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SYSTEMATIC REVIEW

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Determining the impact of mobile-based self-care applications on reducing anxiety in healthcare providers: a systematic review

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Abstract

Background Healthcare providers (HCP) face various stressful conditions in hospitals that result in the development of anxiety disorders. However, due to heavy workloads, they often miss the opportunity for self-care. Any effort to diminish this problem improves the quality of Healthcare providers and enhances patient safety. various applications have been developed to empower Healthcare providers and reduce their anxiety, but these applications do not meet all their individual and professional needs. The objective of this study was to investigate the impact of mobile-based self-care applications on reducing anxiety in healthcare providers.

Methods In this study, keywords such as anxiety, self-care, healthcare providers, and mobile health were used to search PubMed, Scopus, and Web of Science for papers published in the recent ten years (2014–2024). We used the PRISMA diagram to report the results. Ten out of 2515 retrieved articles that addressed the effect of mobile-based self-care applications on Healthcare providers' anxiety were included for analysis. Data were extracted using a data collection form designed based on the research objective. We used this form to collect data including the author's name, publication year, country, study type, intervention duration, study objectives, platform used, Modules presented in technologies, Methods of reducing anxiety, questionnaire details, and Effectiveness assessment. Data collected from the studies were analyzed by SPSS-21 using frequency and percentage.

Results Based on the results, studies were conducted in nine different countries, and the intervention duration and strategies for reducing anxiety using self-care applications ranged from two weeks to four months. The impact of mobile health applications, their content, and intervention strategies on reducing anxiety were positive. The anxiety-reduction strategies were varied among applications. Anxiety reduction strategies in this study included mindfulness, cognitive-behavioral therapy, physical activities, breathing exercises, dietary regimes, and nature exploration through virtual reality. Cognitive-behavioral therapy and mindfulness constituted the most frequently applied reduction techniques across the studies to reduce anxiety in Healthcare providers.Furthermore, the findings revealed the effectiveness of interventions in reducing other mental disorders such as anxiety, stress, depression, drug abuse, and psychotropic drug use of Healthcare providers.

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Conclusion The use of mobile health applications with practical strategies is effective in reducing anxiety and can also reduce other anxiety disorders in Healthcare professional.

Keywords Anxiety, Self-care, Mobile-based self-care applications, Healthcare providers

Background

Anxiety is an unpleasant emotional state or a condition accompanied by fear that manifests with clear distress under stressful conditions [1]. In other words, anxiety is a future-oriented mood associated with readiness for potential negative events in the future [1]. According to Lang, symptoms and signs of anxiety are categorized into three groups: worry (Verbal-subjective), avoidance (Overt motor acts), and muscle tension (Somato-visceral activity) [2]. Anxiety disorders are among the most common mental health problems and can result in the onset of many diseases [3]. According to a study, 4.05% of the global population (301 million people) are affected by anxiety, and the number of these individuals has increased by more than 55% from 1990 to 2022 [4]. Portugal has reported the highest rate of anxiety prevalence, with Iran ranking third on the list [4]. These disorders arise from psychosocial factors (Childhood adversity, stress), trauma, and genetic vulnerability and manifest in neurobiological and neuropsychological dysfunctions [5]. If left untreated, they can cause serious harm to the individual. Anxiety increases harm and costs [6, 7], reduces productivity, and increases the use of healthcare services [7]. Therefore, rapid identification and effective treatment of anxiety substantially reduce the burden of this common, chronic, and disabling condition. Continuous treatment can alleviate symptoms and improve function, reduce disability, and increase individual health while reducing the economic burden of the disease [8].

studies have shown that due to the vital role and direct involvement of healthcare providers with patient lives, many of them experience anxiety over time and with increasing work experience [9, 10]. Anxiety impacts the performance of healthcare providers and challenges the quality of healthcare delivery systems [11] resulting in emotional disorders and decreased patient safety [12]. Any effort to reduce this disorder not only improves the quality of healthcare but also increases patient safety [12, 13]. Educating healthcare providers is one of the solutions to reduce anxiety among healthcare providers. Continuous provision of this education guarantees its effectiveness [14]. Mobile phones, being a straightforward and readily available tool, are highly effective in delivering healthcare services and controlling diseases [15–17]. The utilization of mobile health (m-Health) applications has grown for accessing healthcare information and managing various diseases [18–20]. Mobile health applications have gained attention due to the global expansion of mobile technologies. It is estimated that more than 85% of the global population is currently covered by commercial wireless signals, and there are over 5 billion mobile phone subscriptions [21]. The medical uses of mobile phones span from facilitating communication between individuals and healthcare systems (Such as call centers and appointment reminders) to monitoring health (including surveys and patient monitoring devices) and accessing information during treatment (Health records and decision support systems) [21]. Chakeri et al. reported that phone calls as the most common use of mobile phones significantly reduced anxiety in individuals with COVID-19 [22]. In recent years, with the prevalence of new diseases, the adoption of mHealth applications as a convenient tool for accessing health information has increased and been utilized for managing various illnesses [18–20].

Due to the busy schedule of healthcare professionals reducing the possibility of attending in-person training courses, healthcare professionals can easily use mobile phones for ongoing practical training, enhancing their awareness of therapeutic solutions to effectively manage and prevent diseases [23]. Although many studies have addressed the effectiveness of self-care applications for controlling anxiety in healthcare providers [24, 25], to our knowledge no comprehensive study has investigated the types and outcomes of these interventions. This systematic review analyzed studies in which mobile-based self-care apps have been used for reducing anxiety in healthcare professionals. Additionally, it focused on identifying types of interventions, and evaluating the efficacy of apps. The results of this study can be utilized in the design and development of mobile-based self-care applications aimed at reducing anxiety in healthcare providers.

Methods

This systematic literature review is based on a consistent guideline with the Preferred Reporting Items for Systematic literature review and Meta-Analysis Protocols (PRISMA 2022) [26]. The JBI framework used for conducting this systematic review [27]. The following are the key steps: Planning is the first step, followed by identification, screening, eligibility, discussion, and presentation of the results. In the present study, the quality assessment of the selected articles was not conducted because we did not want to miss any study regarding the mobile-based self-care applications.

In this study, we conducted a comprehensive review of all relevant papers by focusing on a research question

which will lead us toward increased awareness of the effect of mobile-based self-care applications on reducing anxiety in healthcare providers.

Eligibility criteria

SPICE is a useful tool (like PICO) for asking focused clinical questions and qualitative reviews [28]. The acronym SPICE stands for Setting, Perspective, Intervention, Comparison, and Evaluation and presents a way to formulate practice questions for finding evidence in existing research. SPICE may be more appropriate for formulating our research questions:

- Setting: All publications in the world.
- Perspective: Healthcare professionals.
- Intervention: Mobile-based self-care applications.
- Comparison: Reducing anxiety.
- Evaluation: What is the effectiveness of mobile-based self-care apps included in papers.

Studies with the following inclusion and exclusion criteria were included in this review.

Inclusion criteria

The studies that met all the following criteria were entered in the review:

1. Original articles,
2. The efficacy of mobile-based selfcare interventions in reducing anxiety among healthcare professionals,
3. Articles with English language,
4. All related studies published between 2014 and 2024.

Exclusion criteria

The exclusion criteria were:

1. Other journal articles such as review papers, letters, and book chapters, ….
2. Other studies that were not related to anxiety or whose target population was not healthcare professionals,
3. The papers whose English full text of them was not available,
4. Articles that were published outside this period.

Information sources and search strategy

A systematic search was conducted in electronic databases including PubMed, Scopus, Web of Science to identify relevant studies published between 2014 and 2024. Due to the limited number of studies in this area, all relevant articles were examined, with a focus on those that considered anxiety as a secondary outcome and those that addressed stress disorders. The search strategy used in this study included a combination of keywords and Medical Subject Headings (Mesh) terms related to "Self-care", "Mobile Application", "Anxiety", and "Healthcare Professionals". Table 1 shows the list of keywords and terms used in the search strategy for all databases. A reference manager software (EndNote X9, Thomson Reuters) was utilized to collect references and to exclude duplicates.

Study selection

In this stage, assessment of records was done by more than two reviewers. The titles and abstracts of the identified articles were independently screened by two reviewers (L.Gh and M.A). The full text of the articles was retrieved and examined if it was supposed potentially relevant by two reviewers. Any disagreement between the reviewers was resolved by discussion by the other researcher. The following data were extracted from the selected studies and entered into a structured form in Excel. Data were extracted by each of the reviewers, and then the forms were compared with each other.

Meanwhile, the main classification of reviewed articles was determined by two authors independently. The two authors (L.Gh and M.A) analyzed and synthesized the main characteristics of selected papers, and then, they

Table 1 Applied search strategy for all databases

PubMed (*N* = 2) Scopus (*N* = 1103) Web of Science(1410)	(Anxiety) OR (Generalized anxiety disorder) OR (Anxiety disorder) OR (Apprehension) OR (Distress) OR (Agitation) OR (Tension) OR (Restlessness) OR (Psychological distress) OR (Emotional turmoil) AND ((Healthcare Provider) OR (Healthcare Worker) OR (HCW) OR (Health Personnel) OR (Healthcare Professionals) OR (Primary Health Care) OR (Physicians, Primary Care) OR (General Practice) OR (General Practitioners) OR (Physicians, Family) OR (Primary Care Nursing) OR (Family Nursing) OR (Nurses, Community Health) OR (Nurse Practitioners) OR (Nurse Clinicians)) AND ((Mobile Application*) OR (Mobile App*) OR (Web Application*) OR (IT Intervention) OR (Web-Based Tools) OR (Internet-based Treatment) OR (Information Technology) OR (Computer-guided Therapy) OR (Portable Electronic Apps) OR (Portable Software Apps) OR (mHealth App*)) AND ((Self-care) OR (Self-management))

extracted the main specification of papers. The next author (R. Kh) evaluated the extracted information and validated the main elements.

Data collection process and data items

The first reviewer (M.A) gathered the required information from the selected studies. Then, a second reviewer (L.Gh) verified the accuracy of the information accumulated. Any dissensions were examined and resolved with a third reviewer (R.Kh). Data were extracted using a data collection form developed by the researchers. Key data elements such as author's name, publication year, country, study type, intervention duration, study objectives, platform used, modules presented in technologies, methods of reducing anxiety, questionnaire details, and effectiveness assessment were extracted from the reviewed articles. Data were analyzed by calculating frequency and percentage using SPSS-21. The main data elements and specifications of selected papers are displayed in Fig. 2.

Data synthesis and analyses

In our review, meta-analysis was not performed as the methodology and methods of reporting results in included studies were heterogeneous. The results of selected studies had been reported by descriptive statistics.

Results

The screening process of the article was done by two researchers. We conducted the selection of the relevant papers in three phases. The PRISMA diagram illustrating the article screening process is shown in Fig. 1. First,

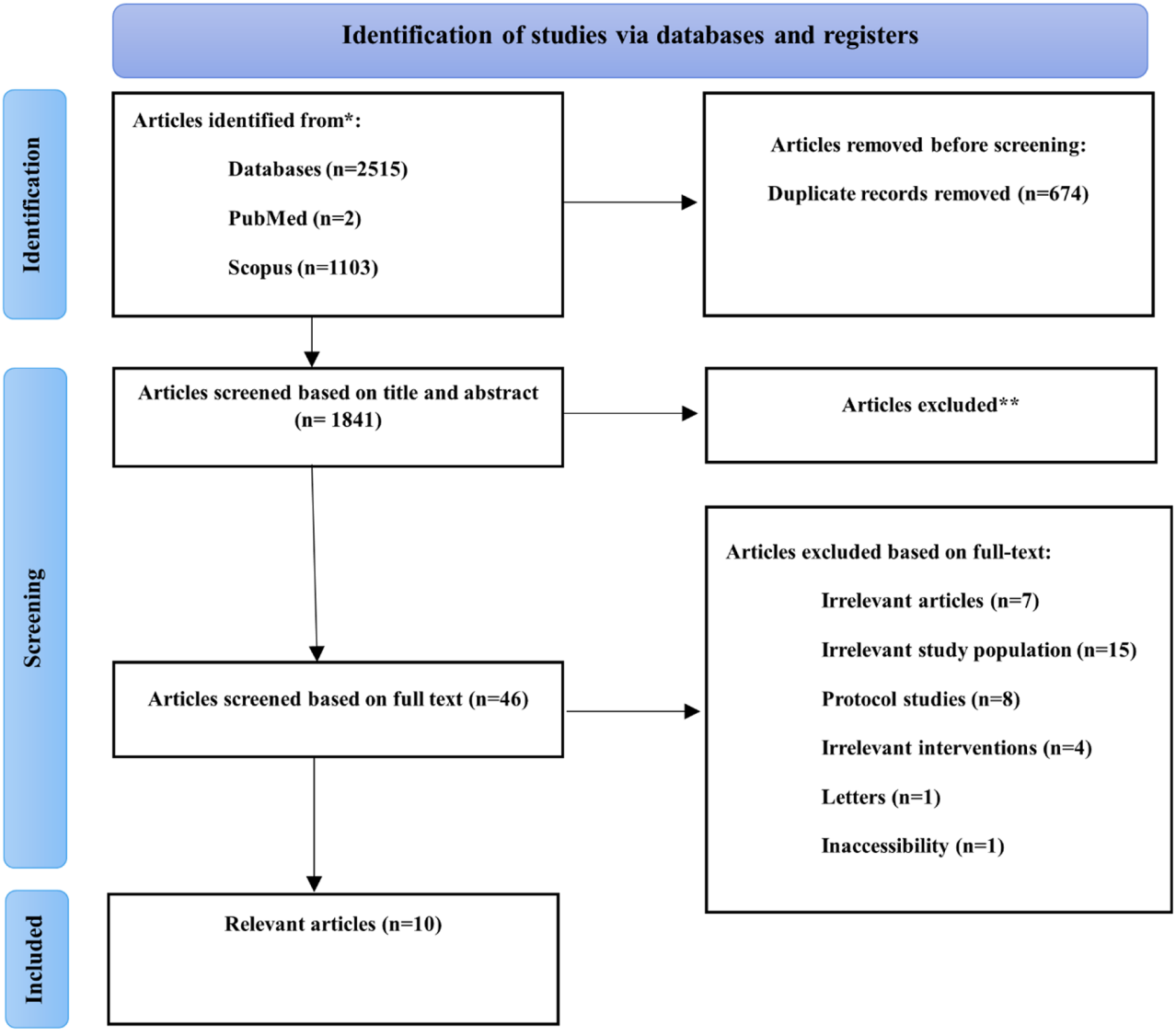

Fig. 1 The flow diagram of identifying, selecting and screening of papers based on PRISMA

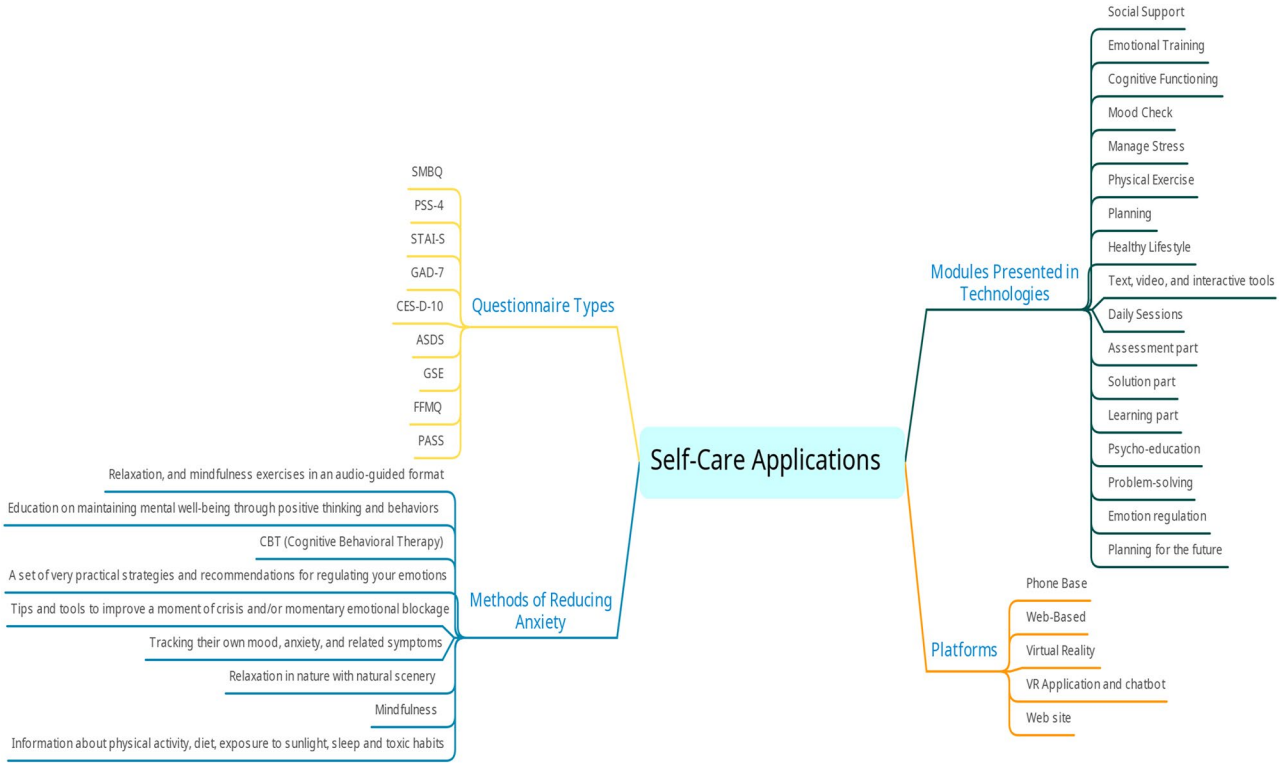

Fig. 2 The main specifications of selected papers

the authors of this study independently screened 2,515 papers based on their titles and abstracts regarding the inclusion and exclusion criteria. Next, 674 duplicated papers were removed, and 1,841 articles remained. Then, the abstracts and titles of all remained articles were screened based on the relevancy of subjects to the mobile-based self-care applications for anxiety reduction. According to exclusion criteria, we removed 1,795 articles remained. Next, we reviewed the full texts of the 46 papers, and 36 irrelevant articles were then removed. Finally, we selected 10 articles that are relevant to the questions of this systematic literature review (Fig. 2). From these articles, information related to anxiety was collected, including the type of questionnaire types, methods for reducing anxiety, platforms, and the modules presented in technologies. This information varied according to the objectives of each article and exhibited diversity (Fig. 2).

The general characteristics of included studies

The general characteristics of the studies are as follows: Studies were conducted in 9 different countries (Fig. 3). Eight studies were randomized controlled trials. The average age of participants was 41.21 years. In six articles reporting the gender of participants, more than half of the study population were women [29–34]. Participants in the studies were limited to individuals with anxiety disorders and included nurses, physicians, and healthcare providers. In a study, the target population was employees, with 35 individuals (13%) of these employees being healthcare workers. Five articles focused solely on anxiety [29–32, 34], while the remaining articles considered anxiety as the secondary objective or focused on stress [35–38]. Table 2 presents additional information related to the articles.

Various types of mHealth applications were investigated in the studies. Some of the information technologies included mobile applications, web-based platforms, chatbots, and virtual reality. The duration of interventions ranged from two weeks to 4 months. The contents and strategies for reducing anxiety varied among applications based on the study objectives. Anxiety reduction methods and strategies included mindfulness, cognitive-behavioral therapy, physical activity, breathing exercise, dietary regime, and nature exploration through virtual reality. Anxiety levels were measured using the STAT, GAD, PSS, and PASS questionnaires. Only three studies addressed usability, with two studies showing relatively high usability due to ease of use [31, 34] and one study reporting low usability due to difficulty in finding the desired icon and limited flexibility [29].

Interventions used in studies and their results

The results of the interventions in the reviewed studies concerned various outcomes such as anxiety, stress, self-esteem, job burnout, substance use, physical health, and

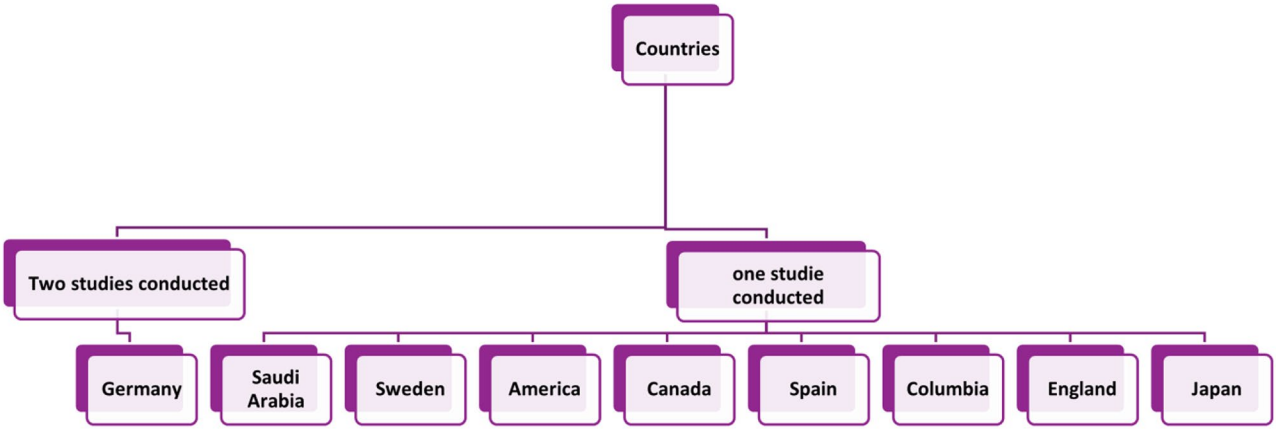

Fig. 3 The frequency of the number of articles in various countries

resilience through mHealth applications. These results are summarized in Fig. 4. The results indicated reduced job burnout, increased resilience, and decreased anxiety following conducting interventions within specified time frames [29]. Studies with cognitive-behavioral therapy interventions reported outcomes such as reduced anxiety and depression, decreased drug use, and increased sick leave [31, 32, 36, 37]. The results of mindfulness interventions indicated a reduction in anxiety and stress among healthcare providers [29, 33, 34]. Another study using nature exploration through virtual reality showed a decrease in anxiety and stress [30]. Overall, based on the findings, one study reported a decrease in participants' job burnout [29] and four articles reported anxiety reduction [29–32]. Three articles indicated a decrease in depression as a result of direct mobile-based self-care interventions [31, 32, 38]. Six articles mentioned stress reduction as an outcome of their interventions [29–32, 36–38]. One article indicated a decrease in resilience [29] and another article noted a reduction in sick leave by healthcare workers [37]. Two articles reported a reduction in drug abuse and psychotropic drugs denoting the effectiveness of interventions [34, 37], and two articles highlighted improvements in physical health [35, 38]. These results underscore the effectiveness of mHealth applications with appropriate educational and therapeutic content.

Discussion

The current study determined the effectiveness of health information technology (IT) interventions in reducing anxiety among healthcare providers, such as mobile applications, web-based platforms, chatbots, and virtual reality, to identify key data items and assess their effectiveness and usability. Among the mHealth applications utilized in the articles were mobile-based and web-based applications, websites, virtual reality initiatives, and chatbots.

The effectiveness of these applications was found to be high, and in the study by Baumann et al. (2023), mobile-based interventions were reported to be more effective than web-based applications Also the effectiveness of self-care programs in reducing stress has been positively reported in the context of long-term interventions [35]. Other studies [39–41] reported that the use of mHealth applications is effective in managing and reducing stress and anxiety. In the study by Katharine et al. the levels of anxiety, stress disorder, and burnout among individuals significantly improved following the intervention based on the mobile application program [29]. The effectiveness of such self-care applications in reducing the inclination to decrease substance use, as well as in alleviating emotional distress, anxiety, stress, depression, and improving concentration, has also been demonstrated in other studies [30, 31, 37].

Based on the findings, m-Health interventions can effectively reduce anxiety and stress, given their constant accessibility to individuals, appropriate content, and proper implementation. Planas and Yuguero [23] also confirmed that health-related IT has the potential to significantly improve mental health, depression, and anxiety. A cross-sectional descriptive study by Erfannia et al. [15]. also demonstrated that the positive effectiveness of m-Health interventions leads to better acceptance and use of such technologies. The duration of interventions in this study ranged from two weeks to four months. Apart from the study by Baumann et al. (2023), which recommended interventions lasting more than eight weeks for better effectiveness [35], other studies reported satisfactory effectiveness within the two-week to four-month time frame.

This study focused on the attitudes of healthcare providers towards the use of mobile phones and the acceptance of m-Health technology. In the studies included, the impact of technology interventions on vital signs was not adequately assessed. It is recommended that future

Table 2 Summary of the findings from relevant articles

	Artic1e 1	Artic1e 2	Artic1e 3	Artic1e 4	Artic1e 5	Artic1e 6	Artic1e 7	Artic1e 8	Artic1e 9	Artic1e 10
Authors name (Publication year)	Katharine Kirykowicz (2023) [29]	Hannes Baumann (2023) [35]	Robert Persson Asplund (2023) [37]	Ivana T. Croghan (2023) [30]	Kathryn Trottier (2022) [31]	Maria Antònia Fiolderoque (2021) [34]	Andrew Miki (2021) [32]	Heather Taylor (2021) [33]	Atsuko Matsumoto (2021) [38]	David Daniel Ebert (2015) [36]
Country	South Africa	Germany	Sweden	United States	Canada	Spain	Columbia	England	Japan	Germany
Type of study	RCT	RCT	RCT	Pilot study	Initial uncontrolled trial	RCT	Open trial	Large multisite RCT	Intervention study	RCT
Intervention duration	1 month	8 weeks	10 weeks	2 to 3-week	1 month	2 weeks	Between October 1 and November 30	4.5 months	4 weeks	7 weeks
Type of participants (sex & N & age)	Physicians *N* = 34 F = 20 Age = 33.4	HCP *N* = 170	182 employees, (60 health care)	HCP *N* = 24 F = 14 Age = 46.3	HCW *N* = 21 F = 20 Age = 39.1	HCW *N* = 482 F = 401 Age: 42(33–49)	HCW *N* = 255 F = 232 Age = 46.04	HCW *N* = 2182 F = 906 Age = 40.42	Nurses *N* = 70	Employees, (health care = 35) *N* = 264
Objectives	Feasibility, acceptability, and the preliminary efficacy of a self-management mental health app in clinicians working during the COVID-19 pandemic	Investigate the impact of individualized, sensor-based mHealth interventions focusing on stress and physical activity on distress coping in healthcare professionals	Evaluate the efficacy of an Internet-based cognitive behavioral intervention for stress-related disorders integrating work-related aspect	Evaluate the safety and use of a nature-based virtual reality (VR) experience among health care providers (HCP) during a pandemic	Feasibility, acceptability, and initial efficacy of RESTORE in healthcare providers on the frontline of the COVID-19 pandemic	The effectiveness of a psychoeducational, mindfulness-based mHealth intervention to reduce mental health problems in healthcare workers during the COVID-19 pandemic.	Evaluate the effectiveness of the RTH program on self-reported depression and anxiety symptoms	Investigate the effectiveness of an unguided digital MBSH app (Headspace) in reducing healthcare worker stress.	Verify the effectiveness of the combined use of the two apps to encourage continuous use, resulting in increased emotional stress reduction, to make it feasible in actual work environments	Evaluate the efficacy of an Internet-based stress management intervention (ismi) among employees

Table 2 (continued)

	Article 1	Article 2	Article 3	Article 4	Article 5	Article 6	Article 7	Article 8	Article 9	Article 10
Effectiveness assessment	Reducing job burnout Reducing resilience Anxiety and acute stress disorder severity improved significantly from pre- to post-intervention	App-based intervention has better efficacy than web-based training (WBT) Positive effects on physical activity-related outcomes with high Individualization, but no significant improvements on stress-related HRV parameters Due to short-term intervention The Necessity of Long-Term Interventions for Achieving Meaningful Outcomes	Effectiveness of reducing chronic stress and several other mental health–related symptoms Reluctance to reduce alcohol consumption and taking long-term sick leave	Reduction in emotional distress, anxiety, and stress, and improvement in focus	Improvements in anxiety, depression, and PTSD symptoms	Psycovid app intervention was not effective in improving mental health outcomes in the short term in this specific population and context However, psycovidapp was effective in improving the primary outcome and some secondary outcomes when used in conjunction with evidence-based treatments (such as psychotherapy or psychotropic medications)	Improvements in the primary mental health outcomes of depression and anxiety	Effective in reducing stress in healthcare workers MBSH interventions could be part of a solution to widening access to mindfulness training	Decrease in stress, depression, blood pressure, and improvement in self-esteem	Effective in reducing typical mental-related and work-related health symptoms of stressed employees

studies focus on this aspect, as this was only addressed in one study (heart rate measurement) [35].

Although this study mainly focused on the level of anxiety reduction among healthcare providers, studies that considered stress as a primary outcome were also examined. However, each study examined different indicators and outcomes according to its objectives, and the evaluation tools for measuring each indicator were different. Assessment of self-management of healthcare providers using mobile health applications demonstrated that mobile health applications can effectively reduce anxiety disorders. Therefore, repeated measurement of knowledge, quality of life, and self-efficacy as secondary outcomes can provide more insights concerning the effectiveness of this intervention.

This review showed that each of the applications studied in the included articles has specific modules according to their objectives. Cognitive-behavioral therapy is identified as one of the effective and practical protocols for reducing the anxiety of healthcare providers [31, 36, 37, 42]. The results of other studies also reported the positive impact of this therapeutic approach [43, 44]. Likewise, Hofmann in a study also demonstrated the effectiveness of cognitive-behavioral therapy but did not find it effective when delivered via the Internet [45]. In some other studies, Internet-based cognitive-behavioral therapy and mobile health programs were not effective [46–48]. None of the studies had examined acceptance and commitment therapy as a therapeutic approach for anxiety reduction; however, this method has recently garnered the interest of psychotherapists and has been shown to yield more favorable long-term results [49–51].

Another recommendation for reducing anxiety is train treatment to prepare and take appropriate actions in stressful conditions. One of the modules of health applications identified in this study was training healthcare workers, which assists them in reducing their anxiety through self-management. Ebrahimi et al. [52] examined the impact of educational intervention on the anxiety of nurses working in hospitals affiliated with Arak University of Medical Sciences and demonstrated that training in mental relaxation skills and techniques, along with continuous practice, helps reduce the anxiety of nurses. Additionally, based on the results of another study addressing the prevalence of depression, anxiety, and stress in military nurses [53], usability assessment helps increase user satisfaction and improve effectiveness [54]. This issue was not seriously addressed in most studies, with only three studies assessed the level of usability as good or bad [29, 31, 34].

One strength of the current study was a comprehensive review of various mobile health applications in reducing healthcare workers' anxiety Healthcare workers in military hospitals are exposed to unique stressors related

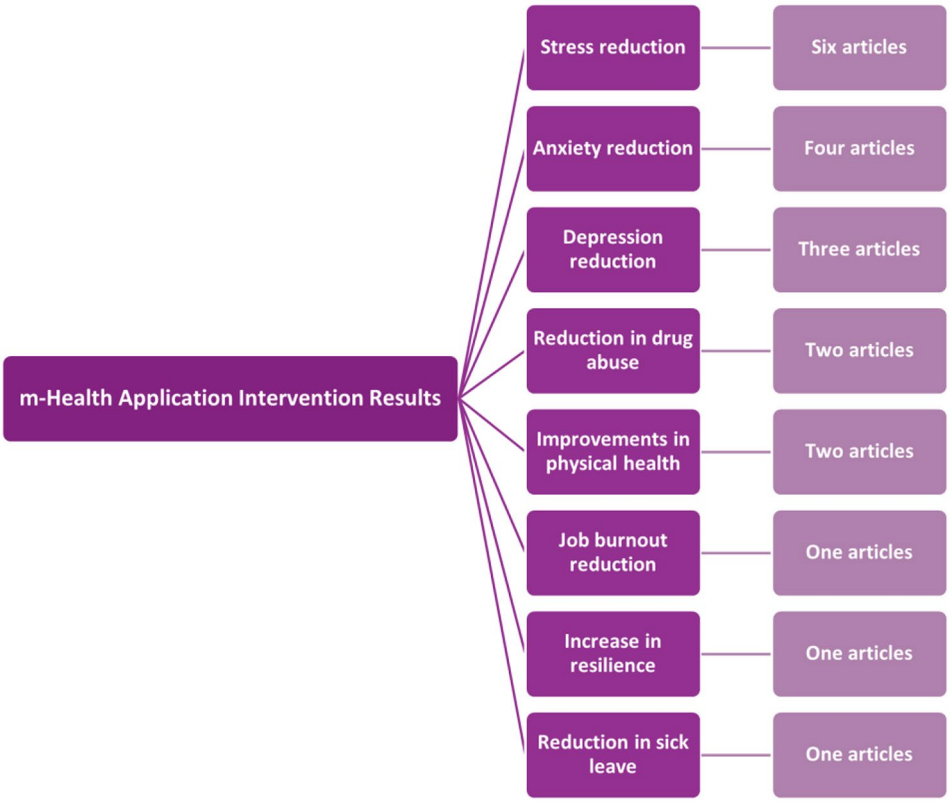

Fig. 4 Results of m-Health app interventions in reviewed studies

to medical environments including job constraints in healthcare settings, accountability to higher authorities, and concerns about critical conditions [55, 56]. Therefore, considering these conditions is necessary for better managing and controlling anxiety of healthcare workers in these environments.

Given the results of examining various mobile health applications, the types of interventions, and the impact of these interventions on healthcare workers' anxiety, as well as the content and modules used in each program, developers of self-care applications for healthcare workers can benefit from the results of this study to design m-Health applications with scientific and effective content to reduce anxiety.

Implication for practice

In health policy, these applications can be considered as part of comprehensive mental health strategies. With the rising incidence of mental health issues in contemporary societies, the incorporation of these technologies into public health programs can enhance quality of life and increase productivity in both occupational and social settings. Furthermore, the data collected through these applications can assist policymakers in identifying the community's real needs and designing more effective programs for the prevention and management of anxiety. Ultimately, this approach can contribute to creating a healthier and more supportive environment for all members of society.

Future research should examine the effect of these applications in other occupational communities and among patients. Furthermore, it is recommended that the necessity of such mobile health programs and the perceived needs of the target population be assessed to enable prompt interventions for the management and enhancement of mental health disorders.

Limitations and future directions

There are some limitations in this systematic literature review that are as follows:

1) We included only articles written in the English language. Articles in other languages may be also missing.
2) In the strategy search, four main databases were surveyed including PubMed, Web of Science and Scopus. While other databases, such as PsycINFO were not considered. Moreover, in the reference lists of the selected articles, manual searching was not performed. It is possible that some articles have not been included in our review study.

3) In the present study, the quality assessment of the selected articles was not conducted because we did not want to miss any study regarding the mobile-based self-care applications.
4) A weakness of this study was the lack of studies that had examined such interventions on populations healthcare workers in military hospitals.
5) The results of this systematic review showed that the number of studies conducted on mobile health applications targeting anxiety in healthcare workers was limited. These results suggest conducting more research on this topic in the future.

Conclusion

Based on the findings of the current study, the use of various mobile health applications effectively reduces healthcare workers' anxiety. The accordance of the content and modules of the applications with their objectives (cognitive-behavioral therapy, physical activities, education, etc.), contributes to the effective reduction of the anxiety target community. Based on the review of studies, in addition to anxiety, other factors such as depression, stress, job burnout, drug use, sick leave, and resilience can be controlled by relevant interventions including educational courses, cognitive-behavioral therapy, mindfulness, breathing exercise, and physical exercise. Individuals increasing utilize mobile health programs due to their accessibility, and these programs tend to produce superior outcomes when they encompass full content. Additionally, the use of psychotherapy protocols, such as cognitive-behavioral therapy, in these programs constitute a crucial module and significantly alleviates anxiety. Overall, m-health programs are varied and can be officious in managing mental health disorders. Implementing interventions through mobile health applications has proven effective in reducing anxiety among employees, and more than four weeks is considered acceptable for increased effectiveness.

Abbreviations

HCP	Healthcare providers
m-Health	Mobile Health
SPSS	Statistical package for social
HCW	Healthcare Worker
App	Application
RCT	Randomized controlled trial
CES-d	Center for Epidemiologic Studies Depression Scale
STAI -S	State Anxiety Inventory
ASDS	Acute Stress Disorder Scale
PSS	Perceived Stress Scale
WHO-5	World Health Organization Five Well-Being Index
SMBQ	Shirom Questionnaire Burnout M
BRS6	Brief Resilience Scale
GAD	General Anxiety Disorders
DASS-21	Depression Anxiety Stress Scale-21
DTS	Davidson Trauma Scale
MBI-HSS	Maslach Burnout Inventory - Human Services Survey
GSE	General Self-Efficacy Scale
SWEMWBS	Short Warwick Edinburgh Mental Well-being Scale
ffmq1515-item	Five Facets of Mindfulness Questionnaire
HASD	Hospital Anxiety and Depression Scale

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Author contributions
MA conducted the search, and extracted the data from databases. LG and RK checked the accuracy of extracted data. MA wrote the first draft of the manuscript. MA, SH, FA and LA contributed to the final draft of this manuscript. All authors read and approved the final manuscript.

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Data availability
No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate
The study was an analysis of published papers in recent years by searching in related databases. Therefore, the ethics approval and consent to participate were not applicable in this study.

Consent for publication
Not available.

Competing interests
The authors declare no competing interests.

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