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REVIEW

Digital Therapy: Alleviating Anxiety and Depression in Adolescent Students During COVID-19 Online Learning - A Scoping Review

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Abstract: The learning method has changed from offline to online since Coronavirus Disease 2019 pandemic cause mental health problems in students such as stress, anxiety, and even depression. Interventions to reduce mental health problems in adolescents need to be carried out digitally to reduce the transmission of Coronavirus Disease 2019. The purpose of this study is to explore methods of digital therapy to reduce symptoms of anxiety and depression among students during the Coronavirus Disease 2019. A scoping review study design was used in this study. Database the study from CINAHL, PubMed, and Scopus databases. This study used PRISMA Extension for Scoping Reviews (PRISMA-ScR) and for quality appraisal used JBI Quality Appraisal. The inclusion criteria for articles in this study are full text, randomized control trial or quasi-experiment research design, English language, students sample, and the publication period during COVID-19 pandemic (2019–2022). There were found 13 articles discussing digital therapy and it was found that the digital therapy model to reduce anxiety and depression includes directions through digital modules, directions via video, and asynchronous discussions via online meeting. The sample range in this study is 37–1986 students. Most of the articles come from developed countries. Delivery services of digital therapy consist of three phases, namely psycho-education, problem-solving, and implementation of problem-solving strategies. The authors found that there are four digital therapy methods, namely Improving psychological abilities, Bias-modification intervention, Self-help intervention, and Mindfulness intervention. The implementation of digital therapy must still pay attention to various aspects that affect students, so that therapists need to pay attention to physical, psychological, spiritual, and cultural aspects. Here we highlight, digital therapy interventions are proven for improving mental health by reducing depression and anxiety levels among students during the COVID-19 pandemic by paying attention to all aspects that affect students.

Keywords: anxiety, COVID-19 pandemic, depression, digital therapy, students

Introduction

Coronavirus Disease 2019 or what is often called COVID-19 has now become a subject of discussion all over the world.[1] According to the Indonesian Ministry of Health, Coronavirus Disease 2019 (COVID-19) is an infectious disease caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2).[2] SARS-CoV-2 is a new type of coronavirus that has never been previously identified in humans. The number of positive cases of COVID-19 in the world and Indonesia in general is still increasing every day.[3] Report from Ministry of Health in Indonesia, on March 18, 2022, showed the total global confirmed cases of COVID-19 were 462,758,117 with 6,056,725 deaths (CFR 5.1%) in 229 affected countries.[4]

COVID-19 caused health problems both physically and psychologically. Physical problems that can be experienced by COVID-19 sufferers are such as fever, cough, and shortness of breath. In severe cases of COVID-19, it can cause pneumonia, acute respiratory syndrome, kidney failure, and even death.[5] Meanwhile, psychological problems that often arise include stress in dealing with changes due to the COVID-19 pandemic.[6] Previous study showed that 24.9% of

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Chinese students have experienced anxiety since the onset of COVID-19.[7] This anxiety arises because of changes in the economy, academic delays and difficulties in activities. In addition, 53.8% of the community felt psychological impacts such as depression, anxiety and stress due to COVID-19.[8] Other studies have shown psychological distress, mental health problems, sadness, helplessness, hopelessness, post-traumatic symptoms, substance abuse, panic, stress, anxiety, depression, loneliness, fear, anger, stigma and concerns about socioeconomic status.[9] In addition, several studies have shown the negative impact of the COVID-19 pandemic, such as the emergence of an increased prevalence of symptoms of depression (14.6–48.3%), anxiety (6.33–50.9%), and stress (8. 1–81.9%) in the general population.[8]

In an effort to prevent the transmission of COVID-19, the government has implemented policies, namely lockdown, physical distancing, restrictions on social activities, working from home, and online learning. Changes in learning methods from offline to online resulted in the emergence of psychological problems in students.[10] These psychological problems are caused by limited communication and interaction, and the lack of socialization with lecturers, friends, and the environment.[11] Students also need to adapt to changes that occur in the learning process, find it difficult to understand lecture material, and workloads that are considered higher, such as additional workloads at home.

The change in learning from offline to online caused psychological problems such as anxiety in dealing with learning and boredom due to studying at home for too long. Based on research, it was found that 28.5% of 571 Chinese students experienced psychological distress due to changes in the learning process.[12] Another study conducted in New York, United States, showed that 40% of students during the COVID-19 pandemic experienced anxiety disorders, post-traumatic stress disorder, and major depressive disorder.[13] These mental health problems arise due to changes in learning methods during the COVID-19 pandemic.

Transmission of Covid-19 through droplets causes various activities to be carried out with distance restrictions.[14] Activities such as school or college must also be carried out online.[15] This causes social interaction in adolescents to decrease.[16] Changes in learning methods cause a variety of mental health problems, the initial symptoms that can arise usually start from confusion, excessive anxiety, and finally cause anger which is often not even known for sure.[17] A study in China showed that there were three symptoms that were most commonly felt by children and adolescents, namely anxiety (24.9%), depression (19.7%) and stress (15.2%).[18]

Based on previous research reports, various factors were found that had an influence on adolescent mental health such as stress, anxiety, and depression during the COVID-19 pandemic.[19] Overall, these factors include online learning processes, eating patterns, use of mobile phones, consumption of news from the media, gender, communication with parents, form of family, use of social media, social isolation, individual, family and social vulnerabilities of adolescents, the level of education is a factor that affects the mental health of adolescents.[20] Meanwhile, other research shows that good stress response recovery and positive appraisal specifically are strong factors that influence high individual resilience in dealing with problems during the COVID-19 pandemic.[21] So that stress, anxiety, and depression are mental health problems that many teenagers experience during the COVID-19 pandemic.

Psychological problems that arise in these students need action to reduce and prevent the negative impact of mental health due to the COVID-19 pandemic. One of the efforts to overcome psychological problems is by intervention in the form of digital therapy.[22] Digital therapy is a psychological intervention used to treat problems, symptoms, and psychological disorders.[23] In times of a pandemic like this, digital therapy packaging can be digital. Digital therapy is a transformation of digital therapy interventions from manual to electronic-based (web or smartphone applications).[24] This potential becomes an opportunity to be used as a means of psychological intervention during a pandemic that requires maintaining distance and minimizing going out of the house.

Previous systematic reviews has shown that digital therapy is effective in reducing the impact of stress and anxiety on college students.[25,26] This intervention is carried out offline by psychiatric nurses for final year students. Then other studies also show that digital nursing interventions can significantly improve the mental health of students who are victims of bullying.[27,28] Other studies also show that digital interventions can reduce symptoms of stress and depression in college students.[29,30] The results of this study found that there were symptoms of anxiety in students. So the study recommends conducting research on digital therapy in reducing symptoms of mental health problems in students during the COVID-19 pandemic. This study is the first study to describe digital therapy to reduce symptoms of anxiety and depression in college students during the COVID-19 pandemic.

Previous study have shown that digital therapy can reduce mental health problems, namely stress.[31] Previous scoping review also found that digital-based nursing interventions were given to students to reduce student anxiety.[29,32] While students have other problems such as stress, depression, and anxiety. So the authors focus on two mental health problems that have not been discussed, namely anxiety and depression. In addition, previous study also used a variety of designs so that they did not focus on providing digital therapy. This is an advantage in this study, namely the scoping review using articles with quasi-experiment designs and digital therapy.

Digital-based digital therapy has a large reach, is easily accessible, and is an online format for dealing with mental health problems.[33] Therefore, researchers are interested in exploring more deeply digital-based interventions to overcome students' mental health problems during the COVID-19 pandemic. The purpose of this study is to explore methods of digital therapy to reduce symptoms of anxiety and depression among students during the COVID-19 pandemic.

Materials and Methods

Design

This study was designed using Arksey and O'Malley's scoping review framework. Scoping review is a methodological technique to explore new topics that are currently being developed.[34] Scoping review aims to explore a topic and usually aims to answer broad questions.[35] The researcher conducted a scoping review to assess the extent of available evidence, to organize them into groups according to similarity.[36] Scoping reviews can also be used as a basis for conducting systematic reviews and meta-analysis. This research framework has a wide conceptual range so that it is able to explain various relevant studies.[37] The framework used consists of five core stages, namely identification of research questions, identification of relevant study results, study selection, mapping data, compiling, summarizing and reporting results.[38] This literature review used PRISMA Extension for Scoping Reviews (PRISMA-ScR) to identify various topics that discuss mental health interventions, namely digital therapy to reduce anxiety and depression in students during the COVID-19 pandemic (Figure 1). The research question in this study is what are the digital therapy methods to reduce symptoms of anxiety and depression in students during online learning during the COVID-19 pandemic?

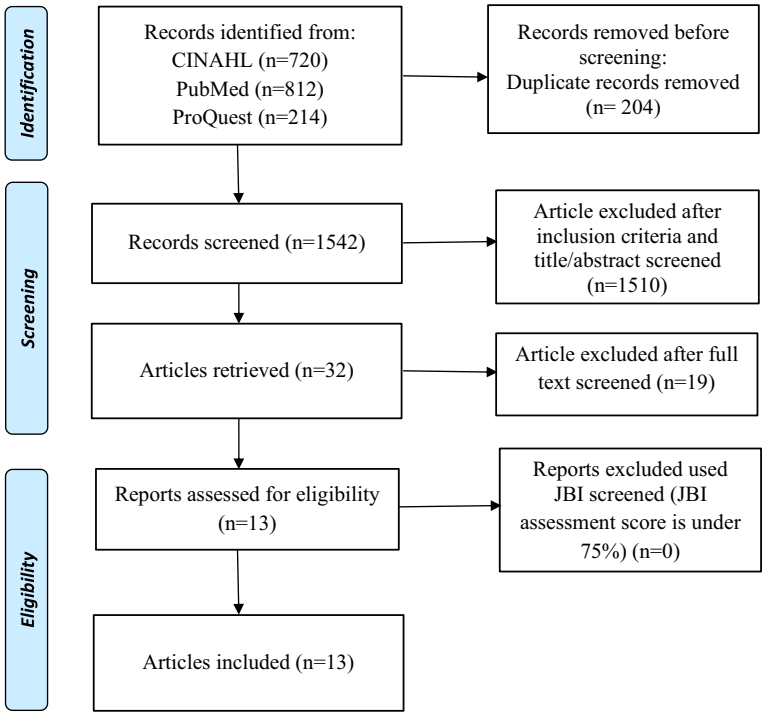

Figure 1 PRISMA Flow Diagram.
Notes: PRISMA figure adapted from Page MJ. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ*. 2021;372:n71. Creative Commons.[39]

Search Strategy and Eligibility Criteria

For publication searches, three databases were used: PubMed, CINAHL, and Scopus. The keywords used in PubMed are: "anxiety" [MeSH Terms] OR 'anxiety' [tw] OR 'anxiety disorders' [tw] AND "depression" [MeSH Terms] OR 'depression' [tw] OR 'depressive' [tw] OR 'depression disorders' [tw] OR 'depressive disorders' [tw] OR 'major depressive disorders' [tw] AND "students" [MeSH Terms] OR 'students' [tw] OR 'adolescent students' [tw] OR 'boy students' [tw] OR 'girl students' [tw] OR 'university students' [tw] OR 'high school students' [tw] AND "COVID-19" [Mesh] OR 'COVID-19' [tw] OR 'Coronavirus Disease 2019 (COVID-19) pandemic' [tw] OR 'COVID-19 pandemic' [tw] OR 'SARS-CoV-2' [tw] OR 'SARS-CoV-2 Infection*' [tw] OR '2019-nCoV' [tw] OR '2019-nCoV Infection*' [tw] OR 'COVID-19 Pandemic*' [tw] OR 'COVID-19 Virus Disease*' [tw]. The keywords used in Scopus are ALL (anxiety OR anxiety disorders) AND ALL (depression OR depressive OR depression disorders OR depressive disorders OR major depressive disorders) AND ALL (students OR adolescent students OR boy students OR girl students OR university students OR high school students) AND ALL (COVID-19 OR Coronavirus Disease 2019 (COVID-19) pandemic OR COVID-19 pandemic OR SARS-CoV-2 OR SARS-CoV-2 Infection* OR 2019-nCoV OR 2019-nCoV Infection* OR COVID-19 Pandemic* OR COVID-19 Virus Disease*). The keywords used in CINAHL are: anxiety OR anxiety disorders AND depression OR depressive OR depression disorders OR depressive disorders OR major depressive disorders AND students OR adolescent students OR boy students OR girl students OR university students OR high school students AND COVID-19 OR Coronavirus Disease 2019 (COVID-19) pandemic OR COVID-19 pandemic OR SARS-CoV-2 OR SARS-CoV-2 Infection OR 2019-nCoV OR 2019-nCoV Infection OR COVID-19 Pandemic OR COVID-19 Virus Disease.

The criteria in this study based on the PICO (Patients, Interventions, Comparison, Outcome) criteria framework were:[40]

Patients: students.

Interventions: digital therapy.

Comparison: no comparison.

Outcome: nursing care, intervention, decrease level of anxiety and depression.

In addition to the eligibility conditions specified above, we consider the inclusion criteria chosen by the authors using the primary research results, namely the Randomized Control Trial and Quasi-Experiment to describe spiritual interventions. The articles used are English articles with full text within the publication period during COVID-19 pandemic (2019–2022). While the exclusion criteria in this study were a non-student sample, and non-digital therapy interventions.

Data Collection

Tabulation method is used to extract data from research results manually. The five authors selected articles by reading the titles and abstracts obtained from searching articles from three databases. Then the four authors read the full-text articles according to the inclusion criteria. Then if there is a debate between the authors, the four authors carry out discussions and deliberations. If there is still no agreement, then the fifth author is invited to discuss. The authors double-checked to reduce the risk of bias in the article selection process and ensure the high quality of the articles in this study. The authors used manual tables to present findings and compares these findings based on the articles that have been reviewed. Data findings were discussed by all authors. The data entered into the table is adjusted based on the research objectives. Among the data items searched for were author, country, study design, objectives, interventions, and results.

Quality Appraisal

Quality appraisal is an assessment of articles that are found to determine the quality of the article. Article quality was assessed using the Joanna Briggs Institute (JBI). The questionnaire contains statements that are adjusted to the research design. The instrument for the randomized control trial design was 13 statements and the instrument for the quasi-experiment design was 11 statements. The answer options consist of yes, not, unclear, and not applicable. Yes answers were given a score of 1 and other answers were given a score of 0. The authors then added up the score of each article as the authors was consideration to determine the eligibility of the article. The articles in this review were analyzed using

Table 1 JBI Critical Appraisal Tool

Author, Published Year	JBI Critical Appraisal Tool	Study Design
[41]	76.9% (10/13)	RCT
[42]	100% (9/9)	Quasi-experiment
[43]	84.6% (11/13)	RCT
[44]	76.9% (10/13)	RCT
[45]	92.3% (12/13)	RCT
[46]	84.6% (11/13)	RCT
[47]	88.9% (8/9)	Quasi-experiment
[48]	92.3% (12/13)	RCT
[49]	100% (13/13)	RCT
[22]	76.9% (10/13)	RCT
[50]	88.9% (8/9)	Quasi experiment
[51]	84.6% (11/13)	RCT
[52]	84.6% (11/13)	RCT

the JBI critical assessment method with standards for the articles above 75% based on criteria and topic relevance (Table 1) (Institute, 2017). The articles were reviewed by three authors and analyzed in this review.

Data Analysis

Data analysis used in this study is a quantitative approach. All authors read the entire article then made a summary and entered it into the data extraction table After that, the authors discussed the findings of the article and compile research results. After that, the authors classified digital therapy according to similar methods. After that, the authors made a narrative description of digital therapy. All authors completed the study selection process and included studies followed the PRISMA flowchart: (1) identifying duplicates; (2) filtering of titles and abstracts; and (3) availability of full text.

Results

Based on the search results for articles from three databases, The number of articles obtained from the search is 1746 articles. Then the authors used the Mendeley application to eliminate articles based on duplication, and obtained 1542 articles. Then the authors read the title and abstract, and eliminated based on the inclusion criteria, and obtained 32 articles. After that, the authors read the articles in full-text and discusses the contents of the article that has been read, the authors finds 13 articles that are in accordance with the research objectives. The authors double-checked when reading full-text articles to ensure that the data obtained was in accordance with the research objectives. The authors evaluated the quality of the article using the JBI Assessment. The results of the article quality assessment to determine articles that have high quality with a standard JBI score of above 75% (Table 1).

Based on the characteristics of the articles in this study, 2 articles came from a developing country (1 article from India and 1 article from Iran) and 11 articles from developed countries (1 article from Spain, 1 article from Canada, 1 article from Switzerland, 2 articles from Australia, 2 article from Finland, 2 articles from United States of America, and 2 articles from Germany). The design of the articles in this scoping review are also 10 articles with a randomized control trial design and 3 article used a quasi-experimental design. The sample in this study is in the range of 37–1986 students.

There are 13 articles that describe digital therapy interventions that can reduce anxiety and depression. As for the research subjects of the articles analyzed, these were elementary school students and undergraduate students. Of the 13

articles analyzed, there are four methods of digital therapy, namely Improving psychological abilities, Bias-modification intervention, Self-help intervention, dan Mindfulness intervention.

This scoping review discusses the potential of digital therapy to improve mental health by reducing anxiety and depression levels in college students during the COVID-19 pandemic. In general, the findings from research related to digital therapy are: the digital therapy model includes directions via digital modules, directions via video, and asynchronous discussions via Online meeting, Delivery services of digital therapy consist of three phases, namely psychoeducation, problem-solving, and implementation of problem-solving strategies.

Authors identified the five methods by providing an explanation of the impacts and activities carried out. The results of the analysis of the article are presented in tabular form as follows (Table 2):

Improving Psychological Abilities

Resiliency Engagement and Care in Health (REaCH) intervention promotes mental wellbeing and reduce depressive symptoms by assisting participants by facilitating social support from family and friends using gadgets.[41] This intervention requires proactive engagement to build positive and supportive relationships with participants, provide emotional support, and psychoeducation about COVID-19 including preventive measures, inquiring about general health and biological functioning. Then it proceeds with problem-solving through supportive therapy by looking for alternative options for decision-making. Finally, participants will be invited to implement the solutions that have been discussed with the involvement of participants in the social or family environment. Thus, the REaCH intervention is able to increase emotional support and reduce depression.

The CATCH-IT intervention used psychoeducation at the start of the intervention. CATCH-IT consists of 14 modules based on behavioral activation, cognitive behavioral therapy, interpersonal digital therapy, and community resilience concept models.[48] The goal of this intervention is to reduce multiple thoughts (dysfunctional thinking, problem-solving disorders, and pessimistic expectations), behaviors (procrastination, passivity, and avoidance), and interpersonal interactions (indirect communication), thought to increase vulnerability to depressive disorder.

Bias-Modification Intervention

Digital therapy can also be done with bias-modification interventions. The intervention is multi-session online interpretation bias modification training, wherein participants were asked to play to analyze the missing words from the last sentence provided by the game. Participants must indicate the first missing letter with the appropriate key, after pressing the space bar as soon as they recognize the word. Each training session consisted of three blocks of 14 trials, with 10 training scenarios and two positive and two negative investigation scenarios (disambiguated in a positive or negative way, respectively). This play intervention can improve mental health by reducing levels of depression and anxiety.

Online interdisciplinary intervention carried out for 10 weeks.[45] This intervention aims to facilitate behaviour change in participants. The e-learning system implemented by the participants also facilitates the participants to create social forums. Participants are facilitated to discuss under the supervision of the facilitator. Then participants were also given education about mental health and independent practice during the COVID-19 pandemic. This intervention showed that there was a decrease in participants' anxiety.

Online Attentional Bias Modification is an intervention carried out over 8 sessions.[42] Participants are given education about COVID-19 and the limits that participants must do in dealing with COVID-19. Participants were also grouped to discuss mental health issues during the COVID-19 pandemic. This intervention can reduce depression and anxiety in participants.

Self-Help Intervention

Module-based therapy can combine several interventions presented through the module. Interventions to reduce stress after psychoeducation are problem solving, muscle and breath relaxation, mindfulness, acceptance and tolerance, self-compassion, and my master plan for planning ahead in reducing mental health problems.[22] Another module-based intervention is the MHP intervention guided by a comprehensive therapist.[51] Modules are delivered via mobile and include text, videos, audio-guided mindfulness exercises, infographics illustrating CBT principles, and journal guides.

Table 2 Extraction Data

No	Author & Year	Outcome	Country	Design	Sample	Intervention	Result
1.	[41]	To find out the effectiveness of Resiliency Engagement and Care in Health (REaCH) to well-being and reduce depressive symptoms.	India	RCT	1440 students	Resiliency Engagement and Care in Health (REaCH)	Resiliency Engagement and Care in Health (REaCH) interventions are able to reduce symptoms of depression and promote better mental health through the mobilization of social support from friends, family and others.
2.	[42]	Effects of Attentional Bias Modification (ABM) on stress, depression and coronavirus anxiety.	Iran	Quasi-experiment	37 students	Online Attentional Bias Modification	Effectively reducing stress, depression, and anxiety among students
3.	[43]	Effect of a mindfulness-based mobile application on reducing anxiety and depression, and increasing empathy, and self-compassion	Spain	RCT	168 students	Mindfulness-based mobile application	Effectively reducing anxiety and depression
4.	[44]	Effect of Online mindfulness and self-compassion skills on anxiety and depression	Canada	RCT	456 students	Online mindfulness and self-compassion skills (Mind-OP)	Significantly reducing anxiety and depression among students
5.	[45]	Effect of online interdisciplinary intervention on mental health and emotional wellness	Australia	RCT	425 students	Online interdisciplinary intervention	Effectively improving mental health by reducing anxiety and depression
6.	[46]	Effect of Self-Help Internet Intervention on anxiety and depression	Australia	RCT	1986 students	Self-Help Internet Intervention	Self-Help Internet Intervention effectively reducing anxiety and depression among students
7.	[47]	Effect of Universal interventions and programs on mental health problems among students	Finland	Quasi-experiment	151 students	Universal interventions and programs	Significantly reducing stress, anxiety, and depression among students.
8.	[48]	To evaluate the Internet-Based Depression Prevention Program in reducing depression in adolescents	United States of America	RCT	83 students	Internet-Based Depression Prevention Program	Internet-Based Depression Prevention Program is effective in reducing hopelessness depression in adolescents
9.	[49]	To test the effectiveness of the internet-based self-help intervention "ROCO - (Resilience and Optimism during COVID-19)" in reducing psychological stress in adolescents	Switzerland	RCT	107 students	Internet-based self-help intervention	The "ROCO" intervention did not significantly reduce symptoms of primary depression, symptoms of anxiety, and stress. However, the "ROCO" intervention significantly improved emotion regulation and resilience skills.

(*Continued*)

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Table 2 (Continued).

No	Author & Year	Outcome	Country	Design	Sample	Intervention	Result
10.	[22]	To evaluate effectiveness of Internet and App-based stress interventions in reducing depression in students following distance learning	Germany	RCT	200 students	Internet- and app-based stress intervention	Internet and app based stress intervention can significantly reduce symptoms of depression, stress, anxiety, worry, and emotional exhaustion and can increase resilience, emotional regulation, self-love, self-esteem, and stress control in adolescents.
11.	[50]	To assess the effectiveness of Mindfulness-Based and Skills-Based "CoPE It" Intervention in reducing psychological distress, depression, and anxiety, and increasing self-efficacy and attention in adolescents	Germany	Quasi-experiment	110 students	E-Mental Health Mindfulness-Based and Skills-Based "CoPE It" Intervention	E-Mental Health Mindfulness-Based and Skills-Based "CoPE It" Intervention can reduce psychological stress, anxiety, and depression and can increase self-efficacy in students.
12.	[51]	To test the effectiveness of the Meru Health Program (MHP) in reducing depression in Finnish students	Finland	RCT	124 students	Meru Health Program	Meru Health Program can significantly increase resilience and reduce stress and depression in students
13.	[52]	To investigate online mindfulness programs in reducing levels of dysfunctional anxiety in college students	United States of America	RCT	166 Students	Online mindfulness program	Online mindfulness programs can significantly reduce anxiety in students

Implementation of daily content and intervention is for 10–45 minutes. MHP includes anonymous peer support via moderated group discussion boards, and asynchronous support by remote therapists.

Self-Help Internet Intervention is an intervention that contains 12 modules over 4 weeks.[46] Each module contains therapeutic techniques based on the principles of cognitive behavior therapy (psychoeducation, getting help and support, cognitive reframing, problem solving, mindfulness, managing relationships, exercise and diet, and sleep hygiene), mood modules (activation of behavior and reducing rumination), modules reduce anxiety, and distress tolerance module. Participants can access the module for 4 weeks. The results of the intervention showed that there was a decrease in anxiety, stress and depression in the participants.

Universal interventions and programs focus on individual motivation to reduce stress.[47] Activities in this intervention are writing a diary, taking tests related to internet use or health evaluation, and reflecting on the test results received in the diary. Participants can also do online counseling with mental nurses and psychologists. The results of this intervention showed that there was a decrease in depression and anxiety.

The modules in the ROCO intervention are based on cognitive behavioral therapy containing short texts, videos, illustrations, exercises, and weekly assignments.[49] The psychoeducation is provided for ROCO therapy regarding psychological stress due to COVID-19. Modules continue with emotion regulation skills, identifying and restructuring thought patterns, strengthening resilience, and developing relaxation and self-care.

Mindfulness Intervention

Mindfulness is also one of the interventions that can be done through digital therapy. The online intervention that can be done is "CoPE It" which consists of four modules.[50] Each activity in the module lasts 30 minutes. Each module features media such as psychoeducational videos, audio mindfulness exercises, and other interactive skills (planning daily routines, stress management and emotional emergencies). The intervention in the form of a mindfulness program was carried out for eight weeks[52] Mindfulness is done online through a 90-minute Online meeting. The activities carried out were mindfulness meditation practices, periods of inquiry and reflection, and interactive exercises based on cognitive behavioral therapy. Apart from online meeting, participants were asked to do it independently at home within 20–30 minutes.

The mindfulness-based mobile application was carried out for 8 weeks using the application in 8 stages.[43] There are three parts in the intervention process, namely Listening, Practicing, and Implementation in everyday life. This application provides a variety of video content regarding explanations about mindfulness, self-compassion, and physiological stress reactions, as well as audio segments that guide participants to practice mindfulness independently. The results of this intervention showed that there was a decrease in anxiety in the participants.

The mindfulness-based mobile application is an online intervention that is carried out independently by participants.[44] The intervention consists of four modules that focus on aspects of mindfulness or compassion. The content in this intervention consisted of psychoeducational videos, audio guides on meditation practices, as well as schedules for participants to practice meditation. Each module is delivered weekly, for a total of four weeks. The module contains general mental health psychoeducational videos related to anxiety, depression, and stress, while the second module introduces the concept of mindfulness. The third module is about integrated meditation and psychoeducational videos about mindfulness from self-compassion. Then the fourth module focuses on the self-kindness component of self-compassion.

Discussion

This study is the first study to discuss digital therapy to reduce symptoms of anxiety and depression in students during the COVID-19 pandemic. The authors found that there are four digital therapy methods, namely Improving psychological abilities, Bias-modification intervention, Self-help intervention, and Mindfulness intervention. Digital therapy is carried out by psychologists and nurses to improve students' mental health in facing challenges during the COVID-19 pandemic.

The articles in this study come from developed and developing countries. COVID-19 is happening all over the world. So that it is not affected by the progress of a country. However, the implementation of digital therapy is mostly carried out in developed countries. This is influenced by the number of health workers and technological advances in developing

digital therapy.[53] Other studies also show that there is a relationship between developed countries and a country's technological progress.[54,55] This is in line with previous studies which show that digital therapy has been implemented in developed countries.[33,56] Other studies also show that health workers in developed countries have implemented digital therapy as an effort to reduce anxiety problems in adolescents during the COVID-19 pandemic.[33,57]

All articles in this study discuss digital mental health interventions for college students and students who are affected by changes in learning methods during the COVID-19 pandemic. Some of the methods used are psychoeducation, video-based therapy, module-based therapy, and asynchronous therapy. Each method has the effect of reducing anxiety and depression among students during the COVID-19 pandemic. This is in line with previous studies which show that digital therapy can reduce anxiety symptoms in adolescents.[56,58] Other studies have also shown that digital therapy can reduce mental health problems while undergoing online learning.[59,60] Other studies also show that digital therapy can increase student resilience in dealing with anxiety in adolescents while undergoing online learning.[61,62]

Digital therapy is given to students to reduce transmission of Covid-19. Efforts to improve mental health utilize technology so that it can be carried out efficiently. In line with this, previous research has shown that digital interventions can efficiently improve mental health.[63] However, other studies show that interventions carried out digitally experience several obstacles such as internet networks, unclear information, and the absence of physical support between therapists and patients.[53,64] So digital therapy packaging needs to be provided with features that can provide maximum physical, psychological, social and spiritual support even though it is done online.

The digital therapy model used in this article is the asynchronous model, video guidance, and guidance module. The asynchronous model used is guidance and exercises via online for 90 minutes, then participants are encouraged to re-do the therapy taught at home. The video briefing model that is carried out is that participants are given a video via a platform used in digital therapy, then they are asked to follow directions from the video reported in the form of assignments or quizzes. The other model used is the provision of modules. The module is presented to participants, then they are asked to follow the directions in the module. At the end, there is an evaluation given to participants to determine the success of the modules that have been given. This is in line with previous studies which show that nursing interventions carried out via online meetings can effectively reduce mental health problems in students.[27]

In general, all digital therapy services have three phases, namely psychoeducation, problem-solving, and implementing strategies to improve the mental health of digital therapy users. The first phase is psychoeducation, the purpose of which is to increase participants' knowledge about the psychological pressures that arise due to the COVID-19 pandemic. There are psychoeducational methods that are carried out through the provision of videos, giving modules, and asynchronous discussions. Previous study have shown the same thing, namely digital therapy is carried out by providing education related to psychological conditions to adolescents.[29] The second phase is problem-solving, this phase aims to increase awareness and help participants recognize the problems they are facing, then they are invited to think about finding solutions to the problems at hand. The results of the literature review found several methods, namely participants were invited to discuss in groups and follow the direction of the module. In another study, problem-solving is content in the process of digital therapy.[65] Problem-solving training is an effort to improve participants' ability to analyze problems and find solutions to problems. The third phase is the implementation of the problem-solving strategies encountered, while the forms of activities carried out are relaxation therapy, mindfulness therapy, discussions through sending messages, and interventions carried out by participants by following module directions or videos. In line with previous studies which showed that the implementation of problem-solving and mindfulness was effective in reducing anxiety symptoms in students.[66,67] Other studies also show that online mindfulness can improve psychological well-being in students who experience stress and anxiety.[68,69]

Based on the research results, digital therapy is effective for improving the mental health of students and students in dealing with changes in learning methods during the COVID-19 pandemic. In terms of education, participants are able to recognize mental health problems that may arise due to the COVID-19 pandemic. In addition, digital therapy can also reduce the spread of COVID-19 because it is done online. Digital therapy is also effective for providing digital therapy, seen from an increase in mental health such as a decrease in anxiety and depression.[70] In line with previous studies showing that digital therapy is effective in reducing anxiety symptoms in adolescents who experience mental health problems.[71,72] Other studies also show that there is a decrease in anxiety and depression in students after receiving digital

therapy.[53,73] Digital therapy is given to students with comprehensive attention to physical and psychological aspects. Providing digital interventions by paying attention to physical, psychological conditions, as well as social and cultural aspects can optimally improve students' psychological health.[57,64]

Improving psychological abilities is a digital therapy that aims to improve students' psychological abilities in dealing with stress and anxiety during the co-19 pandemic. The psychological abilities that are trained are resilience, problem-solving, and improving coping. This ability can reduce symptoms of anxiety and depression in students during the COVID-19 pandemic.[74] Previous study have shown that resilience can reduce anxiety in students.[75] Other studies have also shown that high problem-solving skills are associated with lower rates of depression.[76] Previous studies have also shown that interventions to improve resilience and problem-solving skills are effective in reducing symptoms of anxiety and depression in adolescents.[77,78] Other studies also show that digital resilience training can reduce anxiety and stress in students.[67,79]

Bias-modification intervention is an intervention that focused on modifying the environment and behavior in reducing symptoms of anxiety and depression in adolescents during the COVID-19 pandemic. This modification aims to reduce negative thoughts in adolescents, causing excessive anxiety. So that behavior is diverted to positive things that can reduce anxiety and depression. This is in line with previous studies showing that distracting adolescents can reduce anxiety symptoms during online learning.[80–82] Other studies also show that adolescents who are active have lower levels of anxiety and depression.[83] Digital therapy with the bias-modification method is effective in reducing symptoms of anxiety and depression in students during the COVID-19 pandemic. In line with this, previous studies have shown that bias-modification intervention can significantly reduce symptoms of anxiety in final year students.[51,84] In addition, bias-modification intervention is also effective in reducing depressive symptoms in students who experience academic stress.[85]

Self-help intervention is an intervention that focused on an individual's ability to help himself. Participants are given training to carry out therapy independently in reducing symptoms of anxiety and depression during the co-19 pandemic. Therapy given such as relaxation and meditation which can be done independently. Participants are given a module as a guide in carrying out the intervention. This is in line with previous studies which show that students with high knowledge of self-help therapy have lower rates of depression.[86,87] In addition, interventions carried out independently by students can increase awareness about mental health. Previous studies have also shown that self-help interventions can effectively reduce symptoms of anxiety and depression in first-year students.[87,88] Then another study also showed that self-help interventions can significantly reduce symptoms of anxiety and depression in survivors of COVID-19.[89]

Mindfulness intervention is a mind-focused intervention to improve students' mental health during the COVID-19 pandemic. Participants are trained by the facilitator to meditate by psychologists and mental nurses. This is in line with previous studies which showed that participants who did mindfulness therapy experienced a significant decrease in anxiety levels.[90,91] Other studies have also shown that mindfulness therapy in adolescents can improve mental health by significantly reducing symptoms of depression and stress.[92–94]

Digital therapy has the advantage that it is efficient in terms of distance and can be done at any time. This makes digital therapy suitable for use during the COVID-19 pandemic. Although digital therapy has drawbacks in providing optimal service because it is hampered by the network and the therapist cannot see the full development of the participant/patient, so that the implementation of digital therapy requires full supervision from the therapist and also the role of parents at home to increase the success of the intervention. In addition, features in applications and websites in digital therapy must also have clear and informative content, and facilitate two-way communication between participants and therapists.

Digital therapy is an intervention that used technology effectively to improve students' mental health during the COVID-19 pandemic. Changes in learning methods from offline to online cause stress on students. So this study focused on describing digital therapy as a reference for health workers in reducing symptoms of anxiety and depression in students.

Limitations

The limitation in this study is that primary research on digital therapy is still limited so that it cannot discuss digital therapy in comprehensively reducing symptoms of anxiety and depression in students during online learning. In addition, digital therapy can only be carried out in countries that have developed in terms of technology. This caused the implementation of digital therapy to be adapted to the conditions of each country. Another limitation in this study is that it only explores several digital therapy methods to reduce anxiety and depression in students, but cannot analyze the effectiveness of implementing digital therapy.

Conclusion

The potential of digital therapy to improve adolescent mental health by reducing anxiety and depression in adapting to online learning. Digital therapy models that can be done are in the form of digital modules, instructions from videos, and discussions via online meeting. The authors found that there are four digital therapy methods, namely Improving psychological abilities, Bias-modification intervention, Self-help intervention, and Mindfulness intervention. The implementation of digital therapy is carried out by paying attention to various aspects that affect students, namely physical, psychological, social, cultural, and spiritual aspects to increase the success of the intervention. Digital therapy interventions are proven to improve mental health by reducing depression and anxiety levels in students who are taking online learning, but digital interventions must be improving the features to present clear information and two-way communication between therapists and participants.

The implication of this study is that there are innovative technology-based interventions that can be carried out by health workers, especially nurses, in reducing symptoms of anxiety and depression experienced by adolescents during online learning during the COVID-19 pandemic. Another implication of this research is that there is a basis for feature development as an effort to improve mental health services for adolescents. For future research, the authors recommend further research with a systematic review design and meta-analysis to determine the effectiveness of digital therapy to reduce symptoms of anxiety and depression in students during online learning. We recommend implementing digital therapy and analyzing the advantages and disadvantages of the intervention.

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References

1. World Health Organization. WHO director-general's opening remarks at the media briefing on COVID-19; 2020.
2. Amir LR, Tanti I, Maharani DA, et al. Student perspective of classroom and distance learning during COVID-19 pandemic in the undergraduate dental study program Universitas Indonesia. *BMC Med Educ*. 2020;20:20. doi:10.1186/s12909-020-02312-0
3. Budiharto W. Data science approach to stock prices forecasting in Indonesia during Covid-19 using Long Short-Term Memory (LSTM). *J Big Data*. 2021;8(1):47. doi:10.1186/s40537-021-00430-0
4. World Health Organization. WHO coronavirus (COVID-19) dashboard; 2022. Available from: https://www.who.int. Accessed June 17, 2023.
5. Zhao M, Wang M, Zhang J, et al. Comparison of clinical characteristics and outcomes of patients with coronavirus disease 2019 at different ages. *Aging*. 2020;12(11):10070–10086. doi:10.18632/aging.103298
6. Horesh D, Brown AD. Traumatic stress in the age of COVID-19: a call to close critical gaps and adapt to new realities. *Psychol Trauma Theory Res Pract Policy*. 2020;12(4):331–335. doi:10.1037/tra0000592
7. Cao W, Fang Z, Hou G, et al. The psychological impact of the COVID-19 epidemic on college students in China. *Psychiatry Res*. 2020;278. doi:10.1016/j.psychres.2020.112934
8. Wang C, Pan R, Wan X, Al E. Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) epidemic among the general population in China. *Int J Env Res Public Heal*. 2020;17(5). doi:10.3390/ijerph17051729

9. Mukhtar S. Mental health and psychosocial aspects of coronavirus outbreak in Pakistan: psychological intervention for public mental health crisis. *Asian J Psychiatr*. 2020;51102069. doi:10.1016/j.ajp.2020.102069
10. Fathiyah K, Widyastuti T, Setiawati FA, Al E. Improving mental health during the COVID-19 pandemic through online psychoeducation. *Psychol Res Interv*. 2021;3(2):72–79. doi:10.21831/pri.v3i2.41385
11. Rahmawati S. Dampak psikologis pembelajaran jarak jauh bagi kesehatan mental mahasiswa. *Angew Chemie Int*. 2021;5:952–956.
12. Kraemer MU, Yang CH, Gutierrez B, et al. The effect of human mobility and control measures on the COVID-19 epidemic in China. *Science*. 2020;368(6490):493–497. doi:10.1126/science.abb4218
13. Pirutinsky S, Cherniak AD, Rosmarin DH. COVID-19, mental health, and religious coping among American Orthodox Jews. *J Relig Heal*. 2020;59(5):2288–2301. doi:10.1007/s10943-020-01070-z
14. Shim E, Tariq A, Choi W, Lee Y, Chowell G. Transmission potential and severity of COVID-19 in South Korea. *Int J Infect Dis*. 2020;2020:93.
15. Hehir E, Zeller M, Luckhurst J, Chandler T. Developing student connectedness under remote learning using digital resources: a systematic review. *Educ Inf Technol*. 2021;26(5):6531–6548. doi:10.1007/s10639-021-10577-1
16. Khalil R, Mansour AE, Fadda WA, et al. The sudden transition to synchronized online learning during the COVID-19 pandemic in Saudi Arabia: a qualitative study exploring medical students' perspectives. *BMC Med Educ*. 2020;20(1):285. doi:10.1186/s12909-020-02208-z
17. Radwan E, Radwan A, Radwan W, Pandey D. Perceived stress among school students in distance learning during the COVID-19 pandemic in the gaza strip, Palestine. *Augment Hum Res*. 2021;6(1):12. doi:10.1007/s41133-021-00050-6
18. Maulana HA. Psychological impact of online learning during the COVID-19 pandemic: a case study on vocational higher education. *Indones J Learn Educ Couns*. 2021;3(2):130–139. doi:10.31960/ijolec.v3i2.833
19. Baltà-Salvador R, Olmedo-Torre N, Peña M, Renta-Davids AI. Academic and emotional effects of online learning during the COVID-19 pandemic on engineering students. *Educ Inf Technol*. 2021;26(6):7407–7434. doi:10.1007/s10639-021-10593-1
20. Zhang Q, Zhou L, Xia J. Impact of COVID-19 on emotional resilience and learning management of middle school students. *Med Sci Monit Int Med J Exp Clin Res*. 2020;26:e924994. doi:10.12659/MSM.924994
21. Veer IM, Riepenhausen A, Zerban M, et al. Psycho-social factors associated with mental resilience in the Corona lockdown. *Transl Psychiatry*. 2021;11(1):67. doi:10.1038/s41398-020-01150-4
22. Harrer M, Apolinário-Hagen J, Fritsche L, et al. Effect of an internet- and app-based stress intervention compared to online psychoeducation in university students with depressive symptoms: results of a randomized controlled trial. *Internet Interv*. 2021;24:100374. doi:10.1016/j.invent.2021.100374
23. Locher C, Meier S, Gaab J. Digital therapy: a world of meanings. *Front Psychol*. 2019;10. doi:10.3389/fpsyg.2019.00460
24. Andrews G, Basu A, Cuijpers P. Computer therapy for the anxiety and depression disorders is effective, acceptable and practical health care: an updated meta-analysis. *J Anxiety Disord*. 2018;55:70–78. doi:10.1016/j.janxdis.2018.01.001
25. Leaviss J, Davis S, Ren S, et al. Behavioural modification interventions for medically unexplained symptoms in primary care: systematic reviews and economic evaluation. *Health Technol Assess*. 2020;24(46):1–490. doi:10.3310/hta24460
26. Livingston NA, Berke D, Scholl J, Ruben M, Shipherd JC. Addressing diversity in PTSD treatment: clinical considerations and guidance for the treatment of PTSD in LGBTQ populations. *Curr Treat Options Psychiatry*. 2020;7(2):53–69. doi:10.1007/s40501-020-00204-0
27. Yosep I, Hikmat R, Mardhiyah A, Kurniawan K, Amira I. A scoping review of the online interventions by nurses for reducing negative impact of bullying on students. *J Multidiscip Healthc*. 2023;16:773–783. doi:10.2147/JMDH.S406050
28. Cross D, Shaw T, Hadwen K, et al. Longitudinal impact of the cyber friendly schools program on adolescents' cyberbullying behavior. *Aggress Behav*. 2016;42(2):166–180. doi:10.1002/ab.21609
29. Yosep I, Hikmat R, Mardhiyah A. Types of digital-based nursing interventions for reducing stress and depression symptoms on adolescents during COVID-19 pandemic: a scoping review. *J Multidiscip Healthc*. 2023;16:785–795. doi:10.2147/JMDH.S406688
30. Yosep I, Hikmat R, Mardhiyah A, Lukman M. Interventions focused by nurses for reducing negative effect of traumatic experience on victims of sexual violence: a scoping review. *Healthcare*. 2023;11(1). doi:10.3390/healthcare11010125
31. Goodman R, Newman D. Testing a digital storytelling intervention to reduce stress in adolescent females. *Storytell Self Soc*. 2014;2014:10.
32. Tokgöz P, Hrynyschyn R, Hafner J, Schönfeld S, Dockweiler C. Digital health interventions in prevention, relapse, and therapy of mild and moderate depression: scoping review. *JMIR Ment Heal*. 2021;8(4):e26268. doi:10.2196/26268
33. Weightman M. Digital digital therapy as an effective and timely treatment option for depression and anxiety disorders: implications for rural and remote practice. *J Int Med Res*. 2020;48(6):0300060520928686. doi:10.1177/0300060520928686
34. Peterson J, Pearce P, Ferguson L, Langford C. Understanding scoping reviews: definition, purpose, and process. *J Am Assoc Nurse Pr*. 2017;29:12–16. doi:10.1002/2327-6924.12380
35. Hines D, Modi N, Lee S, et al. Scoping review shows wide variation in the definitions of bronchopulmonary dysplasia in preterm infants and calls for a consensus. *Acta Paediatr*. 2016;106:366–374. doi:10.1111/apa.13672
36. Chen Q, Sun M, Tang S, Castro AR. Research capacity in nursing: a concept analysis based on a scoping review. *BMJ Open*. 2019;9(11):e032356. doi:10.1136/bmjopen-2019-032356
37. Tricco AC, Lillie E, Zarin W. PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. *Ann Intern Med*. 2018;169(7):467–473. doi:10.7326/M18-0850
38. Bradbury-Jones C, Aveyard H, Isham L, Taylor J, O L. Scoping reviews: the PAGER framework for improving the quality of reporting. *Int J Soc Res Methodol*. 2021;1(1):1–14. doi:10.1080/13645579.2021.1899596
39. Page MJ. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ*. 2021. doi:10.1136/bmj.n71
40. Linares-Espinós E, Hernández V, Domínguez-Escrig JL, et al. Methodology of a systematic review. *Actas Urol Esp*. 2018;42(8):499–506. doi:10.1016/j.acuro.2018.01.010
41. Devassy SM, Allagh KP, Benny AM, et al. Resiliency Engagement and Care in Health (REaCH): a telephone befriending intervention for upskilled rural youth in the context of COVID-19 pandemic—study protocol for a multi-centre cluster randomised controlled trial. *Trials*. 2021;22:500. doi:10.1186/s13063-021-05465-5
42. Nasiry S, Ameli Z. Effects of online attentional bias modification on coronavirus anxiety. *Pract Clin Psychol*. 2021;9(2):143–152. doi:10.32598/jpcp.9.2.739.2
43. Orosa-Duarte Á, Mediavilla R, Muñoz-Sanjose A, et al. Mindfulness-based mobile app reduces anxiety and increases self-compassion in healthcare students: a randomised controlled trial. *Med Teach*. 2021;43(6):686–693. doi:10.1080/0142159X.2021.1887835

44. Beshai S, Bueno C, Yu M, Feeney JR, Pitariu A. Examining the effectiveness of an online program to cultivate mindfulness and self-compassion skills (Mind-OP): randomized controlled trial on Amazon's Mechanical Turk. *Behav Res Ther*. 2020;134(June):103724. doi:10.1016/j.brat.2020.103724
45. Przybylko G, Morton D, Kent L, et al. The effectiveness of an online interdisciplinary intervention for mental health promotion: a randomized controlled trial. *BMC Psychol*. 2021;9(1):1–11. doi:10.1186/s40359-021-00577-8
46. Batterham PJ, Calear AL, Farrer L, Gulliver A, Kurz E. Efficacy of a transdiagnostic self-help internet intervention for reducing depression, anxiety, and suicidal ideation in adults: randomized controlled trial. *J Med Internet Res*. 2021;23(1):1–14. doi:10.2196/22698
47. Anttila M, Lantta T, Ylitalo M, Kurki M, Kuuskorpi M, Välimäki M. Impact and feasibility of information technology to support adolescent well-being and mental health at school: a quasi-experimental study. *J Multidiscip Healthc*. 2021;14:1741–1753. doi:10.2147/JMDH.S311788
48. Van Voorhees BW, Fogel J, Reinecke MA, et al. Randomized clinical trial of an internet-based depression prevention program for adolescents (Project CATCH-IT) in primary care: 12-week outcomes. *J Dev Behav Pediatr*. 2019;30(1):23–37. doi:10.1097/DBP.0b013e3181966c2a
49. Brog N, Hegy J, Berger T, Znoj H. Effects of an internet-based self-help intervention for psychological distress due to COVID-19: results of a randomized controlled trial. *Internet Interv*. 2021;27:100492. doi:10.1016/j.invent.2021.100492
50. Bäuerle A, Jahre L, Teufel M, et al. Evaluation of the E-mental health mindfulness-based and skills-based "cope it" intervention to reduce psychological distress in times of COVID-19: results of a bicentre longitudinal study. *Front Psychiatry*. 2021;12(November):1–10. doi:10.3389/fpsyt.2021.768132
51. Raevuori A, Vahlberg T, Korhonen T, Hilgert O, Aittakumpu-Hyden R, Forman-Hoffman V. A therapist-guided smartphone app for major depression in young adults: a randomized clinical trial. *J Affect Disord*. 2021;286(February):228–238. doi:10.1016/j.jad.2021.02.007
52. Simonsson O, Bazin O, Fisher SD, Goldberg SB. Effects of an eight-week, online mindfulness program on anxiety and depression in university students during COVID-19: a randomized controlled trial. *Psychiatry Res*. 2021;305(July):114222. doi:10.1016/j.psychres.2021.114222
53. Børøsund E, Ehlers SL, Varsi C, et al. Results from a randomized controlled trial testing StressProffen; an application-based stress-management intervention for cancer survivors. *Cancer Med*. 2020;9(11):3775–3785. doi:10.1002/cam4.3000
54. Decker MR, Wood SN, Kennedy SR, et al. Adapting the myPlan safety app to respond to intimate partner violence for women in low and middle income country settings: app tailoring and randomized controlled trial protocol. *BMC Public Health*. 2020;20(1):808. doi:10.1186/s12889-020-08901-4
55. Carson JAS, Lichtenstein AH, Anderson CAM, et al. Dietary cholesterol and cardiovascular risk: a science advisory from the American Heart Association. *Circulation*. 2020;141(3):e39–e53. doi:10.1161/CIR.0000000000000743
56. McFarland S, Hay A. Digital and in-person interpersonal emotion regulation: the role of anxiety, depression, and stress. *J Psychopathol Behav Assess*. 2023;45(1):256–263. doi:10.1007/s10862-022-10010-y
57. Mehra D, Lakiang T, Kathuria N, Kumar M, Mehra S, Sharma S. Mental health interventions among Adolescents in India: a scoping review. *Healthc*. 2022;10(2):1–19. doi:10.3390/healthcare10020337
58. Lamela D, Jongenelen I, Pinto R, et al. Understanding the emotional impact of domestic violence on young children. *Child Abuse Negl*. 2021;31(5):2052. doi:10.3389/fpsyg.2019.00641
59. Lan M, Law N, Pan Q, et al. Cyberbullying in elementary and middle school students: a systematic review. *Comput Educ*. 2022;18(5):53–66. doi:10.1016/j.compedu.2021.104356
60. Hamm MP, Newton AS, Chisholm A, et al. Prevalence and effect of cyberbullying on children and young people: a scoping review of social media studies. *JAMA Pediatr*. 2015;169(8):770–777. doi:10.1001/jamapediatrics.2015.0944
61. Wahlund T, Mataix-Cols D, Olofsdotter Lauri K, et al. Brief online cognitive behavioural intervention for dysfunctional worry related to the COVID-19 pandemic: a randomised controlled trial. *Psychother Psychosom*. 2021;90(3):191–199. doi:10.1159/000512843
62. Bilge Y, Bilge Y. Investigation of the effects of coronavirus and social isolation on psychological symptoms in terms of psychological resilience and coping styles. *Klin Psikiyatr Derg*. 2020;23:38–51. doi:10.5505/kpd.2020.66934
63. Hardy A, Ward T, Emsley R, et al. Bridging the digital divide in psychological therapies: observational study of engagement with the slowmo mobile app for paranoia in psychosis. *JMIR Hum Factors*. 2022;9(3):e29725. doi:10.2196/29725
64. Ofoegbu TO, Asogwa UD, Eseadi C, et al. Effect of rational digital storytelling intervention on depression among adolescent-athletes with special educational needs. *J Ration Cogn Ther*. 2021;39(2):217–237. doi:10.1007/s10942-020-00366-z
65. da Silva JL, de Oliveira WA, Braga IF, et al. The effects of a skill-based intervention for victims of bullying in Brazil. *Int J Environ Res Public Health*. 2016;13(11):1042. doi:10.3390/ijerph13111042
66. Caeli EN, Yadav A. Unplugged Approaches to Computational Thinking: a Historical Perspective. *TechTrends*. 2020;64(1):29–36. doi:10.1007/s11528-019-00410-5
67. Akeman E, Kirlic N, Clausen AN, et al. A pragmatic clinical trial examining the impact of a resilience program on college student mental health. *Depress Anxiety*. 2020;37(3):202–213. doi:10.1002/da.22969
68. Yosep I, Hikmat R, Mardhiyah A, Hazmi H, Hernawaty T. Method of nursing interventions to reduce the incidence of bullying and its impact on students in school: a scoping review. *Healthcare*. 2022;10(10):1835. doi:10.3390/healthcare10101835
69. Yosep I, Hikmat R, Mardhiyah A. Preventing cyberbullying and reducing its negative impact on students using E-parenting: a scoping review. *Sustainability*. 2023;15(3):1752. doi:10.3390/su15031752
70. Yang E, Schamber E, Meyer RML, Gold JI. Happier healers: randomized controlled trial of mobile mindfulness for stress management. *J Altern Complement Med*. 2020;24(5):505–513. doi:10.1089/acm.2015.0301
71. Drissi N, Ouhbi S, Marques G, De La Torre Díez I, Ghogho M, Janati idrissi MA. A systematic literature review on e-mental health solutions to assist health care workers during COVID-19. *Telemed e-Health*. 2021;27(6):594–602. doi:10.1089/tmj.2020.0287
72. Clancy B, Bonevski B, English C, et al. Access to and use of internet and social media by low-morbidity stroke survivors participating in a national web-based secondary stroke prevention trial: cross-sectional survey. *J Med Internet Res*. 2022;24(5):e33291. doi:10.2196/33291
73. Hutson E, Kelly S, Militello LK. Systematic review of cyberbullying interventions for youth and parents with implications for evidence-based practice. *Worldviews Evid Based Nurs*. 2018;15(1):72–79. doi:10.1111/wvn.12257
74. Roig AE, Mooney O, Salamanca-Sanabria A, Lee CT, Farrell S, Richards D. Assessing the efficacy and acceptability of a web-based intervention for resilience among college students: pilot randomized controlled trial. *JMIR Form Res*. 2020;4(11):1–17. doi:10.2196/20167
75. Herrero R, Mira A, Cormo G, et al. An internet based intervention for improving resilience and coping strategies in university students: study protocol for a randomized controlled trial. *Internet Interv*. 2019;16(March):43–51. doi:10.1016/j.invent.2018.03.005

76. Noyes K, Zapf AL, Depner RM, et al. Problem-solving skills training in adult cancer survivors: bright IDEAS-AC pilot study. *Cancer Treat Res Commun*. 2022;31:100552. doi:10.1016/j.ctarc.2022.100552
77. Moore B, Woodcock S, Dudley D. Developing wellbeing through a randomised controlled trial of a martial arts based intervention: an alternative to the anti-bullying approach. *Int J Environ Res Public Health*. 2019;16(1):1–18. doi:10.3390/ijerph16010081
78. Akbari A, Khormaiee F. The prediction of mediating role of resilience between psychological well-being and emotional intelligence in students. *Int J Sch Heal*. 2015;2. doi:10.17795/intjsh-26238
79. de Vibe M, Solhaug I, Rosenvinge JH, Tyssen R, Hanley A, Garland E. Six-year positive effects of a mindfulness-based intervention on mindfulness, coping and well-being in medical and psychology students; results from a randomized controlled trial. *PLoS One*. 2018;13(4): e0196053. doi:10.1371/journal.pone.0196053
80. Page MJ, McKenzie JE, Kirkham J, et al. Bias due to selective inclusion and reporting of outcomes and analyses in systematic reviews of randomised trials of healthcare interventions. *Cochrane Database Syst Rev*. 2014;2014(10):MR000035. doi:10.1002/14651858.MR000035.pub2
81. Pyne JM, Constans JI, Nanney JT, et al. Heart rate variability and cognitive bias feedback interventions to prevent post-deployment PTSD: results from a randomized controlled trial. *Mil Med*. 2019;184(1–2):e124–e132. doi:10.1093/milmed/usy171
82. Dieli-Conwright CM, Sweeney FC, Courneya KS, et al. Hispanic ethnicity as a moderator of the effects of aerobic and resistance exercise in survivors of breast cancer. *Cancer*. 2019;125(6):910–920. doi:10.1002/cncr.31879
83. Wagner B, Grafiadeli R, Martin T, Böhm M. Internet-based imagery rescripting intervention for adult survivors of institutional childhood abuse in the former German Democratic Republic - a pilot study. *Eur J Psychotraumatol*. 2022;13(2):2117222. doi:10.1080/20008066.2022.2117222
84. Schmucker C, Bluemle A, Briel M, et al. A protocol for a systematic review on the impact of unpublished studies and studies published in the gray literature in meta-analyses. *Syst Rev*. 2013;2:24. doi:10.1186/2046-4053-2-24
85. Zheng YX, Jiao JR, Hao WN. Prevalence of stress among nursing students: a protocol for systematic review and meta-analysis. *Medicine*. 2022;101 (31):e29293. doi:10.1097/MD.0000000000029293
86. Leanza L, Studerus E, Bozikas VP, Moritz S, Andreou C. Moderators of treatment efficacy in individualized metacognitive training for psychosis (MCT+). *J Behav Ther Exp Psychiatry*. 2020;68:101547. doi:10.1016/j.jbtep.2020.101547
87. Rackoff GN, Fitzsimmons-Craft EE, Taylor CB, Eisenberg D, Wilfley DE, Newman MG. A randomized controlled trial of internet-based self-help for stress during the COVID-19 pandemic. *J Adolesc Heal*. 2022;71:157–163. doi:10.1016/j.jadohealth.2022.01.227
88. Syah R, Hermawati I. The prevention efforts on cyberbullying case for Indonesian adolescent social media users. *J Penelit Kesejaht Sos*. 2018;17 (2):131–146.
89. King-Dowling S, Psihogios AM, Hill-Kayser C, et al. Acceptability and feasibility of survivorship care plans and an accompanying mobile health intervention for adolescent and young adult survivors of childhood cancer. *Pediatr Blood Cancer*. 2021;68(3):e28884. doi:10.1002/pbc.28884
90. Bruin EI, Meppelink R, Bögels SM. Mindfulness in higher education: awareness and attention in university students increase during and after participation in a mindfulness curriculum course. *Mindfulness*. 2015;6. doi:10.1007/s12671-014-0364-5
91. Tan LBG. A critical review of adolescent mindfulness-based programmes. *Clin Child Psychol Psychiatry*. 2015;21. doi:10.1177/ 1359104515577486
92. Van der Gucht K, Ahmadoun S, Melis M, et al. Effects of a mindfulness-based intervention on cancer-related cognitive impairment: results of a randomized controlled functional magnetic resonance imaging pilot study. *Cancer*. 2020;126(18):4246–4255. doi:10.1002/cncr.33074
93. Seto A, Han X, Price LL, Harvey WF, Bannuru RR, Wang C. The role of personality in patients with fibromyalgia. *Clin Rheumatol*. 2019;38 (1):149–157. doi:10.1007/s10067-018-4316-7
94. Carpenter JK, Sanford J, Hofmann SG, Baxley C, Lasslett H. The effect of a brief mindfulness training on distress tolerance and stress reactivity. *Behav Ther*. 2019;50:50. doi:10.1016/j.beth.2018.10.003