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# *A Comparison of AI Mental Health Models and Human Therapy*

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***Abstract.*** The rapid expansion of artificial intelligence (AI) in healthcare has prompted growing interest in its application to mental health support. This review compares AI-based mental health tools to human psychotherapy from neuroscientific, computational, and clinical perspectives. The review outlines the structure and evidence-based human therapy, with a focus on cognitive behavioral therapy (CBT) and the therapeutic alliance; then, the mechanisms underlying AI mental health models, including large language models, natural language processing, and training techniques such as reinforcement learning from human feedback are explained. A comparison of the human brain and artificial neural networks, and the analysis of empathy plus emotional processing in both systems, is presented. Evidence suggests that while AI tools can temporarily reduce symptoms and improve accessibility to professional help for mild to moderate conditions, they are less effective in cases of severe or complex disorders. Their simulated empathy, which is strongly associated with the success of treatment, differs from natural human emotions and also contributes to the decrease in effectiveness. Key limitations, including privacy concerns, algorithmic bias, and inadequate crisis handling, are also discussed. The review concludes that a hybrid model integrating AI tools with human-delivered care is the most promising direction for the future of mental health treatment.

***Keywords:*** Artificial Intelligence, Mental Health, Neuroscience

## 1. Introduction

In recent years, AI technologies have rapidly expanded and begun to reform multiple sectors of healthcare, including mental health support. More accessible AI tools such as ChatGPT and Woebot have attracted millions of users globally, showing increased interest in digital tools. The diagnosis of mental health disorders has significantly increased, too, especially among adolescents and young adults. According to the statistics by Sappenfield et al., in 2023, more than 5.3 million adolescents were diagnosed with mental or behavioral health issues, including anxiety, depression, or behavior/conduct problems [1]. The rising number of anxiety and depression diagnoses is associated with factors such as academic pressure, social media exposure, and reduced access to traditional care. This issue can be caused by interpersonal or socioeconomic pressures. A systematic review by Nyakhar and Wang (2025) analyzed 1,082 participants across nine studies and found that AI chatbot interventions produced statistically significant improvements in anxiety and depression outcomes in

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89% of studies, suggesting that AI may offer a solution to the lack of mental health care accessibility in certain specific populations as an assistant to the traditional mental health treatments [2]. This hypothesis has been supported by the study conducted by Suharwardy et al. (2023), which the results suggested chatbot interventions significantly improved mood-related outcomes in postpartum individuals and reduced symptoms of depression and anxiety when compared to self-guided treatments such as bibliotherapy. These observations suggest that AI systems can effectively deliver elements of CBT, and they may also serve as an effective supplementary therapeutic tool, especially in addressing issues such as cost, stigma, and limited availability of mental health supports [3].

However, despite the advantages of introducing new therapy instruments with AI technologies, there are some distinctions between models of AI and human therapy influencing the efficiency of treatment. The first and main feature of human therapy is based on interpersonal relations conducted by specialists with the help of knowledge about people's emotions and effective communication strategies. Human cognitive processes and emotions occur with the participation of specific brain regions responsible for decisions, memory, and other factors. On the other hand, computational models of artificial intelligence are based only on the process of modeling and pattern recognition, as well as large language models [4]. As a result, the implementation of natural language processing makes the response more adequate and appropriate, which makes a positive contribution to the generation of messages in a conversation. Moreover, in contrast to human beings, artificial intelligence does not have the ability to create conscious models of human emotions due to the peculiarities of the thinking process.

The comparison between AI models and human brain functioning is critical for the identification of gaps in research and potential risks in the application of AI in therapy. Although earlier research confirmed the effectiveness of AI applications in mental treatment, the question still arises about the capacity of AI technologies to imitate the human cognitive and emotional processes involved in therapy. Previous studies were focused on the quantified benefits of AI in mental health treatment (the alleviation of symptoms and improvement of the patients' attention). Only a few studies discuss the similarities and differences in human and artificial intelligence in terms of the neuroscientific process of mental therapy. For this reason, the aim of this review is to compare AI mental therapy models and traditional human therapy. According to the literature, even though AI technologies can be used effectively, it may not be able to substitute human intervention in terms of the peculiarities of models' structure. The hypothesis states that although AI technologies possess the potential of imitation, they are unlikely to replace human therapy due to specific neuroscientific and structural differences.

## 2. The structure and process of human therapy

Human psychotherapy is an evidence-based clinical process that is highly structured. The process starts with assessments and diagnosis of a patient, the development of a personalized treatment plan, including a series of guided therapeutic sessions, which are tailored to suit each individual based on their needs. Sessions are not simply about talking between the patient and the therapist, but about maladaptive cognitive and behavioral patterns. The most common method used is CBT, which identifies and restructures distorted cognitions in patients, providing the change to observe measurable changes in emotional and behavioral outcomes. Butler et al. reviewed 16 meta-analyses and found a large effect size of CBT across depression, generalized anxiety disorder, panic disorder, social phobia and PTSD with a mean effect size of 0.95 compared to no treatment or placebo controls [5]. This study suggests that CBT remains one of the most effective and generalizable forms of psychotherapy overall. The consistency of the efficacy was demonstrated across a wide range of

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psychiatric disorders, and across different age groups, clinical settings and comparison conditions. These data highlight that the effectiveness of human psychotherapy is not only reported by clinicians but is also demonstrated by quantitative studies on psychological results and their underlying neural mechanisms.

But psychotherapy doesn't work just because of structured techniques. The importance of the therapeutic alliance, i.e. the emotional bond between therapist and patient, is underlined by a large body of literature, often reflecting a collaborative and trusting relationship [6-8]. A meta-analysis of the alliance-outcome relationship across a variety of treatments found a consistent, moderate association between alliance strength and treatment success even when controlling for confounding variables [9]. Elliott et al. (2018) state that therapist empathy is one of the major predictors of positive treatment outcomes. The higher the perceived empathy, the more obvious the symptom reduction [10]. Neuroscientific research supports these findings, since it was shown that social and emotional interactions engage distributed neural networks, including regions involved in affective processing, perspective-taking, and emotional regulation [11]. These findings suggest that human therapy is effective primarily due to its ability to integrate cognitive techniques with real-time emotional responsiveness and interpersonal connections.

Human psychotherapy proved to be far superior to AI-based alternatives in terms of effectiveness and advantages in cases of treatment of patients with severe or complicated medical condition. For instance, when treating people with PTSD and personality disorder, human therapists are ready to deal with such challenges as ambiguous diagnosis, complex emotional problems, and clinical risks associated with the condition. Existing chatbots are not ready to do so due to their inability to appropriately cope with such challenges as abnormal thoughts, suicidal ideations, or trauma disclosures. Skilled trauma professionals are still required, and current AI tools are created to supplement therapy, not to substitute it [12]. Research has shown that the efficacy of AI-based interventions in the sphere of mental healthcare decreases over time. This limitation is correlated with the lack of flexibility in AI systems, and flexibility is required to maintain therapeutic effectiveness across the complex nature of human mental health needs [13]. Therefore, while both systems may achieve comparable short-term symptom reductions in mild presentations, human therapy is still the most effective treatment for more severe, complex, and chronic conditions.

## 3. AI mental health models: mechanisms and training

As opposed to human psychotherapists, AI-based mental health applications are absolutely different from one another in several ways. Firstly, most modern solutions rely on large language models (LLM) that are based on big text data training and prediction modeling algorithms that are used to predict the most likely word. An important feature of the transformer architecture is the attention mechanism that models token-token interaction over the entire sequence, ensuring the highest levels of coherence in answers [14]. However, systems lack any understanding of language and are merely capable of producing predictions based on pattern recognition in high-dimensional space. Speaking about the application of NLP techniques for mental healthcare, one should point out that input from the user is processed by the machine, and the emotional tone of the input is estimated by the machine to provide an appropriate response following the principles of therapeutic practice, such as CBT. To improve performance regarding accuracy, therapy applications use scripted techniques, reinforcement learning, or fine-tuning of models on specific datasets [15]. For example, in reinforcement learning from human feedback, human raters evaluate model performance to develop a model based on these judgments. Reinforcement learning from human feedback is necessary because it helps to make AI conversation closer to the standards of therapy, rather than language

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prediction per se. Such techniques have proven to be highly effective in improving model alignment with human preference by making them less likely to say harmful things, more helpful, and calibrated as compared to traditional training techniques [16].

At the same time, fine-tuning of large language models using input of large amounts of domain-specific texts, such as clinical records, therapeutic dialogue, psychoeducational texts, etc., also enhances the quality of AI-generated responses. Indeed, fine-tuning improved the performance of large language models in healthcare, with models tuned on medical or psychological corpora performing significantly better on tasks requiring specialized knowledge [17]. In accordance with the results reported by Abd-alrazaq et al., conversational AI agents are generally considered acceptable and helpful in the context of mental health care provision, with patients expressing high satisfaction and engagement [18]. Similarly, Laranjo et al. suggested that health chatbots can play the role of psychoeducational and behavioral assistants [19].

When comparing AI-based tools to human therapy in terms of treatment outcomes, AI-based tools demonstrate meaningful but limited effectiveness. A meta-analysis of 35 studies found that AI-based conversational therapy reduced symptoms of depression (Hedge's g=0.64) and distress (Hedge's g=0.70), and a meta-analysis of 18 randomized controlled trials that have a sample size of 3,477 participants found significant improvements in both depression (g=-0.26) and anxiety (g=-0.19) symptoms, with the most notable reduce of symptom appearing after approximately 8 weeks of treatment [20]. However, at the three-month follow-up, no substantial long-term effects were shown for either condition [21]. The study suggests that AI tools can produce clinically meaningful short-term symptom reductions, but are less effective for long-lasting outcomes. Patients report that these AI tools make therapeutic processes more accessible, but the lack of feeling genuinely understood is the downside of AI therapy, where the lack of connection reduces the speed or quantity of information they receive [22]. Symptom reduction alone does not guarantee lasting and meaningful psychological transformation, and it remains unclear whether AI chatbot therapy can facilitate the bigger psychological changes that human psychotherapy has demonstrated the potential for. These findings suggest that AI tools could serve as an accessible resource for mild presentations, while human therapists are still the most reliable solution for more complex, severe, and long-term mental health needs.

## 4. Structural comparison of human brain and AI system

Although it is possible that the architecture of artificial neural networks is similar to human brains, there are several significant differences between the two. The human nervous system is constructed with approximately 86 billion neurons, interconnected through highly complex synaptic nets. The neurons communicate via electrochemical signals, which might be inefficient compared to the AI's architecture; however, they react easily to external stimuli. It will cause a chain reaction that is hardly predictable. Besides external stimuli, the performance of human neurons might be modified by the intake of neurochemical substances, physical sensations, and the external environment. Another essential point about human cognition is that emotions play an important role in this process. Amygdala and prefrontal cortex cooperate to control emotions, behavior, and decision-making processes.

Artificial neural networks are mathematical calculations consisting of nodes and connections that have weights, distributed in multiple layers. These weights are continuously updated and optimized during the training process, a procedure known as gradient descent [23]. The algorithm allows the ANN to achieve a very high efficiency in pattern recognition. But it isn't like biological mechanisms. Artificial neural networks (ANNs) are computer simulations of brain functions, but are

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not related to the human brain. For example, the human brain learns from experience, and ANN learns from symbols and logic [24]. Additionally, the ANN uses an attention mechanism to identify relations between all units of the network at the same time [25], whereas humans use sequential, spike-driven computation.

It should be noted that the major difference between human cognition and machine learning lies in the fact that human beings are influenced by their experiences and emotions during the cognitive process. Thus, human cognition makes it possible for people to communicate and adapt their behavior to certain situations. In turn, machines lack any kind of understanding and emotional perception. Therefore, they are not able to communicate and interact with human beings. To conclude, it is necessary to mention that AI technologies can copy human interaction, but they fail to replicate the biological mechanisms required for consciousness and emotional experiences.

## 5. Emotion and empathy: real interaction vs. stimulated

Empathy is one of the most fundamental and therapeutically active components of the human therapeutic relationship. At the neurological level, empathy in humans is partially generated by the mirror neuron system (MNS), a network of specialized neurons that activate when an individual mimics an action that they also observe another person do. The discovery of mirror neurons allows researchers to understand empathy as an immediate, sympathetic engagement of a response to a particular stimulus, enabling an individual to produce the emotion of understanding another person's feelings [26]. The mirroring mechanism can also be associated with language development, and it has reshaped human understanding of social cognition and empathetic behavior [27].

Other than mirror neurons, emotional regulation in the context of therapy relies on multiple neural networks involving the prefrontal cortex, the insula, and the amygdala, which all contribute to affective resonance and the ability to distinguish one's own emotional state from that of another person. These neurobiological foundations enable therapists to make rapid adjustments, which also allow them to give feedback on the patient's constantly shifting internal state.

The studies consistently suggest that the empirical significance of empathy in therapy outcomes is crucial. A meta-analysis examining 82 independent samples and 6,138 clients found that therapist empathy is a moderately strong prediction of therapy outcome, with a mean weighted correlation of $r=0.28$ ($p<0.001$) [28]. Empathy is demonstrated to be one of the most consistent outcome predictors in psychotherapy research, with patients reporting more positive therapeutic experiences when they feel understood, safe, and able to express internal thoughts and personal information to their therapists [29]. Research has shown that patients cannot improve their health condition simply because they receive appropriate recommendations. At the same time, it becomes clear that the feeling of empathy makes people feel better and improves treatment results. In most cases, patients strongly want to be understood and recognized, which means that it is crucial to combine cognitive and affective parts of empathy, both to help patients receive the needed medical assistance and satisfy their psychological needs [30].

At the same time, it is also necessary to admit that AI-generated empathy cannot be considered as a phenomenon typical for humans. Indeed, in most cases, responses generated by AI algorithms are not the result of emotional processes taking place within the organism of the user and can hardly be referred to as genuine empathy because AI algorithms generate a response using statistical methods based on a great number of training samples and do not use real emotional feelings of AI operators [31]. Thus, AI algorithms may oversimplify human emotions by generating emotionally neutral but appropriate answers to questions asked by patients and, therefore, generate an image of a robot

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rather than of a human. It is proven by the fact that users may distinguish empathy generated by AI and humans when they receive it [32].

## 6. Limitations, ethical concerns, and future directions

While AI mental health tools have proven to be reliable and potentially helpful in mental health care, significant limitations and ethical issues are recognized and need to be addressed before its wider implementation in healthcare. AI-based mental health apps gather sensitive data about their users, including conversation logs, emotional states, and behavior patterns. Health information is sensitive in general; however, the kind of data collected by such applications is more sensitive than any other form of personal information. Harmful effects of violations of patients' privacy rights caused by AI conversational agents include emotional harm, concealment of symptoms due to privacy concerns, and misuse of personal data, all of which may adversely affect treatment outcomes. Moreover, unlike professional therapists, these apps are regulated by neither HIPAA nor other legislation concerning privacy in healthcare.

A second concern is algorithmic bias. AI systems learn from existing datasets, which are inevitably biased themselves. The problem of biases in algorithms exists since they can be found based on different criteria, including gender, race, sexual orientation, or disability. As for the field of mental health treatment, the problem can be especially critical since minority groups often have limited access to traditional therapy services. The third major drawback of AI in mental health care is associated with the issue of crisis management. Traditional therapists should be prepared to identify signs of severe conditions and manage crises appropriately. In the meantime, AI tools lack the ability to do so. What is more, even if the app were capable of doing so, it would not be responsible for actions taken [33].

Under these conditions, one way of the development of artificial intelligence in the field of mental healthcare could be the creation of a hybrid model with both offline consultations and the use of technological means. This approach would combine the strengths of each method to provide greater accessibility and interaction while retaining the critical aspects of human-to-human contact. AI technologies can be used for between-session support, mood monitoring and psychoeducation, but the human therapist remains responsible for diagnosis, decision-making and treatment. In the near future, a promising strategy appears to be the creation of a hybrid ecosystem, where AI is actively used to support the work of human professionals, rather than replace them.

The use of AI in clinical practice will likely require further improvements in the detection of emotions and the development of brain-computer interfaces based on knowledge about neuroscience. Existing solutions heavily rely on text-based inference of patients' emotion, which gives access to only one modality used by humans to communicate their distress. In the future, scientists might try to find the best way to recognize emotion with several kinds of input at the same time. This would include text, voice, facial expressions, and physiological indicators. Contrary to text data, these additional modalities provide information about emotions that is much less ambiguous. Within the framework of therapy, it could help to detect signs of crisis and adapt responses, as well as identify potentially high-risk individuals who need to be seen by humans immediately. Some applications of neuroscience have led to breakthroughs in AI technologies: brain-inspired principles helped to advance algorithms of learning, dynamic connectivity, and closed-loop brain-computer systems [34]. The latter refers to constant monitoring of the brain/physiological state of users and subsequent adjustment of output depending on the input received. In mental healthcare, closed-loop systems are expected to make personalized therapeutic interventions possible; current human or AI professionals cannot do it independently. Novel

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technologies will make it possible to create innovative approaches to neuropsychiatric research based on personalized, predictive patient interventions and will facilitate more mechanistic and personalized models of treatment.

## 7. Conclusion

This review focused on the key differences between AI-based mental health tools and human psychotherapy from neuroscientific, computational, and clinical perspectives. While AI systems have demonstrated measurable benefits, specifically in improving accessibility and providing short-term symptom relief for mild to moderate conditions, fundamental differences in cognition, emotional processing, and neural structure continue to limit their ability to replicate the depth of human therapeutic interaction. Therapeutic alliance is important to this limitation, since the collaborative and affective relationship between therapist and patient has been consistently identified as one of the strongest predictors of positive treatment outcomes. The current AI systems are still not capable of understanding and presenting genuine empathy and relatable emotional feedback. Therefore, human therapy continues to demonstrate its greater capacity for genuine empathy, adaptive clinical judgement, and the treatment of complex or severe psychiatric conditions. Nevertheless, AI tools provide a possibility to extend mental health support to underserved populations if the concerns around privacy, algorithmic bias, and crisis management are appropriately addressed. Future research should focus on developing hybrid care systems that integrate AI tools with traditional therapy. AI therapist tools can first be tested on patients with mild symptoms of depression or anxiety, considering the high frequency of diagnosis, and patients with this disorder might ignore it in the early development stage. The feedback provided by these patients can be very useful for improving the known limitations. Rather than framing AI as a replacement for human therapists, the field would benefit most from treating it as a complementary tool that expands, rather than substitutes, the reach of mental health care.

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