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Could the use of web-based applications assist in neuropsychiatric treatment? An umbrella review

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Abstract

Background The aim of this study was to evaluate the use of applications accessed through internet browsers as tools for neuropsychiatric treatment, as well as to verify the benefits and efficacy of virtual support as a therapeutic approach.

Methods A broad review of the MEDLINE (PubMed), SciELE and Cochrane databases for review articles was conducted. Articles involving the use of browser-based applications as a support for neurological and psychiatric treatment, with available texts on the selected platforms with no language or year restrictions, were included.

Results A total of 83 reviews were included in this study. Due to the homogeneity of the information between some articles, the research was grouped according to the following revised themes: mindfulness, tinnitus, electronic health (eHealth), youth and students' mental health, mobile health applications (mHealth), depression, anxiety and stress, psychoactive substances, sleep quality, chronic diseases and mental disorders.

Conclusion The findings suggest that the use of virtual support through applications helps neuropsychiatric treatment, improving the well-being and quality of life of these patients.

Keywords Mobile applications, Quality of life, Mental disorders

Background

The treatment of mental health disorders will likely change substantially over the next 10–20 years as a result of the vast availability of applications for mobile devices and their ability to offer specific psychological treatment directly to the user [1, 2]. This therapeutic approach favors a new treatment paradigm. However, it is associated with many risks, such as the propagation of ineffective interventions or even harmful interventions. In that sense, physicians and patients need access to reliable and updated information on the empirical status and clinical utility of online interventions, referred to as virtual therapy [1, 2].

The science of implementation aims to spread virtual practices in several contexts. This means introducing new habits through technology, such as websites, browser-based applications, and mobile device applications. Countless mental health applications (MHapps) were indeed developed and made available to users through smartphones. These applications intend to enhance the well-being and quality of life of patients, offering guidance for mental health recovery and encouraging beneficial habits for the integral health of the subject. In this regard, a great need for MHapps is noted, as shown

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by recent public research, which found that 76% of 525 interviewed subjects would be interested in using their mobile devices for self-management and mental health self-monitoring if access was complimentary [3].

Smartphones are not limited by geography and are generally used in a private manner by an individual; this means that applications are extremely flexible and attractive for users, who are supported by the confidentiality of their engagement. Help through MHapps seems appropriate for young adults and users who search for more autonomous treatment [4]. There are also those who prefer self-help material if it is delivered by a familiar mean [5], such as a personal smartphone. Applications are almost always widely available and easy to access. As a result, they can be used in various contexts and in almost any environment [6]. Furthermore, the user is motivated throughout the day to reach the goal that made them opt for the virtual therapeutic approach and feels rewarded upon reaching it [7].

This broad review outlines the main findings in the neuropsychiatric context regarding the use of technology and web applications as a therapeutic approach. The articles were selected from a literature review that revealed the need to understand the applicability and efficacy of virtual therapy for the care and health of different patients [1–6]. On this basis, randomized and controlled clinical trials are needed to validate future applications and the principles from which they are projected to corroborate the results achieved in this work. The aim of this study was to evaluate the use of applications accessed through internet browsers, which are used as tools for neuropsychiatric treatment, and to verify the benefits and efficacy of virtual support as a therapeutic approach.The aim of this study was to evaluate the use of applications accessed through internet browsers as tools for neuropsychiatric treatment and to verify the benefits and efficacy of virtual support as a therapeutic approach in the prevention and treatment of mental disorders. Thus, obtaining a better understanding of this topic has great relevance for clinical practice.

Methods

This systematic review was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. A systematic search for review articles was performed on October 30th, 2023, on the MEDLINE (PubMed), SciELE and Cochrane databases. Articles regarding web-based applications as treatment resources or management strategies with available text in the selected platforms, without language or year restrictions, were included (PROSPERO recording CRD42024593512). The Population, Intervention, Comparison, and Outcome (PICO) framework for this study is as follows: P-evaluate research on the use of applications accessed through internet browsers as tools for neuropsychiatric treatment; I—browser-based applications as support for neurological and psychiatric treatment; C- a total of 83 review articles were included in this study, and owing to the homogeneity of the information between some articles, the research was grouped according to the following revised themes: mindfulness, tinnitus, eHealth, youth and students' mental health, mHealth, depression, anxiety and stress, psychoactive substances, sleep quality, chronic diseases and mental disorders; O—the use of virtual support through applications helps neuropsychiatric treatment, improving the well-being and quality of life of these patients.

For the research plan, we used Prospero for registration and initial searches on the platforms (MEDLINE (PubMed), SciELE and Cochrane databases), the study inclusion and exclusion criteria were delimited, organized as data sources and the terms of search within the existing literature, the search procedures were organized and reviewed by three authors, after all the articles found, they were separated as duplicates, incomplete articles or articles that were not within the objective proposed in this review, where we analyzed the consolidated metrics of the 83 reviews completed.

Study selection

The search terms used were "applications" OR "application" AND "cognitive-behavioral therapy"; "self-guided cognitive behavioral therapy"; "internet cognitive behavioral therapy" OR "unguided internet cognitive behavioral therapy" OR "self-guided internet cognitive behavioral therapy" AND "internet cognitive behavioral therapy with interventions". Eligible studies included: (1) review articles only; (2) the use of applications as a resource for any circumstantial neuropsychiatric treatment; (3) any symptomatic disease whose diagnostic criteria were established by specific cutoff points in self-reported scales or diagnostic interviews; (4) neuropsychiatric disorders that developed an internet intervention as a resource for treatment; and (5) applications that were interventional in the treatment of neuropsychiatric disorders.

The excluded articles were those whose intervention (1) did not include applications or technological devices with the ability to treat or manage a neuropsychiatric disorder and (2) included applications or technological resources that were not used as therapeutic tools. (3) applications that did not contribute to neuropsychiatric support or treatment (4) articles that were not systematic reviews (5) articles that did not have instructions as the objective of the article (6) diseases or symptoms that were not with neuropsychiatric associations.

Language restrictions were not applied to cover the possibilities of using the application and achieving its use in different languages. However, despite different discoveries, all articles included were published in English.

Two authors selected the studies to be included (L.P.R. and L.A.Q.). Discrepancies were resolved by the third author (A.E.N.).

The use of the PRISMA guidelines and the systematic search of the electronic databases resulted in a total of 2360 articles for initial screening. No additional studies were found by manual reference search. After 53 duplicates were identified, 2307 articles remained, of which 2138 were rejected on the basis of the title and abstract, and 169 articles were selected for entire text reading. Eighty-six additional studies were excluded because they did not meet the eligibility criteria. Therefore, 83 articles were included in this broad review.

Data extraction, quality score and bias evaluation

The following variables were extracted from all studies: authors, publication year, study design and main outcome. The AMSTAR2 tool was used to assess the quality of the studies. L.P.R. and L.A.Q. extracted the data, and L.P.R., L.A.Q. and A.E.N. agreed upon the final inclusion of the studies in the systematic review, data abstraction and quality assessment.

The quality of the systematic reviews was high in 4.1%, moderate in 8.6%, low in 19.8% and critically low in 67.5% of the total studies included (AMSTAR2) (Fig 1).

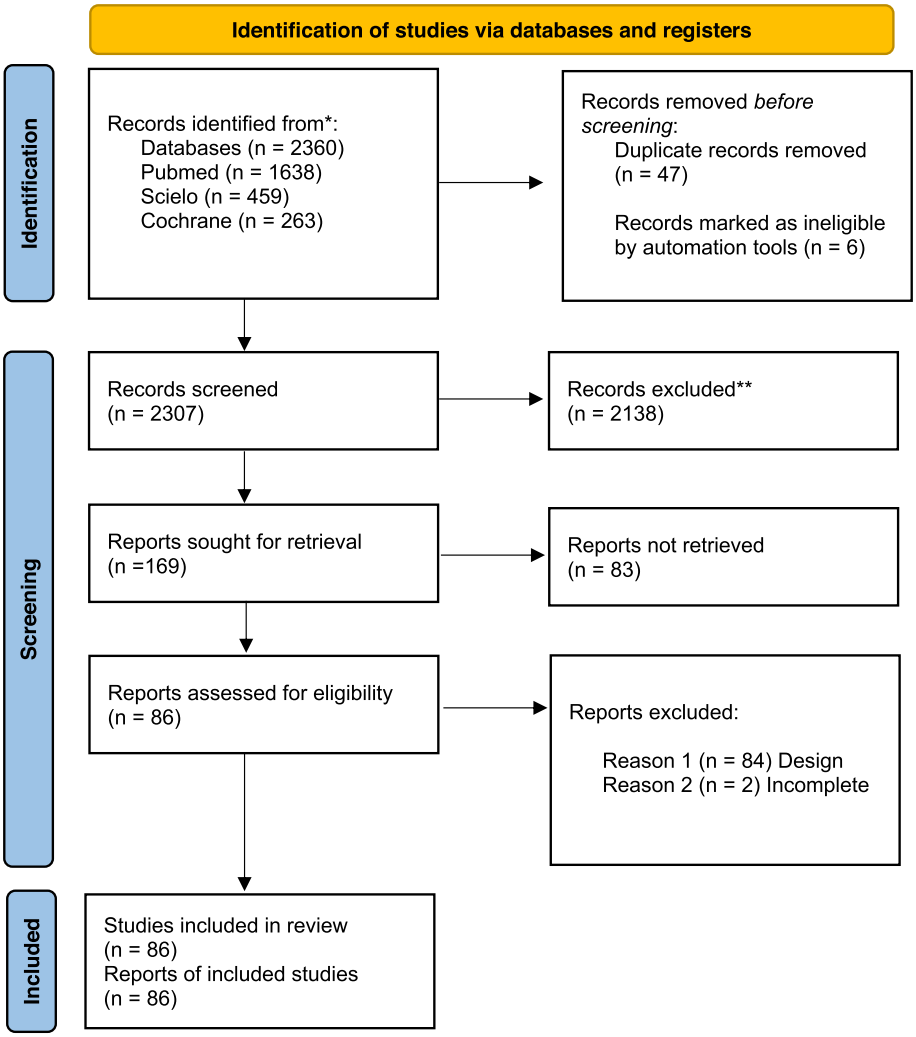

Fig. 1 Prisma 2020 flow diagram for new systematic reviews which included searches of databases and registers only

Results

Considering the 83 retrieved articles, a category chart was created by grouping the articles with the same themes for a better understanding of the associations. The categories that were selected for the division of the findings were mindfulness (8); tinnitus (3); eHealth (9); youth and students' mental health (5); mHealth (12); depression, anxiety and stress (19); psychoactive substances (6); sleep quality (2); chronic diseases (9); and mental health and mental disorders (10) (Table 1).

Mindfulness

The reviews concerning mindfulness were composed of studies focused on different mental conditions to understand the impact of the use of meditation applications on mental health. Mindfulness devices are broadly cited as therapeutic resources for treating different diseases, as they favor the general well-being of patients. A vast variation in sample size, friction rate and intervention period was observed, which, along with the variation in the well-being measures and mobile applications, limited the comparability of the studies. Despite these initial results, the use of technology as mindfulness therapy seems promising [7–15].

Tinnitus

Tinnitus, a complex and heterogeneous psychophysiological condition responsible for causing a ghost sound even in the absence of an external sound source, has a direct influence on the quality of life of patients. A positive aspect of tinnitus therapies is that they can be administered in person and delivered online. Each study used a variety of standardized and validated quizzes to measure treatment results [16–18]. It can be assumed that the development of applications and web-based platforms for the treatment of tinnitus has had a significant effect on the well-being of individuals who suffer from tinnitus.

Electronic health (eHealth)

eHealth offers solutions for the autonomy of patients and health care on the basis of value [19–27]. eHealth services represent efficient, escalating, and cost-effective options for the treatment of patients with limited or no in-person access to mental health care. Research suggests that health interventions through e-Health can contribute to mental health management and reduce stress symptoms in pregnant women, children, and elderly individuals [20–27].

Mental health

With respect to youth and students' mental health, studies have demonstrated the great potential of technology for improving depressive symptoms and other psychiatric disorders among university students through mobile application interventions. Considering the exponential growth of these mental health resources, virtual support is seen as a concrete tool for treating students. In that sense, universities, particularly university counseling services, can benefit from mHealth interventions not only to approach university students' mental health but also to reduce difficulties related to a lack of human resources [28–32].

Mobile health applications (mHealth)

mHealth have been recommended as electronic interventions in several studies. The synergy of these technologies allows patients to self-manage and self-monitor to access relevant information about their health, which allows them to cope with certain clinical conditions and ultimately to self-treat [33–44].

The rapid development of technology related to mental health is a reality, with many mobile applications being created. However, there is a lack of theoretical knowledge and structured research that support their efficacy in clinical practice [33–44].

Depression, anxiety and stress

The studies that relate the use of digital resources to depression, anxiety, and stress suggest that applications favor the reduction of symptoms related to these disorders. This field is an emerging area in mental health, and to reach conclusive evidence, new research has to be performed [45–64]. Nevertheless, even though eHealth results are incipient, they suggest a promising and tangible field for the treatment of depression, anxiety, and stress.

Psychoactive substances

Psychoactive substances are mentioned in studies that have described a great variety of digital applications, including paid and complimentary versions. There is evidence of their applicability, acceptance, and preliminary efficacy in open pilot studies of mHealth aimed at alcohol and tobacco addiction. However, there is a continuous need for studies in this area, especially in the elaboration of efficient digital protocols. Furthermore, no studies regarding the use of mHealth for the treatment of other substance addictions have been conducted [65–70].

Sleep disturbances

Only two studies on the use of applications for sleep disturbances were found, and despite the development of mobile health technologies as interventions for sleep quality improvement, evidence of their efficacy remains limited [71, 72].

Table 1 Summary of studies included in the Umbrella Review grouped by categories

Author	N. References	(N)Participants	Objective	Main results
MINDFULNESS				
Linardon J; 2020	[8]	27	Examine whether principles of acceptance, mindfulness, and self-compassion can be learned through smartphone apps	Findings suggest that principles of acceptance, mindfulness, and self-compassion may be learned through cheap, easily accessible, and low-intensity interventions delivered via smartphone apps. However, the quality of available evidence is poor, as low risk of bias was noted in few trials (18%) and the observed effects were likely explained by a digital placebo
Yogeswa et al., 2021	[9]	2	Investigate whether online mindfulness interventions can be used to promote the mental health of medical students	The evidence reviewed suggests that online mindfulness interventions targeting medical students have the potential to be effective in reducing symptoms of stress and increasing self-compassion, empathy, and mindfulness
Gál et al.., 2021.	[10]	34	Investigate the effects of mindfulness apps and their effectiveness	Mindfulness apps seem promising in improving well-being and mental health, though results should be interpreted carefully due to the small number of included studies, overall uncertain risk of bias and heterogeneity
Wu et al.,2021	[11]	8	Evaluate the effect of mindfulness intervention guided by a smartphone app on negative emotions and stress in a non-clinical population with emotional symptoms	The findings indicate the potentially beneficial effect of mindfulness exercise guided by a smartphone app on symptoms of depression and anxiety among individuals in a non-clinical population with emotional symptoms
Muhiyaddin et al., 2022	[12]	93	Provide an overview of the features of meditation apps as described in empirical literature	Headspace was the most common app among studies and the most common type of meditation was mindfulness. Stress was the most targeted health condition by the studies. Future research needs to focus on different mental conditions other than stress to understand the effect of meditation apps on mental health.
Walker et al., 2023	[13]	16	Evaluate whether evidence from academic research is used to communicate the health effects of two popular mindfulness apps, Calm and Smiling Mind	Stronger evidence-based reporting on the health effects of mindfulness apps is needed to enable people to make more informed decisions for their health and wellbeing
Chen et al., 2023	[14]	10	Evaluate the effectiveness of Mobile mindfulness meditation (MMM) on the mental health of university students in the areas of stress, anxiety, depression, mindfulness, well-being, and resilience	MMM was an effective method to reduce stress and anxiety, and to increase the well-being and mindfulness of university students. However, further studies are needed to confirm our findings
Schwartz et al., 2023	[15]	28	Evaluate the effectiveness and assess the quality of the apps	Although most studies (16/28, 57%) reported small or small to medium effects for at least one well-being outcome, this review demonstrates that the generalizability of the results is limited. Further research is needed to obtain more consistent conclusions regarding the impact of mindfulness-based mobile apps on well-being in nonclinical populations

Table 1 (continued)

Author	N. References	(N)Participants	Objective	Main results
TINNITUS				
Mehdi et al.,2020	[16]	7	Report effectiveness of smartphone apps used for tinnitus management and treatment	The work demonstrated that there exists a plethora of smartphone apps for tinnitus. All of the apps received MARS scores higher than 2, suggesting that they all have some technical functional value. However, nearly all identified apps were lacking in terms of scientific evidence, suggesting the need for stringent clinical validation of smartphone apps in future.
Nagaraj et al., 2020	[17]	5	Evaluate the efficacy of Internet/app delivered tinnitus treatments	The outcome measures were diverse, but both Internet/app-based and traditional methods like Tinnitus Retraining Therapy, Cognitive Behavioral Therapy, and Acceptance and Commitment Therapy had similar improvements in terms of tinnitus distress and quality of life
Demoen et al., 2023	[18]	29	Provide an overview of the research concerning the effectiveness of telerehabilitation interventions for self-management of tinnitus	Overall, there evidence that telerehabilitation interventions effectively reduce tinnitus severity and distress. These interventions form a possible tool to improve the self-management capacities of the patient and the accessibility of tinnitus care as a replacement or an addition to in-person care.
eHEALTH				
Lam et al., 2016	[19]	182	Examine the current development of online intervention programmes for this particular condition	The results obtained from this review have provided insight into the on-going development of eHealth interventions as well as the health informatics approaches in offering a possible and practical solution to tackle this growing problem
Stratton et al., 2017	[20]	23	Evaluate the evidence for the effectiveness and examine the relative efficacy of different types of eHealth interventions for employees	There is reasonable evidence that eHealth interventions delivered to employees may reduce mental health and stress symptoms post intervention and still have a benefit, although reduced at follow-up.
Mikolasek et al., 2018	[21]	17	Summarize eHealth studies with mindfulness- and relaxation-based interventions for medical conditions and to determine whether eHealth interventions have positive effects on health.	There is some evidence that mindfulness- and relaxation-based eHealth interventions for medical conditions can have positive effects on health outcomes. Therefore, such interventions might be a useful addition to standard medical care
Tozzi et al., 2018	[22]	19	Summarize and critically review the literature evaluating the acceptability and efficacy of using technology with treatment and prevention programs for anxiety in young children and adolescents.	Promising results in reducing anxiety, especially relative to the application of cognitive behavioral therapy with technology
Van den Heuvel et al., 2018	[23]	71	Review the current literature on eHealth developments in pregnancy to assess this new generation of perinatal care.	eHealth interventions have a very broad, multilevel field of application focused on perinatal care in all its aspects. Despite the promising preliminary results as presented, we accentuate the need for evidence for health outcomes, patient satisfaction, and the impact on costs of the possibilities of eHealth interventions in perinatal care

Table 1 (continued)

Author	N. References	(N)Participants	Objective	Main results
Badawy et al., 2018	[24]	16	Evaluated the most recent evidence in the literature to (1) review the different types of technological tools used for self-management of sickle cell disease, (2) discover and describe what self-management activities these tools were used for, and (3) assess the efficacy of these technologies in self-management	Despite the promising feasibility and acceptability of eHealth interventions in improving self-management of sickle cell disease, the evidence overall is modest. Future eHealth intervention studies are needed to evaluate their efficacy, effectiveness, and cost effectiveness in promoting self-management in patients with sickle cell disease using rigorous methods and theoretical frameworks with clearly defined clinical outcomes
Stubberud et al., 2018	[25]	23	Reviews the recent research and development of electronic health (eHealth) and, in particular, mobile health (mHealth) strategies to deliver behavioral treatment for migraine.	eHealth and mHealth for behavioral treatments of migraine has been a promising field for long. Electronic behavioral interventions for migraine seem to be acceptable and feasible, but efficacy measures are uncertain. Still, clinical trials on mHealth based classical behavioral therapies, such as CBT, biofeedback, and relaxation are missing in the literature
Roth et al., 2021	[26]	16	Show that the digitalization in psychiatry is not to replace traditional psychiatric care through digital therapies, but to augment it through innovative interventions	Various eHealth services, such as telepsychiatry, C-CBT, I-CBT, and app-based interventions represent effective, scalable, and cost-efficient options for providing treatment to people with limited or no access to mental health care. Therefore, these eHealth services are synergistic with the resolution of the United Nations on universal health coverage
Moghmi et al., 2021	[27]	3	Evaluate the efficacy of eHealth interventions specifically for the treatment of binge eating disorder (characterized by compulsive overconsumption of food, in a relatively short period, and without compensatory behaviors such as purging or fasting).	The results of the analysis demonstrated that when compared with waitlist controls, individuals enrolled in eHealth interventions experienced a reduction in binge episodes
MENTAL HEALTH OF YOUNG PEOPLE AND STUDENTS				
Pospos et al., 2016	[28]	7	Review published data about mobile applications that shown to mitigate stress, burnout, depression, and suicidal ideation among several populations, and selected a small sample that readily can be used by healthcare providers	The list of the resouces served as a starting point to enhance coping with stressors as a healthcare student or professional in order to help mitigate burnout, depression and suicidality
Lehtimaki et al., 2021	[29]	18	Synthesize the current evidence on digital health interventions targeting adolescents and young people with mental health conditions, with a focus on effectiveness, cost-effectiveness, and generalizability to low-resource settings	There is evidence on the effectiveness of computerized cognitive behavioral therapy on anxiety and depression, whereas the effectiveness of other digital mental health interventions remains inconclusive
Oliveira et al., 2021	[30]	8	Explore mHealth interventions in universities, regarding its conceptual framework, acceptability and efficacy outcomes and understand its impact and contributions to address treatment delivery and psychological difficulties resulting from covid-19 pandemic.	Results suggested that college students accept and adhere to the interventions and preliminary evidence of efficacy was demonstrated in different disorders, such as stress, anxiety, depression and risky behaviors such as alcohol and tobacco abuse and sexual knowledge
Chiang et al., 2023	[31]	6	Identify and analyze the BCTs present in mHealth apps targeted at young people with AN	The techniques employed in apps, belonging to the hierarchical clusters of "Shaping knowledge," "Natural consequences," and "Social support," are consistent with those embedded in traditional clinical approaches (i.e., FBT and CBT). However, other techniques focusing on planning of actions, goals, tasks, and working with motivation are missing.

Table 1 (continued)

Author	N. References	(N)Participants	Objective	Main results
Choudhury et al., 2023	[32]	15	Evaluate mHealth interventions for addressing mental health problems among college students	There is potential to improve depressive symptoms and other similar mental health problems among college students via mobile app interventions. However, actions must be taken to improve barriers to communication and better reach the younger generations.
mHEALTH				
Juarascio et al., 2015	[33]	20	Review existing apps for Eating Disorders, determine the extent to which available treatment apps utilize components from Eur Eat Disorders as a basis for treatment provision, and assess the degree to which existing smartphone apps utilize recent advances in smartphone technology to enhance treatment.	For smartphone apps to be a feasible and effective ED treatment modality, it may be useful for creators to begin taking utilizing the abilities that set smartphones apart from in-person treatment while incorporating EBPs. Before mHealth tools are incorporated into treatments for EDs, it is necessary that the feasibility, acceptability, and efficacy be evaluated.
Capon et al., 2016	[34]	33	identify ethical issues in the current uses of smartphones in addiction research and treatment	mHealth technology offers the possibility to collect large amounts of valuable personal information that may enhance research and treatment of substance abuse and addiction. To realize this potential researchers, clinicians and app-developers must address these ethical concerns to maximize the benefits and minimize risks of harm to users
Sundararaman et al., 2017	[35]	8	Provide a critical overview and best-evidence synthesis of the use of mobile health (mHealth) technology among persons with chronic pain and their health care providers and examines the future benefits and barriers of implementing mHealth technology in clinical care	Mobile text reminders improved the rate of attendance at health care appointments compared with no reminders. A second review found very limited evidence that text messaging had a positive impact on the health status of patients with chronic medical conditions (such as diabetes, hypertension, and asthma) and on their ability to manage their own condition.53 Additional reviews suggest that cost
Rathbone et al., 2017	[36]	8	Assess extent research findings with regard to the effectiveness of CBT-related mobile health (mHealth) apps. By assessing only studies employing a randomized controlled trial design, the review aimed to determine app efficacy within the highly regarded method of investigation.	The use of mHealth apps containing CBT principles for a range of mental health issues. However, the effectiveness over longer time periods should be assessed. Researchers and professionals should seek to collaborate effectively when creating new apps to enhance their effectiveness as a treatment for the general public.
Hansen et al., 2019	[37]	397	Provide an analysis of the kinds of smartphone-based intervention apps funded in NIH research grants during the five-year period between 2014 and 2018	Smartphone intervention apps are increasingly competitive for NIH funding. They reflect a wide diversity of approaches that have significant potential for use in applied settings
Hwang et al., 2021	[38]	14	Examines studies on the effects and results of mental health mobile apps for the general adult population.	With the rapid development of technology related to mental health, many mobile apps are developed, but apps based on theoretical knowledge and well-designed research are lacking. Further research and practices should be conducted to develop, test, and disseminate evidence-based mHealth for mental health promotion. RCT studies are needed to expand the application to mental health services to various populations.

Table 1 (continued)

Author	N. References	(N)Participants	Objective	Main results
Aji et al., 2021	[39]	15	Provide evidence for the design engineering and clinical implementation and evaluation of mHealth apps for sleep disturbance	The minimal number of apps with published evidence for design engineering and clinical implementation and evaluation contrasts starkly with the number of commercial sleep apps available. Moreover, there appears to be no standardization and consistency in the use of best practice design approaches and implementation assessments, along with very few rigorous efficacy evaluations.
Mehraeen et al., 2022	[40]	17	Investigate the use apps to improve self-management among HIV-positive patients and the focused on current evidence on HIV self management mobile applications to identify and assess their objective, infrastructure, and target populations	The findings indicate that mHealth strategies for PLHIV have had a substantial positive effect on ART, drug adherence, prevention, and treatment, as well as social and behavioral problems affecting PLHIV. Even though the mHealth market needs to be regulated, it specifies that mHealth is relevant and should be used in the self-management, self-monitoring, and self-care of PLHIV
Voth et al.,2022	[41]	22	Evaluate the evidence-based quality, efficacy, and effectiveness of resilience-building mobile apps targeted toward the MMs, PSP, and veteran populations.	The mHealth apps reviewed are well-suited to providing resilience strategies for MMs, PSP, and veterans. They offer easy accessibility to evidence-based tools while working to encourage the use of emotional and professional support with safety in mind.
MacPherson et al., 2022	[42]	12	Identify pain management apps within the Canadian app marketplaces to aid clinicians in recommending apps	The highest scoring apps are highlighted for health care practitioners who may wish to recommend mHealth technologies to their patients for pain management.
Denecke et al., 2022	[43]	34	Identify the therapeutic aspects of CBT that have been implemented in existing mHealth apps and the technologies used.	There are CBT techniques that can be implemented in mHealth apps. Additional research is needed on the efficacy of the mHealth interventions and their side effects, including inequalities because of the digital divide, addictive internet behavior, lack of trust in mHealth, anonymity issues, risks and biases for user groups and social contexts, and ethical implications.
Nuo et al., 2023	[44]	12	Summarize the status and trends of research in this field; assess the production and usage of sleep mHealth apps; calculate the conversion rate of grants that the proportion of newly developed apps from being funded and developed to published on application stores.	The field of tracking, diagnosing, and intervening in sleep disorders using mHealth apps has shown a trend of rapid development. However, the conversion rate of products from being funded and developed for use by end-users is low.
DEPRESSION, ANXIETY AND STRESS				
Huguet et al.,2016	[45]	12	Identify self-help apps available exclusively for people with depression and evaluate those that offer cognitive behavioural therapy (CBT) or behavioural activation (BA).	The usability of reviewed apps is highly variable and they rarely are accompanied by explicit privacy or safety policies. Despite the growing public demand, there is a concerning lack of appropriate CBT or BA apps, especially from a clinical and legal point of view. The application of superior scientific, technological, and legal knowledge is needed to improve the development, testing, and accessibility of apps for people with depression.

Table 1 (continued)

Author	N. References	(N)Participants	Objective	Main results
Callan et al., 2017	[46]	27	Review the literature currently available technologies and research aimed at relieving symptoms of MDD including computer-assisted cognitive-behavior therapy (CCBT), web-based self-help, Internet self-help support groups, mobile psychotherapeutic interventions, technology enhanced exercise, and biosensing technology.	Research has shown that most people with MDD receive either no treatment or inadequate treatment and the computer and mobile technologies may offer solutions for the delivery of therapies to untreated or inadequately treated individuals with MDD.
Firth et al., 2018	[47]	62	Provide a comprehensive overview of the efficacy, limitations, and future of e-health treatments for anxiety.	Results showed that smartphone versions of psychological treatments, such as CBT and ACT, significantly reduced anxiety, with moderate effect sizes
Wright et al.,	[48]	18	Assess the effectiveness of these newer methods of delivering or augmenting treatment and making recommendations on the clinical use of computer tools in psychotherapy of depression and anxiety.	Results were mixed as to whether disorder-specific interventions were more effective than transdiagnostic interventions. A concern raised in meta-analyses is that CCBT tended to be associated with greater dropout rates, particularly when the treatment involved no therapist contact.
Bommarito et al., 2019	[49]	10	Examine which interventions have been implemented to prevent burnout and depression during intern year and to consider the effectiveness of these interventions.	While most studies demonstrate a modest reduction in depression and burnout with implementation of some form of mindfulness practice, many were unable to reach a significant level of statistical power. More research is needed to determine generalizable findings
Wright et al., 2019	[50]	40	Evaluate the efficacy of computer-assisted forms of cognitive-behavior therapy for major depressive disorder (MDD) and examine the role of clinician support and other factors that might affect outcomes	CCBT with a modest amount of support from a clinician or other helping person was found to be efficacious with relatively large mean effect sizes on measures of depressive symptoms. Self-guided CCBT for depression was considerably less effective
Khademian et al., 2020	[51]	4978	Assess the effects of mental health apps on managing the symptoms of stress, anxiety, and depression.	It seems that mental health apps can be promising media for reducing depressive symptoms. This field is an emerging area of mobile health, and further research should be done in future in order to reach conclusive evidence
Gómez-de-Regil et al., 2020	[52]	7	Search for scientific literature on mobile apps for the management of comorbid overweight/obesity and depression/anxiety and providing a brief and comprehensive summary of their main features, targeted groups, and relevant results.	The prevalence and costs related to overweight/obesity and depression/anxiety are significant and likely to increase. Very often these conditions overlap; thus, it would be recommendable to treat their comorbidity simultaneously. Nevertheless, no mobile app has been designed for this purpose, which would help to reduce service provision costs and make treatment more easily accessible for patients.
Yim et al.,2020	[53]	10	Assist in the creation of new EMA applications, highlighting the potential of using EMA in clinical settings and in drug development, emphasizing the importance of regulating applications in the field of mental health, and providing information on future updates	Available evidence suggests that the use of passive smartphone-based applications may lead to improved management of depressive symptoms

Table 1 (continued)

Author	N. References	(N)Participants	Objective	Main results
Torous et al., 2020	[54]	18	Establish overall dropout rates, and how this differed between different types of apps.	Strategies to improve retention may include providing human feedback, and enabling in-app mood monitoring. However, it critical to consider bias when interpreting results of apps for depressive symptoms, especially given the strong indication of publication bias, and the higher attrition in larger studies.
Nakao et al., 2021	[55]	98	Evaluate the effectiveness of CBT in stressful conditions among clinical and general populations, and identified recent advances in CBT-related techniques	The results of several randomized controlled trials indicated that CBT was effective for a variety of mental problems, physical conditions, and behavioral problems, at least in the short term; more follow-up observations are needed to assess the long-term effects of CBT. Mental and physical problems can likely be managed effectively with online CBT or self-help CBT using a mobile app, but these should be applied with care, considering their cost-effectiveness and applicability to a given population.
Drissi et al., 2021	[56]	167	Provide an analysis of treatment and management-related functionality and characteristics of high-rated mobile applications (apps) for anxiety, which are available for Android and iOS systems.	Anxiety apps incorporate various mental health care management methods and approaches. Apps can serve as promising tools to assist large numbers of people suffering from general anxiety or from anxiety disorders, anytime, anywhere, and particularly in the current COVID-19 pandemic.
Six et al., 2021	[57]	50	Determine whether mental health apps with gamification elements differ in their effectiveness to reduce depressive symptoms when compared to those that lack these elements.	Both mental health apps with and without gamification elements were effective in reducing depressive symptoms. There was no significant difference in the effectiveness of mental health apps with gamification elements on depressive symptoms or adherence.
Furukawa et al., 2021	[58]	76	identify the most effective iCBT programs	The individual patient data cNMA revealed potentially helpful, less helpful, or harmful components and delivery formats for iCBT packages. iCBT packages aiming to be effective and efficient might choose to include beneficial components and exclude ones that are potentially detrimental.
Martinengo et al., 2021	[59]	28	Assess the features, functionality, data security, and congruence with evidence of self-guided CBT-based apps targeting users affected by depression that are available in major app stores	Only a few self-guided CBT-based apps offer comprehensive CBT programs or suicide risk management resources. Sharing of users' data is widespread, highlighting shortcomings in health app market governance. To fulfill their potential, self-guided CBT-based apps should follow evidence-based clinical guidelines, be patient centered, and enhance users' data security
Leong et al., 2022	[60]	348	Review is to characterize the current state of mHealth platforms designed for anxiety or depression that are available for research, commercial use, or both.	A considerable number of mHealth platforms designed for anxiety or depression are available for research, commercial use, or both. The characteristics of these mHealth platforms greatly vary.
Serrano-Ripoll et al., 2022	[61]	12	Analyse the impact of app-based psychological interventions for reducing depressive symptoms in people with depression.	App-based interventions targeted at people with depression produce moderate reductions in the symptoms of depression. More methodologically robust trials are needed to confirm our findings, determine which intervention features are associated with greater improvements, and identify those populations most likely to benefit from this type of intervention

Table 1 (continued)

Author	N. References	(N)Participants	Objective	Main results
Paganini et al.,2023	[62]	121	Provide a comprehensive overview of the quality and characteristics of SMAs to give potential users or health professionals a guideline when searching for SMAs in common app stores.	The moderate information quality, scarce evidence base, constraints in data privacy and security features, and high volatility of SMAs pose challenges for users, health professionals, and researchers. However, owing to the scalability of SMAs and the few but promising results regarding their effectiveness, they have a high potential to reach and help a broad audience
Klimczak et al., 2023	[63]	53	Provides a comprehensive review of online ACT self-help interventions, characterizing the programs that have been studied and analyzing their efficacy	Online ACT produced significantly greater outcomes than waitlist controls at post-treatment for anxiety, depression, quality of life, psychological flexibility, and all assessed outcomes (i.e. omnibus effect), which were generally maintained at follow-up. However, only psychological flexibility and all assessed outcomes at post-treatment were found to be significantly greater for online ACT when compared to active controls, with no significant follow-up effects.
PSYCHOATIVE SUBSTANCES				
Song et al., 2019	[64]	19	Review and synthesize the research evidence about the efficacy of mHealth interventions on various health outcomes for consumer self-control of UAU and to identify the core components to achieve these outcomes	Most studies reported mHealth interventions for self-control of UAU appeared to be improving behavior, especially the ones delivered by short message service and interactive voice response systems
Tofighi et al.,2019	[65]	74	evaluate the functionality, aesthetics, and quality of information of free or low-cost apps claiming to target alcohol, benzodiazepine, cocaine, crack/cocaine, crystal methamphetamine, and heroin use using the validated Mobile App Rating Scale (MARS) and critical content analysis.	Few commercially available apps yielded in our search integrated evidence-based interventions (eg, extended-release naltrexone, buprenorphine, naloxone, Self-Management and Recovery Training recovery, or CBT), and a concerning number of apps promoted harmful drinking and illicit substance use.
García-Pazo et al., 2021	[66]	5	Carry out a review of the smoking cessation apps that apply CBT and to describe the techniques used by them.	The results recommend the inclusion of smoking behavior analysis in these types of apps, as not all of them do so, as well as an interface between the health professionals and the users to provide a personalized treatment
Manning et al., 2022	[67]	unclear	Evaluate the evidence of new mHealth (smartphone) apps for substance use disorders (SUD)	The evidence-base for mHealth SUD apps is weak, inconclusive and hampered by substantial heterogeneity in study designs. However, there have been a number of interesting and novel developments in this area in recent years, which have not been synthesized to date.
Bonfiglio et al.,	[68]	18	Focus mainly on research on the effectiveness of digital treatments for Substance Users (SU)	The current review shows that digital treatments and interventions are effective in reducing the frequency of use, augmenting abstinence, or reducing the gravity of dependence for most of the studies at post-treatment. However, due to the heterogeneity of the variables, there was a reduced generalizability of the results
Bold et al., 2023	[69]	228	Use the American Psychiatric Association app evaluation model to evaluate the top-returned apps from Android and Apple app store platforms related to smoking cessation and investigate the common app features available for end users	Numerous smoking cessation apps were identified, but analysis revealed limitations, including high rates of irrelevant and non-functioning apps, high rates of turnover, and few apps providing evidence-based support for smoking cessation.

Table 1 (continued)

Author	N. References	(N)Participants	Objective	Main results
SLEEP QUALITY				
Shin et al., 2017	[70]	16	Determine the effectiveness of mobile technology interventions for improving sleep disorders and sleep quality	Use of mobile phone interventions to address sleep disorders and to improve sleep quality. The findings suggest that mobile phone technologies can be effective for future sleep intervention research.
Erten Uyumaz et al., 20	[71]	6	Explore the content and interaction styles of commercially available dCBT-I platforms and the ultimate goal is to understand: which features are commonly applied on CBT-I platforms? what do user studies indicate about the potential impact and value of the users' platforms? And which kind of elements are commonly applied for adherence?	The dCBT-I apps were effectively assisting the users, and the type of interactions promoted engagement. The apps' features were based on design principles from interactive product design, experience design, online social media, and serious gaming.
CHRONIC DISEASES				
Bhattarai et al., 2018	[72]	4	Appraise the quality and usability of currently available pain applications that could be used by community-dwelling older adults to self-manage their arthritic pain.	Few of the currently available pain apps offer a comprehensive pain self-management approach incorporating evidence-based strategies in accordance with the Stanford Arthritis Self-Management Program.
Choi et al., 2020	[73]	70	Summarize and analyse research on interventions using mobile applications for patients with hypertension and ischemic heart disease.	To ensure the long-term effects of mobile-application-based interventions, healthcare professionals should consider the functions of mobile applications. Moreover, because the focus of these interventions may differ based on the nature of the disease, it is recommended that the composition of interventions be tailored to the specific disease.
Mäcken et al., 2021	[74]	unclear	Introduce a new holistic approach to measure fatigue and the influencing factors via a mobile app. The objective of the Fimo health app is to help pwMS treat their fatigue. In the first step, fatigue and the influencing factors are measured.	Fatigue fluctuates over time and even throughout the day. These fluctuations are difficult to capture. Mobile health solutions offer new possibilities, particularly for complex chronic diseases such as MS and fatigue. PwMS are especially suited to adopt mobile health solutions, as they usually show their first symptoms between the ages of 20 and 40.
Lin et al., 2021	[75]	unclear	Investigate the use of CBT in patients with functional neurological disorders based on four types of remote delivery delivery to patients with FND to alleviate the access obstacle: workbooks, internet-guided CBT, app-based CBT, and teletherapy.	CBT and app-based CBT appear to be effective for psychiatric disorders, but further studies should determine their effectiveness in FND
Qin et al., 2022	[76]	30	Investigate the effectiveness of mobile phone app interventions on QOL and psychological outcomes in adult patients with cancer, with a special focus on intervention duration, type of cancer, intervention theory, treatment strategy, and intervention delivery format	Smartphone app–based interventions might help address certain psychological issues experienced by cancer survivors. In particular, short-term interventions (duration of ≤3 months), physician-patient interaction interventions (2-way communication using a smartphone app), and cognitive behavioral therapy–based interventions might be more effective in improving QOL and alleviating adverse psychological effects.

Table 1 (continued)

Author	N. References	(N)Participants	Objective	Main results
Shah et al., 2022	[77]	91	Summarize the current use, cost-effectiveness, and patient and clinician perspectives of digital health for intervention delivery in KOA and KR	For people with KOA and KR, many studies found digital health to be as effective as traditional treatments for patient education, physical activity, and exercise interventions. All digital interventions that incorporated cognitive behavioral therapy or similar psychological treatments were reported to result in significant improvements in patients with KOA and KR when compared with no treatment or traditional treatments.
Palmisano et al., 2023	[78]	2	Evaluate the characteristics of specific nutritional apps for chronic renal failure available in Italy	To date, there are only two applications available to monitor nutrition in patients with kidney disease.
Ebrahimi et al., 2023	[79]	17	Evaluate the quality of smartphone applications available on the *Google Play* and *App Store* in the field of overweight control based on CBT by applying the MARS	Future applications related to this field can be improved by providing a personalization program according to the needs of users and the possibility of online chatting with the therapist.
Howard et al., 2023	[80]	14	This study aimed to explore the design characteristics of native mobile apps used for adults living with MS in academic settings.	Behavior change theories were integrated into the design of the apps for fatigue management and physical activity. Regarding persuasive technology, the design principles of primary support were applied across all identified apps. The elements of dialogue support and social support were the least applied. The methods for evaluating the identified apps were varied.
DISORDER AND MENTAL HEALTH				
Loucas et al., 2014	[1]	20	Review the research on the effectiveness of e-therapy for eating disorders, using the methodology employed by the UK's National Institute for Health and Care Excellence (NICE).	Overall, although some positive findings were identified, the value of e-therapy for eating disorders must be viewed as uncertain. Further research, with improved methods, is needed to establish the effectiveness of e-therapy for people with eating disorders.
Lyons et al., 2014	[81]	13	Describe the behavior change techniques implemented in commercially available electronic activity monitors	Electronic activity monitors contain a wide range of behavior change techniques typically used in clinical behavioral interventions. Thus, the monitors may represent a medium by which these interventions could be translated for widespread use. This technology has broad applications for use in clinical, public health, and rehabilitation settings
Bakker et al., 2016	[3]	unclear	Provide a set of clear, sound, and practical recommendations that MHapp developers can follow to create better, more rigorous apps.	Randomized controlled trials are required to validate future MHapps and the principles upon which they are designed, and to further investigate the recommendations presented in this review. Effective MHapps are required to help prevent mental health problems and to ease the burden on health systems.
Schueller et al., 2020	[82]	unclear	Highlight key areas of consideration for leveraging technology to support the implementation of evidence-based treatments and to emphasize challenges and opportunities that come from using technology to scale evidence-based mental health treatments.	continuous growth of knowledge around DMHIs can help provide an evidence-base to translate and scale EBTs through technology and can help find ways to effectively and sustainably integrate these tools into various avenues of mental health service delivery. Combining knowledge in DMHIs with implementation science is a promising venue to unlock the potential of these tools to improve mental health service delivery.

Table 1 (continued)

Author	N. References	(N)Participants	Objective	Main results
Marciniak et al., 2020	[83]	26	Investigates standalone smartphone-based ecological momentary interventions (EMIs) built on principles derived from CBT that aim to improve mental health.	EMIs based on CBT principles can be successfully delivered, significantly increase well-being among users, and reduce mental health symptoms
Saad et al., 2021	[84]	36	Identify the evidence-based, self-directed, technology-based methods of care that can be used in adult patients after they are discharged from mental health services.	There is limited research on the efficacy and suitability of self-directed technology-based care options for mental health. Digital technologies have the potential to bridge the gap between ambulatory care and independent living.
Bernstein et al., 2022	[85]	64	Provide a scoping review of the use of human support or coaching in app-based cognitive behavioral therapy for emotional disorders, identify critical knowledge gaps, and offer recommendations for future research.	Although users tend to self-report that coaching improves their engagement and outcomes, there is limited and mixed supporting quantitative evidence at present.
Imai et al., 2022	[86]	11	Evaluate the effectiveness and adherence of computer-assisted self-help treatment without human contact in patients with OCD using a systematic review and meta-analysis approach.	Unguided computer-assisted self-help therapy for OCD is effective compared with waiting lists or psychological placebo. An exposure response and prevention component and intervention duration of more than 4 weeks may strengthen the efficacy without worsening the acceptability of the therapy.
Liu et al.,2023	[87]	43	Examine the design and implementation of the mobile apps for autism care and intervention.	User-centered design is the most popular approach for mobile app development. Augmentative and alternative communication, video modeling, and various behavior change practices have been used as the theoretical foundation for intervention efficacy.
Lin et al., 2023	[88]	18	Identified mental health conversational agents (CAs) currently available in app stores and assessed the behavior change techniques (BCTs) used.	Mental health CAs mostly targeted various mental health issues such as stress, anxiety, and depression, reflecting a broad intervention focus. The most common BCTs identified serve to promote the self-management of mental disorders with few therapeutic elements. CA developers should consider the quality of information, user confidentiality, access, and emergency management when designing mental health CAs.

Chronic diseases

Articles that mentioned the impact of chronic diseases, such as knee arthritis, kidney disease, multiple sclerosis and obesity; applications for pain; and the evaluation and measurement of fatigue, neurological diseases and cancer, on mental health were also included. Studies suggest the importance of virtual intervention for patients' education. In general, technological approaches integrate communication with clinical cases, as well as biofeedback or patient monitoring. Applications help improve the quality of life, symptoms or physical and emotional handling of patients with different diseases as a support or resource for different treatments [73–81].

Neuropsychiatric disorders

Neuropsychiatric disorders and mental health were described in a total of 10 articles, which were subdivided into eating disorders, neurodevelopment disorders, and autistic spectrum disorders. Therapies based on smartphone applications offer clear promise in the mental health care of symptomatic patients or those at risk of developing these conditions [1, 3, 82–89]. To this end, as smartphone ownership has become generalized, app-based therapies have become increasingly common. However, research on app-based therapies has failed to keep pace. Mental disorders cause a substantial burden on health care worldwide. Mobile health interventions are increasingly used to promote mental health and well-being, as they can improve access to treatment and reduce the associated costs. The aim is to highlight the main areas of consideration to leverage the technology to support the implementation of evidence-based treatments and emphasize the challenges and opportunities arising from the use of technology to escalate evidence-based mental health treatments [1, 3, 82–89].

More explicit connections between specific results podem ser compreendidos peland the broader theoretical implications or hypotheses about digital interventions in mental health, among the categories mentioned above, we have several patients who experience more than one of the issues mentioned and we know that, in addition, today mental health involves a range of care and methods for different treatments [1, 3, 7].

A total of 83 studies were used, divided into the themes mentioned above, to better understand the data. This study provides an overview of the effects of diverse interventions that are interconnected in the conduct and means of treatments, highlighting that the use of web-based applications helps in neuropsychiatric treatment. Our aim is clarifying how these findings interact with existing theories or models could deepen the impact and relevance of the discussion this study.

Discussion

As the use of smartphones has spread, application-based therapies have become more common. However, scientific research on the efficacy of virtual approaches through applications is scarce and limited. Mental disorders have a substantial impact on public health worldwide. The proof that mobile interventions are efficient can speed up and improve access to treatment and reduce associated costs. Therefore, it becomes necessary to highlight the gaps and benefits of technology in the implementation of web-based applications [1, 3, 82–89].

The studies included in this systematic review demonstrate a strong interconnection point, which is the use of applications as a technological resource favorable to the development of scientific research or health management in all ten categories that were listed for disorders or diseases.

Mindfulness

As previously described, studies based on mindfulness, for example, have shown concrete benefits for mental health. They are useful both in the remission and reduction of psychiatric symptoms and related disorders, as well as in improving sleep quality. Mindfulness studies revealed that various mental conditions can be improved through the effects of meditation applications on mental health. Given the broad variation of these studies and the positive results, the findings may be related in future studies, contributing to their improvement and new eHealth connections, quality of life, sleep quality, depression, anxiety, stress, and psychiatric disorders in general [7–15].

Mental health

The mental health of young people and students has also improved in aspects such as anxiety, stress, and the reduction of psychoactive substance use or abuse. We know how important it is to have studies aimed at caring for the health of the youth so that society can develop, enabling young people to be even more included. Such studies contribute more each day to technological advancements in health care, with young people having better mental health and remission of psychiatric disorders [28–32].

Electronic health (eHealth)

Studies in eHealth have demonstrated advances in patients' global treatment, especially with respect to stress and mental health, and even in health management. This finding suggests that it can facilitate all aspects of the treatment and administrative structuring of patients because the use of mobile applications allows

self-management and data recognition. eHealth applied to inform health professionals or manage patients' information helps organize data and possible clinical care. Moreover, professionals who are better supported by improved administration, management, and patient information are more proficient in clinical conduct. They have more space and more quality time to better attend to patients and consequently offer more organized treatment directed at the needs of each patient [19–27].

Sleep disturbances

In terms of sleep quality, studies have shown that good sleep quality promotes health in general, as in the aspects mentioned here, such as stress, anxiety, depression, illnesses, and health disorders. Without quality sleep, stress levels increase, as do physical illnesses, and even mental health can be compromised. This and many other studies need to demonstrate how technological resources can help raise awareness of the necessity for and management of sleep, as well as its time and quality, for positive effects on the lives of individuals, such as increased quality of life and overall well-being [71, 72].

Depression, anxiety and stress

This study also analyzed studies on anxiety, depression, stress, and psychiatric disorders that use technology as a treatment resource. Many patients have monthly consultations and technology and applications can facilitate communication with health care professionals so that patients feel more supported and have even more humanized management of treatment time and engagement. The World Health Organization predicts that depression will become the leading cause of the global disease burden by 2030. Thus, there is an enormous need for improved preventative mental health care, and MHapps aimed at emotional well-being are ready to provide exciting new opportunities in this field. The evidence-based recommendations discussed here are important for all MHapp developers to recognize whether better interventions should be developed to meet this growing demand in the future [45–90].

Technology can assist in information management for both patients and health care professionals in terms of aspects such as teleconsultations and test results, among many other aspects, as mentioned in the different studies in this review [3, 6, 7, 9, 10–12, 14, 15, 17–19].

In general, combined technology that incorporates doctor and patient communication, along with biofeedback and patient monitoring, has shown favorable results with the use of virtual resources. Therefore, these applications help improve the quality of life, symptoms, and physical and emotional handling of patients with different disorders as a support or an instrument for different treatments. Such applications may provide support for patients who can access applications that remind them of when to take medication or provide a psychological technique for relaxation, meditation, or many clinical examples that support treatment, to which the patient can gain access through a smartphone at any time of day in any location [19–32].

Mobile health interventions are increasingly used to promote mental health and well-being since they can improve access to treatment and reduce the associated costs. It is known that online consultations are an example in which technology is already established and is increasingly gaining space and openings to assist in access, minimize the need for transportation, organize the routines of patients and health care professionals, and increase general access and resources.

In this study, there is a wide variety of associations in the results. Our main aim was to research the use of applications and technological innovations in mental health to understand the current scenario and increase the need for further studies and possible treatment paths. Our findings indicate that in terms of mental health, stress, anxiety, depression, sleep quality, tinnitus, psychoactive substances, diseases, and disorders, technological means such as applications and systems that help these patients and their treatments become even more efficient and organized for even more robust results and improved well-being.

There is a need for in-depth discussions on the use of technology and applications to manage psychological support and information in mental health and psychiatric disorders. Owing mainly to technological advancements in general society, such as in neuropsychiatric treatments, understanding the use of the internet, applications, different disorders and issues linked to neuropsychiatry, as reported, is important for clinical health treatments and management.

Conclusion

In addition to the 83 studies reported here, there are others in the literature, but most of them are initial, requiring monitoring and evidence on the development and applicability of the findings in different patients and neuropsychiatric treatments. The evidence presented in this work highlights the necessity of developing new preventive and therapeutic instruments that could benefit patients' physical and mental health.

In this study, we demonstrate different discoveries about the use of applications accessed through internet browsers for neuropsychiatric treatment, even though they initially already benefitted from different treatments, such as mental health in general, anxiety, depression, stress, sleep disorders, mindfulness

disciplines, chronic illnesses, and tinnitus, among others associated with neuropsychiatric disorders and treatments.

The findings suggest that the use of virtual support through applications that favor neuropsychiatric treatment improves the well-being and quality of life of these patients.

From this perspective, browser-based applications have emerged as great allies for patients and health professionals, above all, for neuropsychiatric treatment. Therefore, the findings of this review suggest that the proper use of technology for mental health benefits the well-being and quality of life of patients and represents advances in clinical practice.

Limitations of the review

We recognize the limitations of this review, such as possible prejudices that still exist among health professionals or specific areas of health where the evidence is still inicial; as we observed in this study, few articles in some categories mentioned. We believe that this study contributes to the literature, but more efforts are needed to validate these findings.

Methodology

We confirmed that all methods were carried out in accordance with relevant guidelines and regulations.

Authors' contributions

LP: Conceptualization, Data curation, Formal Analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review editing. LAQ: Conceptualization, Data curation, Formal Analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review editing. AC: Conceptualization, Data curation, Formal Analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review editing. NH: Conceptualization, Data curation, Formal Analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review editing. AEN: Conceptualization, Data curation, Formal Analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review editing.

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Data availability

No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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