

Protocol

# An E–Mental Health Solution to Prevent and Manage Posttraumatic Stress Injuries Among First Responders in Alberta: Protocol for the Implementation and Evaluation of Text Messaging Services (Text4PTSI and Text4Wellbeing)

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## Abstract

**Background:** First responders are confronted with traumatic events in their work that has a substantial toll on their psychological health and may contribute to or result in posttraumatic stress injuries (PTSI) for many responders. Persons with a PTSI usually seek management therapies. Evidence indicates that digital delivery of these therapies is an innovative, efficient, and effective way to improve PTSI symptoms as an adjunct to in-person delivery.

**Objective:** This project aims to implement and provide accessible, convenient, and economical SMS text messaging services, known as Text4PTSI and Text4Wellbeing, to first responders in Alberta, Canada; to prevent and improve the symptoms of PTSI among first responders; and to improve their overall quality of life. We will evaluate posttraumatic symptoms and the impact of Text4PTSI and Text4Wellbeing on stress, anxiety, and depression in relation to the correspondents' demographic backgrounds.

**Methods:** First responders who subscribe to Text4PTSI or Text4Wellbeing receive daily supportive and psychoeducational SMS text messages for 6 months. The SMS text messages are preprogrammed into an online software program that delivers messages to subscribers. Baseline and follow-up data are collected through online questionnaires using validated scales at

enrollment, 6 weeks, 12 weeks, and 24 weeks (end point). In-depth interviews will be conducted to assess satisfaction with the text-based intervention.

**Results:** We hypothesize that participants who enroll in this program will have improved PTSI symptoms; increased or improved quality of life; and significant reduction in associated stress, depression, and anxiety symptoms, among other psychological concerns. Improvement will be determined in comparison to established baseline parameters.

**Conclusions:** This research will be beneficial for practitioners and will inform policy-making and decision-making regarding psychological interventions for PTSI. Lessons from this study will inform the scale-up of the intervention, a cost-effective, zero contact therapeutic option to manage PTSI.

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## KEYWORDS

posttraumatic stress injury; first responders; messaging; mobile phone; text-based intervention; Text4PTSI; Text4Wellbeing

## Introduction

### Background

First responders are personnel with specialized training to render care to patients who experience traumatic events (eg, acute illness, accidents, natural disasters, and terrorism) as the first point of contact. These personnel typically include firefighters, police officers, paramedics, corrections officers, and emergency health care workers, who often attend to persons in critical situations or conditions [1-3].

Posttraumatic stress injury (PTSI) is a mental health condition that first responders may experience at some point in their careers [2]. Some potentially traumatic events include motor vehicle accidents, fires, sexual assault, floods, and situations involving unexpected death, among others. These events can bring about injury and stress-related traumas that influence emotional well-being and prosperity [4]. Most first responders report experiencing multiple traumatic events in their lives [2,4,5]. Approximately 6.8% of people develop PTSI over their lifetime [6]. PTSI symptoms may affect the general well-being of the individuals; alter mood; and contribute to insomnia, irritability, and traumatic flashbacks [2].

PTSI is closely related to posttraumatic stress disorder (PTSD). Both share similar symptoms and are sometimes used interchangeably across the literature. Differences are subject to debate among various schools of thought. Whereas PTSD refers to a psychiatric disorder, PTSI, as defined by the Global PTSI Foundation, refers to biological injury associated with physical changes in the nervous system [7]. Psychiatrists and military officers have suggested that relinquishing the word “disorder” in favor of “injury” will minimize the stigma that prevents troops from seeking treatment. Thus, changing the name from PTSD to PTSI would change people’s perception of the condition [8].

PTSI rates are high among first responders ranging from one-third to more than half of those exposed to potentially traumatic events [9]. Globally, it is estimated that 10% to 35% of first responders experience psychological conditions, including PTSI [3,10]. A meta-analysis examining mental disorders among ambulance personnel estimated prevalence rates of 11% for PTSD, 15% for depression, 15% for anxiety, and 27% for general psychological distress [11,12]. Another

study revealed that 80% of rescue, firefighter, medical, and police personnel who cared for victims of an apartment building explosion reported at least a symptom of PTSD [13]. Surprisingly, the prevalence rate of PTSD in these groups were found to widely range from 0% to 46% [14,15]. First responders experiencing PTSI may decrease productivity, increase risk of suicide, and show poor social interaction [16].

The most common co-occurring diagnosis with PTSI is depression, with about 36% to 55% of patients with PTSI experiencing concurrent depression [4,17]. A study conducted among first responders showed an increased risk of PTSI of 25.6% and 16.7% at 7 and 13 months, respectively, with a depression rate of 16%, after exposure to a traumatic event [18]. A proportion of first responders who are exposed to traumatic events seek psychological support or treatment [6,19]. There is no doubt that PTSI is a substantial mental health concern, especially among first responders, and contributes to a substantial overall cost for mental health. It is estimated that there are 69,000 police personnel; 110,000 firefighters; 30,000 paramedics; 17,000 correctional services personnel; over 7000 border services personnel; and 18,000 volunteer search and rescue personnel who serve as first responders in Canada [18]. About 2.5 million Canadian adults and 70,000 first responders have experienced PTSI in their lifetimes [9].

Psychological treatment to address PTSI may be unavailable due to access considerations such as location or lengthy waitlist, among others [1]. This informs the need for a service that will improve access and prevent and manage PTSI digitally. Narrative synthesis indicates that the digital delivery of these therapies might be as powerful as in-person delivery [20,21]. Additionally, these means may also lessen stigma and price while providing a remedy [22,23]. Evidence has shown that about one-third of persons with PTSI never recover due to inadequate and high-cost care; hence, cost-effective management is required [22]. Because of PTSI and its impact on first responders and their families, governments and other policy-making bodies, including the Canadian Workers’ Compensation Boards, initiated a guide for the rehabilitation of PTSI with a structured legislature to accept PTSI claims [23-25].

Mobile/smartphone technology can support and improve patient outcomes in psychological care [26,27]. An acceptable way to

provide psychological interventions to the public and to those with mental health conditions is supportive SMS text messaging. Considering it is comparatively affordable, available, and efficient, text-based messaging can be delivered to many users at the same time, which may reduce the mental health treatment gap [26]. Mobile/smartphone messaging can prevent and manage health conditions and provide individuals with supportive and customized messages pertaining to their unique health conditions [26,28,29]. Supportive SMS text messaging can reduce hospitalizations and improve health behavior [30,31]. Research has demonstrated that, overall, an individual's mental health improves upon receiving supportive SMS text messages [32-34]. Early provision of psychoeducation is effective in the prevention and management of PTSD [35]. About 80% of subscribers reported high satisfaction with the service and improved mental health status in studies conducted in Alberta [36]. A global survey conducted in 2015 revealed the median of access to the internet, with 87% having access to the internet and 68% of people own a smartphone. Among western countries, Canada is in a high-use group, with 90% of Canadians using the internet and 67% owning a smartphone [37]. These messages will effectively support patients who are attending individual or group treatment at Alberta Mental Health Centres.

Adjunct supportive text message therapy for psychological conditions has been tested on mood disorders among other psychological conditions [26]. However, to our knowledge, this innovation has not yet been conducted with PTSD and with first responders specifically. To address this gap, we propose an innovative program for first responders that seek to prevent and manage PTSD among this cohort with an evidence-based supportive SMS text messaging program developed using the concept of cognitive behavioral therapy.

## Objectives

This project will implement a structured daily SMS text messaging service known as Text4PTSD and Text4Wellbeing, which aims to prevent and reduce the occurrence of PTSD and to manage PTSD symptoms among first responders. We will evaluate posttraumatic symptoms; correspondent's demography; and Text4PTSD's and Text4Wellbeing's impact on stress, anxiety, and depression.

We propose the following research questions:

- Will Text4PTSD and Text4Wellbeing prevent/improve the symptoms of PTSD among Alberta's First Responders (eg, firefighters, police officers, paramedics, sheriffs, corrections officers, and emergency health care workers)?
- Will Text4PTSD and Text4Wellbeing improve the quality of life in the community of first responders experiencing PTSD symptoms by reducing symptom burden?
- How satisfied are subscribers with Text4PTSD and Text4Wellbeing programs (technical care, access, and utility)?

## Methods

### Study Design

The mixed methods study design will engage both quantitative and qualitative approaches [38]. Both approaches will be used independently as well as together and triangulated using the theoretical framework.

### Theoretical Framework

Outcomes have been defined as the change in health status directly attributable to the efforts or success of the health care experience [39-41]. Thus, successful treatment is associated with the efficacy of the provided care [42-45]. However, this study, as with many mental health impact evaluations, is subjective [46], given that it applies self-reported assessments by the participants. However, as suggested by the desire-fulfillment theory, outcomes possess a predominately positive association with satisfaction [47,48]. This is because the underlying rationale for seeking care is often to alleviate some form of functional impairment [49]. Comparing evidence on the difference (and similarities) between the need for health as perceived by the patient and the need for health care (as defined by the physician through scientific means) provides an opportunity for research. Consequently, this study will contribute to closing this gap by triangulating evidence from standardized psychological evaluation with evidence of patient satisfaction. Batbaatar and colleagues [50] identified nine determinants of variations in satisfaction with health care services: technical care, interpersonal care, physical environment, access (accessibility, availability, and finances), organizational characteristics, continuity of care, and outcome of care (Table 1). Our study will be guided by this framework and adapted for our e-mental health intervention (Table 2).

**Table 1.** Theoretical framework guided by Batbaatar et al's [50] determinants of patients' satisfaction.

Determinants	Batbaatar et al's [50] definition	Text4PTSI/Text4Wellbeing adaptation
Technical care	The extent to which the services adhere to standards and norms of clinical diagnoses and treatments	Perception of the extent to which the services adhere to standards and norms of clinical diagnoses and treatments
Interpersonal care	The amount of caring for patients through noticing, participating, sharing, active listening, companionship, complimenting, comforting, hoping, forgiving, and accepting.	Not directly applicable
Physical environment	Pleasantness of the atmosphere, room comfort, bedding, cleanliness, noise level, temperature convenience, lighting convenience, food service, bathroom comfort, clarity of sign and directions, arrangement of equipment and facilities, and parking.	Not directly applicable
Access	Health service access is a multidimensional determinant measured by how (1) organizational issues (accessibility), (2) service resources (availability), and (3) personal barriers (affordability) prevent populations from access to health services.	(1) Ease of use of technology (text messaging services) and (2) personal barriers
Organizational characteristics	Reputation and image of the hospitals	Not directly applicable
Continuity of care	Uninterruptedness of health service process from the same hospital, location, or provider and in which the patient and the physician are cooperatively involved in ongoing health care management toward the goal of high quality, cost-effective medical care	(1) Continued use of intervention throughout the study period and (2) perceived complementary nature or linkage of Text4PTSI and Text4Wellbeing with participants existing mental health care
Outcome of care	Patients' perceived health improvement	Patients' perceived mental health improvement

**Table 2.** Gantt chart for Text4PTSI and Text4Wellbeing text message project.

Milestone accomplishment	Timelines (months)						
	1-2	3-4	5-6	7-8	9-10	11-12	13-15
Ethics approvals: an amendment of existing ethics approval for the Text4Support and Text4Hope programs to cover the Text4PTSI and Text4Wellbeing programs	✓ <sup>a</sup>						
Preimplementation stakeholder engagement: stakeholder participation in content development and program advertisement	✓						
Technology/content development: Text4PTSI and Text4Wellbeing technologies and content development	✓						
Launch of Text4PTSI and Text4Wellbeing programs: Text4PTSI and Text4Wellbeing in operational use for first respondents to self-subscribe	✓	✓	✓	✓	✓		
Program evaluation: conducting quantitative and qualitative evaluation		✓	✓	✓	✓	✓	
Preliminary report: availability of preliminary program evaluation report				✓			
Postimplementation knowledge transfer activities: stakeholder engagement on preliminary findings and dissemination of early results						✓	
Final report development: developing final report and disseminated						✓	✓

<sup>a</sup>The checkmark indicates that this milestone will be accomplished at this time point.

## Inclusion Criteria

First responders who are 18 years or older who can provide informed consent will be eligible for the study. The Text4PTSI and Text4Wellbeing programs will be promoted to all first responders, including those who are healthy and may be seeking prophylactic psychological support to avert the onset of PTSD symptoms, those who might be experiencing PTSD symptoms but have not sought face-to-face psychological care, and those who are already accessing psychological care. First responders

will also need to possess a mobile phone with an active line and have access to SMS text messages.

## Exclusion Criteria

First responders will be ineligible if they do not meet the aforementioned inclusion criteria or reside outside of regular cell phone connection areas.

## Recruitment

The first responders in Alberta (eg, firefighters, police officers, paramedics, corrections officers, and emergency health care



workers) who regularly encounter difficult, risky, and traumatic events, and are willing to consent to the program will be targeted for recruitment. We will work with all first responder organizations to reach out to all first responders with information about the program. In addition, Text4PTSI and Text4Wellbeing would be the subject of a wide-exposure communications campaign (TV, radio, internet, and print media). First responders at risk of PTSI and those experiencing PTSI symptoms and on a waitlist to obtain care through the Alberta Health Services centralized Addiction and Mental Health intake service and the Operational Stress Injury Clinic with extra passageways such as private psychologists and counsellors will be included as the project evolves.

### The Text4PTSI and Text4Wellbeing Interventions

First responders will participate in the Text4PTSI and Text4Wellbeing programs by simply texting “PTSI” and “Wellbeing,” respectively, to a designated phone number. Text4PTSI and Text4Wellbeing will offer quick support to first responders encountering PTSI symptoms, including individuals who are on a waitlist for services or may experience issues getting to support because of geographic boundaries or other access considerations. Beginning on the first day of enrollment, first responders will receive daily unidirectional computer-programmed supportive SMS text messages, which will be specifically designed to alleviate PTSI symptoms. The messages will be written by cognitive behavior therapists and psychologists who have experience in treating PTSI in partnership with a cross section of first responders receiving treatment at the Operational Stress Injury and Addiction and Mental Health clinics in Edmonton and Calgary. The messages will be preprogrammed into a software program that will deliver the messages to subscribers automatically. The content of the SMS text message will focus on two dimensions. The first dimension includes general content that is indicated regardless of symptom presented, including messages of self-care, social support, hope, affirmation, and recovery. In the second dimension, specific content will be provided that focuses on the management of PTSI-related symptoms and conditions, including PTSD, generalized anxiety disorder, panic disorder, major depressive disorder, and suicidal ideation (eg, activity scheduling in depression). The ultimate goal will be to have SMS text message content customized based on end user characteristics. To this end, over time, we will appraise the individual needs of participants based on occupational category, age group, cultural identity, sex, gender identity and gender expression, sexual orientation, ethnicity, culture, religious perspective, income, and non-English language communication. This will be in accordance with the user identified needs and may enhance access for numerous groups, many of whom may be marginalized or underserved. For the program under study, the SMS text messages will target specific PTSI risk factors and symptoms with consideration for occupational and sociocultural context. An example [51] is:

*Letting go of resentment is a gift you give yourself, and it will ease your journey immeasurably. Make peace with everyone, and happiness will be yours. Trauma can feel like a gloomy cloud over all areas of your life. The first step in treatment is to understand what trauma is, the symptoms, and how and why it is treated.*

### Sample Size Considerations

With Alberta’s first responder population of about 33,000 [52], a 95% CI, and a 3% margin of error, the sample size needed for prevalence estimates for likely PTSI will be 1034. Based on baseline survey response rates of 20% achieved with both Text4Mood and Text4Hope programs [26,53,54], to achieve our sample size target, we plan to enroll 5170 first responders in the Text4PTSI and Text4Wellbeing programs.

### Data Collection

At the beginning of the first message, respondents will be introduced to the program by completing an online mental health assessment, which will be repeated at 6 weeks, 3 months, and upon completion of the program at 6 months. A similar approach was successfully used to collect cross-sectional and longitudinal data from thousands of Text4Hope subscribers during the COVID-19 pandemic [53-65]. In-depth interviews on participant satisfaction with Text4PTSI and Text4Wellbeing will be conducted involving a cross-section of 10 to 15 participants selected randomly using an interview guide informed by the theoretical framework.

### Outcome Measures

Key outcomes of interest in this study include change in scores measured by comparing pre- vs posttreatment responses to the following surveys: PTSD Checklist 5 [66], Generalized Anxiety Disorder-7 scale [67], Perceived Stress Scale [68], and the Patient Health Questionnaire-9 [69]. Secondary outcomes will include quality of life, as measured with the Well-being Index [70], and program satisfaction measured with the Text4PTSI and Text4Wellbeing exit questionnaire.

A patient satisfaction questionnaire will be programmed to measure the applicability of the technology as a valuable modality for delivering psychological therapies to large numbers of first responders experiencing PTSI symptoms. It is also designed to assess the benefits of the program to service users. A patient satisfaction questionnaire previously used to evaluate the Text4Mood program and Text4Hope program [26,55] will be adapted to evaluate the Text4PTSI and Text4Wellbeing Programs. As part of the sociodemographic variables, the satisfaction questionnaire will address multiple measures of satisfaction, including subscriber-reported effects of the program on symptoms and quality of life, and the usability of the technology. Table 3 illustrates an overview of the Text4PTSI and Text4Wellbeing outcome measures.

**Table 3.** Overview of the Text4PTSI and Text4Wellbeing outcome measures.

Outcome	Instrument	Time	Data source
<b>Effectiveness</b>			
Quality of life	5-Item World Health Organization Well-being Index	These measures will be assessed at baseline, 6 weeks, 3 months, 6 months, and 12 months	Clinical questionnaire
Depression symptom score	Patient Health Questionnaire-9	These measures will be assessed at baseline, 6 weeks, 3 months, 6 months, and 12 months	Clinical questionnaire
Anxiety symptom scores	Generalized Anxiety Disorder-7	These measures will be assessed at baseline, 6 weeks, 3 months, 6 months, and 12 months	Clinical questionnaire
Participants perceived stress	Perceived Stress scale	These measures will be assessed at baseline, 6 weeks, 3 months, 6 months, and 12 months	Clinical questionnaire
PTSD <sup>a</sup> symptom score	PTSD Checklist	Assessed at baseline, 6 weeks, 3 months, 6 months, and 12 months	Clinical questionnaire
Client satisfaction/experience surveys	Instrument developed and pilot tested, and published by the authors	Assessed at 6 weeks, 3 months, 6 months, and 12 months	Survey questionnaire
<b>Implementation</b>			
Reach	The proportion of first responders who receive the daily supportive text message	Assessed at baseline, 6 weeks, 3 months, 6 months, and 12 months	Survey questionnaire
Acceptability	Instrument developed and pilot tested, and published by the authors	Assessed at 6 weeks, 3 months, 6 months, and 12 months	Survey questionnaire
Fidelity	Part of first responders who read the supportive text messages at least once a day/percentage of scheduled follow up	Assessed at 6 weeks, 3 months, 6 months, and 12 months	Survey questionnaire
Cost	Administrative data	Assessed at baseline and 12 months	N/A <sup>b</sup>

<sup>a</sup>PTSD: posttraumatic stress disorder.

<sup>b</sup>N/A: not applicable.

## Data Analysis

A quantitative evaluation will be used with a descriptive and inferential analytical approach. The analysis will demonstrate the distribution of likely PTSD with respect to sociodemographic characteristics of participants, as well as identify determinants of likely PTSD symptoms and outcomes across various predictor variables. Using subscriber data from the overall study, an additional benefit will be the application of machine learning to develop an artificial intelligence approach to predict characteristics and risk factors of first responders who commonly experience PTSD symptoms. This would allow us to generate predictive tools to differentially support first responders at risk of PTSD. This activity will be achieved through collaboration with the computational psychiatry group. This approach is well within the expertise of the computational psychiatry group members and in line with PTSD/PTSD trauma-related care [71,72].

Qualitative data will be analyzed to explore respondents' preferences, satisfaction, and other characteristics that will help improve outcome, program design, preventive strategies, and workplace and government policies as they relate to PTSD. Qualitative data analysis will involve inductive and deductive thematic analytic approaches using the study's theoretical framework. Qualitative descriptive methodology is an appropriate approach for qualitative research geared toward generating information to refine interventions in everyday terms [73]. In accordance with qualitative descriptive methods [73], qualitative content analysis will be conducted to summarize the content of the data [74].

What is also unique about this study is the demographic data collected from users. Collecting this information will also allow us to engage in comparative analysis, which may reveal new patterns or trends in the mental health of first responders based upon how they identify. This will allow the research team to

further customize text-based supportive messages based on characteristics including age, gender, race, sexual orientation, etc.

### Ethical Considerations

The study received ethics approval from the Health Research Ethics Board (HREB) of the University of Alberta (Pro00108966). Informed consent will be obtained from all participants. Confidentiality and data security measures will be adhered to as approved by the HREB.

### Results

We hypothesize that participants who will enroll in this program will have improved quality of life; reduced PTSD symptoms; and significantly improved associated moderate/high stress, depression, and anxiety symptoms, among others. Improvement will be in comparison to the baseline parameters.

### Discussion

The nature of first responders' work impacts their health, daily activities, and psychological safety and well-being. The psychological impact on this cohort requires innovative, technologically driven psychological supports that have no waitlists, are geographic location independent, and can serve first responders at risk and those experiencing PTSD symptoms, while respecting confidentiality and reducing stigma. This approach will mitigate the potential adverse effects of first responders accessing psychological care. If Text4PTSD and Text4Wellbeing are effective for first responders in Alberta, we will explore opportunities for a national scale-up and global dissemination through engagements with first responder organizations as well as regional and national governments. This would be achieved through a Canadian federally registered not-for-profit organization, the Global Psychological eHealth Foundation [75] working in partnership with the research team. A similar program (Text4Mood) implemented in Alberta demonstrated an improved psychological treatment gap [26]: 77% of the participants felt capable of managing depression and anxiety, while 83% had improved overall mental well-being. Likewise, the Text4Hope program launched in Alberta during the COVID-19 pandemic reduced mental health distress by about 20% in subscribers [51]. It is expected that Text4PTSD and Text4Wellbeing supportive SMS text messages that seek to address access gaps to psychological care for first responders in Alberta and those experiencing or at risk of experiencing

PTSD symptoms will achieve results comparable to the Text4Mood and Text4Hope programs.

Text4PTSD and Text4Wellbeing supportive SMS text messages seek to address access gaps to psychological care for first responders in Alberta and those experiencing PTSD symptoms. The proposed mobile technology intervention is a potentially effective, economical, and accessible way of providing an intervention to first responders. Previous studies have proven positive outcomes with high satisfaction with the delivery of supportive messages [26]. Thus, Text4PTSD and Text4Wellbeing could alleviate onerous challenges of access to care for first responders, considering individual location, unique demographic considerations, financial constraints, stigma, and position on the waitlist for those already being managed for PTSD [76]. This project will provide support to the first responders irrespective of geographical location or identity.

This project will assess outcomes with standard validated questionnaires and provide essential statistics regarding the prevalence of PTSD among first responders in Alberta. Thus, information from this project will be beneficial for practitioners and important for policy- and decision-making regarding psychological interventions for PTSD in the target population.

The project will promote partnerships and networks among mental health stakeholders to improve knowledge and understanding of the social issues and challenges faced by first responders. The research and evaluation aspect of the project may scale up effective approaches to identify and respond to existing and emerging social issues that first responders and their families confront.

A potential limitation of the study design is that there may be selection bias since phone service coverage may be unstable in some rural remote locations in Alberta, which may skew the findings toward a more urban population. Another limitation is that the prevalence of anxiety, depression, and PTSD to be reported in this study is based on standardized self-rated scales rather than clinical interviews using the Diagnostic and Statistical Manual for Mental Disorders (Fifth Edition). These limitations notwithstanding, this study will provide valuable data about the prevalence of anxiety, depression, and PTSD symptoms in first responders and their correlates, as well as the impact of Text4PTSD and Text4Wellbeing on anxiety, depression, and PTSD symptoms in first responders. Similar to results achieved with earlier supportive SMS text messaging programs, we expect Text4PTSD and Text4Wellbeing programs to improve the mental well-being among first responders.

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### Authors' Contributions

VIOA conceived and designed the study. VIOA, GOD, and EE wrote the initial draft of the manuscript. VIOA, GOD, EE, JB, NP, SE, JH, YZ, FM, SC, RG, CJ, SBP, BC, KW, XML, CH, and AG made substantial contributions to the planning and design of the study, and contributed to the revision of the manuscript. All authors read and approved the final version of the manuscript.

## Conflicts of Interest

None declared.

## References

1. Carleton R, Afifi T, Taillieu T, Turner S, El-Gabalawy R, Sareen J, et al. Anxiety-related psychopathology and chronic pain comorbidity among public safety personnel. *J Anxiety Disord* 2018 Apr;55:48-55 [FREE Full text] [doi: [10.1016/j.janxdis.2018.03.006](https://doi.org/10.1016/j.janxdis.2018.03.006)] [Medline: [29566981](https://pubmed.ncbi.nlm.nih.gov/29566981/)]
2. Shalev A, Liberzon I, Marmar C. Post-traumatic stress disorder. *N Engl J Med* 2017 Jun 22;376(25):2459-2469. [doi: [10.1056/nejmra1612499](https://doi.org/10.1056/nejmra1612499)]
3. Haugen PT, Evces M, Weiss DS. Treating posttraumatic stress disorder in first responders: a systematic review. *Clin Psychol Rev* 2012 Jul;32(5):370-380. [doi: [10.1016/j.cpr.2012.04.001](https://doi.org/10.1016/j.cpr.2012.04.001)] [Medline: [22561967](https://pubmed.ncbi.nlm.nih.gov/22561967/)]
4. Gros DF, Price M, Magruder KM, Frueh BC. Symptom overlap in posttraumatic stress disorder and major depression. *Psychiatry Res* 2012 Apr 30;196(2-3):267-270 [FREE Full text] [doi: [10.1016/j.psychres.2011.10.022](https://doi.org/10.1016/j.psychres.2011.10.022)] [Medline: [22386220](https://pubmed.ncbi.nlm.nih.gov/22386220/)]
5. Arapovic-Johansson B, Wåhlin C, Kwak L, Björklund C, Jensen I. Work-related stress assessed by a text message single-item stress question. *Occup Med (Lond)* 2017 Dec 02;67(8):601-608 [FREE Full text] [doi: [10.1093/occmed/kqx111](https://doi.org/10.1093/occmed/kqx111)] [Medline: [29016877](https://pubmed.ncbi.nlm.nih.gov/29016877/)]
6. Gross DP, Rachor GS, Yamamoto SS, Dick BD, Brown C, Senthilselvan A, et al. Characteristics and prognostic factors for return to work in public safety personnel with work-related posttraumatic stress injury undergoing rehabilitation. *J Occup Rehabil* 2021 Dec;31(4):768-784. [doi: [10.1007/s10926-021-09963-w](https://doi.org/10.1007/s10926-021-09963-w)] [Medline: [33751310](https://pubmed.ncbi.nlm.nih.gov/33751310/)]
7. PTSD vs. PTSI. The Recovery Village. 2021. URL: <https://www.therecoveryvillage.com/mental-health/ptsd/related/ptsd-vs-ptsi/#:~:text=In%20essence%2C%20PTSI%20refers%20to,refers%20to%20a%20biological%20injury> [accessed 2022-01-22]
8. Jaffe G. New name for PTSD could mean less stigma. *The Washington Post*. 2012. URL: [https://www.washingtonpost.com/world/national-security/new-name-for-ptsd-could-mean-less-stigma/2012/05/05/gIQAIv8M4T\\_story.html](https://www.washingtonpost.com/world/national-security/new-name-for-ptsd-could-mean-less-stigma/2012/05/05/gIQAIv8M4T_story.html) [accessed 2022-01-22]
9. Wilson S, Guliani H, Boichev GE. On the economics of post-traumatic stress disorder among first responders in Canada. *J Community Safety Well-Being* 2016 Aug 08;1(2):26. [doi: [10.35502/jcswb.6](https://doi.org/10.35502/jcswb.6)]
10. Berger W, Coutinho ESF, Figueira I, Marques-Portella C, Luz MP, Neylan TC, et al. Rescuers at risk: a systematic review and meta-regression analysis of the worldwide current prevalence and correlates of PTSD in rescue workers. *Soc Psychiatry Psychiatr Epidemiol* 2012 Jun;47(6):1001-1011 [FREE Full text] [doi: [10.1007/s00127-011-0408-2](https://doi.org/10.1007/s00127-011-0408-2)] [Medline: [21681455](https://pubmed.ncbi.nlm.nih.gov/21681455/)]
11. Petrie K, Milligan-Saville J, Gayed A, Deady M, Phelps A, Dell L, et al. Prevalence of PTSD and common mental disorders amongst ambulance personnel: a systematic review and meta-analysis. *Soc Psychiatry Psychiatr Epidemiol* 2018 Sep;53(9):897-909. [doi: [10.1007/s00127-018-1539-5](https://doi.org/10.1007/s00127-018-1539-5)] [Medline: [29869691](https://pubmed.ncbi.nlm.nih.gov/29869691/)]
12. Alvarez J, Hunt M. Risk and resilience in canine search and rescue handlers after 9/11. *J Trauma Stress* 2005 Oct;18(5):497-505. [doi: [10.1002/jts.20058](https://doi.org/10.1002/jts.20058)] [Medline: [16281248](https://pubmed.ncbi.nlm.nih.gov/16281248/)]
13. Durham TW, McCammon SL, Allison EJ. The psychological impact of disaster on rescue personnel. *Ann Emerg Med* 1985 Jul;14(7):664-668. [doi: [10.1016/s0196-0644\(85\)80884-2](https://doi.org/10.1016/s0196-0644(85)80884-2)] [Medline: [4014815](https://pubmed.ncbi.nlm.nih.gov/4014815/)]
14. Morren M, Yzermans CJ, van Nispen RMA, Wevers SJ. The health of volunteer firefighters three years after a technological disaster. *J Occup Health* 2005 Nov;47(6):523-532 [FREE Full text] [doi: [10.1539/joh.47.523](https://doi.org/10.1539/joh.47.523)] [Medline: [16369116](https://pubmed.ncbi.nlm.nih.gov/16369116/)]
15. Stewart SH, Mitchell TL, Wright KD, Loba P. The relations of PTSD symptoms to alcohol use and coping drinking in volunteers who responded to the Swissair Flight 111 airline disaster. *J Anxiety Disord* 2004;18(1):51-68. [doi: [10.1016/j.janxdis.2003.07.006](https://doi.org/10.1016/j.janxdis.2003.07.006)] [Medline: [14725868](https://pubmed.ncbi.nlm.nih.gov/14725868/)]
16. Sareen J, Cox BJ, Stein MB, Afifi TO, Fleet C, Asmundson GJG. Physical and mental comorbidity, disability, and suicidal behavior associated with posttraumatic stress disorder in a large community sample. *Psychosom Med* 2007 Apr;69(3):242-248. [doi: [10.1097/PSY.0b013e31803146d8](https://doi.org/10.1097/PSY.0b013e31803146d8)] [Medline: [17401056](https://pubmed.ncbi.nlm.nih.gov/17401056/)]
17. Campbell DG, Felker BL, Liu C, Yano EM, Kirchner JE, Chan D, et al. Prevalence of depression-PTSD comorbidity: implications for clinical practice guidelines and primary care-based interventions. *J Gen Intern Med* 2007 Jun 24;22(6):711-718 [FREE Full text] [doi: [10.1007/s11606-006-0101-4](https://doi.org/10.1007/s11606-006-0101-4)] [Medline: [17503104](https://pubmed.ncbi.nlm.nih.gov/17503104/)]
18. Moroz N, Moroz I, D'Angelo MS. Mental health services in Canada: barriers and cost-effective solutions to increase access. *Healthc Manage Forum* 2020 Nov;33(6):282-287. [doi: [10.1177/0840470420933911](https://doi.org/10.1177/0840470420933911)] [Medline: [32613867](https://pubmed.ncbi.nlm.nih.gov/32613867/)]
19. 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):1370-1376. [doi: [10.1176/appi.ajp.161.8.1370](https://doi.org/10.1176/appi.ajp.161.8.1370)] [Medline: [15285961](https://pubmed.ncbi.nlm.nih.gov/15285961/)]
20. Killip SC, Kwong NKR, MacDermid JC, Fletcher AJ, Carleton NR. The quality, readability, completeness, and accuracy of PTSD websites for firefighters. *Int J Environ Res Public Health* 2020 Oct 19;17(20):7629 [FREE Full text] [doi: [10.3390/ijerph17207629](https://doi.org/10.3390/ijerph17207629)] [Medline: [33086772](https://pubmed.ncbi.nlm.nih.gov/33086772/)]
21. Jones COH, Wasunna B, Sudoi R, Githinji S, Snow RW, Zurovac D. "Even if you know everything you can forget": health worker perceptions of mobile phone text-messaging to improve malaria case-management in Kenya. *PLoS One* 2012;7(6):e38636 [FREE Full text] [doi: [10.1371/journal.pone.0038636](https://doi.org/10.1371/journal.pone.0038636)] [Medline: [22719911](https://pubmed.ncbi.nlm.nih.gov/22719911/)]



22. Grinage B. Diagnosis and management of post-traumatic stress disorder. *Am Fam Physician* 2003 Dec 15;68(12):2401-2408 [FREE Full text] [Medline: [14705759](#)]
23. Mental health disorders. WorkSafeBC. 2019. URL: <https://www.worksafebc.com/en/claims/report-workplace-injury-illness/types-of-claims/mental-health-disorders> [accessed 2021-04-27]
24. Posttraumatic stress disorder in first responders and other designated workers. WSIB. 2018. URL: <https://www.wsib.ca/en/operational-policy-manual/posttraumatic-stress-disorder-first-responders-and-other-designated> [accessed 2021-04-27]
25. Veteran and Family Well-Being Fund Guidelines. Veterans Affairs Canada. 2018. URL: <https://www.veterans.gc.ca/eng/about-vac/research/well-being-fund/vfwb-guidelines> [accessed 2021-06-11]
26. Agyapong V, Mrklas K, Juhás M, Omeje J, Ohinmaa A, Dursun SM, et al. Cross-sectional survey evaluating Text4Mood: mobile health program to reduce psychological treatment gap in mental healthcare in Alberta through daily supportive text messages. *BMC Psychiatry* 2016 Nov 08;16(1):378 [FREE Full text] [doi: [10.1186/s12888-016-1104-2](#)] [Medline: [27821096](#)]
27. Hartnett D, Murphy E, Kehoe E, Agyapong V, McLoughlin DM, Farren C. Supportive text messages for patients with alcohol use disorder and a comorbid depression: a protocol for a single-blind randomised controlled aftercare trial. *BMJ Open* 2017 May 29;7(5):e013587 [FREE Full text] [doi: [10.1136/bmjopen-2016-013587](#)] [Medline: [28554910](#)]
28. Fjeldsoe BS, Marshall AL, Miller YD. Behavior change interventions delivered by mobile telephone short-message service. *Am J Prev Med* 2009 Feb;36(2):165-173. [doi: [10.1016/j.amepre.2008.09.040](#)] [Medline: [19135907](#)]
29. Lim MSC, Hocking JS, Hellard ME, Aitken CK. SMS STI: a review of the uses of mobile phone text messaging in sexual health. *Int J STD AIDS* 2008 May;19(5):287-290. [doi: [10.1258/ijsa.2007.007264](#)] [Medline: [18482956](#)]
30. Campbell KJ, Louie PK, Bohl DD, Edmiston T, Mikhail C, Li J, et al. A novel, automated text-messaging system is effective in patients undergoing total joint arthroplasty. *J Bone Joint Surg Am* 2019 Jan 16;101(2):145-151. [doi: [10.2106/JBJS.17.01505](#)] [Medline: [30653044](#)]
31. Kim BH, Glanz K. Text messaging to motivate walking in older African Americans: a randomized controlled trial. *Am J Prev Med* 2013 Jan;44(1):71-75. [doi: [10.1016/j.amepre.2012.09.050](#)] [Medline: [23253653](#)]
32. Agyapong VI, Ahern S, McLoughlin DM, Farren CK. Supportive text messaging for depression and comorbid alcohol use disorder: single-blind randomised trial. *J Affect Disord* 2012 Dec 10;141(2-3):168-176. [doi: [10.1016/j.jad.2012.02.040](#)] [Medline: [22464008](#)]
33. Agyapong VI, McLoughlin DM, Farren CK. Six-months outcomes of a randomised trial of supportive text messaging for depression and comorbid alcohol use disorder. *J Affect Disord* 2013 Oct;151(1):100-104. [doi: [10.1016/j.jad.2013.05.058](#)] [Medline: [23800443](#)]
34. Agyapong V, Juhás M, Ohinmaa A, Omeje J, Mrklas K, Suen VYM, et al. Randomized controlled pilot trial of supportive text messages for patients with depression. *BMC Psychiatry* 2017 Aug 02;17(1):286 [FREE Full text] [doi: [10.1186/s12888-017-1448-2](#)] [Medline: [28768493](#)]
35. Bryant R, Sackville T, Dang ST, Moulds M, Guthrie R. Treating acute stress disorder: an evaluation of cognitive behavior therapy and supportive counseling techniques. *Am J Psychiatry* 1999 Nov;156(11):1780-1786. [doi: [10.1176/ajp.156.11.1780](#)] [Medline: [10553743](#)]
36. Agyapong VIO, Milnes J, McLoughlin DM, Farren CK. Perception of patients with alcohol use disorder and comorbid depression about the usefulness of supportive text messages. *Technol Health Care* 2013;21(1):31-39. [doi: [10.3233/THC-120707](#)] [Medline: [23358057](#)]
37. Poushter J. Smartphone ownership and internet usage continues to climb in emerging economies. Pew Research Center. 2016 Feb 22. URL: [https://www.diapoimansi.gr/PDF/pew\\_research%201.pdf](https://www.diapoimansi.gr/PDF/pew_research%201.pdf) [accessed 2021-09-03]
38. Creswell JW, Clark VLP. *Designing and Conducting Mixed Methods Research*. Third Edition. Los Angeles: Sage Publications; 2017.
39. Bailey EJ. Sociocultural factors and health care-seeking behavior among black Americans. *J Natl Med Assoc* 1987 Apr;79(4):389-392. [Medline: [3586036](#)]
40. Kyes KB, Wickizer TM, Franklin G, Cain K, Cheadle A, Madden C, et al. Evaluation of the Washington State Workers' Compensation Managed Care Pilot Project I: medical outcomes and patient satisfaction. *Med Care* 1999 Oct;37(10):972-981. [doi: [10.1097/00005650-199910000-00002](#)] [Medline: [10524365](#)]
41. Hall JA, Dornan MC. What patients like about their medical care and how often they are asked: a meta-analysis of the satisfaction literature. *Soc Sci Med* 1988;27(9):935-939. [doi: [10.1016/0277-9536\(88\)90284-5](#)] [Medline: [3067368](#)]
42. Cooper-Patrick L, Gallo JJ, Gonzales JJ, Vu HT, Powe NR, Nelson C, et al. Race, gender, and partnership in the patient-physician relationship. *JAMA* 1999 Aug 11;282(6):583-589. [doi: [10.1001/jama.282.6.583](#)] [Medline: [10450723](#)]
43. Lewis J. Patient views on quality care in general practice: literature review. *Soc Sci Med* 1994 Sep;39(5):655-670. [doi: [10.1016/0277-9536\(94\)90022-1](#)] [Medline: [7973865](#)]
44. Piette JD. Satisfaction with care among patients with diabetes in two public health care systems. *Med Care* 1999 Jun;37(6):538-546. [doi: [10.1097/00005650-199906000-00003](#)] [Medline: [10386566](#)]
45. Bayley K, London MR, Grunkemeier GL, Lansky DJ. Measuring the success of treatment in patient terms. *Med Care* 1995 Apr;33(4 Suppl):AS226-AS235. [Medline: [7723451](#)]
46. Voss RM, Das JM. *Mental Status Examination*. Treasure Island, FL: StatPearls; Sep 16, 2021.
47. Murphy MC. The simple desire-fulfillment theory. *Nous* 1999 Jun;33(2):247-272. [doi: [10.1111/0029-4624.00153](#)]

48. Kristjanson LJ, Sloan JA, Dudgeon D, Adaskin E. Family members' perceptions of palliative cancer care: predictors of family functioning and family members' health. *J Palliat Care* 1996;12(4):10-20. [Medline: [9019032](#)]
49. Tucker J. The moderators of patient satisfaction. *J Manag Med* 2002;16(1):48-66. [doi: [10.1108/02689230210428625](#)] [Medline: [12069351](#)]
50. Batbaatar E, Dorjdagva J, Luvsannyam A, Savino MM, Amenta P. Determinants of patient satisfaction: a systematic review. *Perspect Public Health* 2017 Mar;137(2):89-101. [doi: [10.1177/1757913916634136](#)] [Medline: [27004489](#)]
51. Agyapong VI, Hrabok M, Shalaby R, Vuong W, Noble JM, Gusnowski A, et al. Text4Hope: receiving daily supportive text messages for 3 months during the COVID-19 pandemic reduces stress, anxiety, and depression. *Disaster Med Public Health Prep* 2021 Feb 08;1-5 [FREE Full text] [doi: [10.1017/dmp.2021.27](#)] [Medline: [33551009](#)]
52. Opinko D. Province announces grants to support mental health of first responders. *Lethbridge News Now*. 2022. URL: <https://lethbridgenewsnow.com/2022/02/02/province-announces-grants-to-support-mental-health-of-first-responders/> [accessed 2022-02-17]
53. Agyapong VIO, Hrabok M, Vuong W, Gusnowski A, Shalaby R, Mrklas K, et al. Closing the psychological treatment gap during the COVID-19 pandemic with a supportive text messaging program: protocol for implementation and evaluation. *JMIR Res Protoc* 2020 Jun 22;9(6):e19292 [FREE Full text] [doi: [10.2196/19292](#)] [Medline: [32501805](#)]
54. Shalaby R, Vuong W, Hrabok M, Gusnowski A, Mrklas K, Li D, et al. Gender differences in satisfaction with a text messaging program (Text4Hope) and anticipated receptivity to technology-based health support during the COVID-19 pandemic: cross-sectional survey study. *JMIR Mhealth Uhealth* 2021 Apr 15;9(4):e24184 [FREE Full text] [doi: [10.2196/24184](#)] [Medline: [33750738](#)]
55. Agyapong VIO, Hrabok M, Vuong W, Shalaby R, Noble JM, Gusnowski A, et al. Changes in stress, anxiety, and depression levels of subscribers to a daily supportive text message program (Text4Hope) during the COVID-19 pandemic: cross-sectional survey study. *JMIR Ment Health* 2020 Dec 18;7(12):e22423 [FREE Full text] [doi: [10.2196/22423](#)] [Medline: [33296330](#)]
56. Nkire N, Nwachukwu I, Shalaby R, Hrabok M, Vuong W, Gusnowski A, et al. COVID-19 pandemic: influence of relationship status on stress, anxiety, and depression in Canada. *Ir J Psychol Med* 2021 Jan 14;1-12 [FREE Full text] [doi: [10.1017/ipm.2021.1](#)] [Medline: [33441201](#)]
57. Agyapong VIO, Hrabok M, Shalaby R, Mrklas K, Vuong W, Gusnowski A, et al. Closing the COVID-19 psychological treatment gap for cancer patients in Alberta: protocol for the implementation and evaluation of Text4Hope-cancer care. *JMIR Res Protoc* 2020 Aug 12;9(8):e20240 [FREE Full text] [doi: [10.2196/20240](#)] [Medline: [32750012](#)]
58. Abba-Aji A, Li D, Hrabok M, Shalaby R, Gusnowski A, Vuong W, et al. COVID-19 pandemic and mental health: prevalence and correlates of new-onset obsessive-compulsive symptoms in a Canadian province. *Int J Environ Res Public Health* 2020 Sep 24;17(19):6986 [FREE Full text] [doi: [10.3390/ijerph17196986](#)] [Medline: [32987764](#)]
59. Nwachukwu I, Nkire N, Shalaby R, Hrabok M, Vuong W, Gusnowski A, et al. COVID-19 pandemic: age-related differences in measures of stress, anxiety and depression in Canada. *Int J Environ Res Public Health* 2020 Sep 01;17(17):6366 [FREE Full text] [doi: [10.3390/ijerph17176366](#)] [Medline: [32882922](#)]
60. Osiogo F, Shalaby R, Adegboyega S, Hrabok M, Gusnowski A, Vuong W, et al. COVID-19 pandemic: demographic and clinical correlates of disturbed sleep among 6,041 Canadians. *Int J Psychiatry Clin Pract* 2021 Jun;25(2):164-171. [doi: [10.1080/13651501.2021.1881127](#)] [Medline: [33606597](#)]
61. Sapara A, Shalaby R, Osiogo F, Hrabok M, Gusnowski A, Vuong W, et al. COVID-19 pandemic: demographic and clinical correlates of passive death wish and thoughts of self-harm among Canadians. *J Ment Health* 2021 Apr;30(2):170-178. [doi: [10.1080/09638237.2021.1875417](#)] [Medline: [33522340](#)]
62. Nkire N, Mrklas K, Hrabok M, Gusnowski A, Vuong W, Surood S, et al. COVID-19 pandemic: demographic predictors of self-isolation or self-quarantine and impact of isolation and quarantine on perceived stress, anxiety, and depression. *Front Psychiatry* 2021;12:553468. [doi: [10.3389/fpsy.2021.553468](#)] [Medline: [33597900](#)]
63. Agyapong VIO, Hrabok M, Vuong W, Gusnowski A, Shalaby R, Surood S, et al. Implementation and evaluation of a text message-based addiction counseling program (Text4Hope-Addiction Support): protocol for a questionnaire study. *JMIR Res Protoc* 2020 Nov 17;9(11):e22047 [FREE Full text] [doi: [10.2196/22047](#)] [Medline: [33200993](#)]
64. Hrabok M, Nwachukwu I, Gusnowski A, Shalaby R, Vuong W, Surood S, et al. Mental health outreach via supportive text messages during the COVID-19 pandemic: one-week prevalence and correlates of anxiety symptoms. *Can J Psychiatry* 2021 Jan;66(1):59-61 [FREE Full text] [doi: [10.1177/0706743720969384](#)] [Medline: [33131318](#)]
65. Agyapong VIO, Shalaby R, Hrabok M, Vuong W, Noble JM, Gusnowski A, et al. Mental health outreach via supportive text messages during the COVID-19 pandemic: improved mental health and reduced suicidal ideation after six weeks in subscribers of Text4Hope compared to a control population. *Int J Environ Res Public Health* 2021 Feb 23;18(4):2157 [FREE Full text] [doi: [10.3390/ijerph18042157](#)] [Medline: [33672120](#)]
66. Bovin MJ, Marx BP, Weathers FW, Gallagher MW, Rodriguez P, Schnurr PP, et al. Psychometric properties of the PTSD Checklist for Diagnostic and Statistical Manual of Mental Disorders-Fifth Edition (PCL-5) in veterans. *Psychol Assess* 2016 Nov;28(11):1379-1391. [doi: [10.1037/pas0000254](#)] [Medline: [26653052](#)]
67. Kertz S, Bigda-Peyton J, Bjorgvinsson T. Validity of the Generalized Anxiety Disorder-7 scale in an acute psychiatric sample. *Clin Psychol Psychother* 2013;20(5):456-464. [doi: [10.1002/cpp.1802](#)] [Medline: [22593009](#)]

68. Hewitt PL, Flett GL, Mosher SW. The Perceived Stress Scale: factor structure and relation to depression symptoms in a psychiatric sample. *J Psychopathol Behav Assess* 1992 Sep;14(3):247-257. [doi: [10.1007/bf00962631](https://doi.org/10.1007/bf00962631)]
69. Löwe B, Kroenke K, Herzog W, Gräfe K. Measuring depression outcome with a brief self-report instrument: sensitivity to change of the Patient Health Questionnaire (PHQ-9). *J Affect Disord* 2004 Jul;81(1):61-66. [doi: [10.1016/S0165-0327\(03\)00198-8](https://doi.org/10.1016/S0165-0327(03)00198-8)] [Medline: [15183601](https://pubmed.ncbi.nlm.nih.gov/15183601/)]
70. Bonsignore M, Barkow K, Jessen F, Heun R. Validity of the five-item WHO Well-Being Index (WHO-5) in an elderly population. *Eur Arch Psychiatry Clin Neurosci* 2001;251 Suppl 2:II27-II31. [doi: [10.1007/BF03035123](https://doi.org/10.1007/BF03035123)] [Medline: [11824831](https://pubmed.ncbi.nlm.nih.gov/11824831/)]
71. Zandvakili A, Philip NS, Jones SR, Tyrka AR, Greenberg BD, Carpenter LL. Use of machine learning in predicting clinical response to transcranial magnetic stimulation in comorbid posttraumatic stress disorder and major depression: A resting state electroencephalography study. *J Affect Disord* 2019 Jun 01;252:47-54 [FREE Full text] [doi: [10.1016/j.jad.2019.03.077](https://doi.org/10.1016/j.jad.2019.03.077)] [Medline: [30978624](https://pubmed.ncbi.nlm.nih.gov/30978624/)]
72. Ramos-Lima LF, Waikamp V, Antonelli-Salgado T, Passos IC, Freitas LHM. The use of machine learning techniques in trauma-related disorders: a systematic review. *J Psychiatr Res* 2020 Feb;121:159-172. [doi: [10.1016/j.jpsychires.2019.12.001](https://doi.org/10.1016/j.jpsychires.2019.12.001)] [Medline: [31830722](https://pubmed.ncbi.nlm.nih.gov/31830722/)]
73. Kim H, Sefcik JS, Bradway C. Characteristics of qualitative descriptive studies: a systematic review. *Res Nurs Health* 2017 Feb;40(1):23-42 [FREE Full text] [doi: [10.1002/nur.21768](https://doi.org/10.1002/nur.21768)] [Medline: [27686751](https://pubmed.ncbi.nlm.nih.gov/27686751/)]
74. Sandelowski M. Whatever happened to qualitative description? *Res Nurs Health* 2000 Aug;23(4):334-340. [doi: [10.1002/1098-240x\(200008\)23:4<334::aid-nur9>3.0.co;2-g](https://doi.org/10.1002/1098-240x(200008)23:4<334::aid-nur9>3.0.co;2-g)] [Medline: [10940958](https://pubmed.ncbi.nlm.nih.gov/10940958/)]
75. Global Psychological eHealth Foundation. URL: <https://www.gpehealth.org/> [accessed 2022-03-31]
76. Anderson GS, Di Nota PM, Groll D, Carleton RN. Peer support and crisis-focused psychological interventions designed to mitigate post-traumatic stress injuries among public safety and frontline healthcare personnel: a systematic review. *Int J Environ Res Public Health* 2020 Oct 20;17(20):7645 [FREE Full text] [doi: [10.3390/ijerph17207645](https://doi.org/10.3390/ijerph17207645)] [Medline: [33092146](https://pubmed.ncbi.nlm.nih.gov/33092146/)]

## Abbreviations

**HREB:** Health Research Ethics Board

**PTSI:** posttraumatic stress injury

**PTSD:** posttraumatic stress disorder

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