

Potential Mobile Health Applications for Improving the Mental Health of the Elderly: A Systematic Review

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Abstract: The rapid aging of the global population presents challenges in providing mental health care resources for older adults aged 65 and above. The COVID-19 pandemic has further exacerbated the global population's psychological distress due to social isolation and distancing. Thus, there is an urgent need to update scholarly knowledge on the effectiveness of mHealth applications to improve older people's mental health. This systematic review summarizes recent literature on chatbots aimed at enhancing mental health and well-being. Sixteen papers describing six apps or prototypes were reviewed, indicating the practicality, feasibility, and acceptance of chatbots for promoting mental health in older adults. Engaging with chatbots led to improvements in well-being and stress reduction, as well as a decrement in depressive symptoms. Mobile health applications addressing these studies are categorized for reference.

Keywords: chatbot, mHealth application, older adults, mental health

Introduction

The World Health Organization indicates that the proportion of individuals over 60 years old will rise from 12% to 22%.¹ Due to the rapid aging of the global population, resources for the mental health care of older adults over 65 years old will be in great demand. During the COVID-19 pandemic, older adults have been more vulnerable to psychological and mental distress due to such as social isolation, social distancing, and quarantine measures.² Accordingly, rates of anxiety and depression among older adults have increased during the COVID-19 pandemic in older adults.³ Thus, a pressing issue should be implemented by choosing an appropriate and efficient intervention to improve the mental health of older adults, especially during the COVID-19 pandemic.

Face-to-face therapy and guided self-help techniques (eg, cognitive behavioral therapy [CBT]) have proven effective in treating depression and anxiety. People demand mental healthcare; however, face-to-face therapy fails to comply with these conditions sufficiently. The outbreak of the pandemic also prompted the development of innovative ways to deliver mental health care services. Nonetheless, specific user groups are interested in using technology to address mental health issues. For instance, an increasing number of older adults are willing to search for information on health issues on the internet.⁴ Further, integrating mobile technology and mental health care is of great benefit to seniors over the age of 65.⁵

Mobile health (mHealth) is by definition an application of mobile technology with the purpose to improve health outcomes by health data transmission and health information acquisition.⁶ Mental mHealth is, by definition, an application that uses a mobile phone to perform mental health practices.⁷ MHealth has been considered as a new frontier in the

delivery of mental health treatment.⁶ From a user's perspective, smartphone-based mental health apps are a good fit for certain groups of older adults, such as those who quarantined during the COVID-19 pandemic, people living in social isolation or remote areas, or those not covered by the insurance system.⁸

Randomized controlled trials have shown positive results regarding the use of mobile app in treating patients with depression.⁹ Conversation agents comprise software applications that use natural language to respond to users' needs or to help them complete tasks. Conversation agents are designed with fewer interfaces and input devices, making it easier for people to interact with machines.¹⁰ Many commercially available mHealth applications (eg, Woebot) use conversational agents as well as text-based conversation systems.¹¹ Previous studies have indicated that conversational agents such as text-based and web-based cognitive behavioral therapy can weaken the development of symptoms related to depression and anxiety.¹²

Social support has been another important protective factor for older adults during the pandemic.² There is scarce research on the use of artificial agents for daily social support.¹³ Chatbots have been perceived as humans with humanlike personalities. The first chatbot, Eliza, was developed to examine natural language communication between people and machines in the 1960s.¹⁴ Chatbot interventions comprise a way to provide personalized, asynchronous support in response to people's need for interaction.¹⁵ Digital inventions have been effective in reducing loneliness and social isolation among older adults.¹⁶ Thus, chatbot implementation could serve as a timely invention to provide social support for older adults during the COVID-19 pandemic.

Chen and Schulz conducted a systematic review that demonstrated the efficacy of information and communication technology-based interventions in mitigating social isolation among older adults.¹⁷ These interventions have the potential to enhance the quality of life for this population by fostering social support, promoting engagement in social activities, and reducing feelings of loneliness and depression.

Machine learning is a powerful tool utilized in the medical field, offering benefits in health care communication such as enhanced patient care and education, accelerated decision-making, and resource use reduction.¹⁸ Recently, the Chat Generative Pre-trained Transformer (ChatGPT) has gained significant popularity and has been successfully applied in various domains. It serves as a language model specifically designed for dialogue, functioning as a chatbot. Although ChatGPT has the potential to enhance accessibility to health care services as a disruptive technology, there are apprehensions regarding its utilization as a medical chatbot.¹⁹ Particularly, the design of mHealth interventions for older adults should prioritize reducing barriers to their acceptance. Therefore, emphasizing ease of use is crucial in the development of user-friendly mHealth solutions.

There are several existing mental health and well-being chatbots, including Kokobot,¹⁰ Shim,²⁰ Tess,^{21,22} and Woebot.¹² However, these chatbots were not exclusively designed for older adults. The present review focuses on chatbot application (eg, chatbots and web or mobile applications) that could improve mental health (eg, alleviating depression, insomnia, loneliness, and suicidal ideation) and well-being in older adults.

Methods

Study Identification and Selection

We performed a systematic search on PubMed, ISI Web of science, SCOPUS, the Cochrane Library, and CINAHL databases to identify potentially eligible papers. Further, electronic databases, including JMIR Publications, ScienceDirect, Google Scholar, BMC Medicine, MDPI, ResearchGate, Springer, and Digital Medicine, were searched for relevant publications between January 2017 and December 2021. Published databases of highly cited journals were inspected, including the *Journal of Medical Internet Research*, *Cyberpsychology, Behavior and Social Networking*, and *Internet Interventions*.

Chatbots, which are computer programs that engage in text-based or voice-based conversations with people via an interactive interface, are an innovative tool in psychology.²³ This review focuses on chatbot applications (eg, chatbots, web or mobile applications) defined as mHealts, even though most of them were not exclusively designed for older adults to promote their mental health. To enable a broad search for applications related to the chatbot concept, we enlarged the keyword search for possible journal articles on chatbots, mobile applications, and more. In order to collect

more papers, we also collected studies describing mental health for older adults in the abstract and those including participants over 65 years old. Mental health problems (such as depression, anxiety, loneliness, suicidal ideation, dementia, and decline in cognitive function and memory) and participants' age were the primary criteria in the search algorithm. Abstracts were excluded if they did not meet the following requirements: 1) the age of participants was under 65 years; 2) the design of the chatbot concept applications was not aimed at promoting mental health; 3) the nature of the study was not clinical evidence-based with interpretation; and 4) the focus of the study included the trial system description and systematic or scoping review, but lacked experimental outcomes. Three doctors and two professors were involved in the process of article extraction and screening. Two professors subsequently validated the procedure. The experts engaged in thorough discussions to address any discrepancies in the ratings of the inclusion and exclusion criteria. These discussions continued until a consensus was reached on the final study selection criteria.

Search Strategy

The following terms were used in our search strategy: ("application" OR "mobile app" OR "mobile applications" OR "chatbot") AND ("mHealth" OR "mental health" OR "mental disorder" OR "depression" OR "anxiety" OR "sleep" OR "psychological" OR "sport") AND ("older" OR "adults" OR "aged"). We also manually reviewed the reference lists of included studies and relevant reviews to identify potentially eligible studies.

Results

Study Inclusion

With all abstracts initially identified, 226 of 242 abstracts were excluded based on the title of the string, abstract screening, and duplicate removal. A total of 16 full-text articles that fulfilled the inclusion criteria were selected. The search process is illustrated in Figure 1.

Study Characteristics

We discussed six apps from sixteen publications. The publication dates were organized from 2017 to 2021. It is noteworthy that the number of publications increased in 2021. Table 1 lists the characteristics of studies conducted exclusively on older adults. In addition to the studies listed in Table 1, there are two mHealth application studies that

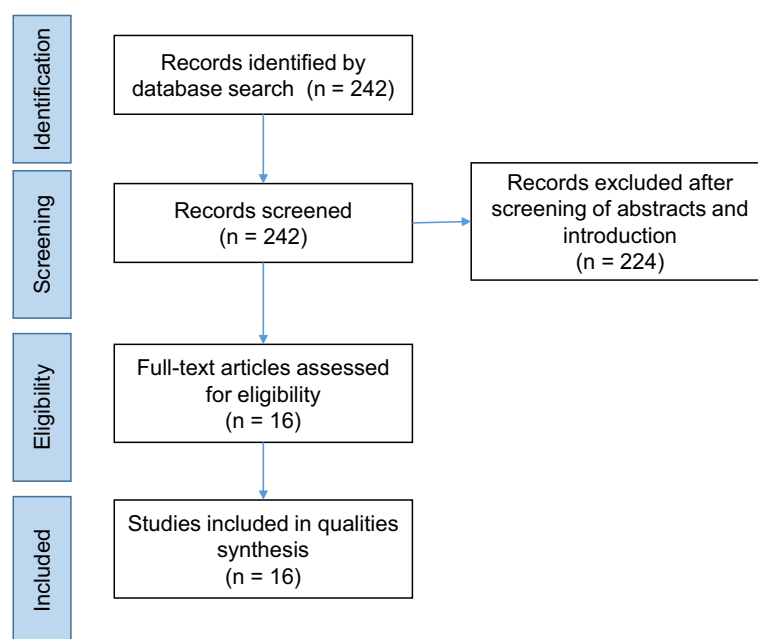


Figure 1 Search process of the studies included in the review.

Table I Reviewed Studies on mHealth Apps for Older Adults (N =4)

App	Study	Design	Measurements	Sample/ age
Oiva	Similä et al 2018 ²⁴	This study focuses on a mobile application with the specific purpose of assisting older adults in addressing depressive symptoms and promoting mindfulness skills. Through an evaluation of feasibility, acceptance, and operational efficacy, the research findings provide robust evidence of the mobile-based mental wellness training application's effectiveness in preventing and reducing mild-to-moderate depressive symptoms, thus benefiting the mental health of the elderly population.	GDS-15 and FMI	N = 7 (66–82, mean age: 73)
MIND MORE	Chung et al 2020 ²⁵	This study examines the relationship between sleep quality, memory issues, and depressive symptoms using the smartphone-based CBT-I application MIND MORE. The findings demonstrate that high levels of memory issues and depressive symptoms are associated with poor sleep quality, while the MIND MORE application effectively improves sleep quality in older adults.	Korean version of the GDS-15 (SGDS-K) Pittsburgh Sleep Quality Index (PSQI) Subjective Memory Complaints Questionnaire (SMCQ)	N = 40 (64–85, mean age: 75.75)
Interaktor	Göransson et al 2020 ⁴	The study involved providing older individuals with access to the home care application. The results revealed a significant improvement in communication abilities and health literacy among this population, highlighting the effectiveness of Interaktor in addressing these important aspects of older adults' well-being.	GDS Nutritional Form for the Elderly	N = 17 (70–101)
MIT App Inventor	Vailati Riboni et al 2020 ²⁶	This study was conducted based on an app addressed in prior research. The findings revealed that the mental health-focused app offered diverse approaches to address specific issues but had limitations in addressing deeper and more complex concerns. Most participants provided positive feedback on their experience with the app, expressing optimism about its potential to enhance their daily lives in the future.	Semi-structured interviews	N = 68 (> 65)

included research participants from various age groups, including middle-aged to older adults, young adults to older adults, rather than focusing solely on older adults.

Chatbot Characteristics

Based on our search, studies on mHealth can be broadly classified into two main categories. The first comprises studies that focus on introducing interface functionality or applying novel technological issues. The second encompasses studies that provide substantial medical evidence demonstrating the potential to enhance the physical and mental well-being of the elderly population.

In this review, we concentrated on the latter category, as we aim to establish a foundation of medical evidence. To achieve this, we examined a series of mHealth studies encompassing participants from various age groups, including the elderly demographic. In this particular exposition, we will exclusively present an overview of these selected studies, underscoring their relevance and significance. There were some chatbot apps involving participants under 65 years old. We describe their functionality as follows:

The Corona Health app, developed by the University of Würzburg for Android and iOS systems, allows users to monitor their health, access COVID-19 news updates, offer daily feedback, and engage in direct communication with health care professionals via a messaging application programming interface (API). After conducting the study, it was reported that the more time older participants used social media, the lower the levels of loneliness and the higher the increased feelings of social well-being amidst the challenges posed by the COVID-19 pandemic.²⁷

The WellPATH app, designed with a user-centered approach for middle-aged and older adults, features medium-to large fonts and simplified sentences to enhance usability. Users reported reduced negative emotions, improved emotion regulation (specifically cognitive reappraisal ability), and high satisfaction with the app. The study findings suggest that utilizing WellPATH or similar applications can effectively mitigate suicide risk and assist middle-aged and older patients in overcoming related challenges.²⁸

Table 2 summarizes four chatbot apps: Oiva,²⁴ MIT App Inventor,²⁶ MIND MORE,²⁵ Interaktor.⁴

Operating platforms included Android and iOS (n = 2 [MIT App Inventor, MIND MORE], Android only (n = 1 [Oiva]), and iOS only (n = 1 [Interaktor]).

These apps are used to prevent and treat depression and other mental problems. Interaktor is the only app for older adults living alone and receiving home care. Further, three apps addressed prevention and treatment of depression and other mental health issues. Prevention and early intervention (n = 2 [Oiva, MIT App Inventor]) and assessment and screening (n = 2 [Oiva, Interaktor]) were the two elementary focuses of these apps. The design and features of these applications are outlined below. Based on our review, only MIND MORE was used to evaluate users' engagement with the chatbots.

Table 2 A List of mHealth Mobile Applications with Features for Older Adults to Be Used (N = 4)

App Name	Description	Main Feature	O.S.	Annual Cost Basic	Available to Download	Area Targeted
Oiva ²⁴	A mental wellness training app involved input from domain experts and user opinions, ensuring a comprehensive and user-centric approach.	Oiva incorporates acceptance and commitment therapy principles and methods, delivering a comprehensive intervention program through bite-sized daily sessions. The app features four distinct intervention modules, namely Aware Mind, Wise Mind, Values, and Healthy Body.	Android	Free	NA	Depression and mindfulness skills
MIND MORE ²⁵	CBT-I app, a research team-developed smart phone-based app, aims to enhance sleep quality by 1) educating users about sleep hygiene; 2) restricting sleep patterns; 3) performing stimulus control; 4) applying cognitive therapy.	The APP integrates multiple functions, such as a sleep diary, cognitive therapy modules, and educational content, to support comprehensive sleep management and provide cognitive interventions.	Android/ iOS	Free	NA	Insomnia

(Continued)

Table 2 (Continued).

App Name	Description	Main Feature	O.S.	Annual Cost Basic	Available to Download	Area Targeted
Interaktor ⁴	An interactive app was developed by a research group, drawing upon the theoretical system with user rate and individual-orientated care. This application serves the purpose of facilitating self-management of health concerns among users.	The platform incorporates various components, including an assessment feature for evaluating health concerns, connectivity to a secure server for data storage and health care professional monitoring, a model that assesses risks by sending alerts to nurses using SMS, access to self-care advice with evidence support and relevant websites, and graphical representation of reporting history.	iOS	Free	NA	Self-management of health
MIT App Inventor ²⁶	MIT App Inventor provides a blueprint for this app to be developed, specifically tailored for the Italian language.	The design of the entire app took into consideration the age-associated physical and cognitive impairments. Its design promises accessibility of the older users to access the app and ensures the usability. The app was designed to improve well-being and mindfulness among older people.	Android/ iOS	Free	NA	Mindfulness

Analysis Articles

The apps targeted older adults, aiming to improve their mental health issues.^{24–26,28} There are several priorities in improving older adults' mental health, such as addressing depression, insomnia, loneliness, suicidal ideation, homecare, and improving mindfulness and well-being. The chatbot apps are classified below according to the abovementioned priorities.

Depression

Oiva

Using the Freiburg Mindfulness Inventory and the Geriatric Depression Scale-15, the mindfulness skills and depressive symptoms were evaluated at baseline and post-trial stages using the Freiburg Mindfulness Inventory and the post-trial stage. Seven female participants were included in this review (N = 7; mean age: 73 years; SD: 7.0 years, age range: 66–82 years).

Insomnia

MIND MORE

After gaining hands-on experience using the app, older adults with sleeping issues were requested to complete the questionnaires concerning sociodemographic characteristics and mental health status, in addition to app usability. MIND

MORE, based on cognitive behavioral therapy for insomnia (CBT-I), is a smartphone-based application that aims to treat insomnia through non-pharmacological means, aligning with the principles of CBT-I.

Based on the results, the study showed that higher ratings of depressive symptoms (40/40; $\rho = 0.60$, $P < 0.001$) and memory complaints (40/40; $\rho = 0.46$, $P = 0.003$) were directly associated with poor subjective sleep quality. Moreover, for the one-week intervention, older adults using the MIND MORE app showed improved sleep quality (9/9; $t = 3.74$, $P = 0.006$). Thus, MIND MORE can improve the sleep quality of users.

There were 40 (women:35) program participants, between 64 and 85 years (mean age:75.75 years, SD:5.87 years) included in the data analysis, while comparisons were drawn regarding subjective sleep quality from pre-intervention to post-intervention.

A two-tailed paired-samples *t*-test found a significant mean difference in the evaluation of subjective sleep quality between pre-intervention (mean:8.00, SD:2.50) and post-intervention (mean:5.11, SD:1.36). Based on this test, one-week usage of the MIND MORE app improved sleep quality in the older adult participants ($t = 3.74$, $P = 0.006$).

Homecare

Interaktor is the only app for home care addressed in the reviewed studies.⁴ The participants ($N = 17$, age range:70–101 years) were asked to report their health concerns by using Interaktor twice a week for three months and answer questionnaires both after the intervention and at a six-month follow-up. Several instruments, including 1) Sense of Coherence, 2) Health Index, 3) Nutrition Form for Older Adults, 4) Geriatric Depression Scale-20, 5) Swedish Communicative and Critical Health Literacy, and 6) Swedish Functional Health Literacy scales, were collected and analyzed in this study.

Based on the results, the median intended usage rate of the application was 96%. Using the Interaktor app, the data showed a significant improvement in older adults' communication and critical health literacy. The pain was among the most important health concerns ($n = 33$). Moreover, there were no significant differences between the Sense of Coherence, Health Index, Nutrition Form for Older Adults, Geriatric Depression Scale-20, and Swedish Functional Health Literacy Scales over time.

Improving Mindfulness and Well-Being

This MIT App Inventor study aims to monitor the status of an e-health mindfulness application that the participants have experienced. The participants were randomly divided into two groups. One group was the treatment group that received the mobile app intervention ($n = 34$) whereas. By contrast, the other group was the waitlist control group that had to wait until trial completion before receiving the app ($n = 34$). Participants were requested to complete the entire intervention for 14 days and perform one exercise daily.

The results of the interview after the trial were polarized. More than half of the participants (56.5%) felt that the app's focused on personal improvement and did not help them improve their relationships with other people. However, 26.1% of the participants thought that the app could improve their interpersonal interactions. Therefore, the smartphone app may increase older adults' willingness to accept health technology in their daily life.

Loneliness

The Corona Health App study examined the relationship between loneliness and the use of a smartphone communication app.²⁷ This study was conducted to examine if the use of the app was associated with feelings of loneliness and social well-being across different age groups during the COVID-19 pandemic. The participants ($N = 364$, age range:18–78 years) were asked to fill out an app-based cross-sectional survey questionnaire. Participants' average usage times of the Corona Health App were also collected.²⁷

The study results indicated that smartphone communication usage time could not represent a person's subjective feeling of loneliness and social well-being. However, for older adults, social media use could represent their feelings of loneliness and well-being.

Suicidal Ideation Treatment

In this study, the WellPATH app aimed to enhance the effects of treatments related to suicide issues.²⁸ This app is one of the components composing the 12-week psychotherapy intervention, which is named CRISP, which refers to Cognitive Reappraisal Intervention for Suicide Prevention. Three stages, including 1) preparation and practice; 2) incorporation; and 3) actual use, were featured in using the WellPATH app during the trial. Being a part of CRISP, the participants discharged from the suicide-related inpatient treatment were allocated with the WellPATH app.

The participants and the therapists were highly satisfied with WellPATH app after the treatment. The participants confirmed that their negative emotions decreased after using WellPATH.

The benefits and drawbacks of mHealth apps based on the need for mental health care can be analyzed as follows:

Benefits

1. Convenience: mHealth apps provide on-demand access to mental health support and resources, enabling users to seek help anytime, anywhere.
2. Personalization: These apps offer tailored mental health tools and programs based on individual needs and goals.
3. Self-management: Users can independently manage and monitor their mental health, engaging in daily self-care activities through the apps' features.

Drawbacks

1. Technological dependency: Users need the skills and resources to use devices such as smartphones or tablets, as well as a stable internet connection to access these apps.
2. Privacy and security risks: Personal and sensitive information may be stored within the apps, requiring adequate security measures to protect user privacy.
3. Lack of interpersonal interaction: While these apps provide psychological support and resources, they cannot replace the value of real-life interpersonal interaction and professional therapy.

Overall, mHealth apps based on the need for mental healthcare offer convenient access to support and resources. However, it is important to consider the limitations of technological dependency, privacy risks, and the absence of in-person interaction.

Discussion

With the aging of society, mental health in older adults is receiving increasing scholarly attention. Various mobile apps have been developed to enhance the physical and mental well-being of older adults. We gathered several applied studies on mHealth for older adults to explore and compare their functionality, experimental processes, and effectiveness. In our review, we identified 16 journals that described either five applications or prototypes. Furthermore, we examined the mHealth addressed in those studies, as well as their contributions (eg, providing user operating data to hospitals or institutions for analysis can assist in diagnosing patients). According to the results of this systematic review, using chatbots to promote mental health appears to be practical, feasible, and well-received. Participants can benefit from the chatbots for psychological variables related to well-being, stress, and depression. Regarding mHealth's effectiveness, it is important to note that the limited sample sizes do not provide sufficient statistical power for a robust assessment.

Chatbots, the AI-based computer programs, are equipped with pre-written interaction scripts that benefit users' communication on an interactive platform by providing text- or speech-based dialogue.²³ Chatbots comprise an innovative approach to use mobile technology for clinical applications in mental health. Various mHealth apps have been shown to be effective in providing personalized treatment and daily CBT to improve mental health issues, such as depression and insomnia. Thus, psychotherapists can develop various scripts with specific treatment objectives for chatbots to follow. Further, chatbots are useful for providing instant interactivity in home care services. The physical and mental health status of older adults living alone can be monitored by a home care chatbot that sends daily messages assigned by medical personnel. However, the chatbot should be designed to provide a positive user experience for older adults. This means keeping the interface simple and intuitive, with clear prompts and easy-to-understand language. The

most common mental health concerns among older adults include 1) depression; 2) anxiety; 3) loneliness; and 4) cognitive decline. Therefore, it is necessary to ensure that chatbots' content is evidence-based and provides helpful support and resources to address the concerns mentioned previously.

Chatbots can serve as a helpful supplement to psychological services for older adults who wish to undergo independent cognitive-behavioral training and evaluation.²⁹ Natural language processing has recently seen rapid development of many AI techniques. OpenAI has introduced a novel technique—the Generative Pre-trained Transformer 3, which uses deep learning to produce human-like text. Recently, ChatGPT has gained significant popularity and has been successfully applied in various domains. By integrating ChatGPT into chatbot applications, psychotherapists could design cognitive-behavioral scripts that represent the next generation of psychological interventions for older adults. In the future, chatbot interventions could be used to address and detect psychiatric problems, improving the reduction of associated symptoms, especially when no treatment is received at all.²⁹ Chatbots have the capability to provide psychoeducation for depression and assist in recording users' mood daily. They can also send “push notifications” for cognitive-behavioral homework aimed at promoting good health. Hence, chatbots have demonstrated their usefulness in offering social support amidst the COVID-19 pandemic. However, chatbots must be accessible to older adults with different abilities, such as those who may have visual or hearing impairments, or those who may have difficulty using technology. This can be achieved through features such as text-to-speech, large text sizes, and easy-to-use buttons.

Concerning the use of chatbots to promote mental health, numerous ethical and legal (eg, data protection) questions must be answered. We suggest the following ways to improve the above-mentioned concerns:

1. Allow users to personalize their experience with the chatbot, indicating their preferred communication style, interests, and goals. Personalization can help improve engagement and motivation to use the chatbot regularly.
2. Collaborate with mental health professionals to develop chatbots' content and ensure that it aligns with established mental health practices and principles. Additionally, service providers should consider integrating chatbots with existing mental health services to offer a more comprehensive approach to care.
3. Continuously test and evaluate chatbots' effectiveness and user experience and iterate based on feedback from older adults and mental health professionals.
4. Protect users' privacy and security by implementing strong data protection measures and following best practices for data storage and handling. Additionally, ensure that users have control over their data and can delete their information at any time.
5. Cooperate with more countries to improve the diversity of samples and find experts and doctors in related fields to prove that the apps can indeed improve the lives of older adults.
6. Propose ways to solve the problem of personal data leakage (eg, ask international organizations to promote legislation, explain to the public how the apps will be used, and protect users' data).
7. Collaborate with governments and public interest groups or raise funds from the public, so that mHealth design teams can continue to focus on researching and developing new technology to improve the health of older adults without worrying about the lack of funding.

Limitations

Although the experimental results in the reviewed articles showed that mHealths could be significantly helpful for older adults in a practical way, they have several limitations. First, the number of studies reviewed was small with limited sample sizes. Second, each study was conducted within only one area, and results were not readily generalized to other countries or cultures.

Some mHealths applied machine learning algorithms to make recommendations and treatments. However, it is hard to find out how results are generated and to evaluate the quality of recommendations. More experts or doctors in related fields should be invited to support and guarantee the quality of recommendations and that treatments are effective.

Furthermore, conflicts between the commercial operation of mHealths and the original purpose of the treatment is another concern. Not all mHealths are free of charge; hence, some patients who cannot afford to unlock chargeable functions might miss the opportunity to be treated.

Conclusion

Although face-to-face therapy is an effective treatment for depression, it is necessary to meet the increasing demand for mental healthcare. Thus, a proven challenge remains. Further, COVID-19 containment measures have had the unintended effect of aggravating individuals' psychological problems. Remote medical consultations and mobile apps for treatment using AI have become increasingly popular. Several startups have developed chatbot-based apps for clinical psychology. This is the first review to systematically examine the literature on chatbot apps to improve older adults' mental health.

Following the review of relevant studies, we delved into the clinical evidence supporting various mHealth apps. mHealth has been proven to promote older adults' physical and mental well-being. For example, an app named Oiva can reduce the development of depression-related symptoms among older adults.²⁴ Another app, MIND MORE, led to improvements in sleep quality among the elderly. However, there remains a significant need for mHealth interventions to assist older adults in enhancing their mental health, addressing concerns such as depression, suicidal ideation, and overall well-being. Moreover, technology is advancing rapidly.²⁵ Apps equipped with new technologies could be applied to improve older adults' physical and mental health by encouraging them to exercise, and by accompanying them to minimize their feeling of loneliness.

Future Research

From our review, we found that mHealth can help improve depression and insomnia among older adults. However, there remain several mental health issues among older adults that need to be addressed through mHealth. Recently, AI and ChatGPT have gained significant popularity and have been successfully applied in various fields. Researchers can combine natural language processing with AI to develop chatbots specifically aimed at improving mental health.^{19,30–32} However, these apps are primarily designed for young people. When designing apps for older adults, it is crucial to consider whether the interface is simple, user-friendly, and easy to navigate, ensuring a positive user experience. By ensuring a user-friendly interface, apps can attract and retain older users, thereby increasing user engagement and ultimately contributing to improving their mental health. Due to older adults often experiencing difficulties in the initial learning phase, mHealth should prioritize design elements that reduce barriers to accepting mobile app-based CBT among older adults.

Research Ethics and Consent

This review does not use or reveal any personal or patient data.

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Disclosure

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