Systematic Review

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Web-Based Psychosocial Interventions for Disaster-Related Distress: What Has Been Trialed in the Past, and What Can We Learn From This?

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Abstract

Objectives: To summarize reports describing implementation and evaluation of Web-based psychosocial interventions for disaster-related distress with suggestions for future intervention and research, and to determine whether a systematic literature review on the topic is warranted.
Methods: Systematic searches of Embase, PsycINFO, and MEDLINE were conducted. Duplicate entries were removed. Two rounds of inclusion/exclusion were conducted (abstract and full-text review). Relevant data were systematically charted by 2 reviewers.
Results: The initial search identified 112 reports. Six reports, describing and evaluating 5 interventions, were included in a data analysis. Four of the 5 interventions were asynchronous and self-guided modular programs, with interactive components. The fifth was a short-term, online supportive group intervention. Studies utilized a variety of evaluation methods, and only 1 of 14 outcome measures used across the studies was utilized in more than 1 project.
Conclusions: Several Web-based psychosocial interventions have been developed to target disaster-related distress, but few programs have been formally evaluated. A systematic review of the topic would not be recommended at this time due to heterogeneity in reported studies. Further research on factors impacting participation, generalizability, and methods of program delivery with consistent outcome measures is needed.

Disasters often result in psychosocial distress for those involved or exposed (eg, victims, first responders, and witnesses).[1,2] Failure to address psychosocial distress can result in the development of mental health disorders, which often last years and require specialized treatment.[1,2] Competing demands in the immediate aftermath of disasters (eg, managing influx of patients, family reunification, maintaining security, and supporting staff needs) can impede the identification, assessment, and treatment of psychological casualties.[3,4] Longer term barriers to mental health assessment and treatment include socioeconomic factors and lack of effective communication about, or physical access to, resources.[3,4] Though the importance of addressing psychosocial needs in a post-disaster environment has been widely reported and many organizations worldwide now include psychosocial responses in their disaster response plans,[5,6] there is limited systematic research on the effectiveness of psychosocial disaster interventions.[7]

The COVID-19 pandemic has negatively impacted the mental health of individuals worldwide, with increased rates of depression, anxiety, suicide attempts, and drug use.[8–10] One common emotional reaction to the COVID-19 pandemic is fear of becoming ill or infecting one's family, causing individuals to avoid social spaces, including doctors' offices and hospitals.[8] In addition to mental health disorders, unhelpful social behaviors have been identified with disaster-related distress. Through the COVID-19 pandemic, social disruption has produced group behaviors such as panic buying.[11] Researchers have noted that online cognitive behavioral therapy may be a potential option to address cognitive restructuring and behavioral modification.[11] Web-based mental health resources, including cognitive behavioral therapy and other evidence-informed psychosocial interventions, could be highly advantageous at this time, due to government recommendations to stay home whenever possible, fear of social spaces, the large number of individuals suffering from psychosocial distress, and the fact that COVID-19 has forced many to rely on web-based software for personal and professional communication.

Mental health care is complex, as differing populations and symptoms require various forms of intervention. This is further complicated when translating to a web-based approach, as this format has its own set of factors to consider (eg, whether a program is synchronous or asynchronous, interactive).[12–15] Nonetheless, research has highlighted guided web-based interventions as a promising treatment method, revealing that they can be as, or more, effective as

traditional face-to-face mental health interventions.[16–18] Multiple systematic and scoping reviews have been conducted to amalgamate literature on web-based psychosocial interventions (though not necessarily disaster-specific). There is wide heterogeneity in the types of interventions available,[17] method of delivery,[19] target populations (including the potential inclusion of caregivers or partners),[20] and target symptoms;[21] existing reviews generally focus on a specific subset. For instance, some reviews focus on interventions with specific features of interest (eg, interactive components or cognitive behavioral strategies), whereas others report on interventions targeting a specific population.[20,22] For example, Berryhill et al. (2019) published a review of 33 articles about *video-conferencing psychotherapy* for the treatment of *depression*.[17] Other reviews focus on program outcomes, for example, evaluations methods,[23] specific patient outcomes, or comparisons with traditional face-to-face care.[22,24] One example is a systematic review of *randomized controlled trials* of digital psychological interventions in low- or middle-income countries.[18] Those authors concluded that further research in the field is needed, with systematic approaches to evaluate the interventions, in order to improve their efficacy and reproducibility.[18] Promising data on the positive impact of web-based psychosocial interventions, and the potential relative advantages of this approach (eg, increasing accessibility of mental health care), highlight the importance of additional work in this field.[16,18,22,25–27]

As the use of web-based mental health supports has been expedited due to the COVID-19 pandemic,[25–30] it is important to synthesize knowledge gained in the past and apply these lessons in a timely and effective manner in order to mitigate negative mental health outcomes worldwide.[31] Web-based psychosocial interventions have been developed for and utilized in previous disaster response,[32] with reports on the development and implementation processes.[32] It is difficult to evaluate such interventions in the immediate aftermath of disasters;[6,33,34] it is unclear whether there is enough published data to warrant a systematic literature review of the effectiveness of these interventions.

This paper reports on a scoping review conducted to synthesize 14 years of research data on the evaluations of web-based psychosocial interventions/resources used to address disaster-related distress, and to summarize lessons learned.[35] The paper concerns interventions for distress related to a disaster, as well as possible underlying mental health conditions. For the purposes of the paper, we defined disaster as any natural or man-made catastrophe, such as tornados or outbreaks, that impacted a large population. The primary aim in conducting this review was to create evidence-informed suggestions for the use of web-based psychosocial interventions/resources in response to the COVID-19 pandemic. To accomplish this aim, we sought to answer the following research questions:

1. What web-based psychosocial disaster-response interventions have been evaluated?
2. What types of evidence are available for such interventions?
3. What lessons have been learned through program implementation and evaluation?
4. Would a systematic literature review of the topic be warranted/beneficial at this time?

Literature Search and Methods

The Preferred Reporting Items for Scoping Reviews (PRISMA-ScR) guided protocol development and manuscript preparation.[36]

Search

Comprehensive database searches of MEDLINE (PubMED), Embase, and PsycINFO were conducted on April 7, 2021, using the search strategies outlined in Appendix A to identify all relevant documents. The search strategy was adapted by the primary reviewer (MBK) from a strategy drafted by an experienced librarian for a larger study regarding psychosocial response in disaster situations.[7] Search results were exported to Microsoft Excel and all duplicates (n = 8) were removed by the primary reviewer.

Study Selection

Two reviewers (MBK, JD) separately screened each abstract for the following inclusion/exclusion criteria (where abstracts were not available, the full report was reviewed):

Inclusion criteria

1. Use of a specific web-based psychosocial intervention/resource in response to disaster-related distress.
2. Paper discusses intervention outcomes (eg, evaluation of feasibility or effectiveness) or experience in implementation (eg, lessons learned).

Exclusion criteria

1. Countries not included in the Organization for Economic Cooperation and Development (as healthcare systems, disaster responses, types of disasters, and Internet availability differ greatly worldwide, this criterion was used with hopes of creating actionable and relevant conclusions by targeting specific countries).
2. War/refugee situations (in an effort to increase homogeneity of data).
3. Conference abstracts (not enough information for data extraction).

The full report was read and reviewed separately by each reviewer in a second round; reports were included if they met both inclusion criteria and none of the exclusion criteria. Disagreements in study selection were discussed and resolved between the two reviewers.

Data Charting

Included reports were read and relevant data were extracted using a systematic approach to reduce risk of bias. A data-charting spreadsheet was developed by the primary reviewer in consultation with the secondary reviewer and supervising author (JE). Information regarding type of disaster was identified, in addition to broader data extraction regarding three categories of interest, to answer the first three research questions: (1) type of intervention/resource, (2) type of evaluation conducted, and (3) conclusions, lessons learned, and suggestions for future work. The two reviewers separately charted data from each included report, discussed and compared results until reaching consensus on most relevant information to include. The data-charting spreadsheet was iteratively updated throughout the process of data charting.

Data Synthesis

Reports were not grouped for synthesis and reporting, due to the small number of included reports. Data are reported according to the three categories of interest: (1) type of intervention/resource,
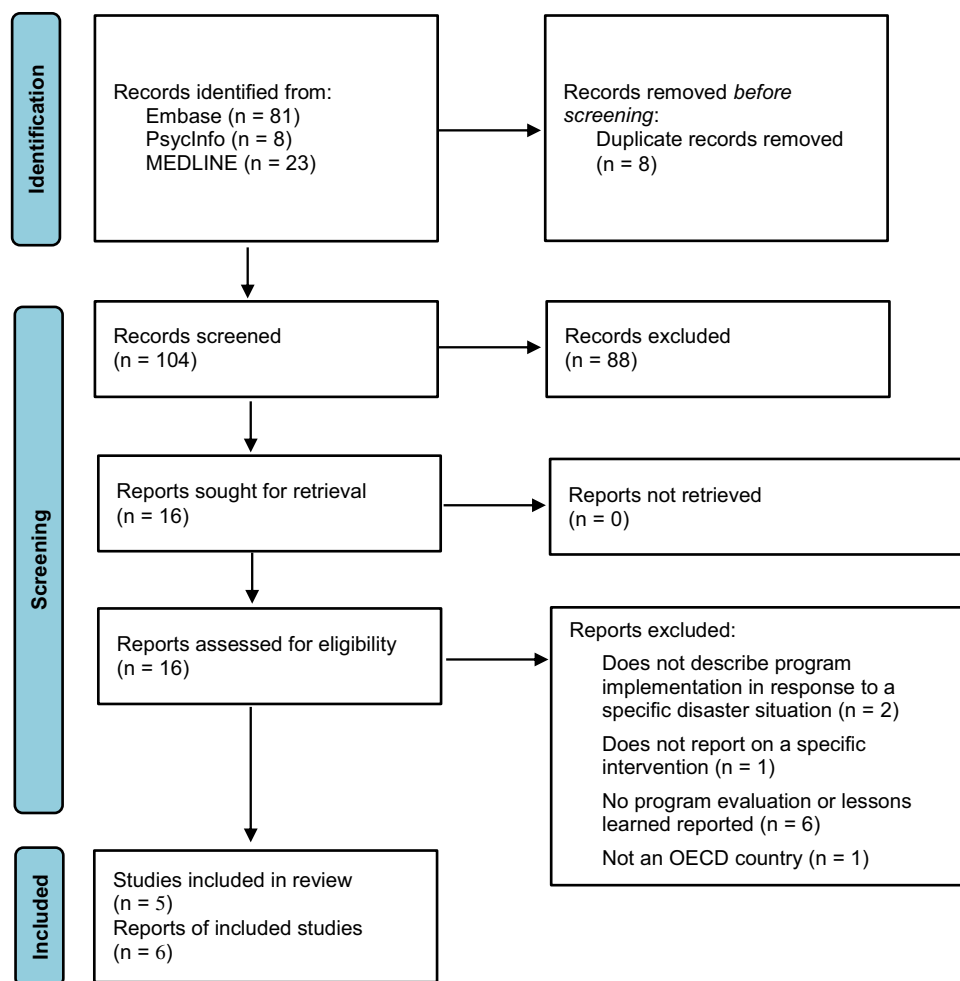
Figure 1. PRISMA flow diagram.

(2) type of evaluation conducted, and (3) conclusions, lessons learned, and suggestions for future work. Categorical data are primarily reported in tables and charts, and descriptive data are primarily reported in a narrative format.

Results

Selection of Sources of Evidence

The results of the scoping review are summarized in a PRISMA diagram (Figure 1).[35] The initial search yielded 112 entries, which was reduced to 104 after duplicates were removed. Based on the abstract review and the inclusion/exclusion criteria, 16 entries were included and 88 were excluded. The full texts of these 16 reports were retrieved and reviewed using the same inclusion/exclusion criteria as the previous round. Six reports were included in this review. Many protocol papers for ongoing studies were screened; however, they did not meet inclusion criteria to be included within this study.

Results and Characteristics of Sources of Evidence are presented according to our 3 main categories of interest.

The interventions

The six included reports discussed the implementation of five interventions in response to three types of disasters (Figure 2):
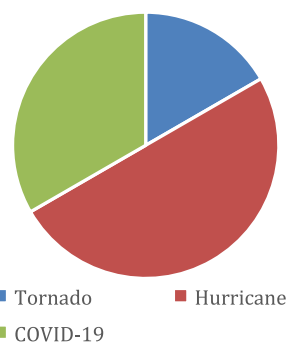
Figure 2. Disaster Type Reported On.

Bounce Back Now,[24] *My Disaster Recovery,*[6] *Disaster Recovery Web,*[33,37] *COndiVIDi,*[25] and an *online cognitive behavioral intervention for dysfunctional worry*[28] (see Table 1 for details).

Bounce Back Now (BBN) is an interactive, self-guided modular program created for disaster-affected adolescents. The four modules were developed considering best evidence for the topics of interest (listed in Table 1), and utilize psychoeducation, behavioral activation, motivational enhancement, and cognitive

Table 1. Intervention details

Intervention	Population	Modules	Screening*	Engagement	Timeline
Bounce Back Now	Adolescents	1. Posttraumatic stress disorder (PTSD) 2. Depression 3. Alcohol use 4. Tobacco use	Modules accessed based on participant interest; screening upon module entry	Asynchronous, self-guided, interactive	Available for 4 months
Disaster Recovery Web	Adults	1. PTSD 2. Depression 3. Generalized anxiety disorder 4. Panic disorder 5. Marijuana use 6. Alcohol use 7. Cigarette smoking	Screen used to identify relevant modules prior to access	Asynchronous, self-guided, interactive	Meant to be 1-time use, available for 4 months
My Disaster Recovery	Adults	1. Seeking professional help 2. Relaxation 3. Social support 4. Unhelpful ways of coping 5. Self-talk 6. Trauma triggers and memories	N/A	Asynchronous, self-guided, interactive	Minimum 30 days of access
COndiVIDi	Psychotherapists, psychology students/trainees and the general public	N/A	N/A	Synchronous psychotherapist-facilitated supportive groups (separate for each target population); 8-12 participants per group	3 weekly sessions
Online Cognitive Behavioral Intervention for Dysfunctional Worry	Adults	1. Worry and evolutionary function of worrisome thoughts 2. Problem solving for solvable problems 3. Identifying and decreasing unhelpful checking or reassurance-seeking behaviors 4. Detaching from unhelpful worrisome thoughts 5. Focus-shifting behaviors + summary and relapse prevention	N/A	Asynchronous, self-guided, interactive	3-week program

Screening refers to screening that is integrated into the intervention, not screening for research study eligibility.

behavioral strategies. Participants complete a short screen upon accessing each module; participants are encouraged to complete the associated module if they screen positive; otherwise, they are given the option of completing or leaving the module.[24]

Disaster Recovery Web (DRW) is a brief, self-guided modular intervention intended for one-time use by victims of disasters. DRW consists of seven modules (topics listed in Table 1) developed based on literature regarding mental health and health risk correlates of disaster, behavioral therapy and brief interventions, and motivational interviewing and enhancement. Participants first complete a screen and are directed to a dashboard with relevant modules. Participants are told which modules they did not "screen into" that they can access if they wish.[33,37]

My Disaster Recovery (MDR) is an interactive, self-guided modular program that tailors the experience to individual users, targeting coping self-efficacy pathways based on social cognitive theory.[6] It includes six modules (topics listed in Table 1).[6]

COndiVIDi (the Italian word for "sharing") is an online supportive group intervention that was offered over three weeks of the first lockdown associated with the COVID-19 pandemic in Milan, Italy. Multiple, structured weekly groups facilitated by two expert psychotherapists were run with 8 to 12 participants of a specific population for homogeneity.[26]

A brief, online, self-guided psychological intervention targeting COVID-19-related worry (no name provided) was developed to address unhelpful worry and behavioral manifestations. This three-week intervention includes five interactive modules (topics listed in Table 1).[28]

Time

Time to program implementation from disaster occurrence ranged from immediately to one-year post-disaster. Timeline of intervention use intended by development teams ranged from one visit to

12 weeks. Three out of the five interventions offered participants four months of access.[24,33,37]

Population

Some interventions targeted sub-populations of the demographic of interest (ie, disaster-affected individuals). Four out of the five interventions were tailored to disaster-affected adults (n = 4),[6,26,33] whereas BBN targeted adolescents.[24] COndiVIDi included supportive groups for specific adult populations (ie, psychotherapists and psychology students/trainees).[26]

Intervention Components

Most interventions were modular treatments (n = 4).[6,24,28,33] The process of accessing modules varied between programs. For instance, DRW screened all users prior to module access, encouraging users to access and complete relevant modules,[33,37] whereas participants were to complete all modules in sequential order for some programs.[6,32] Module content differed between interventions. Most included the use of cognitive behavioral therapy strategies and behavioral interventions (n = 3).[6,24,28] Some incorporated the use of self-efficacy pathways while encouraging self-help (n = 2),[6,37] motivational enhancement (n = 2),[24,37] and psychoeducation (n = 2).[24,26] All five interventions included interactive components. The majority of interventions were asynchronous and self-guided (n = 4);[6,24,28,33] COndiVIDi was the only synchronous, therapist-guided intervention.[26]

Type of Distress Targeted

Interventions targeted differing forms of mental health disorders or distress. Three interventions targeted posttraumatic stress disorder (PTSD),[6,24,33] depression,[6,24,37] and substance abuse.[24,33,37] Worry and other anxiety symptoms were targeted by two interventions.[6,28,33,37]

Evaluations/studies

The six included reports described five studies evaluating the interventions; two reports described different outcomes of one study evaluating the implementation of DRW.[33,37] Details regarding study design and outcomes measured are summarized in Table 2. All reports describe aspects of acceptability;[6,24,26,28,33,37] efficacy or effectiveness were evaluated in four of the included reports.[6,24,26,37] All studies used quantitative outcome measures,[6,24,26,28,33,37] with two of six reports evaluating both qualitative and quantitative outcomes.[26,37]

Population and sample size. Studies were conducted in three countries (Figure 3). Sample sizes ranged from 52–2000 participants. Most studies targeted an adult population (n = 4);[6,26,33] one targeted adolescents.[24] Participants were mainly female in three studies,[6,26,28] with equal distribution between males and females in two (one of which used a targeted sampling approach to achieve equal distribution).[24,33,37] Most studies (n = 4) included a control group.[6,24,28,37]

Measures used. Fourteen validated questionnaires were used across the studies (some were modified for the purposes of the project) (Table 2). The Center for Epidemiologic Studies Depression Scale (CES-D) was used in two studies[6,33,37]; all others were used in only one described study.

Conclusions, lessons learned, and suggestions for future work (Appendix B)

Evaluations of BBN revealed factors impacting access and use of Web-based interventions. There were varying access rates and predictors of access for different modules, with higher rates of access in the PTSD module among adolescents who met criteria for PTSD, reported recent alcohol use, or had parents who were more educated or had accessed health-related information via the Internet.[24] However, those who met diagnostic criteria for depression were not necessarily more likely to access the related module.[24] Overall, being male was a significant predictor for decreased access for all modules, whereas parental use of the Internet was strongly associated with increased access in three of four modules.[24] Overall, the evaluation of BBN in tornado-affected adolescents by Price et al. (2015) provided empirical support that web-based interventions can have high rates of penetration in a population over a relatively brief period of time.[24] They also revealed less of a gender discrepancy in accessing mental health interventions than previously reported in studies of face-to-face interventions,[24,38] possibly indicating that the increased privacy afforded by Web-based treatments may facilitate access.[24]

Price et al. (2013) revealed no difference in rates of non-use or dropout attrition from DRW between white, African American, and Hispanic hurricane-affected adults,[33] despite previously reported disparities in the access of traditional mental health services between these racial groups.[39]

The 2012 study conducted by Price et al. revealed other factors (related to demographics, impact of disaster, and prior Internet use) that may be important to consider regarding use and attrition in web-based interventions. Age was found to be a predictor of non-use of the website and completion attrition.[37] Though older participants were less likely to access the website, education buffered against this effect, and older participants were more likely to complete the intervention upon access.[37] Property damage was associated with increased dropout attrition.[37] Loss of basic services was a predictor of access and completion of more treatment modules.[37] Prior health-seeking behaviors for mental health or having parents who had used the Internet to obtain health-related information were associated with increased rates of accessing web-based interventions.[37] Previous personal use of the Internet to seek health-related information reduced non-use attrition,[40] and those who had previously accessed mental health supports were more likely to access web-based interventions.[37] Authors concluded that this supported the potential for web-based interventions to act as a post-disaster "booster" or reminder of prior learnings for those who had previously accessed therapy.[37] The most frequent reason for lack of access reported by participants was lack of relevance to their needs.[37]

Steinmetz et al. (2012) found that MDR was effective in reducing worry and depressive symptoms, compared to information-only and care-as-usual groups, but not in helping with posttraumatic stress or coping self-efficacy.[6] The authors concluded that this may indicate that symptoms of worry and depression may be more prevalent in the post-acute phase of disasters.[6]

COndiVIDi was the only intervention that connected multiple users.[26] Participants appreciated connecting with others who had similar experiences (ie, psychotherapists being grouped with other psychotherapists). Participants also reported that having online interactions and being part of a group were extremely important to their emotional well-being during times of social distancing.[26] The most important factor for facing emotions was the opportunity to share emotions and learn from others' experience and

Table 2. Study details

| Year of publication	Authors	Intervention	Primary aim	Participants	Design	Data collection/outcome measures
2015	Price M, Yuen E, Davidson TM, Hubel G, and Ruggiero KJ	Bounce Back Now	To determine the proportion of adolescents in urban and nonurban areas affected by tornadoes who completed a Web-based treatment[23]	2000 Adolescents (plus parents) from Alabama and Missouri	Randomized controlled trial	Computer-assisted telephone interviews (baseline and 4-month follow-up) gathered the following information: - Demographics - Disaster impact; physical presence, injury, concern for others, displacement, lost pet or lack of access to water, food, electricity or clean clothes for more than 1 week - Adolescent mental health; validated structured interview - Parent mental health; Kessler-6 for anxiety and depression - Internet access
2013	Price M, Davidson TM, Andrews JO, and Ruggiero KJ	Disaster Recovery Web	To determine the differences in use and completion of by white, African American, and Hispanic adults[32]	1249 Adults from Galveston and Chambers Counties	Longitudinal uncontrolled	Computer-assisted telephone interviews (baseline and 4-month follow-up) gathered the following information: - Demographics - Disaster impact - Mental health symptoms; Posttraumatic Checklist-Civilian Version (PCL-C), and Centre for Epidemiologic Studies-Depression Scale (CES-D) - Mental health service utilization; questions regarding health-seeking behaviors and use of Internet for health information
2012	Price M, Gros DF, McCauley JL, Stauffacher Gros K & Ruggiero KJ.		To examine predictors of nonuse and dropout attrition[36]			
2012	Steinmetz SE, Benight CC, Bishop SL, and James LE	My Disaster Recovery	To conduct an initial test of effectiveness of the My Disaster Recovery website after a major disaster[6]	56 Adults recruited from a larger study at the University of Texas Medical Branch	Randomized controlled trial	- Demographics - Stressful feelings and thoughts; Perceived Stress Scale - Coping self-efficacy; Coping Self-Efficacy Scale for Trauma - Posttraumatic stress disorder (PTSD); Modified PTSD Symptoms Scale - Depression; CES-D - Uncontrollable worry; Penn State Worry Questionnaire - Website use and user satisfaction
2020	Brusadelli E, Ferrari L, Benetti M, Bruzzese S, Tonelli GM, and Gullo S	COndiVIDi	To qualitatively explore individuals' participation in a supportive psychodynamically oriented group during the first lockdown in Milan in March 2020[25]	52 Adults across 3 categories: psychotherapists, psychologists in training/ clinical psychology students, and the general population		- Qualitative exploration of participants' subjective experience; 1-time, 90-minute focus groups which were videotaped and analyzed using 2 methods: 1. Content analysis (thematic coding) 2. Linguistic inquiry word count
2021	Wahlund T, Mataix-Cols D, Olofsdotter Lauri K, de Schipper E, Ljótsson B, Aspvall K, and Andersson E	Online cognitive behavioral intervention for dysfunctional worry	To rapidly evaluate the efficacy of a brief, online, self-guided psychological intervention targeting COVID-19-related worry and behavioral manifestations[27]	670 Adults	Randomized waiting-list controlled trial	- Anxiety; Adapted Generalized Anxiety Disorder – 7-item scale - Functional impairment; COVID-19 adapted version of the Work and Social Adjustment Scale - Depression; MADRS-S - Intolerance of Uncertainty; Intolerance of Uncertainty Scale - Insomnia; Insomnia Severity Index
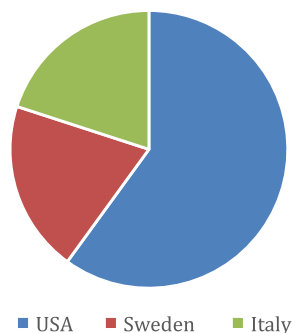
Figure 3. Country of study.

perspectives.[26] The online group helped individuals become aware of their emotions, psychological struggles, and avoidant strategies.[26]

The online cognitive behavioral intervention for dysfunctional worry was associated with improved daily functioning, depressive symptoms, tolerance of uncertainty, and COVID-19-related worry (40% vs 17% in the intervention and control groups, respectively).[28]

Identified Strengths of the Web-Based Approach

Multiple potential strengths of web-based mental health programming, compared to face-to-face interventions, were highlighted. Most often described were benefits related to reaching a wide audience, through mechanisms of increased inclusivity, acceptability, and reduced discrepancies in care. Specifically, studies of DRW by Price et al. (2012, 2013) confirmed the potential for high rates of penetration in a population over a brief period,[24] especially in self-guided, asynchronous programs, as well as the potential of Web-based interventions to *reduce discrepancies* in mental health care.[24,33] The authors reported that this format of intervention may increase acceptability or willingness to participate in certain populations (eg, adolescent boys)[24] and accessibility of programming.[3,33] Similarly, in evaluating BBN, Price et al. (2015) reported the potential benefit of increased inclusivity (ie, fewer exclusion criteria for participation).[37] Finally, it was reported that self-guided programs can reduce the potential of therapist drift and improve the consistency of treatment delivery.[28]

Suggestions for Future Research

1. **Aim to increase generalizability;** generalizability of reported findings may be limited by small sample size,[6,26] unequal gender distribution,[26] higher than average reported participant income (compared to other disaster research),[33] and generally high Internet access and usage rates in the country of study.[28] Compensating individuals for participation may have also inflated adherence rates.[24,33]
2. **Identify predictors of program access, completion, and benefit;** demographic variables, relevance of intervention to cultural groups, and individual history of accessing Web-based health information should be considered so that future implementation efforts can focus on those most likely to engage in and/or benefit from interventions.[6,26,28,33,37] Similarly, motivational factors for access and completion of Web-based interventions should be investigated.[37]

3. **Evaluate the impact of the timeline of intervention/evaluation in relation to different outcomes of interest;** existing data may not reflect effectiveness of the intervention if individuals recovered from disaster-related distress prior to accessing supports. Three reports described relevance of content as a factor influencing participation,[6,33,37] with authors noting that specific content may be more (or less) relevant to users at certain timepoints in recovery.[6,24]
4. **Gather general measures of Internet use and familiarity, as well as health behaviors/help-seeking, and detailed website usage data** to help explore correlations between time spent online and outcomes of interest, and identify most acceptable and/or effective modules, pages, or topics.[6,24,37]
5. **Assess longer-term effects of interventions.**[37]
6. **Utilize controls with approximately the same time commitment as the intervention;**[24] most included randomized controlled trials had non-interactive, information-based controls (which were less time-intensive than interventions) and showed higher completion or access in the control groups (not statistically significant), compared to the interactive intervention, and no difference in satisfaction.[28,37]
7. **Evaluate web-based interventions as part of a stepped care approach,**[24,37] or as a "booster" for those who have had prior mental health treatment.[37]

Recommendations for Future Programming

1. Develop strategies to access households without computers to increase accessibility; this might include the use of tablet and smartphone interventions,[24,33] possibly as part of a multimethod strategy, alongside paper-based approaches.[24]
2. Include social networks or interactive content (eg, games).[24]
3. Partner with experts in graphic design, marketing, and other relevant fields to create highly engaging content.[37]

Limitations

Few reports met the inclusion criteria of this work, and there was a large heterogeneity in these studies; this limited the authors' ability to draw conclusions regarding effectiveness of these interventions, or to make suggestions for response to distress caused by the COVID-19 pandemic. Specifically, this limited the capacity to identify all strengths or drawbacks of web-based approaches and to generalize findings. Future research might expand the criteria to capture work done in countries not included in the Organization for Economic Cooperation and Development and in chronic disasters, such as war/refugee situations.

Discussion

This review identified reports describing the implementation and evaluation of web-based mental health interventions for disaster-related distress in Organization for Economic Cooperation and Development countries over the last 14 years. Five interventions were described in the six included reports. The small sample size (n = 6) of included reports highlights the lack of research evaluating online post-disaster mental health interventions, specifically in the acute phase of disaster (most interventions were implemented months-to-a-year following the disaster). Results reveal the importance of expanding work in this field, as this method of care provision creates the capacity to reach a large and diverse audience

over a relatively brief time period, while offering a level of privacy that may increase target users' willingness to participate.[3,24,33,37]

Research has shown that it can take 17 years for knowledge translation from research to practice.[41] Though the gap in online mental health interventions for disaster-related distress has been identified in very recent years, it is likely that the circumstances surrounding COVID-19 (ie, the need for physical distancing, heightened focus on potential adverse mental health outcomes) fast-tracked knowledge translation in this field. Two studies included in this review were responding to the current COVID-19 pandemic, and multiple protocol papers were identified in the process of this review, highlighting the quickly growing nature of the field. This work identified a variety of factors that should be considered in ongoing/future work. Suggestions included increasing generalizability by using larger sample sizes that include adequate representation from a diverse population (considering gender, economic status, and other sociodemographic variables), assessing longer-term outcomes, gathering general measures of Internet use and familiarity, gathering detailed intervention usage data, and evaluating the use of online interventions as part of a stepped-care program.

There was a wide heterogeneity observed across included reports, in project aims, sample size, timeline of intervention and data collection, type of intervention, outcome measures, and so on. The CES-D was the only outcome measure used in more than one study (n = 2), one evaluating program acceptability, the other effectiveness. This highlights the lack of consistency between the included reports due to differing methodology and outcome measures. This inconsistency is similar to the literature on (non-disaster) online psychological interventions,[18] and, in combination with the small number of studies included, leads to the conclusion that a systematic review to compare outcome data for web-based psychosocial interventions for disasters would not be warranted at this time. However, a systematic review could be beneficial in the near future, considering the ongoing work during the COVID-19 pandemic identified in this review.

The heterogeneity in identified reports may be a relative advantage in terms of identifying lessons learned and making suggestions for future work, as included studies evaluated both feasibility *and* effectiveness of post-disaster web-based mental health treatments. The included studies revealed high levels of intervention acceptability and promising results regarding effectiveness and potential for rapid scaling and access of web-based mental health treatments. Methods of improving program engagement and potential effectiveness were also discussed, such as incorporating engaging, interactive materials, and social networks.[6,24]

Previous literature highlights the importance of interactivity in online interventions,[16] agreeing with suggestions from included reports to focus on interactivity in future work. Interestingly, included randomized controlled trials comparing interactive interventions (eg, DRW) to non-interactive, information-based websites showed no difference in website satisfaction between groups and lower website access and completion in the interactive intervention.[28,37] The authors noted that the non-interactive information-based controls required less of a time commitment from participants; authors highlighted the need for future work to include controls with a similar time commitment as the intervention.[24] This finding might indicate decreased time commitment as a facilitator of engagement. Future work should evaluate engagement in, and impact of, interventions with varying time commitments to identify the minimum "dosage" or amount of time needed for individuals to benefit and the length of intervention with most

uptake/engagement (ie, the amount of time that individuals are willing to commit).

Commonalities in general structure were identified across interventions though specific content and evaluation methods differed; most interventions described were modular, asynchronous, and self-guided.[6,24,28,33] Cognitive behavioral therapy strategies and behavioral interventions were most commonly used in these interventions.[6,24,28] These strategies have been proven effective in treating emotional distress following varying types of traumatic events (including use in disaster response), for both group and individual treatments.[42–46] Strategies to enhance self-efficacy and encourage self-help,[6,37] motivational enhancement,[24,37] and psychoeducation were also described.[24,26] Interventions covered a variety of topics, from PTSD to worry and the evolutionary function of worrisome thoughts. Different topics may be more relevant at different timepoints post-disaster; modular programs should consider timepoint of offering each module (or topic) post-disaster.[6] For example, upon evaluating the use of MDR in addressing worry and depression post-disaster, the authors concluded that feelings of worry and depression may be most relevant in the post-acute phase and perhaps should not be targeted immediately.[6] Perhaps specific social and maladaptive coping behaviors (eg, panic buying and excess alcohol consumption)[11] would be important to target proactively in the acute phase post-disaster. Future work should also aim to identify correlations between time variables (ie, length of overall program and time spent using the interventions/resources) and patient outcomes. Qualitative exploration of the types of distress and maladaptive coping behaviors over time, in response to a disaster, could guide the planning of future programming. Increasing the relevance of content to the target end-users could increase engagement, as "lack of relevance" was reported as the primary reason for lack of engagement in DRW.[37] Another possible way to increase program relevance in the future is to combine multiple programs. As the programs reported on here included content on a variety of topics, combining such interventions would increase the likelihood of perceived relevance for any given individual.

In addition to amalgamating the respective modules of self-guided programming, they might consider adding an asynchronous element to encourage social support by connecting individuals with similar experiences. The opportunity for social interaction and connection with peers was appreciated by participants in the COndiVIDi study,[26] and the literature identifies social support as a powerful tool to mitigate adverse mental health outcomes.[26,40] Individuals have reported feeling better upon connecting to others by participating in online disaster-related activities via social media,[40] even when quantitative effectiveness data do not support a correlation between online behaviors and improved well-being.

Most interventions were self-guided. Positive outcomes following participation in self-guided programming indicate that the guidance of a trained professional is not necessarily critical to program success. This is important, as self-guided programs are highly cost-effective and scalable and can result in increased consistency of treatment delivery without scheduling limitations or risk of therapist drift.[28]

Conclusion

The potential negative mental health effects of disasters are widely recognized. Web-based mental health interventions have grown in popularity over recent years, a trend that has been expedited due to the COVID-19 pandemic. Many interventions have been

developed or proposed to address post-disaster mental health needs for varying populations from victims to first responders, children to adults, and so on, though a systematic evaluation of such interventions is sparse. Understanding the impact of these interventions is imperative to support the mental health of individuals during the COVID-19 pandemic. The results of this study have identified potential strengths of web-based approaches, though more work is needed to confirm these findings. Future work should highlight program accessibility and generalizability, and content relevance across heterogeneous populations.

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APPENDIX A.: Search Strategies Utilized for Each Database Searched

Database: Embase Classic+Embase <1947 to 2021 April 07> Search Strategy:

1. exp mass disaster/
2. exp disaster/
3. exp disaster planning/
4. exp pandemic/
5. exp terrorism/
6. (mass disaster or mass emergency or mass event* or mass trauma or "mass trauma and assessment" or mass casualty incident* or MCI or CBRNE or pandemic or traumatic events or large scale traumatic event or terrorist event or crisis event).mp.
7. or/1-6
8. exp posttraumatic stress disorder/
9. exp psychosomatic disorder/
10. exp acute stress/ or exp mental stress/
11. exp psychologic test/ or exp screening/ or exp psychological aspect/
12. exp psychologic assessment/

13. exp mental disease/ or exp separation anxiety/
14. exp burnout/
15. (psychological casualty or psychological damage or psychological trauma or psychological injury or psychological wounds or emergency mental health care or emergency mental health or emergency psychiatric or psychogenic reaction or acute stress syndrome or acute stress injur* or post traumatic stress disorder or PTSD or common psychological injuries of major event* or walking wounded or walk in patient* or early arriving patient* or patient* arriv* early or psychological screening or psychological assessment or psychological response or vicarious trauma or delayed psychological response or (famil* adj3 separat*)).mp.
16. or/8-15
17. exp early intervention/
18. exp psychosocial care/
19. exp mental health care/ or mental health service/
20. exp ambulatory care/
21. exp psychotherapy/ or exp cognitive therapy/ or exp behavior therapy/
22. exp psychiatric treatment/
23. (early intervention or (management adj5 psychological casualty) or psychosocial management or psychiatric care or distress management or supportive counseling or psychological triage or prevention of PTSD or prevention of post traumatic disorder or psychological first aid or psychological intervention or emotion* support or code orange hospital care or code orange medical team or code orange healthcare professional or code orange plan or code orange policy or code orange psychological care or code orange hospital impact).mp.
24. or/17-22
25. exp internet/
26. 7 and 16 and 24 and 25
27. limit 25to (English language and yr="2007-current")

Database: PsycINFO <1806 to 2021 April 7> Search Strategy:

1. exp Disasters/
2. exp Terrorism/
3. exp Pandemics/
4. exp Emergency Preparedness/
5. (mass disaster or mass emergency or mass event* or mass trauma or "mass trauma and assessment" or mass casualty incident* or MCI or CBRNE or pandemic or traumatic events or large scale traumatic event or terrorist event or crisis event).mp.
6. or/1-5
7. exp Emotional Trauma/ or exp Posttraumatic Stress Disorder/
8. exp Psychological Stress/
9. exp Mental Health/ or exp Mental Disorders/
10. exp Mass Hysteria/ or exp Psychopathology/ or exp Psychiatric Symptoms/ or exp Somatoform Disorders/
11. exp Distress/ or exp Stress Reactions/
12. exp Emotional Responses/
13. exp Vicarious Experiences/
14. (psychological casualty or psychological damage or psychological trauma or psychological injury or psychological wounds or emergency mental health care or emergency mental health or emergency psychiatric or psychogenic reaction or acute stress syndrome or acute stress injur* or post traumatic stress disorder or PTSD or common psychological injuries of major event* or walking wounded or walk in patient* or early arriving patient* or patient* arriv* early or psychological screening or psychological assessment or psychological response or vicarious trauma or delayed psychological response or (famil* adj3 separat*)).mp.
15. or/7-14
16. exp Mental Health Services/
17. exp Crisis Intervention/
18. exp Stress Management/

19. exp Early Intervention/
20. exp Psychotherapy/ or exp Intervention/
21. exp Counseling/ or exp Supportive Psychotherapy/
22. exp Coping Behavior/
23. exp Emotional Security/ or exp Social Support/ or exp Emotional Adjustment/
24. (early intervention or (management adj5 psychological casualty) or psychosocial management or psychiatric care or distress management or supportive counseling or psychological triage or prevention of PTSD or prevention of post traumatic disorder or psychological first aid or psychological intervention or emotion* support or code orange hospital care or code orange medical team or code orange healthcare professional or code orange plan or code orange policy or code orange psychological care or code orange hospital impact).mp.
25. or/16-24
26. exp internet/
27. 6 and 15 and 25 and 26
28. limit 27 to (english language and yr="2007 -Current")

Database: Ovid MEDLINE(R) ePub Ahead of Print, In-Process and Other Non-Indexed Citations, Ovid MEDLINE(R) Daily, Ovid MEDLINE and Versions(R) <1946 to 2021 April 7> Search Strategy:

1. exp disasters/ or exp disaster planning/ or emergencies/ or emergency shelter/ or mass casualty incidents/ or relief work/ or rescue work/
2. exp terrorism/ or bioterrorism/ or chemical terrorism/ or mass casualty incidents/ or september 11 terrorist attacks/
3. Pandemics/
4. (mass disaster or mass emergency or mass event* or mass trauma or "mass trauma and assessment" or mass casualty incident* or MCI or CBRNE or pandemic or traumatic event or large scale traumatic events or terrorist event or crisis event).mp.
5. or/1-4
6. exp stress disorders, traumatic/ or battered child syndrome/ or combat disorders/ or stress disorders, post-traumatic/ or stress disorders, traumatic, acute/
7. emergency services, psychiatric/
8. exp Stress, Psychological/
9. exp Adaptation, Psychological/
10. exp Burnout, Professional/
11. (psychological casualty or psychological damage or psychological trauma or psychological injury or psychological wounds or emergency mental health care or emergency mental health or emergency psychiatric or psychogenic reaction or acute stress syndrome or acute stress injur* or post traumatic stress disorder or PTSD or common psychological injuries of major event* or walking wounded or walk in patient* or early arriving patient* or patient* arriv* early or psychological screening or psychological assessment or psychological response or vicarious trauma or delayed psychological response or (famil* adj3 separat*)).mp.
12. exp Mental Disorders/
13. or/6-12
14. exp Mental Health Services/
15. Crisis Intervention/
16. exp Counseling/
17. child guidance/ or community mental health services/ or emergency services, psychiatric/ or social work, psychiatric/
18. (early intervention or (management adj5 psychological casualty) or psychosocial management or psychiatric care or distress management or supportive counseling or psychological triage or prevention of PTSD or prevention of post traumatic disorder or psychological first aid or psychological intervention or emotion* support or code orange hospital care or code orange medical team or code orange healthcare professional or code orange plan or code orange policy or code orange psychological care or code orange hospital impact).mp.
19. or/14-18
20. exp internet/
21. 5 and 13 and 19 and 20
22. limit 21 to (English language and yr="2007-Current")