

# Chatbots and Conversational Agents in Mental Health: A Literature Review

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## Abstract

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## Abstract:

In this study, we looked at chatbots, conversational agents, technologies for creating conversational agents, perspectives, and ethical issues in this direction. Also examples of therapy that are used by psychologists, psychotherapists, and the prospects of using them in a chatbot are explored in this review. As a result of the review, we considered the chatbot concepts for ourselves and identified technologies and methods for further development of the chatbot for mental health. We came to the conclusion to develop a chatbot for psychological help with the use of cognitive behavioral therapy. As a result of the study, we conclude that chatbots are really able to provide effective psychological assistance and reduce depression and anxiety in people.

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## SECTION 1. Introduction

There is an overwhelming need for more affordable psychiatric treatment in today's world [1]. According to recent reports, more than half of Americans who need it are unable to obtain it owing to the therapist's geographic distance, stigmatization, lengthy waiting periods, and a shortage of practicing therapists [2]. More and more individuals are looking to the Internet for details and help instead of heading to a psychotherapist or a psychological profile. Self-regulation is becoming trendy [3]–[5], and there is a growing interest in “internet technology interventions” [6].

When people are in stressful emotional states, they need support, aid, safety, and a sense of stability. Depression, suicidal impulses, psychiatric disorders, a lack of emotional context, anxiety, and emotional and knowledge exhaustion are now commonplace, especially in big cities where life moves at a rapid pace. According to the World Health Organization, depression is now almost the most prevalent illness, affecting more than 300 million people worldwide [7].

At the moment, there are a plethora of apps available for smartphones and desktop computers that help you to monitor and assess your mental condition. These services seek to increase mindfulness, self-control, and stress management, and some also provide personal development and cognitive ability testing [8].

Psychoeducational approaches seek to clarify to the participant the psychotherapeutic modality's key provisions, as well as the client's perspectives on the disorder, its origins and processes, and an overview of symptoms. Psychoeducation is assigned a special role in the structure of the treatment curriculum of cognitive-behavioral therapy, and the psychoeducation itself has a direct therapeutic impact [9]. Around the

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same time, such teaching can be done without the involvement of a psychotherapist or psychologist, thanks to the use of journals, brochures, information tools, recordings, and other resources. A similar technique is often found in computer programs for self-regulation [10]. Studies of computer applications focusing on psychoeducation as a leading method for serving patients and clients were also conducted.

## SECTION 2.

# Methods of Therapy used in Chatbot Psychologists

Computer systems developed for the treatment of depression and anxiety disorders in the context of a cognitive-behavioral approach were reviewed in a series of studies (Perini S.) and co-authors [11]. The study's approach presupposed the inclusion of video guides for subject psychoeducation, homework, and the probability of professional observation by a therapist and a clinical psychologist. The curriculum lasted eight weeks and consisted of six classes. The lessons were collected into a comic book based on the story of a troubled character called Jess. Participants discovered how she dealt with her symptoms by listening to her account. This showed that they could use the same techniques in their daily lives. Participants were expected to complete their homework assignments and revisit the lesson at the end of each day. Additional tools, such as knowledge on self-confidence skills and sleep hygiene, as well as tales from past participants' encounters, were available throughout the class. Patients with mild to severe depression, as well as generalized anxiety, panic disorder, and social phobia, were included in the study. The authors then contrasted the device and tablet versions of the app, finding no substantial differences between them but a promising impact on symptom relief in both.

Ahtinen and co-authors [12] researched a program focused on the Acceptance Dedication Counseling concepts (ACT). When reading or listening to content, the user may do activities. The curriculum featured audio and video resources as well as independent exercises to help individuals deal with fatigue, anxiety, depression, and sleep issues. The authors of the study found that the participants had higher levels of life satisfaction and lower levels of stress. The limited sample size (15 subjects) and lack of enforcement of the concepts of a randomized controlled trial, however, were the study's drawbacks.

Rhind C. and co-authors' study [13] looked at the feasibility of using a smartphone app as a skills instructor in the context of dialectical-behavioral therapy. Dialectical-behavioral therapy is a type of psychotherapy based on the cognitive-behavioral approach, in which the concepts of clinical program directivity and structurality are central. This, in essence, necessitates the use of external resources for employers and patients to sustain this organized curriculum. Patients of borderline personality disorder and related behavioural problems such as drug dependence and suicide tendencies were included in both trials. The app's creators were able to help users consolidate, develop, and apply skills for controlling their actions and emotions. It was seen as a complement to a patient's continuing dialectical-behavioral rehabilitation regimen, not as a stand-alone treatment. While the authors recognize a range of study shortcomings, including a reduction in consumer interest in the program over time and the failure to define the leading cause of therapeutic effect between the components of the therapy complex, they also emphasize the positive features of the application. Participants remarked on the improved accessibility and security of usage, as well as providing prompt help and assistance. Emotional discomfort, depressive symptoms, and cravings for drug use were all lower in the population of borderline depression and substance misuse. Suicidal activity was correlated with a decline of mental tension, catastrophization of one's own interactions, and a tendency to injure oneself.

The use of computerized or Internet cognitive behavioral therapy (cCBT) [14]–[16] or Internet psychodynamic psychotherapy [17] as an alternative or complement to face-to-face therapy has been the subject of a variety of studies and review articles. Computerized therapy is delivered by an offline computer or web-based curriculum that provides an overview of the psychotherapy model, facilitates activities between appointments, and employs intensive analysis of attitudes and thinking processes, all while being supervised by a professional therapist who analyzes improvement and outcomes. It normally lasts 9–12 weeks, including follow-up acts [18]. It was most widely studied as cCPT was used to treat mild to severe depression, PTSD, anxiety disorders, including panic attacks, and generalized anxiety disorder. Donkin et al. [19] explored the use of a specially designed curriculum for depression symptoms in a sample. It was a cCPT-based curriculum that included sections on depression psychoeducation with CBT elements, behavioral psychotherapy, applied healing, and physical exercise. It allowed users to choose and chose which facets of the care they needed to

deal with, as well as which resources they wanted to use. The researchers drew significant conclusions not only about the program's success, which was measured by a decline in the subjects' depressive symptoms, but also about the association between the time spent using the program and the amount of completed tasks and modules. This partnership was shown by the fact that those participants who used the program more often and actively followed the instructions got the best results.

In recent years, mindfulness practices have been one of the most commonly practiced and actively studied approaches similar to psychotherapy. Mindfulness-based stress reduction (MBSR-mindfulness-based stress reduction) and mindfulness-based cognitive therapy are the most developed mindfulness-based therapies (MBCT-mindfulness-based cognitive therapy). Mindfulness activities have been shown in several studies to alleviate stress, anxiety, and depressive symptoms [20]–[22].

The technology with avatars is another fascinating field of the treatment of psychiatric illnesses. A computer representation or visual simulation of a human in a digitally generated reality is known as an avatar [23]. In a study comparing eyewitness memory when talking “face to face” versus using an avatar, [23] observed that the latter had the benefit of minimizing mistrust, making it easier for eyewitnesses to participate in conversation and remember incidents. Allen et al. [24] looked at the idea of using avatars to diagnose avoidance in posttraumatic stress disorder patients. When discussing the potential of such tools, the writers point out that they can be helpful not only as a screening tool, but also in the treatment of anxiety and post-traumatic stress disorder because they can help people manage avoidant behaviour.

## SECTION 3.

# Mental Health Monitoring Programs and Applications

Right now, the number of people who use remote psychiatric facilities is rising. For example, for \$10 a month, practicing psychologists will give online consultations and retain continuous communication with clients between meetings through homework, diaries, instant messaging, logging all chats, and eventual emotion analysis through the online portal Therachat [25]. Part of the markers of psychological condition will be read continuously on the basis of eye monitoring, KGR, and ECG, similar to medical remote diagnostics using wearable sensors. We should expect a demand for psychological evidence to arise, close to the one that exists today in medicine, where millions of patient reports are placed into the memory of the IBM Watson doctor program. Combining psychiatric studies with large quantities of genomic evidence becomes feasible, which scientists have already started to do in the treatment of Alzheimer's disease.

People are more likely to open up when interacting with a machine than when conversing with a human person because they are less afraid of being judged and less worried with making a good impression. In 2017, a group of Stanford psychologists released Woebot [26], a psychotherapist bot that tracks the user's mental state and provides therapeutic guidance for \$39 per month.

To support clients with depression, Wysa employs a variety of approaches, including cognitive behavioural counseling, behavioral affirmation, and mindfulness [27]. According to a preliminary Pisa report, the high-engagement user community increased their PHQ-9 score slightly more than the low-engagement user group. According to customer comments, 68 percent of users find the app interface to be helpful and motivating [28]. Bauer et al used Ginger.io, a smartphone-based application, to treat stress and anxiety symptoms [29]. Using a case study, they discovered that the care manager's interaction with the patient has an effect on the mobile healthcare platform's appropriateness and acceptability.

Luca built a replica in November 2016 to act as an artificially intelligent companion. Its primary function is to construct a graphical image of users. Creating a chatbot for such an effort, however, is difficult since Luca must create a Replica with appropriate emotional and cognitive skills for a social chatbot. The fact that Replica has received over 83,000 downloads shows its success among Internet users. Based on this convincing data, the researchers intend to examine Replika's emotional language in order to recognize a social chatbot's active-reactive abilities in generating emotional expressions. The researchers hope to add to the growing field of chatbot research by addressing the conscious consideration of emotional expression in a social chatbot [30].

Digital reality systems have been shown to be beneficial in the treatment of different forms of phobias and post-traumatic stress disorders [31]. The patient is immersed in a stressful world with the assistance of exposure therapy, and he copes with the condition with the help of a doctor. This is how scientists are assisting people in overcoming their fear of spiders. Patients have the ability to contact them by virtually touching them. The high cost of supplies prohibits this treatment from being commonly used, but Google has launched a variant of its Google Cardboard helmet that helps you to get support on your own by immersing yourself in virtual reality.

Furthermore, the use of virtual and augmented reality has now greatly increased the possibilities for clinical practice, such as when dealing with perceptions of flight, agoraphobia, and different forms of post-traumatic stress disorder, both of which involve the simulation of a scenario in vivo [32]. Digital reality is commonly used in preparation to model potential action in a number of scenarios. Psychological programs that offer a client a trip through different circumstances of his own life or the lives of people close to him are likely to occur in the future.

## SECTION 4.

# Chatbots and Conversational Agents in Mental Health

The Turing test, which can be used to determine a machine's ability to think, was first published in 1950, and it marked the beginning of the development of virtual assistants. On this subject, the journal Mind published the article Computing Machinery and Intelligence [33]. Shoebox, IBM's first virtual voice assistant, was developed in 1961. (34th) Eliza, the first robotic conversationalist, was published in 1961 [35], and Parry (Parry), a chatbot that simulates an interlocutor with a mental illness, was released in 1972 [36]. The appearance of the Mark V. Shaney bot. Shane), produced using "Markov chain" technology [37], was a watershed moment in 1984. The A. L. I. C. E. chatbot was created in 1995, and it was the first chatbot to use natural language processing (NLP) [38]. Samsung's Bixby and Yandex's Alice debuted in 2017, and Google Assistant's technology for adding a human voice to the virtual assistant [39] was released in May 2018.

While the word "chatbot" was invented in 1994, it was only twenty years later that this device became fashionable. There are several chatbots that can play chess, speak, order food delivery to your home or lunch at the office, and even call a taxi in 2018. Chatbots will assist you in selecting a tour, booking a hotel, and purchasing train or plane tickets. Robot announcers have taken over the top news shows on television and are now "writing" financial news in online industry publications. Chatbots for education are becoming increasingly common. You will take a distance learning course, read the necessary books, take exams, and complete the final exam with their assistance. Messengers (Viber, Telegram, Facebook Messenger) and online chats on websites are the primary "habitat" of chatbots [39].

According to reviews, the number of mental wellbeing and self-regulation apps for smartphones and computers has increased significantly. Chatbots are one of the unique aspects of this sector. [40] explored the use of a chatbot for patients with Parkinson's disease and autism spectrum, and [41] et al. developed an empathic chatbot for patients with psychiatric illnesses. Another notable example is Woebot, a service developed by Woebot Labs Inc. This software is focused on algorithmized cognitive behavioral therapy protocols that are used in human-bot interactions. A group of students with preclinically pronounced levels of anxiety and depressive symptoms engaged in a study by Fitzpatrick K. K. et al. [42]. The patients were given a short psychoeducation of the cognitive behavioral therapy (CBT) technique, which is widely used in psychotherapy. Then they were advised to use the Woebot software for two weeks, with the caveat that it wasn't supposed to replace therapy and that they could get help if they needed it. The authors of the report mention statistically important differences in the study group: anxiety and depression symptoms are less pronounced.

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With the widespread use of mobile devices, researchers Miner et al. [43] wondered how often the dialog agents integrated into them would assist in organising population assistance. They looked at the four most popular dialog agents for smartphones in their analysis. Easy questions about mental wellbeing, interpersonal abuse, and physical health were asked of the dialog agents by the authors. Dialog agents were found to be inefficient in offering prompt help at the time of the analysis because they did not perceive the answered questions to be symptoms of emotional or physical discomfort. When asked about the issue of suicide risk,

some of them recommended that people consult a professional. Improvements in this field, according to the authors, will aid in the use of dialog agents as a method for timely assistance, including psychiatric treatment.

## SECTION 5. Discussion

I'd like to point out that information systems are now opening up tremendous opportunities for the advancement of new or improved approaches for the diagnosis and treatment of psychiatric illnesses. The spectrum of treatments is not limited to borderline conditions, for which various psychotherapeutic techniques are actively used, but also encompasses psychotic disorders, developmental disabilities, learning disorders, alcohol and behavioral condition correction, which has consequences for the prevention and organization of medical and medical services for the general public. Along with the potential for computing technology to be helpful, there are still concerns about their regulatory oversight, since many of the approaches discussed do not meet existing requirements for medical and psychological treatment.

Some businesses show especially dangerous and socially condemned strategies for teaching the machine in their search of success in producing the ideal robot that can lead a conversation like a person. Luka, a Russian-American startup, was one of the first bot providers to benefit from the conversation of two people, one of whom died in a plane crash [44]. Luka used the distinctive characteristics of the deceased individual after analyzing the current data collection. In the same vocabulary and phrases as a once-living human, the bot appealed. During the testing of the application, the owners of the company that developed the bot allowed each person to communicate with the deceased person via a bot. This ignited a national uproar, with many users calling out the immorality of the act, as it blurred the distinction between life and death.

Chatbots are continuously being improved by technology firms all over the world, with the aim of enhancing their success in the so-called Turing Test [45]. The test is essentially an experiment in which a person sends messages to a computer and another user at the same time, then compares the responses to determine which of his interlocutors is a real person.

Nonetheless, the effect of such structures on a person's psychological status is still being discussed in society. Of course, these systems aid in the optimization of many resources' functionality, but whether these robots are suitable for humans remains unknown.

## SECTION 6. Conclusion and Future Work

In recent years, the number of virtual assistants has risen significantly across all sectors, especially in financial services and insurance. They've proven to be indispensable, lowering costs and allowing for better utilization of human resources. Mobile assistants are also being used on other computers, such as smart speakers. Similarly, chatbots that we used to connect with via messaging apps have developed into voice apps. In the long run, as technology advances, more artificial intelligence-enabled voice assistants will hit the industry, and they will be able to execute modern, more sophisticated tasks.

The human spirit is drawn to the synthesis of intellect and commitment. We have an innate need to be heard without having to listen to another soul. A significant concern is that such contact would lead to a preference for artificial intelligence relationships over real-life relationships. As a consequence, when we rely on technologies for awareness and empathy, our social lives can be severely hampered. Bots certainly assist humans in the modern world, but it is important to establish limits when interacting with artificial intelligence.

A robot cannot currently substitute a human (for example, a broadcast journalist or a copywriter) while solving tasks that need an innovative solution at the current level of artificial intelligence technology development. Furthermore, virtual interlocutors (assistants) are unable to detect irony in speech and draw original conclusions in the text they developed.

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In this study, we reviewed chatbots, conversational agents, technologies for creating conversational agents, perspectives, and ethical issues in this direction. Also considered examples of therapy that are used by psychologists and the prospects of using them in a chatbot. As a result of the review, we decided to develop a chatbot for psychological assistance using cognitive behavioral therapy.

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