SYSTEMATIC REVIEW

Establishing the Effectiveness of Interventions Provided to First Responders to Prevent and/or Treat Mental Health Effects of Response to a Disaster: A Systematic Review

W. Tyler Winders, MD; Nirma D. Bustamante, MD, MPH; Stephanie Chow Garbern, MD, MPH; Corey Bills, MD, MPH; Amin Coker, MBChB; Indi Trehan, MD, MPH, DTM&H; Maxwell Osei-Ampofo, MD; Adam C. Levine, MD, MPH; on behalf of GEMLR

ABSTRACT

Objectives: This review systematically explores the current available evidence on the effectiveness of interventions provided to first responders to prevent and/or treat the mental health effects of responding to a disaster.

Methods: A systematic review of Medline, Scopus, PsycINFO, and gray literature was conducted. Studies describing the effectiveness of interventions provided to first responders to prevent and/or treat the mental health effects of responding to a disaster were included. Quality was assessed using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) criteria, and the Critical Appraisal Skills Programme (CASP) checklist.

Results: Manuscripts totaling 3869 met the initial search criteria; 25 studies met the criteria for in-depth analysis, including 22 quantitative and 3 qualitative studies; 6 were performed in low- and middle-income countries (LMICs); 18 studies evaluated a psychological intervention; of these, 13 found positive impact, 4 found no impact, and 1 demonstrated worsened symptoms after the intervention. Pre-event trainings decreased psychiatric symptoms in each of the 3 studies evaluating its effectiveness.

Conclusions: This review demonstrates that there are likely effective interventions to both prevent and treat psychiatric symptoms in first responders in high-, medium-, and low-income countries.

Key Words: bystander, disaster, low- and middle-income countries, mental health, posttraumatic stress disorder (PTSD)

Humanitarian crises, whether due to a natural disaster or human conflict, significantly disrupt the well-being of a population. Meeting the mental health needs of populations affected by humanitarian crises has been recognized as an important component of humanitarian response.[1–4] Training first responders to administer psychological first aid (PFA) is now entrenched in multinational guidelines from the World Health Organization, the International Federation of Red Cross, and Red Crescent Societies.[5–9] However, relatively little is known about the provision of mental health services for the first responders working in a crisis.

First responders to disasters are at high risk for adverse mental health effects. Prior studies have shown that between 10% and over 30% of all first responders may be diagnosed with posttraumatic stress disorder (PTSD).[10–13] An additional 1 in 4 may be diagnosed with depression.[14] Beyond those meeting clinical criteria for these psychiatric diagnoses, a far higher proportion of first responders experience subdiagnostic symptoms, all of which have been shown to be directly proportional to the quantity of trauma exposure.[14–16] The risks of adverse mental health effects may also be greatest in those without formal medical or disaster training. These individuals often constitute a large proportion of first responders, especially in the early stages of a humanitarian crisis.[17]

Numerous interventions ranging from pharmacologic supplements to mindfulness meditation to regimented debriefings have been described in the literature, and while the majority of publications come from high income countries, in 2018 alone, more than 134 million people in low- and middle-income countries (LMICs) were affected by humanitarian crises.[1] The primary objective of this systematic review was to explore the current state of evidence regarding the effectiveness of interventions provided to first responders to prevent

https://doi.org/10.1017/dmp.2019.140 Published online by Cambridge University Press

and/or treat the mental health effects of response to a disaster. Secondary objectives included targeted analyses of mental health interventions for first responders in LMICs and pre- versus post-event interventions.

METHODS

Search Strategies

This systematic review was developed and conducted by the Global Emergency Medicine Literature Review (GEMLR) group. The systematic review protocol was registered with PROSPERO (University of York, United Kingdom National Institute for Health Research, United Kingdom of Great Britain and Northern Ireland) on January 25, 2019. A rigorous search strategy was designed in collaboration with a health sciences medical librarian with the goal of identifying all randomized controlled trials (RCTs) and observational studies that described the effectiveness of interventions provided to first responders to prevent and/or treat the mental health effects of responding to a disaster.

Three principal bibliographic databases were reviewed with computer-assisted searches: Medline, Scopus, and PsycINFO. The used terms, key words, and phrases encompassed 3 broad themes: first responders, disasters and humanitarian crises, and psychological intervention. These terms were honed based on expert consensus and accuracy of initial trial searches. These databases were searched from their inception through December 13, 2018. EMBASE, PsycEXTRA, Clinical Trials.gov, and Google Scholar were manually reviewed for additional articles.

Data Processing

After the removal of duplicate articles, 2 teams consisting of 2 reviewers each (CB/NB and AC/SG) performed an initial screening of titles and abstracts, followed by a full-text screening employing the following exclusion criteria: (1) articles not in English, Spanish, or French; (2) articles not in the first responder or disaster population; and (3) articles with no evident, controlled psychiatric intervention (either pre- or post-event). Discrepancies were resolved by a third reviewer (WTW).

Both qualitative and quantitative studies were included and were evaluated separately. Information extracted from the final selection included author, publication date, location, study type, first responder population, methods, and relevant outcomes. Quantitative study quality was assessed using the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) criteria.[18] Criteria proposed by the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) statement were adhered to in reporting.[19] Qualitative study quality was assessed using the Critical Appraisal Skills Programme (CASP) checklist for qualitative studies.[20] Based on the 10-item CASP checklist, qualitative studies received scores of 1–10, with higher scores corresponding to higher quality.

Data Analysis

Given the heterogeneous nature of the interventions, measurements, methodologies, and outcomes, a descriptive analysis was employed. Findings were organized according to study objectives, study type, and country income level per World Bank classifications as of 2018.

RESULTS

Study Characteristics

After the removal of duplicates, 3867 unique records were identified with an additional 2 records encountered via manual gray literature searches. After title and abstract screening, 235 citations were included for full-text screening. A total of 25 studies met all inclusion/exclusion criteria and underwent an in-depth analysis (Figure 1). Of the 25 studies included for a detailed review, 22 were quantitative and 3 were qualitative. The study design included 3 RCTs, 21 observational cohorts, and 1 cross-sectional survey. Two studies evaluated pharmacologic interventions. The remainder evaluated psychological or training interventions. Six total studies took place in LMICs.

Using GRADE criteria for the quantitative studies, 12 studies were rated as "Very Low" quality, 12 as "Low" quality, 2 as "Moderate" quality, and 1 as "High" quality (Table 1).

All 3 qualitative studies took place in high-income countries. Two evaluated interventions in first responders to natural disasters, and the remaining study evaluated an intervention after a plane crash. A summary of the qualitative studies included is shown in Table 2. Based on the CASP checklist, quality varied from low to high quality. The number of CASP criteria completed were 3, 6, and 8. See Table 3.

Quantitative Studies

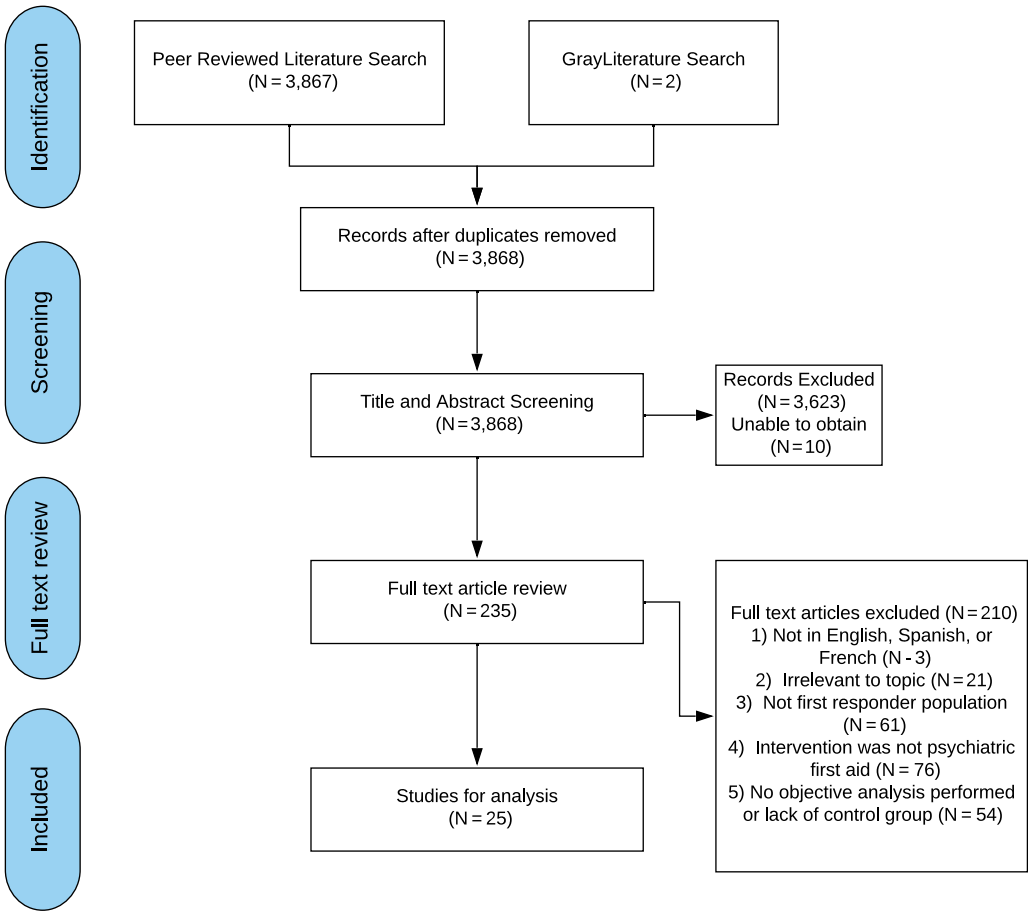
A total of 18 studies objectively assessed the effectiveness of psychological interventions administered post-event to first responders. Specific interventions varied and included Critical Incident Stress Debriefing (CISD) (4 studies), mindful meditation (2 studies), Cognitive Behavioral Therapy (CBT) (1 study), and other forms of psychotherapy or debriefing (11 studies). Thirteen studies found clinical improvements across a variety of outcomes, including PTSD scales, anxiety scales, and depression scales.

Two RCTs[30,34] assessed the effectiveness of psychological interventions. Difede et al. evaluated 31 disaster workers who were exposed to the World Trade Center attack; 16 disaster workers received CBT, and 15 received a "debriefing as usual." They found that, after 12 weeks of therapy, CBT was associated with a significant improvement in validated depression and PTSD scale scores compared with the control group.[30] Wu et al. performed a 3-arm RCT comparing a novel debriefing mechanism "512 PIM" (modified CISD with an increased

https://doi.org/10.1017/dmp.2019.140 Published online by Cambridge University Press

FIGURE 1

Prisma Flow Chart for Selected Studies



focus on cohesion) to debriefing and to no intervention (control group) in 1267 rescue personnel who provided care in the 2008 Wenchuan earthquake. This study found significant improvements in validated anxiety, PTSD, and depression scale scores in the 512 PIM group up to 4 months post-intervention compared with those who received debriefing or the control group. There was no difference between standard debriefing and the control group, although the authors did not fully explain what "standard debriefing" involved.[34] No relevant studies addressed the timing of psychological interventions.

Four observational studies evaluating debriefing and 1 evaluating integrative psychotherapy found no impact on psychological symptoms or diagnosis.[21,22,24,26,37] All 5 studies involved military rescue workers in upper middle- or high-income countries. A single study by Carlier et al. demonstrated harm from debriefing; this study evaluated 105 police officers responding to a plane crash of whom 46 received CISD, and 59 received no debriefing. The study found no significant difference in a PTSD diagnosis or symptoms between debriefed and non-debriefed subjects up to18 months post-event aside from increased risk of hyperarousal symptoms in the debriefed cohort ($P < 0.05$).[26]

Two studies did not assess an intervention explicitly but described characteristics of individuals more likely to use psychological interventions. Both studies found females to be significantly more likely to attend debriefing sessions. Additionally, they found that a higher level of education, higher exposure, and prior disaster experience were associated with the increased likelihood of attending debriefings.[24,39] All studies requesting feedback reported high levels of satisfaction (minimum 80%). PTSD symptoms were associated with very low levels of satisfaction in 2 studies.[25,39] A single study evaluated group versus individual debriefing sessions and found no difference in satisfaction between group and individual sessions.[22]

Three studies evaluated pre-event interventions: Interventions performed to reduce risks of adverse mental health outcomes after responding to a disaster. Two observational cohorts evaluated disaster response workers (professionally trained vs lay people)

https://doi.org/10.1017/dmp.2019.140 Published online by Cambridge University Press

https://doi.org/10.1017/dmp.2019.140 Published online by Cambridge University Press

TABLE 1

Quantitative Studies

Author (year)	Study Type	Country/ World Bank Classification	Participants	Intervention	Effect	GRADE
Lundin (1993)[21]	Observational cohort with pretest/ posttest	Armenia/upper middle	49 rescue workers (20 formally trained, 29 layperson)	A cohort of Swedish military emergency workers responded to an earthquake and was offered debriefing sessions afterward. Cohort was followed up with at 9 months via: The General Health Questionnaire (GES) and the Impact Event Scale (IES).	Out to 9 months, debriefing had no impact on in diagnosis accumulation between educated and non-educated persons or between professionals and non-professionals. However, pre-trained individuals had lower rates of unpleasant feelings ($P < 0.05$).	Very Low (1, 3, 4)
Deahl (1994)[22]	Observational cohort	England/high income	62 British soldiers (42 debriefing, 20 control)	Returning British soldiers received either usual care (N = 20) or post-departure debriefing (N = 42) training. Subjects were then evaluated via various tools: The General Health Questionnaire (GES) and the Impact Event Scale (IES).	No significant difference in IES or GHQ-28 scores were noted between groups ($P > 0.2$). Additionally, timing of briefing (immediate vs delayed) was not noted to affect IES or GHQ scores.	Low (3)
Karakshian[23] (1994)	Observational cohort with pretest/ posttest	Armenia/upper middle	25 Mental health professionals	25 Armenian mental health professionals were present for the 1988 Armenian earthquake disaster. They underwent peer group debriefings with symptoms characterized via the Hamilton Rating Scale for Depression and the DSM-III Criteria for posttraumatic stress disorder (PTSD).	Debriefings reduced scores for depression ($P = 0.05$) and also for PTSD ($P = 0.0001$).	Low (1, 3)
Kenardy (1996)[24]	Cross-sectional	Australia/high	195 Emergency services personnel (62 debriefed, 133 control)	Psychological debriefing was offered "as soon as possible" in emergency services personnel responding to the 1990 Newcastle earthquake. The General Health Questionnaire (GES) and the Impact Event Scale (IES) were used to evaluate symptoms.	Debriefed subjects were more likely to be female and of higher education level ($P < 0.05$). Debriefed subjects trended toward less improvement in symptoms on the IES and GHQ-12 compared to those not debriefed.	Low (2, 4)
Armstrong (1998)[25]	Observational cohort	United States/ high	112 Red Cross workers	Subjects working with the American Red Cross during the Los Angeles earthquake were provided a Multiple Stressor Debriefing (MSD) on exiting their service. Depending on staff availability, individuals participated in individual or group debriefing, followed by a survey.	There was no difference noted in the questionnaire between those in individual vs group experiences. Within group debriefings (MSD): fewer participants per facilitator were associated with greater satisfaction ($P = 0.002$).	Very Low (1, 3)
Carlier (1998)[26]	Observational cohort with pretest/ posttest	Netherlands/ high	105 Police officers (46 debriefed, 59 control)	CISD was offered "as soon as possible" after operations by police officers responding to plane crash. Symptomatology was reassessed at 8- and 18-months post-incident via the structured interview for PTSD (SI-PTSD) administered by trained psychologists.	No significant difference was encountered in PTSD diagnosis or symptoms between debriefed and non-debriefed subjects at 8 or 18 months aside from increased risk of hyperarousal symptoms in the debriefed cohort ($P < 0.05$)	Very Low (1, 3)
Nurmi (1999)[27]	Observational cohort	Finland/high	98 Prehospital providers	CISD was provided to 3 groups of rescue personnel (pilots, firefighters, and policemen) after a mass casualty event in Finland. Nurses were not provided CISD.	Nurses were more distressed when compared to the other 3 groups who received CISD ($P < 0.01$). Nurses had higher levels of anxiety (SCL-90) than the other 3 groups ($P < 0.0001$). Of all person who were debriefed, majority found CISD to be useful (> 60%).	Low (1, 3)

TABLE 1

Continued

Author (year)	Study Type	Country/ World Bank Classification	Participants	Intervention	Effect	GRADE
Wee (1999)[28]	Observational cohort	United States/ high	65 Fire and emergency response personnel (42 intervention, 23 controls)	CISD was mandatory for response providers, although only 42 completed CISD. A self-administered questionnaire was completed. The Frederick Reaction Index – Adult (FRIA) instrument was used to quantify PTSD symptoms.	The average reported FRI-A score was 12.01 (SD 7.45). Those who participated in CISD process scored significantly lower on FRI-A scale 10.78 vs 14.31 ($P = 0.036$)	Low (3, 4)
Hagh-Shenas[29] (2005)	Observational cohort	Iran/upper middle	100 Untrained students, 18 Red Crescent workers, and 36 firefighters	90 Days post-earthquake, first responders received a survey to compare the responses of those with formal training (Red Crescent workers and firefighters) to those without formal training (student volunteers). The Civilian Mississippi Scale (ESHEL), the General Health Questionnaire (GHQ-28), and the Anxiety Sensitivity Index scores were used.	Mean of ESHEL subscales for intrusive thoughts, inability to control emotions, depressive symptoms were higher in students than in Red Crescent workers and firefighters ($P < 0.01$). Untrained responders had higher anxiety scores, lower social functioning, and were more likely to develop PTSD ($P < 0.01$)	Low (2,3)
Difede (2007)[30]	Randomized controlled trial	United States/ high	31 Disaster workers (16 cognitive behavioral therapy [CBT], 15 control)	31 Trained first responders to the World Trade Center attacks in 2001 were randomized into 12 weeks of CBT or treatment as usual. Multiple validated clinical and self-administered instruments assessed for depression and PTSD symptoms.	Less than 50% of the CBT group completed treatment. Dropouts generally had lower levels of income and education. Within and between groups, completion of CBT was associated with statistically significant decreases CAPS ($P = 0.01$) and PCL scores ($P = 0.04$) (screens for depression and PTSD symptoms).	Moderate (1, 2)
Engel (2008)[31]	Observational cohort	United States/ high	4159 Soldiers	Active duty soldiers during the Iraq War attending sick call filled out a simple questionnaire addressing depression and PTSD symptoms. Completed forms are reviewed and scored by the primary care provider for that visit who referred soldiers to the appropriate level of mental health care.	Screens of 10% (404) were positive for depression, PTSD, or both. Forty-eight soldiers had at least 1 follow-up assessed by telephone in the first 6 to 10 weeks. Of those referred, by 12 weeks, 19 of 30 (63%) had a clinically significant drop.	Very Low (1, 3)
Waelde (2008)[32]	Observational cohort	United States/ high	20 Mental health workers	Ten weeks after Hurricane Katrina, 20 mental health workers participated in medication workshop that included an 8-week home medication program and were followed up at 3 and 8 weeks via mail-in assessments (PTSD Checklist, Center for Epidemiological Studies - Depression Scale, State-Trait Anxiety Inventory)	Participants of 93% reported improvement. Statistically significant decreases in PTSD and anxiety symptoms were noted across the 8 weeks ($P < 0.05$).	Low (1, 3, 4)
Essar (2010)[33]	Observational cohort	Israel/high	25 Israeli Defense Forces rescue personnel	Pre-traumatic vaccination (PTV) is a pre-deployment intervention consisting of exposure, reaction, and coping. Twenty-five individuals responded to a gas pipe explosion in Tel Aviv; 13 had received PTV (N = 13) prior to the accident and were compared to those without PTV (N = 12). The Dissociative Experience Scale (DES) and Impact of Event Scale (IES-R) were evaluated post-disaster.	PTV was found to be effect vs non-PTV, with statistically significantly lower DES and IES-R scores. DES Score: 10.1 (SD: 7.4) vs 18.1 (SD: 18.1), $P = 0.011$ IES-R Score: 34.3 (SD: 10.6) vs 27.5 (SD: 7.1), $P = 0.085$	Low (3, 4)

(Continued)

https://doi.org/10.1017/dmp.2019.140 Published online by Cambridge University Press

TABLE 1

Continued

Author (year)	Study Type	Country/ World Bank Classification	Participants	Intervention	Effect	GRADE
Wu (2011)[34]	Randomized controlled trial	China/upper middle	1267 Military personnel (417 "512 PIM" group, 421 debriefing group, and 429 control group)	Rescue personnel who provided care in the 2008 Wenchuan earthquake were randomized to 1 of 3 groups: "512 PIM," debriefing, or no intervention (control). Symptom evaluation took place pre-intervention assessment (baseline) and 3 follow-up assessments: at 1, 2, and 4 months post-intervention. The DSM–IV diagnostic criteria for PTSD and Hospital Anxiety and Depression Scale (HADS) were employed in the assessments.	SI-PTSD and HADS total scores were significantly lower in the "512 PIM" group than in the other 2 groups at 2 months ($P < 0.01$) and at 4 months ($P < 0.01$). Between the 1- and 4-month follow-up, significant differences between "512 PIM" and the other 2 groups were found in re-experiencing ($P < 0.01$), avoidance ($P < 0.01$), or hyperarousal ($P < 0.01$). No significant difference was found between the debriefing and control groups ($P = 0.23$).	High (2)
Nishi (2012)[35]	Randomized controlled trial	Japan/high	172 Disaster medical assistance workers (86 fish oil + psychoeducation, 86 psychoeducation alone)	172 of the 1816 disaster medical team workers to the Great East Japan Earthquake were recruited and randomized to either fish oil + psychoeducation or psychoeducation alone. Patients were reassessed at 2, 4, 8, and 12 weeks after the start of fish oil supplementation. The Impact of Event Scale-Revised (IES-R) was used to evaluate symptomatology.	At a mean 14.2 weeks of follow-up, there was no difference between fish oil + psychoeducation and psychoeducation alone ($P = 0.39$). Both groups decreased in symptoms over the time period.	Moderate (1, 3)
Palgi (2012)[36]	Observational cohort	Lebanon/upper middle	13 Soldiers of the Special Army Administrative Staff	13 Soldiers working inpatient as part of the Special Army Administrative Staff in the Second Lebanon War underwent 7 group therapy sessions. The Impact of Event Scale – Revised (IES-R) was used to measure severity of symptoms.	Vulnerability declined during the therapy. Resiliency was unchanged. A decrease in the IES-R (PTSD symptoms) was noted over the intervention period ($P = 0.033$).	Very Low (1, 3)
Haugen (2015)[37]	Observational cohort with pretest/ posttest	United States/ high	36 Disaster responders	United States World Trade Center disaster responders received at least 3 sessions of integrative psychotherapy. A minority of participants (39%) were also in concurrent pharmacotherapy. The OQ-45.2, a validated distress instrument, was completed before the first session and after the last session.	Seven of the 36 clients experienced improvement (18.9%). Nine of the 36 clients experienced deterioration (27%). Those who experienced sudden gains had improvements in symptoms from the beginning to the end of treatment ($P = 0.07$). Linear regression modeling indicated that sudden gains were not significantly associated with higher levels of psychological distress; however, sudden deteriorations were.	Low (3, 4)
Iwakuma (2015)[38]	Observational cohort	Japan/high	17 Health professionals	17 Health professionals who provided care in the 2011 Japanese earthquake were instructed on breath-based meditation for stress reduction. Intervention: single session, with pretest/posttest using the Temporary Mood Scale (TMS).	All components of the Temporary Mood Scale showed statistically significant improvements after meditation.	Very Low (1, 2, 3)

TABLE 1

Continued

Author (year)	Study Type	Country/ World Bank Classification	Participants	Intervention	Effect	GRADE
Haugen (2016)[39]	Observational cohort	United States/ high	29 First responders	World Trade Center responders with a diagnosis of partial or full PTSD received outpatient psychotherapy and completed weekly measures of therapeutic alliance, technique (cognitive behavioral [CB] or psychodynamic interpersonal [PI]) and symptom distress.	Subjects who reported lower alliances reported better outcomes when their therapist used more PI techniques ($P = 0.01$) and/or CB techniques ($P = 0.05$). Subjects with higher alliances tended to have better outcomes when their therapist used fewer CB techniques ($P = 0.01$). No significant statistical difference in demographics and outcome of posttraumatic psychological disorders.	Low (1, 2, 3, 4)
Waelde (2017)[40]	Observational cohort	Philippines/ lower middle	68 Counselors and psychologists	12 Weeks post-typhoon, subjects received psychological screening and training in Mindfulness Meditation.	Exposure to more types of typhoon-related stressors and more positive training experiences was related to expectations to use meditation ($P = 0.05$). Depression, anxiety, and PTSD were not significantly related to plans to employ meditation.	Low (1, 3)
Ke (2017)[41]	Observational cohort with pretest/ posttest	Taiwan/high	67 Health care professionals	All individuals responding to earthquake received the following: during intervention (on-site debriefing and physical therapy), immediate postoperation (debriefing), and 1 year follow-up.	Of health care providers, 16.4% developed immediate symptoms of PTSD; 9 months post-event, 0% had symptoms. Presence of symptoms was not associated with any demographic variable, although nurses trended toward having a higher incidence of symptoms than physicians (22.9% vs 9.4%)	Very Low (2, 3)
Tran (2018)[43]	Observational cohort	United States/ high	167 Firefighters	Firefighters responding to the Oklahoma City bombing volunteered for debriefing. Initial assessment was performed via National Institute of Mental Health Diagnostic Interview Schedule (DIS) for DSM-III-R10 and Disaster Supplement.	Of total, 65% were (very or mostly) satisfied with the debriefing. Subjects with PTSD were more likely to be very dissatisfied with the debriefings, compared to the workers without PTSD ($P = 0.044$). Increasing avoidance/numbing symptoms were associated with being dissatisfied with the debriefings ($P = 0.001$).	Very Low (1, 3)

https://doi.org/10.1017/dmp.2019.140 Published online by Cambridge University Press

TABLE 2

Qualitative Studies

Author (year)	Country/World Bank Income Classification	Participants	Intervention (duration, type, description)	Data Analysis Method	Effect	# CASP Criteria Completed
McCarroll (1992)[46]	United States/high	Rescue workers who responded to the crash of United Airlines flight 232 in Sioux City, Iowa in July 198.9	A military psychiatric consultation team was deployed and administered presentations to the general group, as well as individual consultations. Longitudinal therapeutic relationships were maintained with the unit leader, his wife, and 2 other team members.	Personal summary and report	At 6 weeks, a return to normalcy was evident. The workers were able to discuss the disaster events with less affect and reconstruct their actions on the day of the disaster in an unemotional, but not detached, manner. They acknowledged that there were difficult choices that had to be made. Some rescue workers were labeled heroes during the disaster. These individuals had been selected for awards and honors and were often asked to give speeches. Consultations with heroes acknowledged the pleasure of their recognition, as well as the cost.	3
Smith (1994)[47]	United States/high	10 Police officers	10 Police officers who had provided disaster relief after Hurricane Hugo underwent CISD and interviews describing symptoms severity and quality of life.	Not specified.	Participants described consistent reactions of empathy, helplessness, anger, guilt, sleep disturbance, worsening symptoms of medical conditions, gastrointestinal disturbances, flashbacks; aftermath processed in phases – shock/disbelief, emotional release. CISD provided symptom relief of flashbacks.	6
Iwakuma (2017)[38]	Japan/high	17 Health professionals who provided care in the 2011 Japanese earthquake	17 Health professionals who provided care in the 2011 Japanese earthquake were instructed on breath-based meditation for stress reduction. The instruction consisted of a single session, which entailed a pretest and a posttest that assessed temporary moods of depression, anger, fatigue, vigor, strain, and confusion, using the Temporary Mood Scale (TMS). The posttest also offered a qualitative, handwritten section.	Steps Coding and Theorization (SCAT) was used	Emerging common themes were emancipation from chronic and bodily senses; holistic sense: transcending mind-body; returning an axis in life through reflection, self-control, and/or gratitude; meditation into mundane, everyday life; and coming out of pain in the aftermath of the earthquake.	8

TABLE 3

Critical Appraisal Skills Program (CASP) Checklist

Author (year)	1. Was there a clear statement of the aims of the research?	2. Is a qualitative methodology appropriate?	3. Was the research design appropriate to address the aims of the research?	4. Was the recruitment strategy appropriate to the aims of the research?	5. Was the data collected in a way that addressed the research issue?	6. Has the relationship between researcher and participants been adequately considered?	7. Have ethical issues been taken into consideration?	8. Was the data analysis sufficiently rigorous?	9. Is there a clear statement of findings?	10. How valuable is the research?
McCarroll (1992)[46]	Yes	Yes	No	No	No	Yes	No	No	No	Due to the lack of listed aims and outcomes, it is difficult to truly appreciate the impact of the intervention. Therefore, the value is low.
Smith (1994)[47]	Yes	Yes	Yes	No	Yes	Yes	Yes	No	No	The analysis leaves doubts to the rigor and reflexivity, but it does help explore CISD in police officer first responders
Iwakuma (2017)[38]	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No	The research provides valuable data that meditation may be a valuable tool in the post-disaster healing process.

to 2 distinct earthquakes. One cohort was followed for 90 days and the other for 9 months. Both found that laypeople had significantly higher rates of unpleasant feelings and PTSD symptoms during these time frames.[17,21] The third study evaluated pretraumatic vaccination (PTV) in 25 Israeli Defense Forces rescue personnel, which involved predeployment intervention consisting of exposure, reaction, and coping. Subsequently, 25 individuals responded to a pipe explosion in Tel Aviv, and only 13 had received PTV. Within 48 hours of the event, PTV was shown to reduce the psychological impact of the disaster via several validated scales.[36]

A single RCT by Nishi et al. evaluated a pharmacologic intervention, fish oil supplementation, for attenuating posttraumatic stress symptoms.[35] This study assigned rescue workers responding to the Great East Japan earthquake to a group who received fish oil supplementation, as well as psychoeducation versus a group that received psychoeducation alone. This trial found no difference between the 2 groups out of 12 weeks.[35]

Only 6 studies, varying from "Very Low" to "High" quality, performed in LMICs met criteria for inclusion. One controlled cohort demonstrated no effect of debriefing on first responders to the 1988 Armenian earthquake.[21] Each of the remaining 5, including 4 cohorts and 1 found RCT, found debriefing to be useful for preventing or alleviating mental health symptoms in first responders to crises in the LMIC setting.[23,29,34,36,40]

Qualitative Studies

Three qualitative study met criteria for inclusion. Iwakuma et al. offered a breath-based meditation session and evaluated a written interview post-intervention.[38] The authors found the following themes: emancipation from chronic and bodily senses, holistic/transcending sensation, reflection, and self-control – and therefore concluded that meditation is a viable option for temporary relief from disaster-related mental health symptoms. McCarrol et al. evaluated the experiences of a military psychiatric consultation team that was deployed to provide care for responders after a major plane crash.[45] This study noted that, with time, "return to normalcy was evident" and also found that individuals labeled heroes for their work, "acknowledged the pleasure of their recognition, as well as the cost."[45] Smith et al. evaluated interviews of 10 police officers who provided disaster relief in the aftermath of Hurricane Hugo and focused on their disaster experiences and perceived utility of CISD.[46] In this study, participants described consistent reactions of empathy, helplessness, anger, guilt, sleep disturbance, worsening symptoms of medical conditions, gastrointestinal disturbances, and flashbacks. They noted that CISD provided symptom relief from flashbacks.[46]

DISCUSSION

While heterogeneity of studies limited our ability to perform formal meta-analyses, this review demonstrated that both prevention and treatment of psychiatric symptoms in first responders are possible and effective in high-income countries and LMICs.

The majority of studies focused on treatment rather than prevention. These studies varied from high quality to very low quality (GRADE criteria), and the interventions themselves ranged from CISD to meditation to multiple stressor debriefing. Yet, the studies generally demonstrated that psychological interventions were cathartic, generally well received, and effective in reducing symptoms of anxiety, hyperarousal, and depression post-disaster. However, the actual timing of delivery of psychological intervention in first responders has not been studied, and thus the optimal window for intervention remains unclear.

Given that psychological interventions likely positively impact the mental health outcomes in first responders post-disaster, it is important to consider identification of at-risk individuals to improve utilization rates of therapy. A large US military cohort study found that questionnaires combined with protocolized screening and referral effectively referred symptomatic individuals for psychological intervention who ultimately reported improvement in PTSD and anxiety symptoms from baseline.[31] Unfortunately, pre-intervention rates were not reported. In terms of recognition, training sessions have been shown to increase identification of recognition of PTSD in first responders.[47]

Interestingly, a 3-armed RCT found that locally modified CISD with increased cohesion training, named "512 PIM," significantly improved anxiety and depression symptoms, yet, debriefing (which did include CISD) was no different than no intervention at all. This study highlights that adapting a general framework (CISD) to local cultural norms is more effective than standard debriefing. The lack of difference amongst the general debriefing and no intervention groups underscores the importance for interventions to be considered in the local sociocultural context.[34] Additionally, this was the only study to focus on cohesion training, which emphasizes the importance of personal relationships, which have been shown to have a protective effect against psychiatric symptoms in military units.[45]

Prevention was evaluated in 3 studies.[27,29,33] It was effective to varying degrees in all 3, most notably in the Essar et al. publication evaluating PTV.[33] These articles underscore the important nature of preventive interventions coupled with reactionary treatments. This review highlights the need for future work in the area of symptom prevention and pre-event interventions.

Pharmacotherapy is considered an important option in the treatment of disaster victims[5]; yet, only 1 pharmacologic study in the first responder population was found.[35] While some extrapolation from non-first responder populations may exist,

https://doi.org/10.1017/dmp.2019.140 Published online by Cambridge University Press

there is a paucity of literature in both populations and a need for future studies to be performed regarding pharmacologic adjuncts to prevention and treatment of adverse mental health outcomes.

Finally, amongst our 25 included studies evaluating psychological interventions, 20 different symptomatology scales were used. There is a strong need for a development of standards to help guide future research.

Limitations

Based on the language skills of this study's authors, this systematic review was limited to articles published in English, Spanish, and French; studies published in other languages addressing this topic have therefore not been included. Additionally, LMICs were underrepresented, and no studies from South America or Africa met criteria for inclusion. This may limit the generalizability of this study's results to regions of the world that face different sets of challenges in implementing mental health interventions for disaster responders. Many of the lower quality studies have small sample sizes, lack formal control groups, and are subject to significant biases, such as observer and selection bias, simply based on study design; however, the high quality RCTs do lend credence to the overall positive findings in this review. Additionally, this study included all types of first responders, from laypeople to soldiers, and thus our findings may be challenging to generalize to any 1 specific group. Last, heterogeneity of study design, interventions, and outcomes limited the possibility of formal meta-analysis.

CONCLUSIONS

The current evidence is largely heterogeneous and low quality; yet, both pre- and post-crisis psychological interventions appear effective in reducing the mental health burden on responders working in complex humanitarian crises. There is a need for future behavioral studies, pharmacotherapy studies, studies conducted in LMICs, and consensus guidelines meant to standardize instruments used amongst investigators.

About the Authors

Department of Emergency Medicine, Medical University of South Carolina, Charleston, South Carolina (Dr Winders); Brigham and Women's Hospital, Boston, Massachusetts (Dr Bustamante); Department of Emergency Medicine, Warren Alpert Medical School of Brown University, Providence, Rhode Island (Drs Garbern, Levine); Department of Emergency Medicine, University of California San Francisco School of Medicine, San Francisco, California (Dr Bills); Emergency Medicine Directorate, Komfo Anokye Teaching Hospital, Kumasi, Ghana (Mr Coker, Mr Osei-Ampofo); Lao Friends Hospital for Children, Luang Prabang, Lao, PDR (Dr Trehan) and Department of Pediatrics, Washington University in St. Louis, St. Louis, Missouri (Dr Trehan).

Correspondence and reprint requests to W. Tyler Winders, Department of Emergency Medicine, Medical University of South Carolina, 169 Ashley Ave., MSC 300, Charleston SC 29425 (e-mail: tylerwinders@gmail.com).

REFERENCES

1. Global Humanitarian Overview 2018. Interactive.unocha.org. United Nations Office for the Coordination of Humanitarian Affairs; 2017.
2. World Health Organization (WHO). *Environmental health in emergencies and disasters: a practical guide*. World Health Organization; 2002.
3. Perrin P. War and public health. In: *Handbook on War and Public Health*. International Committee of the Red Cross; 1996.
4. Update of the Mental Health Gap Action Programme (mhGAP) guidelines for mental, neurological and substance use disorders. World Health Organization; 2015.
5. Hansen P. *Psychosocial interventions: a handbook*. International Federation Reference Centre for Psychosocial Support; 2009.
6. Hobfoll SE, Watson P, Bell CC, et al. Five essential elements of immediate and mid-term mass trauma intervention: empirical evidence. *Psychiatry*. 2007;70:283-315.
7. Bisson JI, Tavakoly B, Witteveen AB, et al. TENTS guidelines: development of post-disaster psychosocial care guidelines through a Delphi process. *Br J Psychiatry*. 2010;196:69-74.
8. Cassan P, Markenson D, Lo G, et al. *International first aid and resuscitation guidelines*. Geneva, International Federation of Red Cross and Red Crescent Societies; 2011.
9. Vymetal S, Deistler A, Bering R, et al. European Commission project: European guideline for target group-oriented psychosocial aftercare-implementation. *Prehosp Disaster Med*. 2011;26:234-236.
10. Marmar CR, Weiss DS, Metzler TJ, et al. Longitudinal course and predictors of continuing distress following critical incident exposure in emergency services personnel. *J Nerv Ment Disord*. 1999;187:15-22.
11. North CS, Tivis L, McMillen JC, et al. Coping, functioning and adjustment of rescue workers after the Oklahoma City bombing. *J Trauma Stress*. 2002;15:171-175.
12. Weiss DS, Marmar CR, Metzler TJ, Ronfeldt HM. Predicting symptomatic distress in emergency services personnel. *J Consult Clin Psychol*. 1995;63:361-368.
13. Ursano RJ, Fullerton CS, Vance K, Kao TC. Posttraumatic stress disorder and identification in disaster workers. *Am J Psychiatry*. 1999;156:353-359.
14. Osofsky HJ, Osofsky JD, Arey J, et al. Hurricane Katrina's first responders: the struggle to protect and serve in the aftermath of the disaster. *Disaster Med Public Health Prep*. 2011;5(Suppl 2):S214-219.
15. Neria Y, Nandi A, Galea S. Post-traumatic stress disorder following disasters: a systematic review. *Psychol Med*. 2008;38(4):467-480.
16. Jones S. Describing the mental health profile of first responders: a systematic review. *J Am Psychiatric Nurses Assoc*. 2017;23(3):200-214.
17. Fullerton CS, Ursano RJ, Vance K, et al. Debriefing following trauma. *Psychiatr Q*. 2000;71(3):259-276.
18. Guyatt GH, Oxman AD, Schunemann HJ, et al. GRADE guidelines: a new series of articles in the *Journal of Clinical Epidemiology*. *J Clin Epidemiol*. 2011;64(4):380-382.
19. Guyatt GH, Oxman AD, Vist GE, et al. GRADE: an emerging consensus on rating quality of evidence and strength of recommendations. *BMJ*. 2008;336(7650):924-926.
20. Moher D, Liberati A, Tetzlaff J, et al. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *PLoS Med*. 2009;6(7):e100097.
21. Critical Appraisal Skills Programme. CASP qualitative checklist. 2019. https://casp-uk.net/wp-content/uploads/2018/01/CASP-Qualitative-Checklist-2018.pdf. Accessed August 10, 2019.
22. Lundin T, Bodegård M. The psychological impact of an earthquake on rescue workers: a follow-up study of the Swedish group of rescue workers in Armenia, 1988. *J Trauma Stress*. 1993;6(1):129-139.
23. Deahl MP, Gillham AB, Thomas J, et al. Psychological sequelae following the Gulf War. Factors associated with subsequent morbidity and the effectiveness of psychological debriefing. *Br J Psychiatry*. 1994;165(1):60-65.
24. Karakshian M. Countertransference issues in crisis work with natural disaster victims. *Psychother Theor Res Pract Train*. 1994;31(2):334-341.

https://doi.org/10.1017/dmp.2019.140 Published online by Cambridge University Press

25. Kenardy JA, Webster RA, Lewin TJ, et al. Stress debriefing and patterns of recovery following a natural disaster. *J Trauma Stress*. 1996;9(1):37-49.
26. Armstrong K, Zatzick D, Metzler T, et al. Debriefing of American Red Cross personnel: pilot study on participants' evaluations and case examples from the 1994 Los Angeles earthquake relief operation. *Soc Work Health Care*. 1998;27(1):33-50.
27. Carlier I, Lamberts R, Van Uchelen A, Gersons B. Disaster-related posttraumatic stress in police officers: a field study of the impact of debriefing. *Stress Med*. 1998;14(3):143-148.
28. Nurmi LA. The sinking of the Estonia: the effects of critical incident stress debriefing (CISD) on rescuers. *Int J Emerg Ment Health*. 1999;1(1):23-31.
29. Wee DF, Mills DM, Koehler G. The effects of critical incident stress debriefing (CISD) on emergency medical services personnel following the Los Angeles civil disturbance. *Int J Emerg Ment Health*. 1999;1(1):33-37.
30. Hagh-shenas H, Goodarzi MA, Dehbozorgi G, Farashbandi H. Psychological consequences of the Bam earthquake on professional and nonprofessional helpers. *J Trauma Stress*. 2005;18(5):477-483.
31. Difede J, Malta LS, Best S, et al. A randomized controlled clinical treatment trial for World Trade Center attack-related PTSD in disaster workers. *J Nerv Ment Dis*. 2007;195(10):861-865.
32. Engel CC, Oxman T, Yamamoto C, et al. RESPECT-Mil: feasibility of a systems-level collaborative care approach to depression and post-traumatic stress disorder in military primary care. *Mil Med*. 2008;173(10):935-940.
33. Waelde LC, Uddo M, Marquett R, et al. A pilot study of meditation for mental health workers following Hurricane Katrina. *J Trauma Stress*. 2008;21(5):497-500.
34. Essar N, Palgi Y, Saar R, Ben-ezra M. Pre-traumatic vaccination intervention: can dissociative symptoms be reduced? *Prehosp Disaster Med*. 2010; 25(3):278-284.
35. Wu S, Zhu X, Zhang Y, et al. A new psychological intervention: "512 Psychological Intervention Model" used for military rescuers in Wenchuan earthquake in China. *Soc Psychiatr Epidemiol*. 2012; 47(7):1111-1119.
36. Nishi D, Koido Y, Nakaya N, et al. Fish oil for attenuating posttraumatic stress symptoms among rescue workers after the Great East Japan earthquake: a randomized controlled trial. *Psychother Psychosom*. 2012; 81(5):315-317.
37. Palgi Y, Ben-ezra M, Possick C. Vulnerability and resilience in a group intervention with hospital personnel during exposure to extreme and prolonged war stress. *Prehosp Disaster Med*. 2012;27(1):103-108.
38. Haugen PT, Goldman RE, Owen J. Sudden gains and deteriorations in the treatment of posttraumatic stress disorder in World Trade Center responders. *J Nerv Ment Disord*. 2015;203(3):205-209.
39. Iwakuma M, Oshita D, Yamamoto A, Urushibara-Miyachi Y. Effects of breathing-based meditation on earthquake-affected health professionals. *Holist Nurs Pract*. 2017;31(3):177-182.
40. Haugen PT, Werth AS, Foster AL, Owen J. The role of theory-specific techniques and therapeutic alliance in promoting positive outcomes: integrative psychotherapy for World Trade Center responders. *J Nerv Ment Disord*. 2016;204(12):955-959.
41. Waelde LC, Hechanova MRM, Ramos PAP, et al. Mindfulness and mantra training for disaster mental health workers in the Philippines. *Mindfulness*. 2017;9(4):1181-1190.
42. Ke YT, Chen HC, Lin CH, et al. Posttraumatic psychiatric disorders and resilience in healthcare providers following a disastrous earthquake: an interventional study in Taiwan. *Biomed Res Int*. 2017;2017:2981624.
43. Tran DV, North CS. The association between dissatisfaction with debriefing and post-traumatic stress disorder (PTSD) in rescue and recovery workers for the Oklahoma City bombing. *Disaster Med Public Health Prep*. 2018;12(6):718-722.
44. Whealin JM, Batzer WB, Morgan CA, et al. Cohesion, burnout, and past trauma in tri-service medical and support personnel. *Mil Med*. 2007; 172:266-272.
45. Te Brake H, Dückers M, De Vries M, et al. Early psychosocial interventions after disasters, terrorism, and other shocking events: guideline development. *Nurs Health Sci*. 2009;11(4):336-343.
46. McCarroll J, Ursano R, Fullerton C, Wright K. Community consultation following a major air disaster. *J Community Psychiatry*. 1992;29:271-275.
47. Smith CL, De Chesnay M. Critical incident stress debriefings for crisis management in post-traumatic stress disorders. *Med Law*. 1994;13(1-2): 185-191.
48. Zimmerman G, Weber W. Care for the Caregivers: a program for Canadian military chaplains after serving in NATO and United Nations peacekeeping missions in the 1990s. *Mil Med*. 2000;165(9):687–90.

https://doi.org/10.1017/dmp.2019.140 Published online by Cambridge University Press