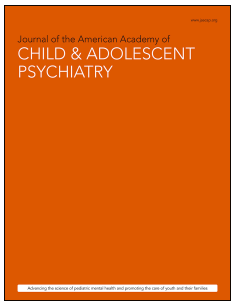

Scoping Review: Digital Mental Health Interventions for Children and Adolescents Affected by War

Andrea Danese, MD, PhD, Dmytro Martsenkovskyi, MD, PhD, Barbara Remberk, MD, PhD, Monika Youssef Khalil, MD, Emma Diggins, MB BChir, Eleanor Keiller, MA, Saba Masood, MSc, Isang Awah, PhD, Corrado Barbui, MD, Renée Beer, MSc, Rachel Calam, MClinPsychol, PhD, Marcio Gagliato, PhD, Tine K. Jensen, PhD, Zlatina Kostova, PhD, James F. Leckman, MD, PhD, Stephanie J. Lewis, MBBS, PhD, Boris Lorberg, MD, Olha Myshakivska, MD, PhD, Elisa Pfeiffer, PhD, Rita Rosner, PhD, Jessica L. Schleider, PhD, Yulia Shenderovich, MPhil, PhD, Norbert Skokauskas, MD, PhD, Patrick H. Tolan, PhD, Ernesto Caffo, MD, Marit Sijbrandij, PhD, Dennis Ougrin, PhD, Bennett L. Leventhal, MD, John R. Weisz, PhD, the Global Resources fOr War-affected youth (GROW) Network

PII: S0890-8567(24)00243-0

DOI: https://doi.org/10.1016/j.jaac.2024.02.017

Reference: JAAC 4610

To appear in: *Journal of the American Academy of Child & Adolescent Psychiatry*

Received Date: 7 August 2023

Revised Date: 19 February 2024

Accepted Date: 23 February 2024

Please cite this article as: Danese A, Martsenkovskyi D, Remberk B, Khalil MY, Diggins E, Keiller E, Masood S, Awah I, Barbui C, Beer R, Calam R, Gagliato M, Jensen TK, Kostova Z, Leckman JF, Lewis SJ, Lorberg B, Myshakivska O, Pfeiffer E, Rosner R, Schleider JL, Shenderovich Y, Skokauskas N, Tolan PH, Caffo E, Sijbrandij M, Ougrin D, Leventhal BL, Weisz JR, the Global Resources fOr War-affected youth (GROW) Network, Scoping Review: Digital Mental Health Interventions for Children and Adolescents Affected by War, *Journal of the American Academy of Child & Adolescent Psychiatry* (2024), doi: https://doi.org/10.1016/j.jaac.2024.02.017.

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Drs. Leventhal and Weisz are joint last authors of this work.

DEI

Accepted May 3, 2024

Prof. Danese and Dr. Lewis are with the Institute of Psychiatry, Psychology and Neuroscience, King's College London, London, United Kingdom, and South London and Maudsley NHS Foundation Trust, London, United Kingdom. Dr. Martsenkovskyi is with Bogomolets National Medical University, Kyiv, Ukraine; SI Institute of Psychiatry, Forensic Psychiatric Examination and Drug Monitoring of Ministry of Health of Ukraine, Kyiv, Ukraine; and National Children's Specialized Hospital OHMATDYT, Kyiv, Ukraine. Prof. Remberk and Dr. Khalil are with Institute of Psychiatry and Neurology, Warsaw, Poland. Dr. Diggins is with the University of Leeds, Leeds, United Kingdom; and Leeds Community Healthcare NHS Trust, Leeds, United Kingdom. Mss. Keiller and Masood, and Prof Ougrin are with Queen Mary University of London, London, UK; East London NHS Foundation Trust, London, United Kingdom. Dr. Aawah is with the University of Oxford, Oxford, United Kingdom. Prof. Barbui is with the University of Verona, Verona, Italy. Ms. Beer is with EMDR Europe Association, Lausanne, Switzerland. Prof. Calam is with the University of Manchester, Manchester, United Kingdom. Prof. Gagliato is with The Mental Health and Psychosocial Support Network – MHPSS.net; Fordham University, New York City, New York. Dr. Jensen is with the University of Oslo, Oslo, Norway; and Norwegian Centre for Violence and Traumatic Stress Studies, Oslo, Norway. Drs. Kostova and Lorberg are with the University of Massachusetts Chan Medical School, Worcester, Massachusetts. Prof. Leckman is with Yale University, New Haven, Connecticut. Dr. Myshakivska is with the Institute of Psychiatry, Taras Shevchenko National University of Kyiv, Kyiv, Ukraine. Dr. Pfeiffer is with Ulm University, Ulm, Germany. Prof. Rosner is with Catholic University of Eichstätt-Ingolstadt, Eichstätt, Germany. Dr. Schleider is with Northwestern University, Evanston, Illinois. Dr. Shenderovich is with Cardiff University, Cardiff, United Kingdom; and the University of Oxford, Oxford, United Kingdom. Dr. Skokauskas is with Norwegian University of Science and Technology, Trondheim, Norway. Dr. Tolan is with the University of Virginia, Charlottesville, Virginia. Dr. Caffo is with the University of Modena and Reggio Emilia, Italy; Foundation Child; and the Foundation SOS Il Telefono Azzurro ONLUS.

Dr. Sijbrandij is with VU University, Amsterdam, the Netherlands. Dr. Leventhal is with the University of Chicago, Chicago, Illinois. Prof. Weisz is with Harvard University, Cambridge, Massachusetts; and Harvard Medical School, Boston, Massachusetts.

The authors have reported funding for this work by the National Institute for Health Research (NIHR) Biomedical Research Centre at South London and Maudsley National Health Service Foundation Trust and King's College London (NIHR203318 to Andrea Danese).

This work has been prospectively registered: https://osf.io/hrny9/.

Disclosure: Dr. Diggins has received funding from an NIHR Doctoral Fellowship. Dr. Awah has received funding from the Global Parenting Initiative at Department of Social Policy and Intervention, University of Oxford, UK. Prof. Calam has reported being a Developer for the United Nations Office on Drugs and Crime (UNODC) and The University of Manchester resources. Dr. Lewis has received funding from the South London and Maudsley NHS Foundation Trust and King's College London. Prof. Rosner has received funding from the German Research Foundation, Federal Ministry of Education and Research Germany, Bavarian State Ministry of Labour and Social Welfare, Family Affairs and Women. Dr. Schleider has received funding from the National Institutes of Health Office of the Director (DP5OD028123), the National Institute of Mental Health (R43MH128075), the National Science Foundation (2141710), the Health Research and Services Association (U3NHP45406-01-00), the Society for Clinical Child and Adolescent Psychology, Hopelab, the Upswing Fund for Adolescent Mental Health, and the Klingenstein Third Generation Foundation. Preparation of this article was supported in part by the Implementation Research Institute (IRI), at the George Warren Brown School of Social Work, Washington University in St. Louis; through an award from the National Institute of Mental Health (R25MH080916; JLS is an IRI Fellow). She has served on the Scientific Advisory Board for Walden Wise and the Clinical Advisory Board for Koko; and has received book royalties from New Harbinger, Oxford University Press, and Little Brown Book Group. Dr. Shenderovich has received support from DECIPHer and the Wolfson Centre for Young People's Mental Health. DECIPHer is funded by the Welsh Government through Health and Care Research Wales. The Wolfson Centre for Young People's Mental Health has been established with support from the Wolfson Foundation. She has served as an Adviser for the Ukraine Parenting Response. Prof. Ougrin has received funding from the Bart's Charity, the National Institute for Health Research, and the Kavli Trust. Prof. Weisz has received funding from the National Institute of Mental Health, the Manton Foundation, the Marriott Foundation, and the Templeton World Charity Foundation. He has received royalties from Cambridge University Press, Guilford Press, and PracticeWise. Ms. Keiller has received funding from the Bart's Charity. Prof. Danese, Dr. Martsenkovskyi, Prof. Remberk, Dr. Khalil, Prof. Barbui, Dr. Gagliato, Prof. Jensen, Dr. Kostova, Prof. Leckman, Drs. Lorberg, Myshakivska, and Pfeiffer, Profs. Skokauskas, Tolan, Caffo, Sijbrandij, and Leventhal, and Mss. Masood and Beer have reported no biomedical financial interests or potential conflicts of interest.

Correspondence to Andrea Danese, MD, PhD, Professor of Child & Adolescent Psychiatry Child & Adolescent Psychiatry, 16 DeCrespigny Park, London, Greater London SE5 8AF; e-mail: andrea.danese@kcl.ac.uk

ABSTRACT

Objective. Over 200 million children and adolescents live in countries affected by violent conflict, are likely to have complex mental health needs, and struggle to access traditional mental health services. Digital mental health interventions have the potential to overcome some of the barriers in accessing mental health support. We performed a scoping review to map existing digital mental health interventions relevant for children and adolescents affected by war, examine the strength of the evidence base, and inform the development of future interventions.

Method. Based on a pre-registered strategy, we systematically searched MEDLINE, Embase, Global Health, APA PsychInfo, and Google Scholar from the creation of each database to 30th September 2022, identifying k=6,843 studies. Our systematic search was complemented by extensive consultation with experts from the GROW Network.

Results. The systematic search identified 6 relevant studies: one evaluating digital mental health interventions for children and adolescents affected by war and five for those affected by disasters. Experts identified 35 interventions of possible relevance. The interventions spanned from universal prevention to specialist-guided treatment. Most interventions directly targeted young people and parents/carers and were self-guided. A quarter of the interventions were tested through randomized controlled trials. Because most interventions were not culturally or linguistically adapted to relevant contexts, their implementation potential was unclear.

Conclusion. There is very limited evidence for the use of digital mental health interventions for children and adolescents affected by war at present. The review provides a framework to inform the development of new interventions.

Study preregistration information: Digital mental health interventions for children and young people affected by war: a scoping review; https://osf.io/; hrny9.

Diversity & Inclusion Statement: We actively worked to promote sex and gender balance in our author group.

Key words: war; mental health; children; adolescents; digital intervention

INTRODUCTION

Two hundred million children and adolescents live in countries affected by violent conflict.[1] Most recently, the Russian invasion of Ukraine has brought war to European soil, leaving over 5 million children and adolescents in need of humanitarian assistance.[2]

Children and adolescents affected by war have complex mental health needs.[3–6] Direct or indirect exposure to multiple traumatic events can disrupt psychosocial development [7] and lead to a range of mental health problems, including not only post-traumatic stress disorder (PTSD) but also depressive disorder, anxiety disorders, conduct disorder, substance misuse, and others.[3,8] Such trauma-related psychopathology can interrupt education and result in self-harm and suicide attempts.[8,9] During and after war, these effects are compounded by ongoing threat, grief following the loss of loved ones, and parental psychopathology.[10] Furthermore, in response to the war, some young people may be able to remain in their home communities, while others may be internally displaced or have to leave their countries as asylum seekers or refugees—with increasing levels of displacement, separation from their families, and disruption of their routines.

Six decades of research has produced effective interventions for youth mental health disorders and problems.[11,12] However, these beneficial interventions cannot be accessed by many young people in war-affected regions because of multiple barriers to providing mental health services and delivering psychosocial support.

Some barriers are psychological. Common trauma-related emotions (e.g., shame, guilt), cognitions (e.g., distrust, hopelessness), and behaviors (e.g., avoidance, inactivity) may reduce engagement with mental health services, even when universal access to care is available.[13]

Some barriers are cultural. Limited mental health knowledge, stigma around mental illness, or concern about being stigmatized by others may prevent detection of mental health needs or make certain interventions unacceptable. These barriers are major impediments to mental health help-seeking in young people globally and are particularly prominent in some cultures.[14]

Other barriers are structural. War-related disruption of transport systems (e.g., by shelling) and of family and community networks (e.g., because of displacement) can impede access to mental health services,[15] and refugees displaced to other countries may be hosted in asylum centers in remote areas with scarce local service provision. Countries in which refugees are resettled usually do not have enough mental health professionals speaking the language of refugees and access to funding for trained translators is limited.[16] Furthermore, the limited specialist workforce trained in child and adolescent psychiatry or psychology can be easily overwhelmed by a rapid rise in demand for services.[15,17] Moreover, in this specialist workforce, training in assessment and treatment of trauma-related psychopathology is often inadequate to meet demand even in peacetime.[13]

Digital mental health interventions [18] have the potential to help overcome some key barriers to delivering mental health and psychosocial support to children affected by war. For example, they can provide free, engaging, psycho-educational materials to reduce stigma and increase help-

seeking.[19] They can be promptly delivered with no/minimal contact with mental health professionals, directly reaching children and parents at times and places that are most convenient for them.[20] They can also widen the reach of the existing specialist and non-specialist workforce by supporting remote and/or asynchronous delivery of treatment and enabling training and supervision in assessment and treatment of trauma-related psychopathology.[21] Finally, they are supported by growing empirical evidence from randomized clinical trials showing that brief digital interventions, even those consisting of only a single session, can produce substantial mental health benefit.[22] There are also important limitations of digital intervention that need to be considered in development and implementation phases. Although there has been a rapid growth in mobile communication and internet access in low-and-middle-income (LMIC) countries that are more often affected by war,[23] access can be unequal (digital devide), so that more vulnerable and/or affected individuals may struggle more to use a mobile network, find charging facilities, and understand the functioning of devices or applications. Of course, the impact of war can also affect the availability or reliability of internet access at the population level.

Based on this developing evidence, the World Psychiatry Association's (WPA) Commission on the Future of Psychiatry has named digital psychiatry as a key priority area for improving global mental health in the next decade.[24] This WPA Commission statement has been extended with a focus on child and adolescent mental health by the WPA Section on Child and Adolescent Psychiatry, the International Association for Child and Adolescent Psychiatry and Allied Professions (IACAPAP), the World Association for Infant Mental Health (WAIMH), the International Society for Adolescent Psychiatry and Psychology (ISAPP), the UN Special

Rapporteur on the Right to Health, and representatives of the WHO Department of Mental Health and Substance Abuse.[25]

We have undertaken this scoping review to map and describe the available digital mental health interventions that may be relevant for children and adolescents affected by war and to provide evidence related to the global agenda of the WPA and other key stakeholders. We aimed to identify evaluations of digital mental health interventions in this area. We also aimed to identify promising resources that could be further tested in future studies or inform the development of new interventions. As such, we also reviewed digital mental health interventions developed in the context of natural disasters, which may be similar in scale and for the involvement of entire communities but also typically differ for the acute, non-interpersonal nature of the trauma and the greater availability of local support infrastructures.

METHOD

The scoping review was conducted in accordance with the Joanna Briggs Institute (JBI) Reviewer Manual [26] and the framework suggested by Arksey and O'Malley.[27] The protocol was registered on the Open Science Framework (https://osf.io/hrny9/). The scoping review is reported using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) (Table S1).[28]

We undertook an extensive consultation within the Global Resources fOr War-affected youth (GROW) Network, our large, multidisciplinary, international group of experts in the areas of emergency and disaster psychology, child and adolescent mental health, and digital mental health. This consultation assisted in planning the systematic database search and additionally enabled us

to identify further studies and relevant resources (hereafter collectively referred to as interventions) not identified in our systematic search.

Interventions were included based on expert opinion if they included content that [1] addressed presentations, concerns, and types of psychopathology relevant to war-affected young people; [2] was of good quality (i.e., reflected safe and/or evidence-based principles); [3] was easy to understand (ideally co-produced with young people and families); [4] targeted different levels on needs in the population and delivery methods (ranging from self-guided psycho-education to delivery by specialist workers); and [5] was ideally available in multiple languages. Overall, the aim was to identify interventions that, although not develop/tested in the context of war, could be adapted and tested in further research.

Eligibility criteria for the systematic search

Inclusion criteria: Studies were included if: (1) they considered digital mental health interventions, defined as the use of information and communications technology in support of mental health;[29] (2) they included evaluation of these interventions (e.g., experimental designs, uncontrolled trials, randomized controlled trials); (3) the interventions aimed to improve promotion of well-being, or prevention or treatment of any mental illness (symptoms or disorders); (4) the interventions targeted children or adolescents (0-18 years old); (5) the interventions may be relevant to children or adolescents affected by war (i.e., living in war-affected countries, or internally or externally displaced); and (6) information on the interventions was published (e.g., in scientific journals or on websites), without restrictions to language or geographical area.

Exclusion criteria: Studies were excluded if: (1) they targeted only adults; (2) they focused on digital tools for diagnosis, screening, monitoring, communication, or data management.

Search strategy

We systematically searched MEDLINE, Embase, Global Health, and APA PsychInfo from the creation of each database to 30th September 2022 through Ovid (https://ovidsp.dc1.ovid.com/ovid-b/ovidweb.cgi). To retrieve gray literature of studies not published through traditional models, we also conducted a Google Scholar search and screened the first 10 pages of relevancy-ranked results (200 results).

We undertook three searches, progressively expanding the search terms (see https://osf.io/hrny9/). We used results from the last and most comprehensive systematic search, which included the following search terms: (telemedicine OR telehealth OR mobile health OR mhealth OR m-health OR digital health OR tele* OR digital* OR remote* OR video* OR Ehealth OR e-health OR electronic health OR virtual* OR internet OR mobile app* OR web-based OR website OR online) AND (PTSD OR post traumatic* OR posttraumatic* OR post-traumatic* OR trauma OR traumat* OR stress OR depress* OR anxiety OR anxious OR mental health OR mental disorder OR psychological OR psychosocial OR wellbeing OR well-being OR coping) AND (child* OR adolescen* OR young people OR teen* OR youth* OR parent* OR famil*) AND (prevention OR intervention* OR treatment OR therapy) AND (war OR armed conflict OR community violence OR political violence OR disaster* OR displace* OR refugee* OR terror* OR sexual abuse OR rape OR loss OR grief).

Study selection

The studies identified through the systematic search were deduplicated and downloaded into Rayyan.[30] Title, abstract, and full-text screening was conducted by two independent reviewers (DM, BLL). Discrepancies were reviewed in consultation with a third reviewer (AD), when required. If any retrieved article was in a language unknown to the authors, the article was translated into English by a native network member or using Google Translate.

Data extraction

A standardized form was developed for documenting extracted relevant information, which was modified after piloting on a small sample of articles. Information extracted for each study included: intervention name, author, description of the intervention, target of the intervention, intended audience, delivery method, settings for the intervention, country where the intervention was developed, language, digital elements, platform required to access the intervention, fees to access the intervention, access restriction, evidence for efficacy, link to intervention, and link to evaluation study.

For studies identified in our systematic search, two reviewers (BR and MYK) independently extracted the relevant data. Discrepancies were resolved in consultation with a third reviewer (AD), when required.

For additional interventions identified by GROW Network expert opinion, three reviewers (ED, EK, SM) each extracted data from a third of the identified articles and then checked a third of

another reviewer's data extraction. Discrepancies were resolved in consultation with a fourth reviewer (JRW), when required.

Data synthesis

As in previous reviews and editorials on (non-digital) interventions for children and adolescents affected by war,[10,31,32] we have organized the results of the scoping review according to the Inter-Agency Standing Committee (IASC) intervention pyramid:[33]

Levels 1 and 2 include universal interventions that are self-guided or guided by non-specialists and thus, are typically aimed at children (or their parents/carers) who do not have current psychiatric symptoms, are at risk of developing symptoms, or have mild or transient symptoms.

Level 3 includes targeted interventions that are self-guided or guided by non-specialists and, thus, are typically aimed at children (or their parents/carers) who already have high level of symptoms.

Level 4 includes targeted interventions that are guided by specialists and, thus, are typically aimed at children (or their parents/carers) who either have persistently high level of symptoms or meet criteria for a disorder.

RESULTS

Search results

The systematic search process is displayed in Figure 1. The systematic search identified 6 studies evaluating digital mental health interventions relevant for children and adolescents affected by

war,[34–39] which are summarized in Table 1. Experts from the GROW Network identified 35 additional interventions [40–74], which are summarized in Table 2. We therefore considered a total of 41 interventions.

Target outcome

The interventions were aimed at four main targets. Nineteen interventions focused on addressing specific psychological symptoms or disorders (9 on anxiety and on depression, 5 on PTSD, 2 on behavioural difficulties, and 1 on alcohol use, anger, or insomnia; additionally 2 covered many of these symptoms and a broad range of other specific difficulties). Fifteen interventions focused on coping with traumatic or stressful experiences (7 on war/displacement-related experiences, 6 on generic traumatic or stressful experiences, and 2 on rape). Six interventions focused on normalization and/or psycho-education. One intervention focused on managing emotional and behavioural difficulties in those with special needs, such as learning disabilities.

Level of intervention

Most interventions (27) were for level 1 or 2 of the IASC intervention pyramid — universal interventions that are self-guided or guided by non-specialists and, thus, are typically aimed at children (or their parents/carers) who do not have current psychiatric symptoms, are at risk of developing symptoms, or have mild or transient symptoms.

Fifteen interventions were for level 3 of the IASC intervention pyramid — targeted interventions that are self-guided or guided by non-specialists and, thus, are typically aimed at children (or their parents/carers) who already have high level of symptoms.

Ten interventions were for level 4 of the IASC intervention pyramid — targeted interventions that are guided by specialists and, thus, are typically aimed at children (or their parents/carers) who either have persistently high level of symptoms or meet criteria for a disorder.

Audience

The interventions were mainly for adolescents (24) or parents/carers (22) and a few (12) focused on children (we classified children and adolescents as participants younger than 12 years or between 12-18 years, respectively, or as described by the interventions when age range was not clearly provided). Of these, 8 interventions were for both adolescents and parents/carers and 5 were for children and parents. Three interventions were for non-specialist workers and 3 were for specialist workers.

Settings

Most interventions (30) were developed in the general population, 8 in the context of war and/or displacement, and 3 in the context of natural disasters.

Country

Fifteen of the interventions were developed (and, where relevant, examined) in the USA, 9 in the UK, 5 in the Netherlands, 3 in Norway, 2 in New Zealand, and 1 each in Australia, Canada, Denmark, Kenya, Poland, Sweden, Switzerland, or Ukraine.

Language

Most interventions (35) were available in English. Nine interventions were in Ukrainian, 4 in Arabic, Dutch or Russian, 3 in French or Norwegian, 2 in Farsi, German, Pashto, Spanish, or

Vietnamese, and 1 in Chinese, Danish, Dari, Estonian, Finnish, Georgian, Greek, Hungarian, Italian, Korean, Japanese, Lithuanian, Malay, Myanmar, Romanian, Serbian, Slovak, Somali, Tigrinya, Tongan, Turkish, and Urdu.

Delivery

Most interventions (36) were delivered, or could be delivered, as self-guided interventions. Seven interventions were guided by a specialist worker, while only 1 was guided by a non-specialist worker.

Digital elements

Most interventions relied on online text (33) and/or videos (25) to deliver their content, and some included online sound clips (4). Some used more interactive elements, such as games/exercises (17), messaging/chatbox (4), or phone calls (1).

Platform

Most interventions (28) were hosted on websites that only required internet and web-browsing access, while some (13) required specific apps.

Fees

Most interventions (28) were freely available, while 5 had paid access and 8 had unclear costing.

Access

Most interventions (24) were open access, while 17 were restricted either by costs or geographical limitations (i.e., they were only openly available in the country where they had been developed).

Evidence

Most of the interventions (25) were not formally evaluated for their efficacy, while 11 were investigated with randomized controlled trials (RCTs) and 5 with uncontrolled trials. Of the RCTs, 5 tested interventions at level 1 or 2, 6 tested interventions at level 3 (5 of them were self-guided, 1 was guided by non-specialist workers), and 1 tested an intervention at level 4 (the intervention was guided by a specialist worker but focused on a low severity target, namely depression onset). Of the uncontrolled trials, none tested interventions at level 1 or 2, 2 tested interventions at level 3, and 3 tested interventions at level 4.

Two of the 11 RCTs were identified by the systematic search. First, in an RCT of the Bounce Back Now modular CBT-based intervention with 987 adolescents affected by tornadoes and recruited irrespective of baseline mental health status, intention-to-treat analyses found small improvements in PTSD symptoms (Cohen's d=0.19) and depressive symptoms (d=0.14) in adolescents at 12-month follow-up. Second, in an RCT of a psycho-educational intervention immediately preceding post-sexual assault examination with 140 female victims of sexual assault aged 15 years or older (mean age=26 years), the intervention led to reduction in depression symptoms (d=-0.30), anxiety (d=-0.19), and PTSD (d=-0.14) at 6 weeks after baseline in those with previous rape history but worsening in anxiety (d=0.16), depression (d=0.08), and PTSD (d=0.02) symptoms in those without previous rape history; no group differences were found at 6-month follow-up. The remaining 9 RCTs were identified by experts from the GROW network to provide examples of interventions on a wide range of psychopathology (PTSD, depression, anxiety, sleep problems, disruptive behaviours) that might be adapted in the context of war.

DISCUSSION

This scoping review comprehensively mapped digital mental health interventions aimed at preventing or treating psychopathology among children and adolescents affected by war. Our focused systematic search identified a limited set of 6 relevant interventions, of which only one focused directly on young people who experienced war, while others included young people who experienced disasters. The systematic search was complemented by input from topic experts, who identified several other interventions of potential relevance. This exercise has highlighted helpful resources and future challenges in the area.

Overall, the interventions identified span the different levels of the IASC intervention pyramid, from universal prevention to targeted and specialist-guided treatment. The interventions focused on normalization and/or psycho-education about psychological responses to stress, information on coping with traumatic or stressful experiences, and treatment for the different types of psychopathology that are typically seen in children and adolescents exposed to trauma and in those who are refugees and asylum seekers.[3] However, the interventions do not specifically cover some issues that are common in the context of war, such as separation from one or both parents, worry about a parent who is on a battlefield, or ongoing loss and grief. Of note, most interventions directly targeted young people and parents/carers and were self-guided, thereby potentially improving access to psychological support without increasing demand on typically limited and strained clinical services. As such, the interventions have the potential to enhance mental health care capacity in a cost-effective fashion.[24] To fulfill this premise, future studies will need to ensure efficacy and support implementation. A summary of our reccomendations is displayed on Table 3.

Only a quarter of the interventions identified were formally tested for their efficacy through randomized controlled trials. Universal, low-intensity interventions (levels 1 and 2), which provide normalization messages and essential psycho-educational materials, are typically conceptualized as useful and safe and, therefore, are often implemented even without strong evidence base.[19] However, only 6 of the 15 interventions at level 3 (40%) and 1 of the 10 interventions at level 4 (10%) were tested in RCTs. Because of the greater severity of the conditions targeted at higher levels of the IASC intervention pyramid and greater associated risks, it is crucial to further test digital mental health interventions before large-scale implementation.

With regard to targeted interventions that are either self-guided or guided by non-specialist workers (level 3), there is initial evidence in adults that self-guided interventions may be effective in reducing PTSD symptoms and comorbid depressive and anxiety symptoms.[75] However, it is unknown if the findings generalize to children and adolescents, and specifically those affected by war. In addition, there is evidence in adults to suggest that self-guided interventions for depression may lead to smaller improvement when compared to guided interventions.[76] Therefore, it is important to also develop new digital mental health interventions involving non-specialist workers already working with children and adolescents (e.g., teachers, nurses, etc.). Building on the task-shifting paradigms frequently used in LMIC countries,[24,77,78] these interventions could boost the delivery of targeted and guided interventions even when the local specialist clinical capacity is limited.

With regard to targeted interventions that are guided by specialist workers (level 4), preliminary evidence in adults suggests that such interventions might be beneficial for general [79] and trauma-related psychopathology.[80] However, it is again unknown if the findings generalize to children and adolescents affected by war. Ongoing trials of specialist-guided digital mental health interventions for trauma-related psychopathology in children and adolescents (e.g., [81]) will make an important contribution to the field.

Overall, there remain many open questions about the efficacy of digital mental health interventions for children and adolescents affected by war including effects in controlled trials, non-inferiority to face-to-face interventions, digital placebo effects, optimal levels of guidance, cost-effectiveness, adverse events, mechanisms of change, and predictors of efficacy and dropout. Future research will require closer collaboration between clinicians, app developers, statisticians, young people, and their families.

Beyond the focus on efficacy, it is important to consider potential barriers to implementation of digital mental health interventions [82] in order to maximize their dissemination in relevant settings.[83] Common barriers to the dissemination of digital mental health interventions, such as cost, data protection, and culpability, are also relevant here.[84]

There are also several compounded challenges regarding the appropriateness/acceptability of, and engagement with, existing digital interventions. It is unclear if existing interventions are appropriate to the mental health needs of children and adolescents affected by war. First, most interventions identified (80%) were not developed in the context of war and/or displacement, and

those that have been developed in relevant settings are low-intensity interventions (lower levels of the IASC intervention pyramid) and untested. Three additional interventions (at higher levels) were developed in the context of natural disasters, but their generalizability to the context of war and/or displacement is unclear because of the differences in traumatic experiences (non-interpersonal and acute vs interpersonal and chronic, respectively) and related clinical presentations [8,85] and in the presence of local support infrastructures.[19] Second, most interventions were not culturally or linguistically adapted to the relevant contexts. Less than 10% of the interventions were developed in LMIC countries where war and/or displacement typically occur. Furthermore, most interventions are not available in languages other than English, which is not fluently spoken in many areas affected by war and/or displacement. Future work will need to focus on strategies for efficiently translating–both linguistically and culturally–well-tested interventions, with attention to retaining the effective functions of the interventions,[86] if the interventions are to cross national and regional boundaries to address the needs of youths in diverse parts of the world.

Future work will also need to more directly target uptake and continued engagement, which are typically low for digital mental health interventions [18,87,88] and are recognized as a specific challenge in trauma-exposed individuals.[89] Only a small minority of interventions were specifically co-designed and co-produced with children and adolescents. However, the creation of psycho-educational messages and interventions for children and adolescents has to be responsive to the particular developmental needs of these age groups, the language they use, their ways of conceptualizing mental health problems, and their preferences for interventions.[90] To maximize engagement, co-design and co-production should be recognized as a necessary component of new

digital mental health interventions.[91] Furthermore, most interventions identified relied on online text or videos to deliver their content, simply digitizing content that was previously available in leaflets or books. This is useful because of the wealth of information available in these formats. It may even be necessary in contexts where digital poverty makes access to more complex digital resources impossible. However, there may be further opportunities to engage the audience and increase adoption of the interventions through interactive features, such games/exercises or messaging/chatboxes.[92]

The development and implementation of digital mental health interventions for war affected children and adolescents must be integrated within the broader range of scalable psychosocial interventions employed in humanitarian contexts. Current preventative psychological and social interventions do not show evidence of efficacy in children and adolescents affected by humanitarian crises.[93] In contrast, treatment interventions in the same contexts show some evidence of efficacy for PTSD but not for depression or anxiety.[94–96] In particular, there is initial evidence for the efficacy of group interventions for children and adolescents with PTSD.[97–102] At the same time, trauma-focused evidence-based treatments, such as trauma-focused cognitive behavioral therapy (TF-CBT) or eye movement desensitization and reprocessing (EMDR) have been demonstrated to be effective in children who experienced war trauma.[103] Although they are normally delivered in person, they can be adapted for online and remote delivery to children and their families (TF-CBT: https://tfcbt.org/telehealth-resources/; EMDR: https://globalchildemdralliance.com). Digital technologies have the potential to significantly expand the delivery of such interventions [83] through both self- and non-specialist-guided interventions that can reach children, adolescents, and their families at convenient times and

places. However, it is necessary to thoroughly evaluate the new digital technologies to ensure that they do not inappropriately divert resources from alternative, non-digital approaches.[29]

Major public health emergencies, such as those triggered by war, can provide both the impetus and the opportunity to innovate and advance existing health care systems. Our review of the literature did not find digital mental health interventions that have sufficient evidence base to be readily implemented in current conflict areas, including Ukraine. To realize the potential of digital mental health interventions for children and adolescents affected by war, future work will need to address the development and implementation challenges highlighted by our review.

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Table 1. Studies on Digital Mental Interventions Relevant for Children and Adolescents Affected by War Identified by the Systematic Search

Name (Author)	Description	Key targets	Level of IASC intervention pyramid	Audience	Delivery	Settings	Country of development (Language) Race/ethnicity in sample (%)	Digital elements	Platform	Fees	Access	Evidence	Intervention link	Study link
Bounce Back Now (Ruggiero ,2015)[34]	Modular CBT-based intervention in which adolescents and parents self-selected content from four multi-session modules for PTSD symptoms, depressive symptoms, alcohol use, and cigarette use	Specific symptoms (PTSD, depression, alcohol use)	1	Adolescents, parents /carers	Self-guided	Natural disaster	USA (English) 62.5 'White', 22.6 'Black', 3.8 other, 2.7 'Hispanic'; 11.1 declined to report	Online text, sound clips, and videos, interactive games/exercises	Specific app	Free	Open	RCT with 987 young people affected by tornadoes and recruited irrespective of baseline mental health status. Intent-to-treat analyses found small improvements in PTSD symptoms[1] (Cohen's d=0.19) and depressive symptoms[2] (d=0.14) and in alcohol use (d=0.12) in adolescents at 12-month follow-up	https://apps.apple.com/gb/app/bounce-back-now/id1584368927	https://www.jaacap.org/article/S0890-8567(15)00433-5/fulltext
Unnamed (Resnick, 2007)[35]	Video delivered immediately before to a forensic medical examination in the aftermath of sexual assault including description of key aspects of the examination , psycho-education about possible reactions to rape, and coping skills	Coping with trauma or stressful experiences (rape)	1	Adolescents	Self-guided	General population	USA (English) 50.7 'White', 44.3 'African American', 2.1 'Asian', 1.4 'Hispanic', 1.4 'Native American'	Online videos	-	Free	Restricted (videos not publicly available)	RCT with 140 female victims of sexual assault aged 15 years or older (mean age=26 years). Intervention led to reduction in PTSD[3] (d=-0.14), anxiety[4] (d=-0.19), and depression symptoms[5] (d=-0.30) at 6 weeks after baseline in those with previous rape history, but worsening in anxiety[4] (d=0.16), depression[5] (d=0.08), and PTSD[3] (d=0.02) symptoms in those without previous rape history. No	-	https://www.sciencedirect.com/science/article/pii/S0005796707001076?via%3Dihub

												group differences at 6 months follow-up		
Happy Helping Hand (Schuler, 2022)[36]	Toolkit with simulations (with a psychologist or avatar) building coping skills in a series of life-like scenarios	Coping with trauma or stressful experiences (war, displacement)	3 or 4	Adolescents	Guided by specialist (or self-guided)	War, displacement	Norway (English, French, Norwegian, Ukrainian, Arabic) Race/ethnicity not reported	Online text and videos, games/interactive exercises	Specific app	Free	Open	Uncontrolled trial with 125 Syrian adolescent refugee in Lebanon. Intervention associated with significant improvement in anxiety and depression symtpoms[6] and in wellbeing[7] between pre- and post-treatment conditions	https://apps.apple.com/gb/app/happy-helping-hand/id1584828621	https://www.emerald.com/insight/content/doi/10.1108/IJMHSC-07-2021-0060/full/html
Sonoma Rises (Heinz,2022)[37]	CBT-based toolkit on coping with traumatic experiences based on the U.S. National Center for PTSD / National Child Traumatic Stress Network 'Skills for psychological recovery' and the PTSD Coach app	Coping with trauma or stressful experiences (generic)	3	Adolescents	Self-guided	Natural disaster	USA (English, Spanish) 71.4 White, 13.2 'Hispanic/Latino', 15.5 other	Online sound clips, interactive games/exercises	Specific app	Free	Restricted (App not available to download after 2020)	Multiple-baseline single-case experimental design with 7 adolescents with PTSD symptoms. Due to small sample size, efficacy not formally evaluated	https://www.mysonomastrong.com/index.php	https://psycnet.apa.org/doiLanding?doi=10.1037%2Fser0000576
Brave Online (Stasiak,2016)[38]	CBT-based toolkit focused on anxiety symptoms	Specific symptoms (anxiety)	4	Children, adolescents, parents /carers	Guided by specialist	Natural disaster	New Zealand (English) Race/ethnicity not reported	Online text, sound clips and videos, interactive games/exercises	Internet	Free	Restricted (Australia)	Uncontrolled trial with 42 young people 18 months after earthquakes. Intervention associated with reduction in anxiety disorder diagnoses[8], anxiety symptoms, mood symproms, and improvements in quality of life at 6 months after baseline	https://exp.psy.uq.edu.au/brave/	https://www.jacap.org/article/S0890-8567(16)30911-X/pdf#relatedArticles

Interapy (De Haas,2009)[39]	CBT-based intervention providing coping advice after trauma and stressful experiences through online sessions and messaging	Coping with trauma or stressful experiences (rape)	4	Adolescents	Guided by specialist	General population	Netherlands (Dutch) Race/ethnicity not reported	Messaging/chatbox	Internet	Paid	Restricted (contact provider: www.interapy.nl)	Uncontrolled trial with 8 adolescent victims of sexual assault age 18 or younger. Intervention associated with nominal reduction in PTSD[9], anxiety[10], and depressive[10] symptoms between pre- and post-treatment conditions	www.interapy.nl	https://www.interapy.nl/docs/wetenschap/de-haas-2009---interapy-behandeling-via-het-internet-voor-jeugdige-slachtoffers-van-seksueel-geweld.pdf?sfvrsn=5e0fe2ac_2

Note: CBT= Cognitive-Behavioral Therapy, PTSD = Post-Traumatic Stress Disorder, RCT = Randomized Controlled Trial

Table 2. Digital mental health interventions of possible relevance for children and adolescents affected by war identified by expert opinion

Name (Author)	Description	Key targets	Level of IASC intervention pyramid	Audience	Delivery	Settings	Country of development (Language)	Digital elements	Platform	Fees	Access	Evidence	Intervention link	Study link
BBC Bitesize: How to boost positivity for your family at home (Danese)[40]	Blog with CBT-based advice for families on how to boost positivity at home	Specific symptoms (depression)	1	Parents/carers	Self-guided	General population	UK (English)	Online text	Internet	Free	Open	None listed	https://www.bbc.co.uk/bitesize/articles/zykkvwx	-
Families Under Pressure (Danese)[41]	Video animations delivering accessible CBT-based advice to support parents helping children and young people who are struggling with anxiety or depression	Specific symptoms (anxiety, depression, behaviour difficulties)	1	Parents/carers	Self-guided	General population	UK (English, German)	Online text and videos	Internet	Free	Open	None listed	https://maudsleycharity.org/familiesunderpressure-emotions/; www.familienunterdruck.de	-
Keep Cool (Danese)[42]	Videos co-produced with young people to provide CBT-based advice on coping with strong emotions (anger, anxiety, sadness)	Specific symptoms (anger, anxiety, depression)	1	Adolescents	Self-guided	General population	UK (English)	Online text and videos	Internet	Free	Open	None listed	https://www.kcl.ac.uk/research/keepcool	-

Dare to Share (Child Mind Institute)[43]	Videos of celebrities and young people describing their own challenges and how they asked for help in order to normalize help seeking	Normalization, psycho-education	1	Children, adolescents, parents/carers	Self-guided	General population	USA (English)	Online text and videos	Internet	Free	Open	None listed	https://childmind.org/daretoshare/?utm_medium=email&utm_source=email&utm_campaign=dts_wk4_2022-06&utm_content=dare_to_share	-
Mental Health is Health (MTV)[44]	Toolkit to normalize conversation on mental health and provide coping resources	Normalization, psycho-education	1	Adolescents, parents/carers	Self-guided	General population	USA (English)	Online text and videos, interactive games/exercises	Internet	Free	Open	None listed	https://www.mentalhealthishealth.us	-
Sleepio (Big Health Inc)[45]	CBT-based programme to treat insomnia	Specific symptoms (insomnia)	1	Adolescents, parents/carers	Self-guided	General population	UK (English)	Online text and videos, interactive games/exercises	Specific app	Free	Restricted (UK)	Multiple RCTs	https://onboarding.sleepio.com/sleepio/nhs-sleepio/171#1/1	https://www.bighealth.co.uk/research/
Children and War Guide for Refugee Parents: Parent Guide (Children and War Foundation, Danish Red Cross)[46]	Phone app delivering parenting advice to support children through traumatic life events in a refugee situation	Coping with trauma or stressful experiences (war, displacement)	1	Parents/carers	Self-guided	War, displacement	Denmark / Norway (English, Danish, Norwegian, Pashto, Tigrinya, Serbian, Russian, Somali, Persian, Arabic and Ukrainian)	Online text	Internet, specific app	Free	Open	None listed	https://apps.apple.com/us/app/parent-guide/id1247444812	-

Ukraine Parenting Response[47]	Online text with practical tips for parents to help themselves and their children cope during the current crisis in Ukraine	Coping with trauma or stressful experiences (war, displacement)	1	Parents/carers	Self-guided	War, displacement	UK (English, Russian, Ukrainian)	Online text and videos	Internet	Free	Open	None listed	https://ukraineparenting.web.ox.ac.uk/eng	-
Handhold (Massachusetts Department of Mental Health)[48]	Online text with practical tips for parents to help children and young people who are struggling with mental health difficulties	Normalization, psycho-education	1	Parents/carers	Self-guided	General population	USA (English)	Online text and videos	Internet	Free	Open	None listed	https://handholdma.org	-
Beebo App (UNICEF Ukraine)[49]	Phone app delivering parenting advice on how to provide mental health support and practical support (feeding/nappies) children, and how to monitor child health (e.g., vaccinations and milestones)	Normalization, psycho-education	1	Parents/carers	Self-guided	War, displacement	Ukraine (Ukrainian)	Online text and videos	Specific app	Free	Open	None listed	https://www.unicef.org/ukraine/en/press-releases/unicef-launches-bebbo-mobile-app-help-parents-care-children-during-war	-

Sesame Street[50]	Videos with coping skills for pre-school children in the context of war and crisis situations	Normalization, psycho-education	1	Children, parents/carers	Self-guided	General population	USA (English, multiple translations for some episodes)	Online videos	Internet	Free	Open	None listed	https://sesamestreetincommunities.org/subtopics/resources-in-ukrainian/	-
Inside Out (Disney Pixar)[51]	Feature film providing accessible information on emotions and coping skills for children	Normalization, psycho-education	1	Children, adolescents, parents/carers	Self-guided	General population	USA (English, multiple translations)	Online videos	Internet	Paid	Restricted	None listed	https://www.pixar.com/feature-films/inside-out	-
Heroes (Safarzyńska-Płatos)[52]	Short therapy books for children discussing the difficult emotions related to war and fleeing to another country	Coping with trauma or stressful experiences (war, displacement)	1	Children	Self-guided	War, displacement	Poland (Ukrainian)	Online text	Internet	Free	Open	None listed	https://potrzebafantazji.com/bohaterowie/?fbclid=IwAR1ji2TddjBJFf1Q15xZeeGHDMqiPvokWRbtmXwaCyvxCyAzjSOQrHcG6o0	-

MindEd, Trauma and Coping Page (Danese)[53]	Online text/video providing psycho-education on responses to trauma and coping strategies	Coping with trauma or stressful experiences (generic)	1	Parents/carers	Self-guided	General population	UK (English)	Online text and videos	Internet	Free	Open	None listed	https://mindedforfamilies.org.uk/Content/trauma_and_coping/#/id/5e3150ac12321b4bca7242d7	-
Safe Place App (Barnen; Save the Children)[54]	Toolkit of coping skills to support young people who had difficult experiences, stress, difficulty sleeping and worries	Coping with trauma or stressful experiences (generic)	1	Children, adolescents	Self-guided	General population	Sweden (English, Swedish, Ukrainian)	Online text and videos, interactive games/exercises	Specific app	Free	Open	None listed	https://apps.apple.com/de/app/safe-place/id1445174667	-
Do to Learn[55]	Toolkit for young people with special needs including social skills and behavioral regulation activities and guidance	Managing emotional and behavioural difficulties and improving skills relevant to those with special needs	1	Parents/carers, non-specialist workers	Self-guided	General population	USA (English)	Online text and videos, interactive games/exercises	Internet	Free	Open	None listed	https://do2learn.com/	-
Lifeline for Kids (UMASS)[56]	Videos providing parenting advice to support children after challenging experiences	Coping with trauma or stressful experiences (generic)	1	Parents/carers	Self-guided	General population	USA (English)	Online videos	Internet	Free	Open	None listed	https://www.umassmed.edu/cttc/pair-a-docs-video-series/	-

Doing what matters in times of stress (WHO)[57]	Online text/cartoons providing information on helpful coping skills to use at times of stress	Coping with trauma or stressful experiences (generic)	1	Children, adolescents, parents/carers	Self-guided	General population	Switzerland (Arabic, Chinese, Dari, English, Estonian, Farsi, French, German, Georgian, Greek, Hungarian, Italian, Korean, Japanese, Lithuanian, Romanian, Russian, Spanish, Slovak, Tongan, Turkish, Ukrainian, Urdu, Vietnamese)	Online text and sound clips	Internet	Free	Open	None listed	https://www.who.int/publications/i/item/9789240003927	-
Cool Little Kids (Rapee)[58]	Online text/videos delivering parenting advice to support shy or anxious children	Specific symptoms (social anxiety)	1	Parents/carers	Self-guided	General population	Australia (English)	Online text and videos	Internet	None listed	Restricted (contact authors)	RCT with 433 parents of 3- to 6-year-old children with inhibited temperament. Intervention led to improvement in child anxiety symptoms at 24 weeks after baseline	https://coollittlekids.org.au/login	https://www.sciencedirect.com/science/article/pii/S0890856717301065
E-Health Programs [59]	Toolkit for children and adolescents with a range of mental health problems	Specific symptoms (very broad range)	1 to 3	Children, adolescents	Self-guided	General population	Netherlands (Dutch)	Online text and videos, games/interactive exercises, messaging/chatbox	Internet	Paid	Restricted	None listed	https://therapieland-nl.translate.goog/programmas/?_x_tr_sl=nl&_x_tr_tl=en&_x_tr_hl=en&_x_tr_pto=wapp	-

First Aid to Terror[60]	Telegram-based chat bot for Ukrainians affected by war based on psychological first aid from WHO	Coping with trauma or stressful experiences (war, displacement)	1 to 3	Non-specialist workers	Self-guided	War, displacement	Netherlands (English, Ukrainian)	Online text, messaging/ chatbox	Specific app	Free	Open	None listed	http://firstaidtoterror.com/	-
MindReSolve (Watkins)[61]	CBT-based toolkit targeting rumination to prevent depression in at-risk adolescents / young adults	Specific symptoms (worry, rumination)	1 or 4	Adolescents	Self-guided (or guided by specialist)	General population	UK (English)	Online text and videos	Internet	None listed	Restricted (contact authors)	RCT with 235 high-risk university students. Guided and non-guided intervention led to reduction in risk of depression onset	https://www.minddistrict.com/catalogue/reducing-worry-rumination-and-stress-mindresolve	https://www.jmir.org/2019/5/e11349/
Family Skills Programmes (United Nations)[62]	Set of programs providing parenting skills training across a range of scenarios and needs	Coping with trauma or stressful experiences (war, displacement, natural disaster)	1 to 4	Parents/carers	Self-guided	War, displacement, natural disaster	UK (English, Malay, Myanmar, Pashto, Russian, Ukrainian, Vietnamese)	Online text	Internet	Free	Open	None listed	https://www.unodc.org/unodc/en/prevention/family-skills.html	-
Dossier Oekraïne (EMDR Europe)[63]	Set of guidelines for EMDR healthcare professionals and hosts/carers to support young people from Ukraine	Coping with trauma or stressful experiences (war, displacement)	1 to 4	Parents/carers, non-specialist workers	Self-guided	War, displacement	Netherlands (English, Dutch)	Online text	Internet	Free	Open	None listed	https://www.emdr.nl/dossier-oekraine/#richtlijnen-emdr-europe	-

Project Empower (Schleider)[64]	Single session intervention for anxious parents to reduce parental accommodation	Specific symptoms (anxiety)	3	Parents/carers	Self-guided	General population	USA (English)	Online text, interactive games/exercises	Internet	Free	Open	RCT with 301 parents who reported elevated anxiety symptoms and had children aged 4-10 years. Intervention led to reduction in parental accommodation of child anxiety and overall distress tolerance from baseline to 2-week follow-up in parents	www.schleiderlab.org/empower	https://mental.jmir.org/2021/7/e29538/
Project YES (Schleider)[65]	Single Session Intervention on growth mindset and behavioural activation for adolescents with emotional symptoms	Specific symptoms (anxiety, depression)	3	Adolescents	Self-guided	General population	USA (English)	Online text	Internet	Free	Open	RCT in 2452 adolescents aged 13-16 years. Intervention led to reduction in depressive symptoms at 3 months	www.schleiderlab.org/yes	https://www.nature.com/articles/s41562-021-01235-0
Project Shamiri (Osborn)[66]	Single session intervention on growth mindset, gratitude, and value affirmation for adolescents with emotional symptoms	Specific symptoms (anxiety, depression)	3	Adolescents	Self-guided	General population	Kenya (English, French, Arabic)	Online text	Internet	Free	Open	RCT in 103 adolescents. Intervention led to reduction in depressive symptoms at 2-week follow-up. No significant effects on anxiety symptoms, well-being, or happiness	https://thrive-online.shamiri.institute	https://psycnet.apa.org/doiLanding?doi=10.1037%2Fccp0000505
SPARX (Merry)[67]	CBT-based intervention to reduce depressive symptoms in help seeking adolescents	Specific symptoms (depression)	3	Adolescents	Self-guided	General population	New Zealand (English)	Interactive games/exercises	Specific app	None listed	Restricted (contact authors)	RCT of 187 help-seeking adolescents in primary care. Intervention was not inferior to TAU with face-to-face contact after treatment and at 3-month follow-up	https://www.sparx.org.nz/home	https://www.bmj.com/content/344/bmj.e2598

Coping Coach (Kassam-Adams)[68]	CBT-based game on coping with traumatic experiences for young people physically recovering following injury or sudden illness	Coping with trauma or stressful experiences (generic)	3	Children, adolescents	Self-guided	General population	USA (English)	Interactive games/exercises	Internet	None listed	Restricted (contact authors)	RCT with 72 children over 6 weeks. Most children used the intervention; half completed it. Intervention led to reduction in PTSD symptoms at 6 weeks and 12 weeks	https://injury.research.chop.edu/blog/posts/coping-coach-web-based-game-help-children-recover	https://www.sciencedirect.com/science/article/pii/S0005796707001076?via%3Dihub
Strongest Families Intervention (Sourander)[69]	Parent training programme for parents of children with disruptive behavioural problems	Specific symptoms (behavioral difficulties)	3	Parents/carers	Guided by non-specialist	General population	Canada (English, Finnish)	Online text and videos, phone call	Phone, internet	None listed	Restricted (to referred families)	RCT with 464 parents of 4-year-old children with high level of disruptive behavioral problems identified through whole-population screening. Intervention led to improvement in externalizing and internalizing symptoms in children at 12 months after baseline	https://strongestfamilies.com	https://jamanetwork.com/journals/jamapsychiatry/fullarticle/2494708
TF-CBT Triangle of Life[70]	App to assist therapists in delivering Trauma-Focused Cognitive-Behavioural Therapy to children and adolescents	Specific symptoms (PTSD)	4	Children, adolescents, specialist workers	Guided by specialist	General population	USA (English)	Online text, interactive games/exercises	Specific app	None listed	Restricted (USA)	None listed	https://apps.apple.com/us/app/tf-cbt-triangle-of-life/id978441894	-

Min hverdag (My everyday life; Birkeland)[71]	App to assist therapists in delivering Trauma-Focused Cognitive-Behavioural Therapy to children and adolescents	Specific symptoms (PTSD)	4	Children, adolescents, specialist workers	Guided by specialist	General population	Norway (Norwegian)	Online text, interactive games/exercises	Specific app	None listed	Restricted (contact authors)	None listed	https://www.nkvts.no/english/project/my-everyday-life/	https://osf.io/2hdp4
VEVO (Processing and Strengthening Online; Omgeving)[72]	App to assist therapists in delivering Trauma-Focused Cognitive-Behavioural Therapy to children and adolescents	Specific symptoms (PTSD)	4	Children, adolescents, specialist workers	Self-guided	General population	Netherlands (Dutch)	Online text and videos, interactive games/exercises	Specific app	None listed	Restricted (contact authors)	None listed	https://www-jouwomgeving-nl.translate.goog/nieuws/2017/7/18/nieuwe-module-verstaken-en-verwerken-online/?_x_tr_sl=nl&_x_tr_tl=en&_x_tr_hl=en&_x_tr_pto=wapp	-
Minddistrict[73]	Toolkit for adolescents and parents/carers with various mental health problems	Specific symptoms (very broad range)	1 to 4	Adolescents, parents/carers	Self-guided (or guided by specialist)	General population	UK (English)	Online text and videos, interactive games/exercises, messaging/chatbox	Internet, specific app	Paid	Restricted	None listed	https://www.minddistrict.com/catalogue/interventions?filter=Youth	-

LIFT (Jaycox)[74]	CBT-based school-based programme for adolescents with symptoms of anxiety, depression, or PTSD	Specific symptoms (anxiety, depression, PTSD)	3	Adolescents	Self-guided	General population	USA (English)	Online text and videos, interactive games/exercises	Internet	Paid	Restricted	Uncontrolled trial with 51 adolescents with anxiety, depression, or PTSD symptoms. Intervention associated with improvements in PTSD symptoms but not in depressive or anxiety symptoms	https://www.lift-program.org	https://www.sciencedirect.com/science/article/pii/S0005796707001076?via%3Dihub

Note: CBT= Cognitive-Behavioural Therapy; EMDR = Eye Movement Desensitisation and Reprocessing, PTSD = Post-Traumatic Stress Disorder, RCT = Randomized Controlled Trial, TAU = Treatment As Usual, WHO = World Health Organisation

Table 3. Recommendations for the Development of New Digital Mental Health Interventions

- To develop and/or adapt interventions so that they are culturally and developmentally appropriate—i.e., engaging communities affected by war and particularly young people, in locally-spoken languages.

- To test interventions adequately (e.g., with RCTs in war-related settings), particularly those targeting higher levels of the IASC intervention pyramid and, thus, greater severity of the conditions and greater associated risks.

- To include content on war-related issues, e.g., separation from one or both parents, worry about a parent who is on a battlefield, and ongoing loss and grief.

- To consider upfront common barriers to implementation, such as cost, data protection, culpability, and digital poverty/divide.

- To consider the integration with the broader range of scalable psychosocial interventions employed in humanitarian contexts.

Figure 1. PRISMA Flow Diagram for the Systematic Search