Barriers and facilitators to acceptance and implementation of eMental-health intervention among older adults: A qualitative systematic review

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Abstract

Objective: Electronic mental health interventions are effective but not well promoted currently among older adults. This study sought to systematically review and summarize the barriers and facilitators of accepting and implementing electronic mental health interventions among older adults.

Methods: We comprehensively retrieved six electronic databases from January 2012 to September 2022: PubMed, Web of Science, Embase, Scopus, PsycINFO, and CINAHL. The JBI-QARI was used to assess the quality of the research methodology of each publication. Eligible studies underwent data coding and synthesis aligned to inductive and deductive methods. The Consolidated Framework for Implementation Research 2.0 was used as a deductive framework to guide a more structured analysis.

Results: The systematic review screened 4309 articles, 17 of which were included (eight with mixed methods and nine with qualitative methods). We identified and extracted the barriers and facilitators of accepting and implementing electronic mental health interventions among older adults: (1) innovation: technology challenges, optimized functions, and contents, security and privacy; (2) outer setting: community engagement and partnerships, financing; (3) inner setting: leadership engagement, available resources, incompatibility, intergenerational support, training and guidance; (4) individuals: perceptions, capability, motivation of older adults and healthcare providers; and (5) implementation process: recruit, external assistance, and team.

Conclusion: These findings are critical to optimizing, promoting, and expanding electronic mental health interventions among older adults. The systematic review also provides a reference for better evidence-based implementation strategies in the future.

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Introduction

As society rapidly ages, mental health issues among older adults have become a concern. The proportion of older adults worldwide is predicted to increase from 12% to 22% between 2015 and 2050.[1] Approximately 15% of adults aged 60 and older worldwide suffer from mental disorders,[2] which can affect their physical health and increase the risk of developing chronic diseases, such as cardiovascular, diabetes, and chronic obstructive pulmonary disease.[3–5] Severe mental disorders among old adults can even lead to premature death by harming themselves, which accounts for up to 25% of deaths among older people with psychological problems.[2] Therefore, addressing mental disorders among older adults is crucial for promoting their psychological and physical wellbeing.[6]

Electronic mental health interventions (EMHIs) are a promising approach to meeting the mental health needs of older adults.[7] EMHIs utilize information and communication technology to provide mental health management, telepsychiatry counseling or treatment, and virtual communities of support groups.[8,9] Mental health management means providing self-help or asynchronous psychological treatments or interventions using different devices (personal computer, laptop, or tablet) or smartphones (iPhone Operating System, Android, or Windows) to access online programs or applications.[10] Telepsychiatry counseling or treatment is defined as remote, synchronized, real-time, interactive assessments, consultations, and treatments provided by professional psychotherapists or trained volunteers via videoconferencing.[11] Virtual communities of support groups refer to online platforms where individuals with shared experiences, challenges, or interests come together to provide mutual support, share information, and foster a sense of community.[12]

EMHIs have increased treatment availability at a lower cost while maintaining clinical outcomes comparable to face-to-face therapies and outperforming the waiting lists.[13] A systematic review (15 randomized controlled trials involving 3100 participants) demonstrated that the internet or telephone cognitive behavioral therapy reduced late-life depressive symptoms.[14] Also, technology-supported interventions potentially alleviated loneliness and helped socialize the home-isolated older adults.[15]

Despite all the benefits of EMHIs, there are many barriers to adoption and promotion in older adults. The successful implementation of this technology depends on acceptance. A cross-sectional survey in the United States found that about 83% of older adults might not consider using technology to manage mental health.[16] More than two-thirds of healthcare providers did not have sufficient knowledge or resources to provide and implement EMHIs.[17] Meanwhile, only 7.7% of healthcare agencies reported using telehealth interventions for depression care, and they lack technological solutions to improve the workflow and quality of care.[18] Therefore, identifying barriers and facilitators from stakeholders is important in tackling this challenge.

By systematically searching the PubMed database, we failed to find existing reviews drawing this evidence together regarding the facilitators and barriers of EMHIs in older adults. Previous studies have explored these factors for EMHIs in adults and youth,[19–23] but older adults may face unique challenges, such as difficulties understanding application interfaces, dexterity issues, a preference for human interaction, and cognitive concerns.[24] Some reviews summarized barriers and facilitators of digital intervention in the older population.[25,26] However, they focused on chronic conditions but neglected the field of mental health. Thus, systematically summarizing the determinants of implementing EMHIs in older adults is necessary.

Qualitative research is a practical design to thoroughly understand stakeholders' perceptions of barriers and facilitators. Synthesizing published qualitative studies helps integrate research evidence to apprehend a chosen topic better. The Comprehensive Framework for Implementation Research 2.0 (CFIR 2.0) is renowned for its comprehensive coverage across multiple domains, including innovation, inner and outer settings, individuals, and the implementation process.[27] This breadth allows for a thorough examination of factors influencing EMHI acceptance and implementation. Previous studies have successfully utilized CFIR 2.0 to identify barriers and facilitators.[28–30] Meanwhile, the technology acceptance model (TAM), the reach effectiveness adoption implementation and maintenance (RE-AIM) framework, and normalization process theory (NPT) can be used to summarize effecting factors. However, TAM and NPT may not comprehensively capture the broader organizational and contextual factors.[31] RE-AIM's primary strengths lie in the evaluation and are more aptly suited for quantitative reviews.[32] Consequently, this study selects CFIR as the deductive framework for qualitative analysis.

Therefore, this review aims to summarize the barriers and facilitators to the acceptance and implementation of EMHIs among older adults, in order to inform better evidence-based implementation strategies for the future.

Method

Study design

The review was undertaken according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 checklist and was prospectively registered with PROSPERO, under the registration number: CRD42022361173.

Search strategy

The systematic literature search was conducted from January 2012 to September 2022 using six electronic databases: PubMed, Web of Science, Embase, Scopus, PsycINFO, and CINAHL. Additionally, a hand review of the reference lists from related studies was retrieved. The inclusion criteria specified that articles were limited to those published in English between January 2012 and September 2022, as articles from 10 years ago were potentially outdated due to the rapid evolution of electronic health interventions. Prior systematic assessment of digital health technology for mental illness has utilized 10 10-year range.[23,33] The search strategy identified key terms related to four concepts: 'older adults, eMental Health, mental disorder, and qualitative.' Through browsing the literature, mental disorders in older adults identified included 'loneliness, depression, anxiety, stress, distress.' Relevant Mesh, non-Mesh, and thesaurus terms were used, and Boolean operators were used to link the keywords. The search syntax was adapted to suit each database. The benchmark definitions and search strings can be found in Supplemental Appendix 1.

Eligibility criteria and study selection

Table 1 lists the inclusion and exclusion criteria. The search identified 4309 publications imported into Endnote X20

software (Clarivate, Philadelphia, PA, USA). Endnote X20 and hand searching identified 1059 duplicates and 275 records marked as ineligible by automation tools, leaving 2975 papers assessed by title and abstract relevance. After the screening, 134 articles were found to fit the selection criteria, and the complete texts of these publications were retrieved for additional evaluation. After reading the entire content, 17 articles qualified for quality evaluation. The PRISMA diagram 2020 displays search results (Figure 1). Two authors (RP and XL) independently undertook the screening process. Any disagreements about inclusion were resolved through recourse to a third author (YG).

Quality assessment

We utilized the Joanna Briggs Institute Qualitative Assessment and Review Instrument (JBI-QARI) to assess the quality of the research methodology of each publication. Each question answered as "yes" was assigned a score of 1. We added an entry Q11 to JBI-QARI to measure article saturation. Publications with a total score of 5 or lower were deemed low quality and excluded from the synthesis. None were excluded as they all met quality assessment criteria. The critical appraisal was independently performed by two reviewers (RP and XL) on each selected research synthesis. Any disagreements were resolved through discussion between the reviewers or with the

Table 1. Inclusion and exclusion criteria.

Study aspect	Inclusion criteria	Exclusion criteria
Populations	(1) Participants: older adults (average age ≥ 60 years), (2) Providers: healthcare providers and healthcare agencies who provide EMHIs to older adults.	(1) Participants: children, adolescents, middle-aged adults, or if unable to obtain an age range; (2) Providers: healthcare providers and agencies that do not provide EMHIs to older adults.
Interventions	Meet both: (1) The study had an information and communication technology component (videoconference, web, or mobile technologies to deliver mental healthcare) (2) The psychotherapeutic intervention targeted a mental disorder.	(1) Not using electronic intervention. (2) Not aimed at mental disorders. (3) Not implementing electronic health intervention.
Phenomena of interest	Barriers and facilitators	
Design	Qualitative methodology or mixed methods	Quantitative studies and mixed-method studies with predominantly quantitative results
Article type	Peer-reviewed journal articles and dissertation	Reviews, commentaries, editorials, protocol, and conference abstracts.
Language	English	All other languages

EMHIs: electronic mental health interventions.

PRISMA 2020 flow diagram for new systematic reviews which included searches of databases, registers and other sources

Identification of studies via databases and registers

Identification

Records identified from:
Databases (n=4309)
PubMed: n=343
Embase: n=1977
Web of science: n=732
Scopus: n=417
CINAHL: n=280
PsycInfo: n=560
Registers (n=0)

Records removed *before screening*:
Duplicate records removed (n=1059)
Records marked as ineligible by automation tools (n=275)

Identification of studies via other methods

Records identified from:
Citation searching (n=1)

Screening

Records screened
(n=2975)

Records excluded
(n=2841)

Reports sought for retrieval
(n=134)

Reports not retrieved
(n=0)

Reports assessed for eligibility
(n=134)

Reports excluded:
-Not aimed at older adults (n=20)
-Not qualitative study (n=29)
-Not use electronic intervention (n=24)
-Not aimed at mental health (n=44)
-Combined due to reporting on same research (n=1)

Included
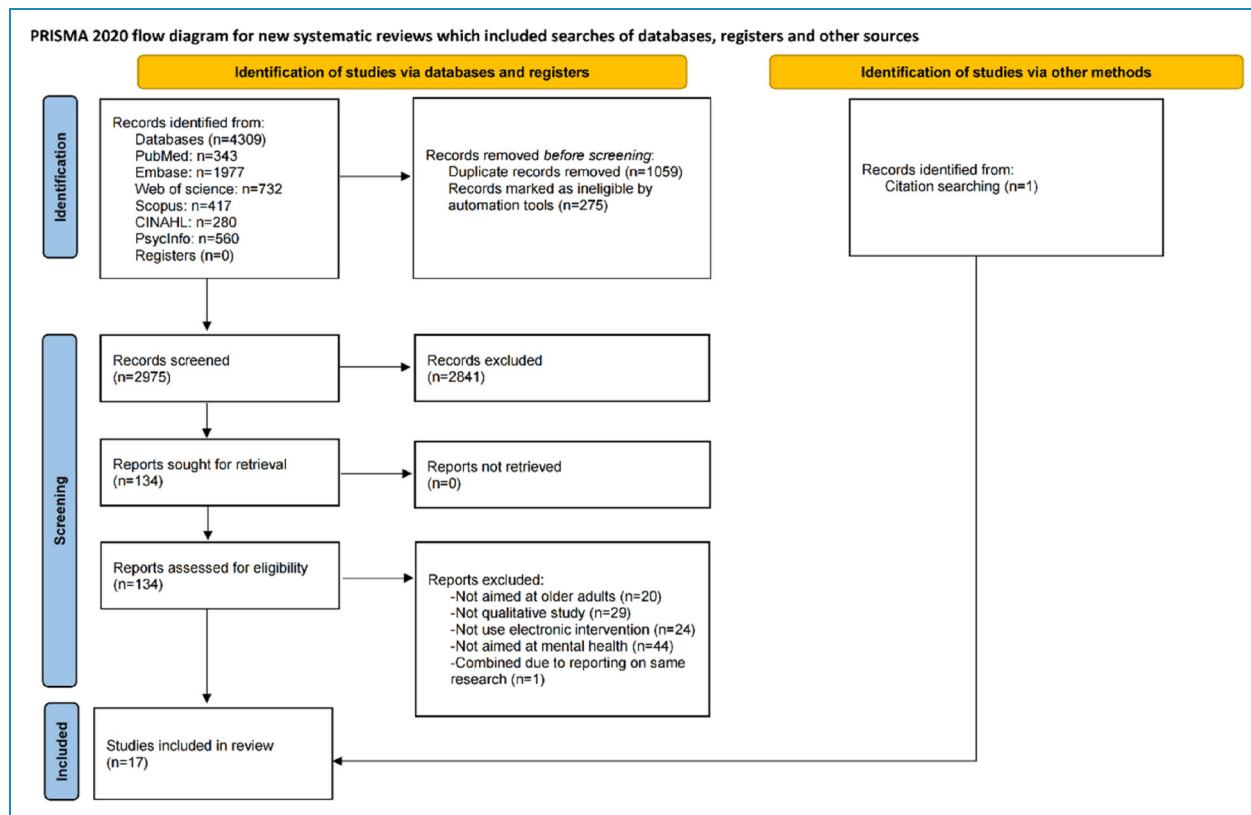
Studies included in review
(n=17)

Figure 1. Flowchart of the search process Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020).

assistance of a third team member. The quality assessment of the included studies is presented in Table 2.

Data extraction and synthesis

A specific data extraction matrix was created to collect information from each included study. The first reviewer extracted data from the 17 studies, including the author (year), methodology, qualitative method, geographical location, participants, data analysis, type of mood disorder, technology applied, and main functions (Table 3). In addition, two reviewers identified and extracted the barriers and facilitators of accepting and implementing EMHIs among older adults. The coding process employed in this study was a dual approach, combining inductive and deductive methods.[34] Initially, we applied an inductive coding strategy to identify themes and findings from the qualitative and mixed-methods studies included in this review. This open coding phase aimed to capture a diverse range of barriers and facilitators without predetermined categories. The reviewers (RP and XL) separately read the included literature and quotations to code using Nvivo12plus software. During this process, the reviewers together reviewed and refined iteratively and reflexively. Subsequently, the CFIR 2.0 was introduced as a deductive framework to guide a more structured analysis from

innovation, inner setting, outer setting, individuals, and implementation process. We also tailored CFIR 2.0 concepts to align with the specific context of EMHIs among older adults. In the presence of doubt, the reviewers consulted the original literature and conducted a group discussion to reach an agreement. The integration of both inductive and deductive approaches ensured a balanced exploration of the data, capturing the richness of emerging themes while providing a structured framework for analysis within the context of the chosen framework.

Results

Study characteristics

The review comprised 17 research studies.[35–51] Of the papers, nine were qualitative studies, and eight were mixed-method studies with an analysis of qualitative data. The sample size ranged from 2 to 90. Among the 17 studies, nine were from the United States, and the other eight were from the UK, Australia, Finland, Sweden, Denmark, South Africa, and Austria, respectively. The psychological issues addressed in the study were depression ($n = 8$, 47%), mental health ($n = 4$, 24%), loneliness ($n = 4$, 24%), and wellbeing ($n = 1$, 6%). The technology applied included web-based platforms, mobile apps, and videoconferences.

Table 2. Quality assessment of the studies.

	Similä et al. (2018)	Gould et al. (2021)	Johansson-Pajala et al. (2022)	Xiang et al. (2021)	Pywell et al. (2020)	Christensen et al. (2021)	Ni (2018)	Choi et al. (2014)	Jarvis et al. (2019)	Gould et al. (2020)	Jiménez et al. (2021)	Andrews et al. (2019)	Averbach and Monin (2022)	Eichenberg et al. (2018)	Gadbois et al. (2022)	Kim et al. (2019)	Choi et al. (2021)
Q1	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Q2	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Q3	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Q4	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Q5	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Q6	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N
Q7	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N
Q8	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y
Q9	Y	U	Y	U	Y	Y	Y	U	U	U	U	Y	U	Y	U	U	U
Q10	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Q11	U	U	U	U	Y	Y	Y	U	U	Y	U	U	U	U	U	Y	U
JBI scores	8	7	8	7	8	8	10	7	7	7	8	8	7	7	8	8	7
Redefine scores	7	6	7	6	8	8	10	6	6	7	7	7	6	6	7	8	6

Q1. Is there congruity between the stated philosophical perspective and the research methodology?
Q2. Is there congruity between the research methodology and the research question or objectives?
Q3. Is there congruity between the research methodology and the methods used to collect data?
Q4. Is there congruity between the research methodology and the representation and analysis of data?
Q5. Is there congruity between the research methodology and the interpretation of results?
Q6. Is there a statement locating the researcher culturally or theoretically?
Q7. Is the influence of the researcher on the research, and vice-versa, addressed?
Q8. Are participants, and their voices, adequately represented?
Q9. Is the research ethical according to current criteria or, for recent studies, and is there evidence of ethical approval by an appropriate body?
Q10. Do the conclusions drawn in the research report flow from the analysis, or interpretation, of the data?
Q11. Are the criteria for data saturation of results assessed?

Table 3. Data extraction of included studies.

Author (year)	Methodology	Qualitative method	Geographical	Participants	Data analysis	Type of mood	Technology applied	Main functions
1 Similä et al. (2018)	Mixed method	Interviews	Finland	Seven older adults, two healthcare providers	Content analysis	Mental health	Mobile apps	Self-guided platforms
2 Gould et al. (2021)	Mixed method	Interviews	US	19 older adults	Inductive and deductive methods	Depression	Mobile apps	Self-guided platforms
3 Johansson-Pajala et al. (2022)	Mixed method	Diaries, logbook, and interviews	Sweden	28 older adults	Inductive and deductive methods	Loneliness	Web-based platforms	Social networking
4 Xiang et al. (2021)	Qualitative	Interviews	US	21 homebound older adults, eight healthcare providers	Grounded theory	Depression	Web-based platforms	Self-guided platforms
5 Pywell et al. (2020)	Qualitative	Interviews	UK	10 older adults	Thematic analysis	Mental health	Mobile apps	Self-guided platforms
6 Christensen et al. (2021)	Qualitative	Interviews	Denmark	13 older adults, 12 healthcare providers	Thematic analysis	Depression	Videoconference	Synchronous psychotherapy
7 Ni (2018)	Mixed method	Textual data analysis	US	47 older adults	Grounded theory	Depression	Web-based platforms	Self-guided platforms
8 Choi et al. (2014)	Qualitative	Interviews	US	12 healthcare providers, 42 older adults	Thematic analysis	Depression	Videoconference	Synchronous psychotherapy
9 Jarvis et al. (2019)	Qualitative	Interviews	South Africa	13 older adults	Content analysis	Loneliness	Mobile apps	Social networking
10 Gould et al. (2020)	Mixed method	Interviews	US	79 older adults	Thematic analysis	Mental health	Web-based platforms; mobile apps; and others	Self-guided platforms
11 Jiménez et al. (2021)	Qualitative	Interviews	US	Three healthcare providers, two volunteers, 18 older adults	Thematic analysis	Loneliness	Web-based platforms	Social networking

Table 3. Continued.

Author (year)	Methodology	Qualitative method	Geographical	Participants	Data analysis	Type of mood	Technology applied	Main functions
12 Andrews et al. (2019)	Qualitative	Interviews	UK	15 older adults	Template analysis	Mental health	Mobile apps	Self-guided platforms
13 Averbach and Monin (2022)	Mixed method	Interviews	Australia	Seven healthcare providers	Thematic analysis	Wellbeing	Videoconference	Synchronous conference
14 Eichenberg et al. (2018)	Mixed method	Interviews	Austria	Two older adults, eight healthcare providers	Thematic analysis	Depression	Web-based platforms	Collaborative online care
15 Gadbois et al. (2022)	Mixed method	Interviews	US	21 older adults	Content analysis	Loneliness	Web-based platforms	Social networking
16 Kim et al. (2019)	Qualitative	Interviews	US	20 healthcare providers	Grounded theory	Depression	Videoconference	Synchronous psychotherapy
17 Choi et al. (2021)	Qualitative	Interviews	US	90 older adults	Thematic analysis	Depression	Videoconference	Synchronous psychotherapy

The main functions were self-guided platforms, social networking, synchronous psychotherapy or conferences, and collaborative online care. Detailed information about these studies is given in Table 3.

Barriers and facilitators

See Table 4.

Innovation. **Technical challenges:** Technical challenges were reported in 14 studies.[35,38–44,46–51] Some applications or website programs adopt generic designs for intervention that are not tailored to the specific needs of older adults, resulting in complex user interfaces.[35,40–44,46,48–52] For example, small screens and keyboards, low color image saturation, unsuitable volume, difficult-to-use function buttons, complex installation or login, and frequent updates. Besides, older adults would face challenges in human–computer interaction, such as difficulties in navigating, getting backward, reviewing previous content, and typing long answers in response to questions after practice.[42,48,50,53] In videoconferences, programs usually used Zoom or Skype as platforms.[37–39,46,47] Though older adults were relatively familiar with those tools, they still faced usability issues, like screen freeze, audio delays, unstable networks, and interruptions in transmission.[38,39] Particularly, abrupt disruptions seemed to diminish the clinical focus of the conversation and distracted stakeholders.[39,46]

Optimized functions and contents: Ten studies identified many barriers and facilitators to intervention design.[35,36,38,39,41,42,48–51] EMHIs serve various functions to cater to users' diverse needs, encompassing self-guided platforms, social network platforms, and synchronous psychotherapy videoconferences. (1) Self-guided platforms offer pre-recorded courses and practices for users to study independently. Each older adult accessed the same course, prompting a desire for more personalization and feedback.[35,42,43,48–51] Besides, the contents should fit common problems and challenges in old age, such as chronic disability challenges, major life event transitions, loneliness and social isolation, family relationships, financial constraints and housing stability, and early life trauma.[50] Unengaging and irrelevant program content makes it difficult to empathize and engage.[45,50] Some older adults noted a preference for real-life stories as intervention content.[50] Long modules might lead to fatigue and poor concentration,[49–51] while sufficiently short and easy to exercise could motivate older adults to apply learned skills to real-life situations.[38,42,50] In addition, some older adults highlighted potential issues with using technology for self-diagnosis, as it could lead to false beliefs about rare or extreme conditions.[35] (2) Social networking platforms involved social conversations through videoconference[41,44–46] or creating a virtual community component to post likes, comments, and storytelling.[42,44] Older adults could share experiences, get social support, and lessen emotional pressures.[44,49] However, current virtual community components were perceived as complex to use, with issues such as uninteresting text communication, reluctance to interact with strangers, and non-anonymity leading to stigmatization.[42,46] (3) Synchronous psychotherapy or conference: A notable barrier to synchronous psychotherapy videoconference related to therapist' call schedules. While the one-way call feature might benefit the organization, it also presents limitations that counter the concept of person-centered mental health care. Patients expressed dissatisfaction with the inability to call their providers freely.[39,48] Besides, some older adults preferred longer therapy sessions and duration of treatment to maximize benefit.[36–38]

Privacy and security: Privacy and security concerns emerged prominently across nine studies.[35,38–40,43,45,48,50,51] Older individuals expressed a lack of confidence in data protection, fearing that their data could be hacked or compromised. Additionally, skepticism arose regarding whether real doctors were behind the screen.[38,39,48] Some studies showed older adults were reluctant to download apps or access websites unless these tools had clear credentials.[48] Furthermore, the presence of informal or formal caregivers, leading to a lack of privacy, posed a barrier to discussing depression, as therapists struggled to find the space and time to be alone with their clients.[38] To address these privacy concerns, certain studies underscored the importance of incorporating anonymity, robust access control mechanisms, and transparent permission management into EMHIs.[43,48,50]

Outer setting. **Community engagement and partnerships:** Four studies highlighted referrals from trusted facilitators could effectively scale up EMHIs.[37,38,45,48] Relying solely on researchers to promote EMHIs was deemed insufficient.[48] Given the scarcity of home-based psychotherapy programs in the community, community healthcare workers were pleased to refer their clients to EMHIs.[37,38] Aging service network agencies had established infrastructure and were already supporting the needs of homebound older adults.[37,38,45] Leveraging their existing systems could facilitate the integration of EMHIs into the overall care framework. Moreover, in one study, older adults highlighted the potential impact of media coverage, suggesting that if journalists recommended a new mental health app on platforms like BBC, it could generate interest and engagement.[48]

Financing: The absence of financial compensation and reimbursement was a major deterrent for healthcare agencies adopting or expanding EMHIs in regular practice ($n = 2$).[45,47] Agencies should have funds to purchase program materials, subsidize healthcare providers, and pay for program coordinators. Another study also showed that appropriate financial compensation for healthcare providers could offset job stress.[47]

Table 4. Barriers and facilitators.

Domains	Constructs	Details	Reference
Innovation	Technical challenges	Barriers: generic designs, complex user interface; human–computer interaction challenges; usability issues	35,38–44,46–51
	Optimized functions and contents	Barriers: unengaging and irrelevant content; long self-study modules; problematic self-diagnose; uninteresting text communication; reluctance to interact with strangers; non-anonymity; one-way call Facilitators: personalization; real-life stories; fit contents; longer therapy sessions	35,36,38,39,41,42,48–51
	Security and privacy	Barriers: lack of confidence and trust; hack and compromise of data; skepticism Facilitators: clear credentials; anonymity; robust access control mechanisms; transparent permission management	35,38–40,43,45,48,50,51
Outer setting	Community engagement and partnerships	Barriers: lack of reliable recommendation Facilitators: community engagement; collaboration with the aging-service network; media recommendation	37,38,45,48
	Financing	Barriers: absence of financial compensation and reimbursement Facilitators: appropriate financial compensation	45,47
Inner Setting	Leadership engagement	Facilitators: managerial leadership's recognition and attention; establish realistic goals and strategic actions	45,47
	Available resources	Facilitators: stable internet access; available devices; enough human resources and infrastructural	36,38–43,45,47–51
	Incompatibility	Barriers: prioritized chronic illness, pain, medications, and other things; lacking energy or feeling fatigued; overwhelmed with other programs	38,45,49,50
	Intergenerational support	Facilitators: monitoring, feedback, and timely technical and psychological assistance for family members	40,47,49
	Training and guidance	Facilitators: technology training and guidance for older adults; specialized workflow training and technology guidance for healthcare providers; on-call expertise training for volunteers	35–51
Individuals (older adults)	Perceptions	Barriers: misconceptions and stigma toward depression; fear and skepticism toward technology; bias	35,37–39,41,45,48,50,51
	Capability	Barriers: low digital self-efficacy; physical deficits; low financial competency	35–51
	Motivation	Facilitators: perceived benefits; self-reliant determination	35–51
Individuals (healthcare providers)	Perceptions	Barriers: skeptical; stereotype	39,45,47,49,50
	Capability	Barriers: low digital literacy and online treatment competency; limited knowledge of lay or volunteers Facilitators: coaching agreement and training agreement	39,45,47,49,50

Table 4. Continued.

Domains	Constructs	Details	Reference
	Motivation	Barriers: ineffective; decreased payment; heavy workload Facilitators: perceive benefits; performance review; reduce readmission and rehospitalization	39,45,47,49,50
Implementation Process	Recruit	Barriers: recruiting clients and volunteer challenges	40,45
	External assistance	Barriers: concerns about burdening the supporters; uncertain communication frequency Facilitators: tailored feedback; therapist guidance	35–51
	Team	Facilitators: coordinators or volunteers engage; technicians' help; role clarity and job functions	43,45,46

Inner setting. **Leadership engagement:** Two studies reported that effective implementation and sustaining EMHIs relied heavily on managerial leadership's recognition and attention.[45,47] Some healthcare providers might initially doubt the effectiveness of EMHIs. Leadership could reframe thinking and convince them that changes were not only imperative but achievable.[47] Another study emphasized establishing realistic goals and strategic actions would ensure healthcare providers prioritize program goals.[45]

Available resources: Thirteen studies emphasized that resources were vital.[36,38–43,45,47–51] Ensuring stable internet access and devices were essential for low-income and homebound older adults. Besides, enough human resources and infrastructure were prominent for healthcare agencies to implement and support EMHIs.[47]

Incompatibility: Four studies show that some older adults prioritized chronic illness, pain, medications, and other things in their lives, which made it challenging to participate in EMHI programs.[38,45,49,50] Besides, lacking energy or feeling fatigued led to refusal of treatment for depression.[38,45,49,50] On the other hand, healthcare agencies acknowledged that they were overwhelmed with other programs and did not have the staff and resources to implement and support a new program.[47]

Intergenerational support: The successful implementation of EMHIs required intergenerational support (n = 3).[40,47,49] Family members could monitor the effectiveness of the intervention, provide feedback to healthcare professionals, and provide timely technical and psychological assistance to older adults.

Training and guidance: All 17 studies reported that technology training and guidance during the initial training would encourage more exploration of EMHIs.[35–51] Older users might be hesitant to make mistakes or press the wrong buttons, leading to a reluctance to explore the technological tools fully. The provision of training effectively overcame this hesitancy.[41–43,45,48–51] Besides, specialized workflow training and technology guidance for healthcare providers could improve work efficiency and comfort.[36,38,39,41,45,49,50] Furthermore, volunteers and coordinators have limited medical knowledge, and there was a need to train them in on-call expertise.[45]

Individuals. **Older adults:** *Perceptions.* Nine studies highlighted older adults' negative perceptions as essential barriers.[35,37–39,41,45,48,50,51] First, misconceptions about psychological problems and stigma made older adults reluctant to seek help. They mistakenly believed that mental problems were personal issues, a long-term lifestyle experience, and a result of aging. Second, fear and skepticism toward technology might affect its acceptance.[35] Third, some older adults were biased against EMHIs, with concerns over efficacy, security, and usability.

Capability. Low digital self-efficacy was the main barrier to adopting EMHIs by older adults (n = 17).[35–51] Besides, cognitive, sensory, and motor deficits might reduce their ability to use EMHIs.[35,38,49,50] Moreover, older adults with low financial competency usually made treating mental disorders a low priority.[38]

Motivation. Perceived benefits motivated older adults to engage in interventions, as evidenced by 17 studies.[35–51] Participants felt they would stop using the intervention if they did not make enough progress.[41,48] One study pointed out that the determination to be self-reliant motivates them to engage with technology to support mental health.[45] Especially, long-term benefits were essential in encouraging older adults to continue participating in EMHIs.[50]

Healthcare providers: *Perceptions.* Five studies reported that healthcare providers' attitudes and perceptions would influence the implementation.[39,45,47,49,50] Skepticism about the efficacy of EMHIs and stereotypes that older adults do not use technology potentially impeded recommendation.[39,47,50]

Capability. Digital literacy and competency among healthcare providers were essential for smooth interventions and adequate support (n = 5).[39,45,47,49,50] One study

mentioned that therapists hesitated to use EMHIs because their ability to communicate with patients in face-to-face counseling was higher than in virtual (lack of objective micro-information in virtual visits).[39] In addition, some lay or trained volunteers were employed as providers in the team. However, their medical knowledge and technical solutions were limited.[45]

Motivation. When perceiving benefits in patient care, healthcare providers became EMHI supporters.[39,45,47,49,50] Meanwhile, EMHI utilization as part of a measurable performance review and reduced readmission and rehospitalization could increase motivation.[47] In contrast, providers might reduce patient recommendations or stop offering EMHI if they felt the intervention was ineffective, decreased payment, or had a heavy workload.[39,45,47,50]

Implementation process. **Recruit:** Recruiting participants and volunteers was the most significant challenge encountered during implementation ($n = 2$).[40,45] Organizations initially had difficulty identifying older adults interested in participating in EMHIs.[45]

External assistance: Seventeen studies reported effective EMHIs need regular professional guidance.[35–51] Therapists could improve adherence by providing tailored feedback on reflections, active reminders, and weekly messages.[37,39,42,48,50,51] Besides, therapist guidance was a reliable resource for older individuals to decrease electronic distrust and facilitate usage. However, older adults did not seek help because of concerns about burdening the supporter. They also described uncertain communication frequency, which acted as barriers to effective utilization.[42,50]

Team: Three studies highlighted staffing and division of duties would facilitate implementation.[43,45,46] Low digital literacy was common among older adults, contributing to significant time spent recruiting participants, fielding questions, and supporting participants. Therefore, a part-time program coordinator or volunteer was critical to successful implementation and operation.[43,45,46] Besides, technicians could deliver, test, and install the EMHI equipment for older people.[43]

Discussion

We identify and synthesize barriers and facilitators to accepting and implementing EMHIs among older adults: (1) innovation: technology challenges, optimized functions and contents, security and privacy; (2) outer setting: community engagement and partnerships, and financing; (3) inner setting: leadership engagement, available resources, incompatibility, intergenerational support, training and guidance; (4) individuals: perceptions, capability, motivation of older adults and healthcare providers; and (5) implementation process: recruit, external assistance, team.

In Table 5, we provide recommendations and future implications based on the summarized barriers and contributing factors in order to improve the adaptation, optimization, and expansion of EMIS for older adults in the future. Besides, we also highlight some points as follows.

Innovation

While computer literacy and technological skills are not new barriers to older adults, they remain important factors in ensuring continued engagement. The main reason is the absence of considering age adaptations in design. Co-design and human-centered design are practical solutions to improve the user experience by including older users in the research process, respecting their psycho-physiological needs, and focusing on their behavioral and personality traits.[54,55] Per our results, all studies mention that EMHIs must also include supportive training and consistent external assistance to alleviate technical barriers. Supportive training equips older persons with the necessary skills, and constant external help provides continuous support to meet any challenges that may arise.[50]

Our results emphasized that achieving personalization in interventions is particularly important. Personalization is a purposeful variation between individuals in interventions' therapeutic elements or structure.[56] According to Hornstein's study, personalized content and communication with the user are particularly popular. And personalization via decision rules and user choice were the most used mechanisms.[56] Additionally, machine learning emerged as a promising approach, leveraging algorithms to adjust the difficulty of exercises based on user input, change the type of content, and modify the frequency of interactions based on user responses.[56] Besides, making sufficiently short, easy to exercise, and real-life story content is essential. Furukawa et al.[57] did an individual participant data component network meta-analysis of internet-delivered cognitive behavior therapy (iCBT) trials for depression. The results showed that iCBT packages target relieving depression that might include behavioral activation but not relaxation and cognitive restructuring. Researchers need to simplify the current intervention package using more efficacious and less burdensome intervention components.

To optimize the functionality of virtual communities, leveraging voice input and handwriting features presents potential remedies for minimizing reliance on typing. Additionally, to foster progressive and controlled interactions within the community, consider incorporating features like icebreaker activities, interest groups, or private messaging options. These elements contribute to cultivating a sense of common purpose or shared goals among community members, promoting sustained engagement.[58] By prioritizing these elements, the virtual community can establish a secure, inclusive environment conducive to meaningful and active participation.

Privacy is more important for older adults who experience stigma or reluctance to help-seeking. Robust access

Table 5. Recommendation and implication for future.

Recommendation and implication for future	
Co-design and human-centered design	Prioritize user-centric design, involving older adults in the process.
Optimized functions and contents	Make sufficiently short, easy to exercise, and real-life story content. Emphasize personalized content, interactions, and machine learning approach. Create interactive modules for active user participation, fostering a sense of agency and control. Enhance features for easier interaction and controlled engagement.
Prioritize privacy and anonymity	Provide robust access control mechanisms, transparent permission management, and anonymization.
Supportive training and assistance	Include training and ongoing assistance to overcome technical barriers and address computer literacy.
Reliable involvement	Encourage the participation of communities, aging service network organizations, media channels, intergenerational support, etc.
Leveraging the core elements of EMHI sustainability	Policy, funds, resources, and leadership initiation should be considered.
Demonstrate benefits to older users	Use objective indicators and visual data tables to demonstrate mental health improvements in older adults.
Provide positive feedback	Offer positive feedback and acknowledgment to reinforce user engagement.
Engage healthcare providers	Implement local consensus discussions, educational meetings, and demonstrations to engage healthcare providers.
Enhance healthcare providers' competence	Address workflow confusion and improve competence and teamwork among healthcare providers to support EMHI implementation.
Clarify role functions and develop support protocols for team	Create and disseminate clear practice guidelines specifying monitoring frequency, compliance measures, and issue handling.
Targeted recruitment strategies	Use e-mail addresses to reach receptive older adults with technology experience or interest.
Role clarity and job functions	Make clear roles and functions of healthcare providers, coordinators, telehealth technicians, and volunteers.

EMHIs: electronic mental health interventions.

control mechanisms, transparent permission management, and anonymization can effectively address privacy concerns.[43,48,50] It is worth emphasizing that social forums with many users should be anonymous, using pseudonyms or avatars to bolster anonymity, and reinforcing the platform's commitment to confidentiality and privacy. Videoconferences with therapists can be public with each other to create a therapeutic alliance and capture more micro-expressions.

Inner and outer setting

The core of sustaining and expanding EMHIs includes funds, resources, leadership initiation, and multi-party involvement.[19] This aligns with a previous study that emphasized the necessity for policy changes at both state and federal levels to effectively address the burden on providers.[59] Some countries' governments have recognized the potential of EMHIs and have integrated telepsychiatry services into their healthcare frameworks.[59] We believe policies in this area can evolve rapidly as digital health continues to play an increasingly significant role in healthcare delivery.

Although only two studies mentioned intergenerational support as facilitators. However, we believe that future studies should focus on family members' role in EMHIs. Prior research has examined the positive effect of the peer

support component,[53,60] and lay counselors (peers, family members, friends, and volunteers) could fill the professional geriatric mental health workforce shortage gap.[61] Clarify how family members effectively monitor the intervention, provide feedback to healthcare providers, and provide timely technical and psychological assistance to older adults.

Individual

The individual domain covers intrinsic factors pertaining to stakeholders' perception, competency, and motivation. Older adults are typically the main population in the "digital divide."[62] The reason may be the social context. They grew up when digital resources and psychological therapies were scarce or unavailable, and developed a stoic and misguided attitude toward mental health.[62] Therefore, we have re-emphasized the need for user-friendly designs. Besides, targeted psychological and technical education at the outset of the intervention equips older adults with the skills and information to take ownership of their mental health journey. And share positive stories of older adults who benefited from EMHIs with users.

According to our results, we know that older adults need to perceive the benefits of EMHIs. In addition to self-conscious mood changes in older adults, research points to the possibility of presenting objective indicators. Demonstrate continued improvement in mental health to older adults using longitudinal or visual data tables.[35] Besides, therapists provide positive feedback and acknowledgment to older adults for accomplishments. Design interactive modules that allow users to actively participate in their mental health journey actively, reinforcing a sense of agency and control.

Another aspect is the competencies, perceptions, and perceived benefits of healthcare providers, consistent with Feijt et al.'s[63] research on healthcare providers' readiness for EMHIs. To engage healthcare providers, Graham et al.[64] proposed local consensus discussions, educational meetings, presentations, and demonstrations of EMHIs, along with stressing the benefits of EMHIs implementation and data security safeguards.

Implementation process

Guided interventions typically have higher engagement than unguided interventions. A previous RCT study ($n =$ 433) indicated that either therapist-guided or self-management iCBT might significantly reduce symptoms of anxiety and depression in older adults.[65] But our qualitative results indicated older adults need healthcare providers to provide emotional support, build trusting therapeutic relationships, and improve adherence to websites and apps.

It is suggested that healthcare providers' competence and teamwork are critical, but inevitably there is workflow

confusion among non-professionals, volunteers, and even therapists. Studies have also shown that developing support protocols for providers and teams can improve productivity. Develop and disseminate clear and consistent practice guidelines that specify the frequency of monitoring the use and results of EMHIs, measures of consumer compliance (e.g., daily or weekly logins), criteria for successful completion of EMHIs, and the handling of any issues during the monitoring of EMHIs.[66]

Not all older people are receptive to EMHIs, and targeted recruitment strategies are the most successful. Using e-mail addresses to contact self-identified potential participants directly.[45] The most appropriate participants were homebound older adults with experience using technology or a strong interest in developing mental skills.[45]

Role clarity and job functions could reduce workload and increase efficiency. Healthcare providers should offer assistance, services, and feedback to older adults. Coordinators ought to oversee project implementation by organizing, managing, and communicating. Telehealth technicians and volunteers could deliver, test, and install the EMHI equipment for older people.[37,39]

Limitations

This systematic review had several limitations. First, we did not search for grey literature or research published in languages other than English, which may have missed some valuable information. Second, we identified barriers only from older adults who participated in the intervention, which may not represent those who did not or dropped out. Finally, we did not differentiate findings by the category of psychological disorders, as this field is still relatively new, and there were not enough studies for each disorder to provide sufficient information. Although some barriers and facilitators appear common to all mood disorders (e.g. loneliness, depression, anxiety, stress, and distress), some strategies may have nuanced differences. Future studies focusing on EMHIs for different psychological disorders would be more meaningful.

Conclusion

Previous studies have shown the potential of EMHIs to improve older adults' mental health. To improve the acceptance and implementation of EMHIs, we identified facilitators and barriers across the studies reviewed. Further, we have summarized the key recommendations in discussion. However, revisions are encouraged to allow adequate space for perceptions of various implementation actors and the target group.

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