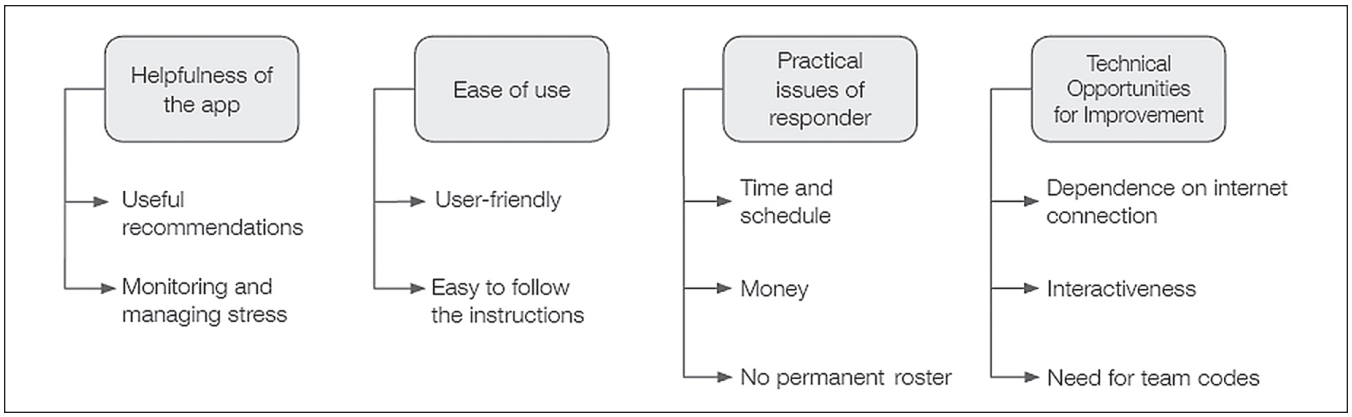

Figure 2. Themes and subthemes of the survey on app user experience.

the app was "useful more importantly for the first responders like me."

Under this theme, the subthemes were useful recommendations, and monitoring and managing stress. Many participants cited useful recommendations as the feature that they valued in the app, stating that the app has "good recommendations" or that the "recommendations were useful." Monitoring and managing stress was another subtheme that was found, as many responders reported that what they liked about the app was it helped them in "stress management" and that it "monitor[ed] team stress level." Another responder also mentioned that the app "really helps in maintaining health."

The Second Theme: Ease of Use

The second theme found in the survey responses was ease of use, which can be defined as the ability of the app to be used without much effort. Most participants highlighted the app's ease of use as the feature that they appreciated in the app. The participants described the app as "very easy to use" and "user friendly." One participant also found it "easy to follow [the] instructions."

The Third Theme: Practical Issues of the Responder

On the other hand, what often made the participants unable to follow or implement the recommendations were the practical issues of the responder, and this emerged as the third theme of the survey responses. Almost all the reasons cited by the participants for not being able to follow or implement the recommendations were practical issues, such as time and schedule, money, and lack of permanent roster. Time and schedule was the most prominent subtheme under this theme, with some participants answering "timing and schedule is an issue" and "time constraints due to time-sensitive activities" as the reasons for not being able to follow the recommendations. In addition to time and schedule, money also emerged as a practical issue, as fees were cited as the reason for not being able to follow one of the recommendations for exposure to disturbing conditions, which was to seek help from a psychosocial support service provider. There was also a participant with "no specific team," which made them unable to implement the recommendations that involved their teammates; hence, lack of permanent roster was also found to be a practical issue.

The Fourth Theme: Technical Opportunities for Improvement

The fourth theme in the survey responses was technical opportunities for improvement, with dependence on internet connection, interactiveness, and need for team codes as subthemes. The opportunity for improvement most frequently pointed out by the participants is the app's dependence on internet connection. Some participants have expressed that they "hope the app works without the need of the internet" and found that the app's "internet dependen[ce]" was the main drawback of the app. Some participants also commented that the app could be more interactive by using videos to illustrate recommendations and to improve the language and user interface to further increase ease of use ("app is not that interactive, better if there is improvements in the UI and if app is straight forward and recommendations are video-based"; "Improve language and UI/UX for ease of use for responders"). The third subtheme under technical opportunities for improvement is the need for team codes, as one of the participants mentioned that they "hope [the app] no longer needs team code just to enter the app."

These results show that the app was found to be helpful and that the recommendations were useful, as shown by the results of the quantitative and qualitative analyses. Nevertheless, the app could be improved further by exploring how the app can be used without internet connection, using more engaging language and delivery of recommendations, and reassessing how team codes can be omitted from the app or how these can be used without being a hindrance to the users.

Focus Group Discussion (FGD)

Out of the 32 participants of the survey, 11 first responders, ages 22 to 54 years old, also participated in the FGD,

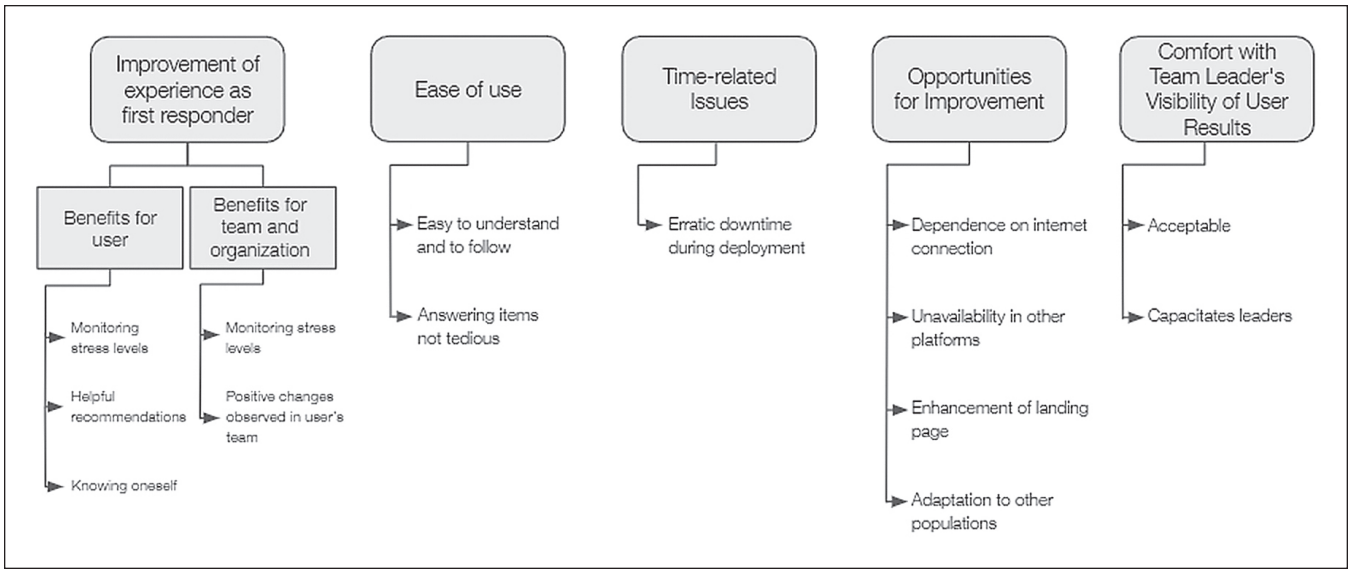

Figure 3. Themes and subthemes of the focus group discussion.

in which they discussed their experiences in more detail. They tackled the app's ease of use, factors that helped them or prevented them from following the recommendations, their comfort with their results being visible to their team leaders, the usefulness and helpfulness of the app, and the effect of the app in monitoring stress levels and acting accordingly. The data were analyzed using inductive thematic analysis.

Five main themes emerged from the analysis, namely, (1) improvement of experience as first responder, (2) ease of use, (3) time-related issues, (3) opportunities for improvement, and (5) comfort with team leader's visibility of user results. The themes and subthemes that emerged from the FGD can be seen in Figure 3.

The First Theme: Improvement of Experience as First Responder

Improvement of experience as first responder was the most prominent theme in the FGD, which can be broken down into benefits for user and benefits for team.

Benefits for User

The sub-subthemes under benefits for user are monitoring stress levels, increased awareness of oneself, and helpful recommendations. The app was found by the participants to be generally beneficial, with one participant stating that the app was important in ("Kapaki-pakinabang naman at nakakatulong dahil ito ay dagdag na gamit para sa ikakaganda ng operation." (The app) was beneficial and helpful because it was an additional tool for the improvement of an operation] and another participant remarking that the app contributed to decisions made in their daily lives ("Malaki po yung ambag ng app na "Mi Salud" sa aming mga pang-araw araw na pagdedesisyon." (The "Mi Salud" app had a great contribution in our daily decision-making.). Moreover, some of the participants noted that the app was helpful for everyone, especially those who may be more vulnerable to stress, such as young responders, elder responders, less experienced responders, and responders who came from long or distressing deployments.

Many participants emphasized that the app had helped them in monitoring stress levels ("Mas aware na po kami sa lebel ng aming stress." (We are now more aware of our stress levels.); "Nakatulong po ang "Mi Salud" app sa pag-monitor ng aming stress level po at sa pag-alaga ng aming kalusugan po." (The "Mi Salud" app has helped us monitor our stress levels and take care of our health.). To illustrate how the app had helped them monitor stress, one participant explained that monitoring could be done by regularly taking the screenings in order to update their status and information in the app ("So yung "Mi Salud" app po ay pwede pong i-update o i-retake po para po naa-update din po kung ano na po yung kalagayan ko po.") (So the "Mi Salud" app can be updated or retaken to update our current status.).

Aside from monitoring stress levels, participants also mentioned an increased awareness of oneself, with participants explaining that they came to know themselves more through the app ("Mas aware na po kami sa lebel ng aming stress at mas nakikilala po namin ang aming sarili dahil sa "Mi Salud" app." (Mas aware na po kami sa lebel ng aming stress at mas nakikilala po namin ang aming sarili dahil sa "Mi Salud" app.); ("Nakatulong po ito dahil naging aware po ako sa nararamdaman ko at sa emosyon ko o yung lebel na yung aking stress.") (This has helped because I became aware of my feelings and emotions or my stress level.). In addition to this, they noted that another aspect of their experience as a first responder that was improved by the app was that it helped them express their feelings ("Napabuti naman po dahil nagkaroon ng paraan upang maipahiwatig ang saloobin ng

bawat isa.") (The experience as a first responder was improved because we had an avenue to express our feelings.).

The third sub-subtheme was helpfulness of the recommendations, which encompassed all the benefits experienced by the users from the app's recommendations. Some of the participants commented that the app was helpful because it reminded them to take care of their health ("…naging paraan po ito para maipaalala sa amin na mahalaga din yung disiplina pangkalusugan."(…this served as a reminder for us that discipline in health matters was also important.); ("…yung mga payo niya ay parang paalala po samin na dapat ay alagaan din po namin ang aming mga sarili.") (…its advice is like a reminder for us that we should also take care of ourselves.). Another benefit from the app was that it called attention to the needs that may often be overlooked by first responders ("Nabibigyan ng pansin yung mga simpleng bagay na akala mo hindi mahalaga sa isang responder na katulad namin, kulang sa kain, sa tulog, stress sa pamilya, at sa trabaho." (Simple things that you thought were not important to first responders like us, lack of food, sleep, stress from family and work, are given attention.).

Benefits for the Team

The other sub theme under improvement of experience as first responder was the benefits for team, which mainly comprised of the ability to monitor the status of the team as well as the positive changes observed in the user's team. Aside from helping users monitor their own stress level, the app also allowed the team leaders to monitor their teams' stress levels, which was found to be helpful ("Nakatulong ito dahil agad na nalalaman ang status ng bawat member ng team.") (It helped because the status of each member of the team will be known.). The participants also noted positive changes in the behavior of their teammates ("Nakita ko po sa kanila ang mga pagbabago dahil nasunod naman po kasi nila nang maayos yung mga binigay na payo ng "Mi Salud"."") (I saw changes in them because they properly followed the recommendations given by "Mi Salud".); "mas masigla at mas mabilis na po siyang [team leader] kumilos ngayon." ([my team leader] is livelier and acts more quickly now]). Evidently, the app positively affects not only the team members who mainly use and take the screenings in the app, but also the team leader and the teammates of the users who monitor their stress levels.

The Second Theme: Ease of Use

The second main theme was ease of use, with which all the participants in the FGD concurred. Participants highlighted that the app was easy to understand and to follow due to the simple words used, familiar topics, and straightforwardness of the app itself ("Madali lang po dahil ang mga gamit na salita ay hindi po malalalim na Ingles at yung mga tanong po ay kadalasan naman pong nangyayari sa amin sa araw-araw.") (It was just easy because the words used were not deep English and the questions were events that often happen to us daily); ("yung app very straightforward to use") (the app was very straightforward to use). Furthermore, answering the screenings was found to be easy and not tedious ("Madali lang 'tong gamitin po dahil po kapag pinipindot ko ay hindi siya yung drop-down po. Pagka-click po ay awtomatikong lumilipat na sa susunod na pahina po, kaya hindi siya nakakatamad gamitin at [ito ay] madaling gamitin po.") (This was easy to use because when I click it, it's not drop-down. After I click, it automatically moves to the next page, so it is not boring to use and [it is] easy to use.).

The Third Theme: Time-related Issues

However, although the app was found to be easy to use, some participants revealed that it was difficult to follow some recommendations, mostly due to lack of time. Hence, time-related issues was found to be the third theme. The recommendations were said to be easy to follow if the participants had enough time to follow them ("Madali lang pong sundan yung mga payo po ng "Mi Salud" app po… minsan nga lang po ay mahirap pong sundin ang advice niya dahil minsan ay [kami ay] masyado pong busy.") ("The recommendations of the "Mi Salud" app are easy to follow… sometimes, however, its advice is difficult to follow because sometimes [we are] too busy.). Another participant also mentioned that being on-call made it difficult to follow the recommendations ("Madali pong sundan yung mga payo kaso maraming mga pagkakataon na lagi po kaming on-call kaya hindi po nasusunod ng basta-basta." (The recommendations are easy to follow but there are many times when we are always on-call so they cannot simply be followed.). This theme showed that one of the limitations of this study was that the extent to which the recommendations, and even the app itself, could be effective was dependent on the responders' availability to use the app and to follow its recommendations.

The Fourth Theme: Opportunities for Improvement

The fourth theme was opportunities for improvement, which covered conceptual and technical aspects of the app. The most frequently mentioned improvement they wanted was being able to be used without internet connection. As explained by one of the participants, "Sana po ay maging available na po siya offline dahil kapag wala pong internet or pang-data, paano po kami makakapag-update?" (Hopefully the app will be available offline because without internet or data, how can we update?). Considering that the first responders would often be deployed in areas without reliable internet connection, the app's dependence on internet connection was a valid concern. Another technical opportunity for improvement was the app's unavailability in other platforms, since the app was currently available only on mobile phones with an Android operating system ("Sana po available po yung app sa lahat po ng platforms.") (Hopefully the app will be available on all platforms.). The third technical opportunity for improvement that was mentioned by some participants was the enhancement of a landing page where

the main buttons are located ("Di naman siya issue. Parang more of room for enhancement lang yung… user interface, how it's arranged sa landing page… Siguro doon sa landing page or yung when you open the app meron ka dung parang direct… usually mga buttons where to go in the app.") (It's not an issue. Just more of a room for enhancement… the user interface, how it's arranged in the landing page… Maybe in the landing page or the one wherein when you open the app you have the direct… usually buttons where to go in the app.").

The last opportunity for improvement that emerged from the FGD was adaptation to other populations. Some participants remarked that they wished there were more questions to cover other topics so that others, including those who were not first responders but were mindful of their health, could also use and benefit from the app ("Mas maganda po sana na mas malawak yung tinatalakay po doon para at least maka-relate din po yung iba at mas makatulong pa siya lalo na sa mga tao na tutok sa kalusugan nila.") (It would be better if the scope would be broader so that others can also relate and it can help further especially for people who are focused on their health.). However, it must be noted that the scope of the current study was limited to monitoring the conditions of first responders, and that the items were focused on the fundamental aspects found in the needs assessment phase.

The Fifth Theme: Comfort with Team Leader's Visibility of User Results

The last theme that emerged was the users' comfort with team leader's visibility of user results. Most of the participants stated that they were comfortable that their team leader could see their responses in the app. In fact, one of the participants asserted that team leaders should know the status of their team members because knowing the status of their team would enable team leaders to manage their team more effectively ("…I believe na dapat alam [ng mga team leader] kung ano yung nararamdaman mo… how can they manage their people if they don't know what they feel?") (…I believe that [team leaders] should know what you're feeling… how can they manage their people if they don't know what they feel?). Furthermore, they emphasized that the app helps team leaders check up on their team more easily since talking to each team member would be time-consuming and may require social skills as well ("I think that's one of the help of the app in terms of managing… Wala naman silang time magtingin ng… one on one nila… diba, medyo mahirap iyon?… And honestly yung mga ibang team leaders naman don't have that skill, kasi it takes a significant skill din to coach at that level.") (I think that's one of the ways the app helped in terms of managing… They don't have time to check… them one on one… that's a bit difficult, right?… And honestly other team leaders don't have that skill, because it also takes a significant skill to coach at that level.).

These results from the FGD corroborated many of the themes that emerged from the survey, particularly the benefits of using the app and the app's ease of use. Interestingly, the participants observed positive effects both on the users and on the user's team leader and teammates, which further established the value of the "Mi Salud" app. The challenges for the first responders, however, were securing a reliable internet connection for the app and finding the time to use the app, as time-related issues were a recurring theme in the rollout.

DISCUSSION

The survey and FGD findings evidenced the usefulness, helpfulness, and ease of use of the "Mi Salud" App. The respondents also attested to the app's benefits to the users and the whole team. However, the respondents recognized practical issues with following the app's recommendations and the technical opportunities for the app's improvement.

The functionality of apps and ecological momentary assessment tools of the same nature was substantiated by extant literature. A scoping review by Ezeonu and colleagues explored the use of mental health mobile phone apps in natural disaster settings.[44] They found that apps for survivors' use were advantageous in addressing the mental health concerns of users with natural disaster exposure. They also reported the effectiveness of a psychological first aid app for disaster health workers in increasing their self-efficacy in providing service to survivors. This finding is supported by another scoping review by Voth et al. on the efficacy and effectiveness of resilience-based mobile apps for service providers (e.g., military, veteran, and public safety personnel), which revealed that the apps they assessed were pertinent to the provision of resilience skills and strategies for service providers.[45] They also specified that the apps were perceived to be trustworthy if they were evidence-based and from reliable developers. Moreover, they explained that the presentation of information increases the app's usability. Users of apps can be overwhelmed with longer texts, which could also be unfavorable to users with alternative ways of learning.[46] As such, the "Mi Salud" App might have been perceived as easy to use by the disaster responders with its brief text presentation of instructions, questions, and recommendations.

In addition, the quantitative study by Yang and colleagues assessed the affect and stress of police officers in South Korea through an EMA-based mobile app.[47] Their respondents reported that the app accurately measured their stress and affect, and was easy to use. The researchers suggested that using EMA diminished recall bias among the respondents and increased the ecological validity of the app. These findings could explain the usefulness and helpfulness of the EMA-based "Mi Salud" app, as it offers real-time evaluations and recommendations that reflect the responders' present mental state in terms of stress.

Moreover, a longitudinal qualitative study by Vaghefi and Tulu investigated the factors affecting users' decisions to use mental health apps continuously, and they identified actionable recommendations as one of the key factors influencing their

decisions.[48] Their respondents shared that apps should offer actionable recommendations for improving their conditions and provide clear, detailed steps to reach their goals within the desired timeline in order to achieve the benefits of using the app. Given this, the perceived usefulness of the "Mi Salud" App could also be derived from the practical and behavioral recommendations it provides to the responders in managing their stress.

On the other hand, the concern most frequently mentioned by participants was securing a reliable internet connection for the app. Since the app's functionality requires timely access to data by agencies and team leaders, a stable internet connection is necessary. Efforts are underway, involving discussions with government agencies, to provide mobile internet access to first responders, in order to mitigate this concern. Additionally, the Starlink internet system may be a possible alternative to enhance connectivity, especially in remote or underserved areas where traditional mobile networks may be unreliable or unavailable. This strategy could offer a more robust and resilient solution to ensure continuous data access especially during critical operations.

Aside from the app's functionality, the responders also recognized the value of the stakeholders' (i.e., team leaders') involvement in monitoring their mental health and stress in real-time. They saw it necessary for their team leaders to know their psychological states as it improves their management of the team. They also acknowledged the efficiency the app provides in checking in with the team members compared to talking with each one individually. Given that team leaders and other stakeholders in authority are in the most pertinent position to enact changes in the workplace, their ability to monitor their team members' psychological well-being in real-time could enable them to enforce immediate interventions. Early intervention is crucial for burnout prevention given that, according to Freudenberger and Richelson as cited by McCormack[49], workers tend to be more defensive and less accepting of help when the severity of their burnout increases. The team leaders' timely resolutions for their members' stress management could ensure their performance quality, as occupational stress can negatively impact job performance.[50]

While most disaster responders expressed their comfort in sharing their stress-related information with their team leaders, some might have reservations about this. A plausible source of this concern is the prevailing stigma on mental health in the Philippines. The stigma surrounding mental health is one of the most salient barriers to the mental health help-seeking of Filipinos.[51] Furthermore, Haugen et al. revealed that one in three first responders experience mental health stigma and that the most prominent concern related to this stigma is that seeking formal help for their psychological needs would unfavorably affect their career.[52] Specifically, these negative career consequences due to mental health stigma endorsed by first responders include discrimination and loss of status.[53] These findings suggest the distinctive nature of disaster responders' work in which resilience is expected, and issues related to mental health might be perceived as a sign of weakness.

CONCLUSION

The "Mi Salud" stress check-app can be used to manage stress levels of Filipino first responders, who must optimally function during their deployment and in their day-to-day lives. The results of the survey and FGD establish the benefits of using the app and the app's ease of use. However, it must be reiterated that the "Mi Salud" app is not a diagnostic app but an app to support team planning and intervention. It is hoped that through the "Mi Salud" app, many Filipino first responders, together with their team leaders and agencies, can better manage their stress levels and maintain or improve their wellness.

Recommendations

The COVID-19 pandemic limited options for data collection, affecting participant diversity and modes of delivery. To address these limitations, future research may expand the sample size and include Filipino populations outside Luzon to ensure broader representation. Additionally, given that this study serves as a proof of concept, subsequent studies may test the app during actual emergency operations, or in simulated scenarios if there are no opportunities for field testing, and incorporate follow-up assessments in order to evaluate long-term benefits and user adherence to the app and its recommendations. Furthermore, to fully assess the app's impact, future studies could explore the comparative analysis of stress levels among first responders before and after consistent use of the app.

In terms of the app itself, future research may focus on enhancing user engagement by using more engaging language and delivery of recommendations. Reassessing how team codes could be omitted or streamlined to ensure ease of use without compromising the app's effectiveness.

Statement of Authorship

All authors certified fulfillment of ICMJE authorship criteria.

Author Disclosure

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REFERENCES

1. Gundran CP, Tuazon AC, Santamaria E, Lopez J, Tayao L. Documenting and analyzing the quality of coordination and response of emergency medical services in areas acutely affected by Typhoon Haiyan. Prehosp Disaster Med. 2015;30(1). doi:10.1017/S1049023X15002162.
2. Ma IC, Chang WH, Wu CL, Lin CH. Risks of post-traumatic stress disorder among emergency medical technicians who responded to the 2016 Taiwan earthquake. J Formos Med Assoc. 2020 Sep;119(9):1360-71. doi: 10.1016/j.jfma.2019.11.021. PMID: 31839523.
3. Haugen PT, Evces M, Weiss DS. Treating posttraumatic stress disorder in first responders: a systematic review. Clin Psychol Rev. 2012 Jul;32(5):370-80. doi: 10.1016/j.cpr.2012.04.001. PMID: 22561967.
4. Bonumwezi JL, Tramutola D, Lawrence J, Kobezak HM, Lowe SR. Posttraumatic stress disorder symptoms, work-related trauma exposure, and substance use in first responders. Drug Alcohol Depend. 2022 Aug 1;237:109439. doi: 10.1016/j.drugalcdep.2022.109439. PMID: 35623285.
5. Jeong YJ, Shin S. The relationship between secondary traumatic stress and burnout in critical care nurses: The mediating effect of resilience. Intensive Crit Care Nurs. 2023 Feb;74:103327. doi: 10.1016/j.iccn.2022.103327. PMID: 36208974.
6. Frazer H, Hansen C, Searle A, Lawrence-Wood E, Van Hooff M. Exploration of potential indicators of burnout, psychological distress and post-traumatic stress disorder, among Australian female first responders. Psychiatry Res. 2022 Oct;316:114771. doi: 10.1016/j.psychres.2022.114771. PMID: 35987064.
7. Yung M, Du B, Gruber J, Yazdani A. Developing a Canadian fatigue risk management standard for first responders: Defining the scope. Saf Sci. 2021 Feb;134:105044. doi: 10.1016/j.ssci.2020.105044.
8. Yung M, Du B, Gruber J, Hackney A, Yazdani A. Fatigue measures and risk assessment tools for first responder fatigue risk management: A scoping review with considerations of the multidimensionality of fatigue. Saf Sci. 2022 Oct;154:105839. doi: 10.1016/j.ssci.2022.105839.
9. Guansi S, Shaker R. Strategies on coping stress among Filipino employees in the private service institutions in the Kingdom of Bahrain. Journal of Business Management. 2017 Jun;3(6):48-59.
10. Rilveria J. The development of the Filipino Coping Strategies Scale. Asia-Pacific Social Science Review. 2018 Jun;18(1):111-26. doi:10.59588/2350-8329.1151.
11. Cometa J. Ugnayan ng Pahinungód UPOU launches KaYa: A mental health app [Internet]. University of the Philippines Open University. [cited 2024 Dec]. Available from: https://www.upou.edu.ph/news/ugnayan-ng-pahinungod-upou-launches-kaya-a-mental-health-app/
12. United States Agency for International Development. USAID and DOH launch Philippines' first mobile app for mental health [Internet]. United States Agency for International Development. 2023 Apr [cited 2023 Sep]. Available from: https://www.usaid.gov/philippines/press-release/usaid-and-doh-launch-philippines-first-mobile-app-mental-health
13. MindNation. MindNation launches app to make mental health care more accessible in the Philippines [Internet]. The Philippine Star. 2022 Oct 19 [cited 2023 Sep]. Available from: https://www.philstar.com/lifestyle/health-and-family/2022/10/19/2217806/mindnation-launches-app-make-mental-health-care-more-accessible-philippines
14. Linz R, Puhlmann LMC, Engert V, Singer T. Investigating the impact of distinct contemplative mental trainings on daily life stress, thoughts and affect-Evidence from a nine-month longitudinal ecological momentary assessment study. Psychoneuroendocrinology. 2022 Aug;142:105800. doi: 10.1016/j.psyneuen.2022.105800. PMID: 35598494.
15. Park SH, Petrunoff NA, Wang NX, van Dam RM, Sia A, Tan CS, et al. Daily park use, physical activity, and psychological stress: A study using smartphone-based ecological momentary assessment amongst a multi-ethnic Asian cohort. Ment Health Phys Act. 2022 Mar;22:100440. doi: 10.1016/j.mhpa.2022.100440.
16. Saulnier KG, Saulnier SJ, Allan NP. Cognitive risk factors and the experience of acute anxiety following social stressors: An ecological momentary assessment study. J Anxiety Disord. 2022 May;88:102571. doi: 10.1016/j.janxdis.2022.102571. PMID: 35487044.
17. Rabasco A, Andover M. Ecological Momentary Assessment. In: Comprehensive Clinical Psychology. 2nd ed. Elsevier; 2022. pp. 83-90. doi: 10.1016/B978-0-12-818697-8.00189-8.
18. Shiffman S, Stone AA, Hufford MR. Ecological momentary assessment. Annu Rev Clin Psychol. 2008;4:1-32. doi: 10.1146/annurev.clinpsy.3.022806.091415.
19. American Speech-Language-Hearing Association. Experience sampling method [Internet]. ASHA. 2014 Nov [cited 2023 Sep]. Available from: https://academy.pubs.asha.org/2014/11/experience-sampling-method/#:~:text=Experience%20sampling%20methodology%20is%20a,a%20week%20or%20two%20weeks.
20. McKay D, Przeworski A, O'Neill S. Emerging Technologies for Clinical Practice. In: Luiselli JK, Fischer AJ, editors. Computer-Assisted and Web-Based Innovations in Psychology, Special Education, and Health. Academic Press; 2016. pp. 365–78. doi:10.1016/B978-0-12-802075-3.00014-0.
21. American Psychological Association. Why sleep is important and what happens when you don't get enough [Internet]. 2020 [cited 2023 Sep]. Available from: https://www.apa.org/topics/sleep/why
22. Watson NF, Badr MS, Belenky G, Bliwise DL, Buxton OM, Buysse D, et al. Recommended amount of sleep for a healthy adult: A Joint Consensus Statement of the American Academy of Sleep Medicine and Sleep Research Society. Sleep. 2015 Jun 1;38(6):843-4. doi: 10.5665/sleep.4716. PMID: 26039963; PMCID: PMC4434546.
23. Feldman TR, Carlson CL, Rice LK, Kruse MI, Beevers CG, Telch MJ, et al. Factors predicting the development of psychopathology among first responders: A prospective, longitudinal study. Psychol Trauma. 2021 Jan;13(1):75-83. doi: 10.1037/tra0000957. PMID: 32940524.
24. Hawley JA, Burke LM. Effect of meal frequency and timing on physical performance. Br J Nutr. 1997;77(S1):S91–S103. doi: 10.1017/S0007114500001050.
25. Gyasi RM, Obeng B, Yeboah JY. Impact of food insecurity with hunger on mental distress among community-dwelling older adults. PLoS One. 2020 Mar 31;15(3):e0229840. doi: 10.1371/journal.pone.0229840. PMID: 32231372; PMCID: PMC7108730.
26. Fang D, Thomsen MR, Nayga RM. The association between food insecurity and mental health during the COVID-19 pandemic. BMC Public Health. 2021;21(1). doi: 10.1186/s12889-021-10631-0.
27. Siefert K, Heflin CM, Corcoran ME, Williams DR. Food insufficiency and physical and mental health in a longitudinal survey of welfare recipients. J Health Soc Behav. 2004 Jun;45(2):171-86. doi: 10.1177/002214650404500204. PMID: 15305758.
28. Ulrich-Lai YM, Fulton S, Wilson M, Petrovich G, Rinaman L. Stress Exposure, Food Intake, and Emotional State. Stress. 2015;18(4):381–99. PMID: 26303312. PMCID: PMC4843770.
29. Army Public Health Center. Performance Nutrition [Internet]. Army Public Health Center; 2020 [cited 2023 Sep]. Available from: https://phc.amedd.army.mil/topics/healthyliving/n/Pages/PerformanceNutrition.aspx
30. Northwestern Medicine. The Best Times to Eat [Internet]. 2023 [cited 2023 Sep]. Northwestern Medicine. Available from: https://www.nm.org/healthbeat/healthy-tips/nutrition/best-times-to-eat#:~:text=If%20your%20schedule%20varies%20every
31. Alampay LP, Jocson MRM. Attributions and attitudes of mothers and fathers in the Philippines. Parent Sci Pract. 2011 Jul;11(2-3):163–76. doi: 10.1080/15295192.2011.585564. PMID: 21826132; PMCID: PMC3150789.
32. Hopwood TL, Schutte NS, Loi NM. Anticipatory traumatic reaction: outcomes arising from secondary exposure to disasters and large-scale threats. Assessment. 2019 Dec;26(8):1427-43. doi: 10.1177/1073191117731815. PMID: 28918648.
33. Landahl M, Cox C. Beyond the Plan: Individual Responder and Family Preparedness in the Resilient Organization [Internet]. Homeland Security Affairs. 2009 [cited 2023 Sep 9]. Available from: https://www.hsaj.org/articles/98.

34. Demme NC. Government expectations and the role of law enforcement in a biological incident [Internet]. 2007 [cited 2023 Sep 9]. Available from: https://calhoun.nps.edu/handle/10945/3557
35. Galea S, Nandi A, Vlahov D. The epidemiology of post-traumatic stress disorder after disasters. Epidemiol Rev. 2005; 1;27(1):78–91. doi: 10.1093/epirev/mxi003. PMID: 15958429
36. Fullerton CS, Ursano RJ, Wang L. Acute stress disorder, posttraumatic stress disorder, and depression in disaster or rescue workers. Am J Psychiatry. 2004 Aug;161(8):1370-6. doi: 10.1176/appi.ajp.161.8.1370. PMID: 15285961.
37. Brooks SK, Dunn R, Sage CA, Amlôt R, Greenberg N, Rubin GJ. Risk and resilience factors affecting the psychological wellbeing of individuals deployed in humanitarian relief roles after a disaster. J Ment Health. 2015 Dec;24(6):385-413. doi: 10.3109/09638237.2015.1057334. PMID: 26452755.
38. Prati G, Pietrantoni L. The relation of perceived and received social support to mental health among first responders: a meta-analytic review. J Community Psychol. 2010 Apr;38(3):403–17. doi: 10.1002/jcop.20371.
39. Wethington E, Kessler RC. Perceived support, received support, and adjustment to stressful life events. J Health Soc Behav. 1986 Mar;27(1):78-89. PMID: 3711634.
40. Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. J Gen Intern Med. 2001 Sep;16(9):606-13. doi: 10.1046/j.1525-1497.2001.016009606.x. PMID: 11556941; PMCID: PMC1495268.
41. Elal G, Slade P. Traumatic Exposure Severity Scale (TESS): a measure of exposure to major disasters. J Trauma Stress. 2005 Jun;18(3):213-20. doi: 10.1002/jts.20030. PMID: 16281215.
42. Bride BE, Robinson MM, Yegidis B, Figley CR. Development and validation of the secondary traumatic stress scale. Res Soc Work Pract. 2004 Jan;14(1):27–35. doi: 10.1177/1049731503254106.
43. Schwarzer R, Schulz U. Instrument Title: Berlin Social Support Scales (BSSS) [Internet]. 2000 [cited 2023 Sep]. Available from: https://www.midss.org/sites/default/files/berlin_social_support_scales_english_items_by_scale.pdf
44. Ezeonu NA, Hertelendy AJ, Adu MK, Kung JY, Itanyi IU, Dias R da, et al. Mobile apps to support Mental Health Response in Natural disasters: Scoping review. J Med Internet Res. 2024 Apr 17;26. doi: 10.2196/49929. PMID: 38520699. PMCID: PMC11063879.
45. Voth M, Chisholm S, Sollid H, Jones C, Smith-MacDonald L, Brémault-Phillips S. Efficacy, effectiveness, and quality of resilience-building mobile health apps for military, veteran, and public safety personnel populations: Scoping Literature Review and app evaluation. JMIR Mhealth Uhealth. 2022 Jan 19;10(1). doi: 10.2196/51609. PMID: 37639713. PMCID: PMC10495842.
46. O'Toole K, Brown CA. Evaluating the quality of resilience apps for military members and public safety personnel. J Mil Veteran Fam. 2021 Feb 1;7(1):87–101. doi: 10.3138/jmvfh-2020-0002.
47. Yang YS, Ryu GW, Han I, Oh S, Choi M. Ecological momentary assessment using smartphone-based mobile application for affect and stress assessment. Healthc Inform Res. 2018 Oct;24(4):381-6. doi: 10.4258/hir.2018.24.4.381. PMID: 30443427; PMCID: PMC6230530.
48. Vaghefi I, Tulu B. The continued use of mobile health apps: Insights from a longitudinal study. JMIR Mhealth Uhealth. 2019 Aug 29; 7(8). doi: 10.2196/12983. PMID: 31469081. PMCID: PMC6740166.
49. McCormack N. Managers, Stress, and the Prevention of Burnout in the Library Workplace. In: Woodsworth A, Penniman WD, editors. Management and Leadership Innovations. Emerald Publishing Limited; 2014.
50. Motowidlo SJ, Packard JS, Manning MR. Occupational stress: Its causes and consequences for job performance. J Appl Psychol. 1986;71(4):618–29. doi: 10.1037/0021-9010.71.4.618.
51. Martinez AB, Co M, Lau J, Brown JSL. Filipino help-seeking for mental health problems and associated barriers and facilitators: A systematic review. Soc Psychiatry Psychiatr Epidemiol. 2020;55(11):1397-413. doi: 10.1007/s00127-020-01937-2. PMID: 32816062.
52. Haugen PT, McCrillis AM, Smid GE, Nijdam MJ. Mental health stigma and barriers to mental health care for First Responders: A systematic review and meta-analysis. Journal of Psychiatric Research. 2017 Nov;94:218–29.
53. Crowe A, Glass JS, Lancaster M, Raines J, Waggy M. Mental illness stigma among first responders and the general population. Journal of Military and Government Counseling. 2015;3(3):132–49.