

The Role of Artificial Intelligence in Mental Health Diagnosis and Treatment

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Abstract. Artificial intelligence (AI) is reshaping the field of mental health, with particularly strong potential in diagnosis and treatment. In diagnostics, AI systems can perform disease classification, risk prediction, early screening, and emotion recognition. Research shows that multimodal models combining neuroimaging, clinical scales, and behavioral signals significantly improve accuracy in identifying common psychological disorders such as depression and anxiety. They also enable continuous monitoring and personalized profiling. In treatment, AI tools are mainly applied to depression, anxiety, emotion regulation, and suicide prevention. Chatbots based on cognitive behavioral therapy (CBT), acceptance and commitment therapy (ACT), and narrative therapy transform the core therapeutic process into immediate dialogue and feedback. Applications and wearable devices have further enabled daily emotion management and crisis intervention. Randomized controlled trials and systematic reviews have shown that these tools can produce moderate to strong effects in alleviating symptoms while lowering the barriers to accessing mental health services. For future development directions, AI needs to achieve breakthroughs in three aspects: First, it should strengthen scientific validation through multi-center and longitudinal research to address the lack of long-term and cross-cultural data; Second, embed crisis identification and referral mechanisms in the dialogue system to enhance clinical safety; Third, improve the fairness, interpretability and privacy protection of algorithms, and establish transparent and responsible application standards. Overall, AI is not an autonomous diagnostic or therapeutic agent, but it has become an important complementary tool for enhancing the accessibility and efficiency of mental health care.

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1. Introduction

Mental health disorders (such as depression and anxiety) have become a significant have become a leading cause of disability worldwide. Traditional approaches, relying on clinical interviews and scales, face significant challenges of accessibility and scalability. Artificial intelligence (AI) has recently emerged in this field. With the capabilities of multi-source data integration and pattern recognition, it has provided a new technical channel for improving diagnosis efficiency, sinking intervention, and extending services (Graham et al., 2019; Lee et al., 2021).

On the diagnostic side, research has shifted from single scales and static indicators to multimodal frameworks that integrate clinical records and scales, behavioral and linguistic data, physiological measures, and imaging. High-level evidence shows that the model performance varies among different tasks and groups of people, but it has a usable level in image and behavioral clue scenarios. Overall, findings support the view that multimodal approaches outperform unimodal ones. (Abd-alrazaq et al., 2022; Goh et al., 2025). Among these, suicide risk identification has advanced most rapidly: The combination of EHR, social/wearable , and NLP signals makes continuous monitoring - threshold triggering - outreach referral possible (Lejeune et al., 2022; Atmakuru et al., 2024).

On the therapeutic side, AI tools mainly focus on the integration of dialogue agents based on CBT, ACT, and narrative therapy, together with mobile and wearable devices: on the one hand, they translate therapeutic techniques into structured dialogues and real-time feedback, and they extend interventions into daily contexts and crisis response. On the other hand, extend the intervention to daily situations and crisis response. *Randomized controlled trials and meta-analyses* suggest that such tools can achieve moderate to strong symptom improvement in depression and psychological distress, and have advantages in accessibility and user engagement. (Li et al., 2023; Denecke et al., 2021).

Meanwhile, systematic reviews caution that long-term efficacy in the real world, cross-cultural extrapolation, and deep coupling with clinical workflows remain weak links in the chain of evidence (Lattie et al., 2021).

Overall, AI has demonstrated benefits across the continuum of mental health diagnosis and treatment, but it is still more appropriate to play an auxiliary role. The main shortcomings fall into three areas: (1) evidence strength and external validity, including the lack of multi-center, cross-cultural, and long-term studies; (2) safety and clinical integration, with insufficient crisis detection, referral pathways, and interpretability; and (3) fairness and governance, as issues of data bias, privacy compliance, and transparent accountability remain unresolved. (Gamble, 2020; Zafar et al., 2024). Based on this, this article will review the existing evidence and methodological approaches in diagnosis and treatment, and at the end, distill the corresponding development directions and practical key points, with the aim of providing an operational reference system for subsequent research design and clinical translation.

2. How to diagnose

Artificial intelligence is now central to mental health diagnostics, encompassing disease classification, risk prediction, early screening, and emotion recognition; although each domain emphasizes different dimensions of assessment, together they construct a coherent framework that extends from perception to discrimination and from risk identification to individualized profiling.

Research demonstrates that AI systems can reliably distinguish disorders such as depression and anxiety from healthy individuals. Abd-alrazaq et al. (2022), in an umbrella review, reported accuracy ranging from 21% to 100%, with performance markedly enhanced when neuroimaging was combined with clinical features. Building on this, Tutun et al. (2023) developed the Psikometrist platform, integrating psychometric questionnaires with computational models to achieve 89% accuracy, underscoring the potential of AI classification systems to complement and accelerate preliminary diagnostic evaluations.

AI is also applied to risk anticipation, targeting both clinical and high-risk populations, with suicide and relapse prediction emerging as key areas. Lejeune et al. (2022) constructed a predictive model based on clinical records and adolescent behavioral data to identify suicide vulnerability. Atmakuru et al. (2024) combined linguistic markers with biometric data from wearable devices to achieve dynamic real-time monitoring.

AI's predictive ability can also improve early screening by adding emotional context. Graham et al. (2019) showed EHR- and mobile-based tools can reach AUCs up to 0.85 for depression. Zafar et al. (2024) demonstrated that unstructured cues like vocal prosody and movement can act as digital phenotypes of distress. Zafar et al. (2024) demonstrated that unstructured cues like vocal prosody and movement can act as digital phenotypes of distress.

By providing continuous and easily accessible psychological support, these tools lower the barriers to accessing care and are particularly useful for individuals with limited access to professional services or those who are reluctant to seek traditional treatment. The Psikometrist platform (Tutun et al., 2023) combines the questionnaire responses with behavioral indicators to classify mental disorders and propose treatment options, thereby simplifying the initial consultation and reducing diagnostic errors. Using the NEPAR algorithm, 90 questionnaire items were reduced to 28, after which machine learning models generated probabilities for ten disorder categories along with individualized recommendations. Such output approaches the depth of a clinical interview within minutes, significantly lowering the professional threshold in the fields of primary care and telemedicine.

At the organizational level, artificial intelligence helps optimize resource allocation and expand digital services. Lattie et al. (2021) reported that artificial intelligence platforms connected to Electronic Health Records (EHRs) can allocate resources based on regional needs, while Graham et

al. (2019) demonstrated that combining social data with predictive models can enable early detection and stratified intervention of psychological disorders at the population level.

Artificial intelligence has two major benefits in mental health diagnostics. It lowers the threshold for seeking medical treatment and enhances accessibility by enabling individuals to obtain rapid and low-cost psychological state assessments. AI has alleviated the clinical burden, reduced frontline workload, and improved efficiency by handling initial screening and data collection.

AI should help clinicians, not replace them. It cannot take legal or ethical responsibility. Because it relies on large-scale models that focus on common patterns, AI struggles with rare or complex cases. Emotional, behavioral, or cultural differences make accurate diagnosis harder. Bias in training data — by gender, age, ethnicity, or income — can lead to structural inequality. Some models already show clear differences by ethnicity in identifying depression. To reduce harm, experts urge audits and oversight (Gamble, 2020) and the use of explainability and fairness tools like SHAP and transparency reporting (Zafar et al., 2024). How to Treat

3. Therapeutic Focus

The application of artificial intelligence in treatment mainly focuses on depression, anxiety, emotional dysregulation, and suicide prevention. These applications include daily symptom management and emergency crisis intervention.

CBT-based systems are a central research field. Denecke et al. (2021) designed a chatbot that can identify negative automatic thoughts, use structured dialogues, and guide users through cognitive restructuring and emotion regulation. This process is helpful in alleviating symptoms. Zafar et al. (2024) reviewed recent work and found that multi-source data integration can improve symptom monitoring and support personalized treatment plans. The result is more precise and timely.

Emotion regulation is another major focus. Artificial intelligence tools can not only identify emotional states but also provide real-time feedback and adaptive training. Goh et al. (2025) created a multimodal system that infers emotions by analyzing voices, facial expressions, and physiological signals. Based on these results, the system recommends strategies, such as breathing exercises, mindfulness practices, or social interaction tasks. These functions help users develop long-term skills in daily emotional management.

3.1 Therapeutic Approaches

CBT focuses on identifying and restructuring negative automatic thoughts. Denecke et al. (2021) designed a SERMO chatbot that operationalized this process into three modules - thought recording, cognitive restructuring, and behavioral experimentation - using emotion lexicons and semantic analysis to detect distortions such as catastrophizing or overgeneralization, and guiding users with structured questioning to challenge these ideas and design behavioral tasks. The meta-analysis by Li et al. (2023) found a moderate effect in reducing depressive symptoms (Hedges' $g = 0.64$), and the results were consistent in both mobile and voice-based environments.

ACT is carried out through acceptance, value clarification, and committed action. Lattie et al. (2021) created a digital ACT platform that generates personalized mindfulness exercises from user input, supports value clarification through ranking tasks, and encourages committed actions with reminders. Acting as a feedback system, it adapts intervention content to progress data, reinforcing value-driven behavioral change.

Narrative therapy's externalization–rewriting process has been translated into interactive AI systems. Rowe and Lester (2020) developed a platform that elicits users' "problem stories," constructs characters and scenarios with natural language generation, and guides reframing through interactive narratives that transform a "problem avatar" into a manageable entity, producing alternative "strength narratives" that enhance agency and self-efficacy.

Psychodynamic concepts have been approximated through AI models based on rule systems and fuzzy logic. The MeHDES platform (Kosarkar & Bhende, 2016) maps user reports to latent conflict

themes such as intimacy struggles or childhood trauma, and offers symbolic prompts—phrases or images—to stimulate reflection. Simulating psychoanalytic questioning, lowers costs and expands access to basic psychodynamic screening, especially in resource-limited settings.

Emotion regulation is conceptualized as involving identification, understanding, and control. Goh et al. (2025) designed a multimodal framework combining speech, facial, and physiological data to infer emotional states in real time, then recommending strategies such as breathing exercises, mindfulness practice, or social interaction tasks, providing personalized (“one-size-fits-one”) regulation strategies.

Crisis models emphasize detection, immediate support, and referral. Reviews by Lejeune et al. (2022) and Atmakuru et al. (2024) show that natural language processing can identify suicide risk cues in records or social media; once thresholds are reached, AI systems initiate automated responses including hotline prompts, alerts to responders, or referrals to emergency services, shortening the time between detection and intervention.

3.2 Treatment Forms

The application of artificial intelligence in the field of mental health has developed into a technological continuum, ranging from lightweight conversation tools to clinical-grade decision support, including six complementary modalities.

By leveraging natural language processing (NLP) and large language models (LLMs), chatbots compress the structured components of cognitive behavioral therapy (CBT) into immediate text or voice-based interactions. For instance, SERMO (Denecke et al., 2021), Woebot, and Wysa (Balcombe, 2023) detect cognitive distortions in user input through emotion lexicons and semantic analysis, and provide tailored cognitive restructuring tasks within seconds. This enables users to participate in the micro-therapeutic cycles of “expression–feedback–correction”.

App-based interventions extend therapeutic scenarios into everyday life. Platforms such as IntelliCare (Mohr et al., 2017) and SuperBetter (Roepke et al., 2015) integrate CBT exercises, emotion tracking, behavioral check-ins, and micro-video modules. Following each self-check-in, algorithms dynamically adjust task frequency and difficulty based on behavioral trajectories, creating a hybrid intervention model of “self-guided practice plus algorithmic coaching.”

Narrative reconstruction is facilitated through situational simulation and role-playing. The platform developed by Rowe and Lester (2020) employs generative algorithms to create virtual characters and social challenges in real time. Each user decision within branching storylines provides an opportunity to reframe personal life narratives. The system adaptively modifies narrative complexity based on interaction history, offering an immersive “story-as-therapy” experience.

Embodied agents enhance digital interventions by reducing the sense of detachment and fostering emotional resonance. Balcombe (2023) demonstrated that 3D avatars, combined with speech synthesis, can replicate therapists’ facial expressions, prosody, and gestures. Such avatars allow users to interact with perceptibly “human-like” figures and conduct consultations via voice or video, thereby improving therapeutic alliance, trust, and engagement.

Wearables transform intervention from reactive assistance to continuous monitoring and protection. For instance, the REACH VET system (Lee et al., 2021) continuously models emotional states using multimodal data streams such as heart rate, speech prosody, and sleep patterns. Upon detecting signals that surpass suicide risk thresholds, the system automatically activates safeguards, including text alerts, hotline activation, or clinician intervention—establishing a closed-loop framework of “passive monitoring to immediate response.”

3.3 Therapeutic Effect

The impact of artificial intelligence (AI) on mental health is studied from several sides. Researchers look at changes in symptoms, how well the models work, and what users say about their experience.

Li et al. (2023) reviewed many randomized controlled trials. They used Hedges' g to measure the effect size. The results showed that AI-based support had a moderate to strong effect in reducing depression and anxiety (Hedges' $g \approx 0.5-0.8$). This means AI can help people improve their mental health on their own, and it can also add value when used with professional treatment.

Denecke et al. (2021) tested the CBT-based SERMO chatbot. They measured changes with tools such as PHQ-9 and GAD-7. The study found clear drops in depression and anxiety scores. The progress was close to what people achieve with short-term therapy guided by a human. Users also gave feedback through the User Experience Questionnaire. Most said the system was easy to use, gave emotional support, and helped them stay on track.

Goh et al. (2025) studied a multimodal emotion regulation system. They looked at self-reported emotion levels, task completion, and resilience. Their results showed that the system reduced negative feelings in the short term and helped users manage their emotions better in daily life.

Taken together, current studies show that AI can reduce symptoms and give users a good experience. These tools bring measurable benefits and make mental health care easier to reach and maintain.

3.4 Critical Review

Chatbots based on CBT can guide users through structured dialogue and support cognitive restructuring. But they have limits. They cannot fully understand complex human emotions, notice non-verbal signals, or build deep emotional connection (Denecke et al., 2021). The system is driven by algorithms, not real experience, so its effect is weaker for people with severe or high-risk mental health problems.

Users also trust human therapists more than AI systems. Human counselors can build strong relationships through empathy and quick responses. AI does not have real emotional ability, so it cannot match this depth. When people face crises or serious distress, they usually choose human support instead of AI tools.

There are also technical limits. Emotion recognition and risk monitoring are not always accurate. Mistakes can lead to wrong actions or delays in care, which increase risks. Studies show that AI can help reduce symptoms, but it often needs human oversight or professional support. AI cannot replace human knowledge, and it cannot solve the shortage of workers in mental health care.

4. Discussion Future Development Directions

Overall, artificial intelligence demonstrates substantial potential in mental health diagnosis and treatment, which is reflected not only in the gradual verification of intervention effects, but also in the expansion of user experience and clinical application (Darcy et al., 2021; Inkster et al., 2018). Among text-based artificial intelligence mental health applications, Woebot and Wysa stand out in terms of user satisfaction. They have received high reviews on both Google Play and the Apple App Store. Specifically, Woebot has ratings of 4.1 and 4.7 on the two platforms, while Wysa has ratings of 4.7 and 4.9, and has received multiple awards and recommendations from industry institutions (Wired, 2023). Users often emphasize the 24-hour accessibility, anonymity and non-judgmental communication environment provided by these applications. They also affirmed personalized feedback based on historical dialogue and emotion tracking, as well as user-friendly interfaces and natural interaction experiences (Inkster et al., 2018; Fitzpatrick et al., 2017).

In terms of adherence, these applications have lowered the usage threshold and, through short and frequent interaction designs (such as Woebot's approximately 10-minute session), the integration of multiple intervention methods (Wysa combined with CBT, DBT, and mindfulness methods), The use of specific avatars (such as Wysa's "AI Penguin") and cross-platform accessibility to increase the possibility of continuous participation (Fulmer et al., 2018; Prochaska et al., 2021). Randomized controlled trials have also shown that Woebot can significantly alleviate depressive symptoms in college students within two weeks (Fitzpatrick et al., 2017), and establish treatment alliances

comparable to those of human therapists in a short period of time (Darcy et al., 2021). Similarly, large-scale observational data on Wysa indicated that over 65% of users experienced a reduction in depressive symptoms after 2 to 4 weeks of use, and described the app as "helpful and inspiring" (Inkster et al., 2018).

However, these applications also have limitations. From a functional perspective, Woebot and Youper are unable to provide emergency psychological assistance or immediate medical support, making it difficult for them to replace the profound empathy and clinical insight of human therapists (Fiske et al., 2019). In addition, Wysa occasionally generates responses that are overly lengthy or suddenly shift the topic, which may harm the user experience. Other challenges in the report include data interpretation bias, over-reliance on technology, slow performance, and restricted access to free features (Selek et al., 2022). In terms of clinical validation, although Woebot and Wysa have undergone a certain degree of scientific evaluation (Fitzpatrick et al., 2017; (Ramachandran et al., 2020), but most similar products still lack large-scale randomized controlled trials and long-term follow-up studies, limiting the ability of users to evaluate the scientific rigor and reliability of their results (Selek et al., 2022).

Privacy and ethical considerations are also of vital importance. Although some applications comply with HIPAA or GDPR, many applications still fail to meet the relevant regulatory requirements and lack sufficient transparency in data storage, processing and third-party access (Fiske et al., 2019). Furthermore, users express concerns about the insufficient cultural or religious sensitivity in the algorithmic responses, which limits the global applicability of these systems (Aladag et al., 2023).

In conclusion, these factors indicate that the future development of text-based artificial intelligence mental health applications requires more rigorous scientific validation and functional optimization. At the same time, it is necessary to provide strong guarantees for user privacy and data security to enhance practical value and user trust.

Looking to the future, three key directions seem indispensable. The first is to strengthen the scientific validation system. At present, most applications rely on user feedback and short-term trials, lacking long-term, large-sample randomized controlled studies. This gap not only limits the scientific proof of efficacy, but also hinders the adoption by clinicians and public health systems (Selek et al., 2022). Future efforts should promote cooperation with universities, hospitals and research institutions to carry out multi-center and cross-cultural longitudinal studies. These should include a systematic assessment of emotional improvement, **treatment adherence** and the outcomes of crisis intervention, and adopt transparent data sharing and review mechanisms to establish a reliable evidence base.

The second is to further deepen clinical functionality and human-machine collaboration. The current application lacks the ability to intervene immediately in crisis situations. Embedding an emergency risk detection module in the dialogue system enables prompt reporting to professionals or referral to local crisis hotlines when suicidal ideation or acute psychosis symptoms.

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