Digital Mental Health Treatments for Depression

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KEYWORDS

• Depression • Digital mental health treatments • Mental health • Review
• Digital health • Internet interventions

KEY POINTS

- Depression is one of the most common mental health disorders worldwide and is associated with a significant societal burden.
- Only a small percentage of individuals affected by depression receive evidence-based mental health services and digital mental health treatments (DMHTs) could reduce this treatment gap.
- DMHTs have robust evidence for their effectiveness in treating depression.
- DMHTs for depression can be integrated into routine clinical practice at different points in the continuum of care.
- DMHTs still need to overcome significant implementation barriers related to poor uptake, low engagement, and high attrition.

BACKGROUND

Depression is one of the most common mental health disorders worldwide, with a prevalence rate of approximately 13%.[1] This high prevalence makes depressive disorders one of the leading causes of years lived with disability and disability-adjusted life years globally.[2] Despite this significant societal burden, only one in five individuals presenting with depression globally receives some mental health treatment, with treatment rates as low as 11% and 3% in middle-income and low-income countries, respectively.[3] Given this significant treatment gap, it is not surprising that the societal burden associated with depression has remained virtually unaltered for over 3 decades.[4] Therefore, evidence-based depression treatments need to be made more widely available and accessible.

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Abbreviations	
AI	artificial intelligence
CBT	cognitive-behavioral therapy
DMHT	Digital mental health treatment
LLM	large-language model
VR	Virtual reality

Digital mental health treatments (DMHTs) are a class of digital therapeutics that are defined by the International Organization for Standardization as, "software intended to treat or alleviate a disease, disorder, condition, or injury by generating and delivering a medical intervention that has a demonstrable positive therapeutic impact on a patient's health".[5] As such, DMHTs go beyond merely connecting patients with mental health providers but instead provide psychological interventions to prevent and treat mental health conditions through technology. A rich history of the use of DMHTs to treat depression has unfolded over the past 4 decades. These treatments emerged in the late 1980s and early 1990s as simple adaptations of traditional treatment manuals but delivered via CD-ROM.[6] As technologies continued evolving, DMHTs kept pace by using text messaging, websites, virtual reality (VR), and apps, among other technological tools. Importantly, studies suggest that interventions effective in one medium can be similarly effective in another.[7] Analogically, various mediums of DMHT have been found to be effective.

Most effective DMHTs are based on cognitive-behavioral therapy (CBT) principles and include specific intervention components, such as psychoeducation, self-monitoring, goal setting and action planning, behavioral activation, cognitive restructuring, and problem-solving.[8] However, a variety of other treatment modalities with demonstrated efficacy are being developed and evaluated in digital versions, including mindfulness-based interventions[9] and brief psychodynamic treatments.[10] Recent calls have also noted that DMHTs should focus on novel approaches that do not simply replicate what is often done in brick-and-mortar therapy, as these digital replications of traditional treatments often fail to reach and keep users engaged long enough to benefit from the intervention.[11] Some of these innovative approaches that go beyond the "one hour, once a week, with homework in between sessions" model may include low-intensity programs that involve almost no reading or writing[12] and even single-session interventions.[13]

STATE OF THE EVIDENCE OF DIGITAL MENTAL HEALTH TREATMENTS FOR DEPRESSION

Web-Based

The DMHT modality with the most robust evidence-base to date are web-based interventions, structured therapy programs delivered via platforms that can be accessed through the Internet. Initially examined as computerized programs in CD-ROM formats,[8] these interventions now take advantage of the almost ubiquitous access to and everyday use of the Internet globally. Crucially, meta-analyses consistently show that web-based DMHTs are effective in treating depressive disorders and can lead to treatment effect sizes similar to those of face-to-face treatments.[14] These DMHTs seem to be more effective for patients meeting diagnostic criteria for depression than those with subclinical symptoms,[14,15] adult populations compared with youth,[16] and when they involve some human support compared with fully self-guided formats.[14,15]

Moreover, multiple moderators of treatment might influence these treatment outcomes. For instance, meta-analytic work has shown that among individuals with

low baseline depression severity, the difference in effectiveness between guided and unguided modalities is minimal, whereas this difference becomes more pronounced for those with higher baseline severity.[15] Crucially, multiple studies suggest that web-based DMHTs are effective across different populations, including youth, immigrants and refugees, individuals with medical conditions, women with perinatal depression, and older adults.[14,15] Considering their empirical support, web-based DMHTs should be considered a front-line treatment for depression.

Text Messaging

Text messaging consists of sending electronic messages via mobile devices (eg, short message service) and messenger services (eg, WhatsApp). This DMHT modality leverages the ubiquity of technologies with text messaging capabilities across all socioeconomic groups and users' relationships with these technologies, as most individuals report reading and responding to text messages within a few minutes.[17] For over 2 decades, text-messaging interventions have been used to schedule and coordinate traditional care, send reminders and motivational content, track treatment progress and promote self-monitoring, and deliver the intervention itself.[17,18] Studies show that these interventions effectively promote treatment adherence and reduce attrition and increase the effectiveness of traditional and digital concurrent treatments for depression.[16]

Meta-analyses show that for standalone text-messaging interventions for depression, however, the treatment effect sizes are small.[19] Indeed, at least one meta-analysis has failed to find these standalone text-messaging interventions effective at all.[18] Among potential moderators of these treatment effects, text-messaging interventions that send 2 or more daily text messages compared with those with fewer messages, and those interventions containing CBT principles compared with other treatment approaches, seem to be slightly more effective.[19] Given their current evidence, text-messaging interventions for depression seem to be better positioned to promote engagement in traditional services or other more intensive DMHTs (eg, web-based) rather than be standalone treatments.

Virtual Reality

VR is a computer-generated simulation where users can interact with an environment that responds to their actions in real time using specialized hardware (ie, a VR set). Significantly, VR simulations can elicit physiologic, cognitive, and behavioral responses like those experienced in similar real-life situations,[20] which makes them an ideal tool for performing therapeutic activities. To date, most VR interventions for depression are delivered by clinicians in the context of traditional therapy,[21] and few of these programs include some of the most studied techniques for the treatment of depression, such as behavioral activation or cognitive restructuring.[21,22] Despite some promising results showing VR interventions for anxiety can lead to moderate-to-large treatment effect sizes,[22] fewer studies support their effectiveness in treating depression and less is known about for whom these interventions are more or less effective. Therefore, more studies examining the effectiveness of VR interventions in different modalities (eg, self-guided programs), leveraging technological tools accessible to even the most vulnerable segments of the population (eg, cardboard VR goggles), and among different groups (eg, youth) are still needed.

App-Based

App-based DMHTs are applications ("apps") that deliver interventions via mobile devices, enhancing treatment reach by allowing patients to access care at their fingertips

24/7. Apps can offer either structured therapeutic content or just-in-time interventions where users receive personalized recommendations based on their input and real-time data.[23] Although more than 20,000 mental health apps are available to the public, most lack scientific evidence.[24] When these DMHTs have been empirically tested, apps for depression yield small-to-moderate treatment effects.[23] Although research examining potential moderators of these treatment effects is still scarce, some data suggest that app-based DMHTs are more effective with human support versus fully self-guided, with CBT-based interventions versus other treatment modalities, and with reminders versus those without them.[23] It also remains unclear whether there are differences in treatment response to app-based DMHTs between patient subgroups, suggesting that future research efforts should examine user characteristics that affect treatment outcomes. Given the current empirical evidence, only a few apps can be considered evidence-based, and their chance of success seems to be higher when they involve human support.

OTHER RELEVANT OUTCOMES IN DIGITAL MENTAL HEALTH TREATMENTS

Acceptability, Treatment Satisfaction, and Therapeutic Alliance

In addition to their demonstrated effectiveness, DMHTs are well tolerated by users who consistently report high acceptability and treatment satisfaction and experience a strong therapeutic alliance across treatment modalities. DMHT users consistently report high treatment acceptability and satisfaction across DMHT modalities, even among those who initially reported preferring traditional therapy over DMHTs.[25] Patients also report experiencing a strong therapeutic alliance during treatment, regardless of the DMHT modality.[26] Importantly, just as in traditional psychotherapy, therapeutic alliance in DMHTs is associated with better treatment outcomes.[27]

Factors that seem to drive DMHT acceptability and satisfaction include users' ability to use the intervention when desired, having the digital literacy necessary to use the DMHT, well-designed technologies, relevant and not overcomplicated content, the ability to personalize the DMHT, and the desire (or not) to receive human support.[25] In the case of therapeutic alliance, similar factors to those associated with a strong bond in traditional psychotherapy, such as emotional connection, empathy, and trust, also seem to be at play even in fully self-guided DMHTs.[28] Therefore, when DMHTs are the only care option available, psychoeducation and motivational and commitment strategies may be necessary to gain initial "buy-in" from patients who are likely to benefit from DMHTs, even if they would prefer traditional mental health services.

HOW TO ASSESS, SELECT, AND USE DIGITAL MENTAL HEALTH TREATMENTS IN CLINICAL PRACTICE

A significant barrier to using DMHT is the lack of knowledge of properly incorporating these treatments into routine clinical care. Providers often feel overwhelmed by the number of available choices and the inability to separate effective and safe DMHTs from those that are ineffective at best and harmful at worst. For instance, a review of almost 300 apps for the treatment of depression in digital app stores found that fewer than 5% of them had any published research evidence.[29] Reviewing hundreds of DMHTs at a time is hardly feasible for a busy provider. An alternative approach is to identify DMHTs that have received U.S. Food and Drug Administration clearance or approval (eg, Deprexis, Rejoyn) or DMHTs that have been designated as effective by clearinghouses (eg, American Psychiatric Association's App Advisor, the Organization for the Review of Care and Health Apps' Baseline Review). Few such DMHTs

currently exist, but the numbers will likely increase, as capital investments continue to be made in the digital mental health space.

Another approach for clinicians is to use 3 criteria to assess and select DMHTs: (1) evidence base, (2) user experience, and (3) safety and security. Evidence base refers to whether a DMHT has clinical evidence demonstrating its benefit. As discussed earlier, reviewing the evidence of effectiveness is necessary to differentiate a DMHT from other digital health products that may not meet the bar of clinical treatment. User experience refers to whether the DMHT is easy to learn, simple to use, and likely to be sustained in use over time. Although some aspects of user experience might be subjective (eg, color scheme), other aspects (eg, intuitive design) are crucial for high-quality products that lead to positive user experiences. Some aspects of the user experience might be better suited for specific groups like young people or minoritized groups. Providers should consider the user experience vis-à-vis their typical patient population. Finally, safety and security include whether the treatment could potentially do harm, as well as data security and privacy practices. DMHTs are at least as safe as traditional treatments. For instance, DMHT users do not seem experience more frequent or severe negative treatment effects as patients receiving face-to-face therapies.[30] Even in fully self-guided DMHTs, users experience less symptom worsening than individuals in control conditions.[31] Regarding privacy, however, a review found that only half of apps for depression had a data security and privacy policy, and even those that did often only provide it after consumers provided identifying information.[32] Hence, clinicians should identify DMHTs that are safe and compliant with health data protection regulations.

In addition to selecting well-designed, effective, and safe DMHTs, considerations about how DMHTs can be incorporated into the clinical workflow need to be contemplated. DMHTs exist along a continuum of care, including unsupported or self-guided interventions, supported or guided interventions, and blended care or therapy extenders.[33] Unsupported DMHTs are interventions where consumers receive treatment without additional human support. In supported DMHTs, the technology provides the intervention, but human support is present to help with user engagement or maximize the impact of the intervention. In this modality, non-professionals often provide support after receiving some training. Human supporters in these interventions typically help onboard patients, check in to motivate patients, and problem-solve technical challenges. Blended care refers to the combination of DMHTs with a traditional course of treatment, such as psychotherapy or psychiatric medication. In this case, the technology augments these treatments to make them easier to adhere to and efficient and effective. Because blended care relies on traditional treatments, human support comes from trained mental health professionals. In those DMHT modalities that involve human support, this guidance can be synchronous (eg, real-time communication via phone call or text message) or asynchronous (eg, email feedback), and its frequency varies with some programs offering weekly support and others providing support only upon request.[34] Regardless of the role that technology plays in the patient's care, DMHT use in care systems needs to be guided by careful consideration of the goals of the organization and key stakeholders, the context where care is delivered, the maturity and viability of the DMHT company, the DMHT fit with users' needs, financial sustainability, and the availability of resources to support DMHT employment, among other implementation factors.[35]

A final consideration is how to match patients with the DMHT most likely to be effective for them. Insights around this issue are still emerging. One way to consider DMHTs for depression is in a stepped care paradigm, where patients initially receive a DMHT and then access more intense treatment if they do not respond. One trial evaluated a

stepped care paradigm where those who received a DMHT and did not improve subsequently received telephone-based CBT.[36] In this trial, the stepped care paradigm was compared to starting with telephone-based CBT and evaluated in terms of non-inferiority and cost. The trial found that the stepped care sequence was not inferior to telephone-based CBT and less costly, primarily due to reduced therapist time. Another option is to provide DMHTs only to those users likely to benefit from them. This approach is called tiered care, where treatments are decided based on patient characteristics and symptom severity. For instance, human support seems to be more important for patients with higher levels of depressive symptoms.[15] A better understanding of whom benefits most from DMHTs and how to incorporate this information into clinical decision-making is an important area for future research.

LIMITATIONS OF EXISTING EVIDENCE AND FUTURE DIRECTIONS IN DIGITAL MENTAL HEALTH TREATMENTS FOR DEPRESSION

Engagement

A crucial challenge for DMHTs has been the limited engagement and high attrition in these programs, especially when implemented in routine care. Engagement is important for treatment outcomes in DMHTs.[37] While average dropout rates from randomized controlled trials range from approximately 25% to 50%,[38] these rates are even higher in community implementation efforts. Data on DMHT implementation in routine care show that approximately 40% to 50% of potential users are lost from screening to enrollment,[39] and even among those users who do access the DMHT, an additional 30% to 80% drop out prematurely.[40] It is worth noting that these issues are not unique to DMHTs, as even traditional treatments for depression face poor engagement and high attrition. In randomized controlled trials of traditional therapy for depression, on average 20% to 36% of participants drop out, with rates ranging from 0% to 84%,.[41] In routine care, uptake from referrals reaches 69% for traditional therapy and 17% for telehealth.[42] In other words, while improving uptake and engagement in DMHTs is crucial, when appropriately implemented, DMHTs for depression have similar success (and challenges) as traditional mental health services.

Several strategies have been used to improve engagement and retention with DMHTs. Among those, human support shows significant promise. Different models of human support exist, including clinical technology specialists,[43] digital navigators,[44] and digital peer supporters.[45] Across models, supporters help DMHI users problem-solve issues with technology and tech literacy, motivation and logistic barriers, lack of understanding of intervention principles, the cultural fit of the DMHI, and even deliver some treatment content. Crucially, DMHTs with some human support seem to have better engagement and treatment outcomes compared with fully self-guided DMHTs.[14,15] Indeed, human support is already being employed successfully to increase DMHT uptake and engagement in routine care.[46]

Personalization is another method to promote sustained engagement with DMHTs. Personalization refers to purposefully designed variations in DMHTs' elements or structure to adapt the DMHT to meet the users' needs, preferences, or limitations. Several dimensions of personalization for treating depression have been identified, including content, the order in which it is shown, and the nature of automated communications.[47] Personalization seems more effective when it considers user characteristics (eg, age, gender, educational level, symptom severity) and incorporates such information throughout treatment planning.[48] However, mental health symptoms, user states, and environmental contexts can fluctuate over days and hours, presenting changing needs, challenges, and opportunities for specific intervention. Much of the

detection of states for DMHTs has used ecological momentary assessment or data from sensors in smartphones and wearables to create a *digital phenotype.* However, identifying such digital phenotypes of depression has been proven challenging, thus limiting their immediate applications to routine clinical practice.[8] In the meantime, researchers and practitioners may consider other approaches that more immediately minimize barriers to DMHT use, such as onboarding procedures, tech literacy support, problem-solving barriers to engagement, and motivational and accountability techniques.

Digital Mental Health Treatment Integration into Routine Care

As DMHTs become integrated into routine care, health care systems are creating ecosystems that include various digital programs to meet their patients' different needs and preferences.[35,39,49] As such, methods to determine the most appropriate DMHT for a given patient are necessary. Different matching approaches exist, such as allowing patients and clinicians to choose their preferred DMHT,[49] conducting standardized assessments to find an appropriate match,[50] and individualized intervention rules that determine the sequencing of several DMHTs.[51] Other approaches may also exist, including matching based on DMHT treatment modalities (eg, CBT vs brief psychodynamic therapy), preferred or available technologies (eg, web-based DMHT vs VR DMHT), or delivery aspects preferences or needs (eg, fully self-guided DMHT vs therapy extenders). Some of these matching methods are now being empirically tested.[52,53]

For DMHTs to become part of routine care for depression, these technology-enabled services need to be reimbursable. First, the field will need to establish clear standards of treatment effectiveness that distinguish DMHTs from simple wellness apps and products. Indeed, the current literature, including studies reviewed in this study, often fail to distinguish DMHTs from other digital products with less robust empirical evidence. Although this is a developing area, some guidelines already exist that can allow regulatory bodies to establish which digital products should be considered DMHTs and thus reimbursable.[54] In addition to effectiveness considerations, billing codes that cover all aspects of DMHT clinical practice are lacking. Currently, clinicians using DMHTs with their patients must use existing billing codes laxly for reimbursement purposes.[55] However, this approach does not cover other important support services provided during the deployment of a DMHT, such as helping patients access the DMHT, training them on their use, and providing technological support throughout treatment. As such, new codes that allow billing for the different components of technology-enabled services are necessary. A promising development in this area is the publication of the new Healthcare Common Procedure Coding System codes incorporated in the 2025 Medicare Physician Fee Schedule. These new codes allow for the billing for the supply of the DMHT device, the initial education and onboarding necessary, and the ongoing treatment management services directly related to the patient's use of the DMHT. In short, the standardization and broad implementation of these billing codes could contribute to making DMHTs a frontline treatment of depression.

Cutting-Edge Technologies

Perhaps some of the most disruptive new technological advances are generative artificial intelligence (AI) and large-language models (LLMs). AI is a system capable of generating content using machine learning (ie, algorithms that allow computers to learn from data without being explicitly programmed). LLMs refer to AI models trained on text data to generate human-like text responses. LLMs are already being explored in Chatbots that mimic therapeutic interactions and can reduce depressive symptoms.[56] However,

LLMs often fail to respond adequately to users' prompts and struggle to identify individuals in crisis. These agents can also produce "hallucinations," where the agent generates content that is grammatically correct but inappropriate, incorrect, or even potentially dangerous. Further, because LLMs are based on existing language data, they can carry implicit biases, stereotypes, and systematic inequities.[57]

These challenges notwithstanding, the potential of LLMs for the treatment of depression is enormous. In the short term, it may be more realistic to think of ways AI and LLMs can support mental health professionals rather than replace them. LLMs can monitor the content of sessions for both clinician training and quality assurance,[58] improve the language used in messaging interventions and support platforms,[17] and translate traditional evidence-based treatments into engaging visuals and tools or even new DMHT content.[59] In future research, AI and LLMs could examine extensive samples of therapy encounters and identify the most potent therapeutic techniques or behaviors leading to iatrogenic effects or assist in personalization and treatment allocation through precision treatment rules.[59] In short, AI and LLMs may soon open entirely new approaches to improving the treatment of depression via technology.

Advancing Equity in Digital Mental Health Treatments

Although one of the promises of DMHTs is to advance mental health equity by providing care to historically marginalized groups, these interventions still face similar challenges as traditional mental health services.[60] For instance, DMHTs rarely reach members of marginalized groups, seriously limiting the generalizability of research findings.[8,60] Devising purposeful recruitment strategies that reach historically underrepresented groups and including detailed demographic surveys in DMHT trials could help solve this problem. Including these groups in study samples and collecting rich demographic information will allow researchers to determine who accesses and benefits from DMHTs, potentially improving the precision of these interventions and developing new support strategies for successful implementation.

As DMHTs begin to reach more diverse users, concerns related to the relevance of their content and their ability to meet the unique needs of these groups can be addressed. Similar to traditional therapies, some researchers have argued that DMHTs must be designed or adapted for these groups to ensure their effectiveness. However, designing new DMHTs or adapting existing ones for every cultural group may not be sustainable.[60] Thus, studies must determine when, how, and how much to design or adapt for different groups. For example, DMHT implementation studies in routine care can provide information about potential inequities in uptake, engagement, or clinical outcomes in certain groups. Community-based and qualitative methodologies can then be used to understand better the specific factors leading to these inequities in outcomes. Involving key stakeholders (ie, DMHT users, mental health providers, DMHT supporters) in the design of solutions could also lead to strategies that are responsive to their needs. Similarly, when researchers and providers cannot modify the DMHTs available, idiographic, flexible, and personalized approaches to ensuring the cultural relevance of these programs can be used instead.[60] In short, diverse and complementary research methodologies, including implementation science, community-based participatory research, and human-centered design, hold promise to advance DMHT equity.

SUMMARY

With more than 4 decades of evidence supporting their acceptability and effectiveness across different technological modalities, certain types of DMHTs are an evidence-

based approach to the treatment of depression. From completely self-guided programs to therapy extenders under the supervision of a mental health professional, DMHTs expand the portfolio of care options. Importantly, these products should be carefully selected based on the unique needs of potential users and the characteristics of each DMHT, including their evidence base, user experience, and safety and security practices. In short, DMHTs are positioning themselves as a frontline treatment approach for those affected by depression rather than a "subpar" care option.

While DMHTs hold significant promise, these interventions still face significant challenges in becoming integral to routine care. Poor uptake and engagement are typical in DMHTs for depression, albeit similarly to traditional treatments. These products are rarely integrated into routine care, and the current mental health reimbursement system is poorly equipped to promote their long-term sustainment. Without careful consideration, DMHTs can also perpetuate existing or even create new inequities among vulnerable groups. Although we propose potential solutions for each of these issues, only demonstration in real-world settings will allow us to develop "gold standard" practices in the treatment of depression via DMHTs. Finally, as new technologies emerge, these tools could disrupt "business as usual" in mental health care, pushing researchers and clinicians to re-envision the field and go beyond replicating decades-old practices now in the digital space.

CLINICS CARE POINTS

- DMHTs are an evidence-based approach to the treatment of depression.
- DMHTs exist within a continuum of care, from completely self-guided interventions to traditional therapy extenders.
- DMHTs can be evaluated and selected based on their evidence base, user experience, and safety and security.
- Significant barriers to making DMHTs part of routine care for depression still exist.

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