

## REVIEW ARTICLE

**Artificial Intelligence: A Manifested Leap in Psychiatric Rehabilitation**Payaam Vohra<sup>1</sup>, Saba Khan<sup>2</sup>, Mohd Anas Shaikh<sup>2</sup><sup>1</sup>Department of Pharmacology, NIPER, Mohali, Punjab, India, <sup>2</sup>Department of Pharmaceutics, HKCP, Mumbai, Maharashtra, India.**Received: 08 August 2023; Revised: 25 August 2023; Accepted: 05 September 2023****ABSTRACT**

The goal of psychiatric rehabilitation is to help disabled individuals develop the emotional, social, and intellectual skills needed to live, learn, and work in the community with the least amount of professional support. This study aims to identify opportunities and utilization of AI in mental healthcare and to describe key insights from implementation science of potential relevance to understanding and facilitating AI implementation in psychiatric care. Mental health professionals are using artificial intelligence (AI) to improve the accuracy of diagnosis and treatment. Our mental health system faces significant challenges such as a shortage of psychiatrists, long wait times, and stigma. The integration of AI-grounded procedures and the Internet of things is very important in the advancement of smart and intelligent paradigms. The compilation of articles in this particular edition exemplifies the promise inherent in digital therapeutics for mental health. AI can bring about a revolutionary paradigm shift in the rehabilitation of psychiatric disorders.

**Keywords:** Artificial intelligence, avatar therapy, chatbots, CogMed, psychiatric rehabilitation, Woebot

**INTRODUCTION**

Psychiatric rehabilitation is rooted in the hope of recovery and increased quality of life for those with mental illness. To best understand psychiatric rehabilitation, we must look at the three core principle components: Emotional, social, and vocational well-being. The fostering of increased quality of life is generated by the integration of psychosocial and person-centered interventions that build skill mastery in emotional health, symptom management, social functioning, and relationship building.<sup>[1]</sup> Artificial intelligence (AI) could help alleviate this problem by providing help without any need for the patient to disclose their issue to another human being. Virtual mental health therapists or chatbots can provide mental health support, and they can also provide diagnoses and recommend therapies. Innovative technologies, such as machine learning (ML), big

data, and AI, are being adopted for personalized medicine, and psychological interventions and diagnoses are facing huge paradigm shifts.<sup>[2]</sup> In this literature review, we aim to highlight potential applications of AI in psychological interventions and diagnosis. In just over a year, nearly every part of the medical industry has been ushered into a new era of care delivery through the utilization of ML and AI. AI in psychiatry is a general term that implies the use of computerized techniques and algorithms for the diagnosis, prevention, and treatment of mental illnesses.<sup>[3,4]</sup>

**AI**

Developing machines to mimic human behavior (behaving the way a human would behave).

**ML**

A subset of AI that enables a machine to learn by looking for patterns within algorithms and trying to make predictions.

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## Deep Learning

A specific type of ML that mimics how a human brain works (thinking the way a human would think).<sup>[5,6]</sup>

At present, AI has become a hot field of technological development; in the process of returning mentally ill people to society, we can use ML, and extensive data analysis technology to build predictive models for psychological evaluation and screening based on AI technology. The “Internet plus” psychological platform can also collect big data, and establish a unique mental health data baseline for each user, to provide proper treatment and personalized services; The recurrence of mental illness can be identified, and early warning, AI and electronic intelligent devices, Psychotherapy jointly derived from computerized cognitive behavioral therapy (CBT) can also be through a variety of computer interface for psychotherapy and cognitive improvement training, we can also use for intelligent follow-up. In addition to the high accuracy of diagnostic and relapse screening, AI can do these complex tasks instead of doctors, effectively reducing costs and increasing efficiency.<sup>[7,8]</sup> Given the substantial burden that mental health issues pose in the wake of the pandemic, effectively addressing this intricate matter presents significant challenges. The scope of this predicament surpasses the capacity of psychiatrists alone or conventional treatment approaches.<sup>[9,11]</sup> The COVID-19 pandemic has had a significant impact on individuals who already struggle with mental disorders, thereby exacerbating the existing disparities within the field of mental health.<sup>[9]</sup> Scientific research has demonstrated that pandemics can trigger stress-related disorders, which was notably observed during the severe acute respiratory syndrome outbreak.<sup>[10]</sup> Consequently, the ongoing COVID-19 pandemic is anticipated to contribute to an increased occurrence of a wide range of mental disorders across different levels of severity.<sup>[11]</sup> The enforced isolation and extended quarantine measures resulting from the COVID-19 pandemic have been associated with a heightened risk of developing depression and anxiety.<sup>[12,13]</sup> Furthermore, the implementation of social distancing measures, disrupting established routines and livelihoods, has

been found to evoke feelings such as frustration, stress, boredom, decreased mood, anxiety, and depression.<sup>[14,15]</sup> Adding to these challenges, there is the potential interruption of psychiatric services, which could be classified as non-essential during these trying times.<sup>[16]</sup> The myriad of factors linked with the COVID-19 pandemic has the potential to amplify existing barriers and complexities arising from stigmatization, entrenched religious and traditional beliefs, sociocultural determinants, low literacy levels, inadequate service accessibility, and the discrimination frequently associated with mental illnesses.<sup>[17,18]</sup> It is plausible that there could be a notable rise in the incidence of post-traumatic stress disorder (PTSD) both during and after the pandemic.<sup>[19-21]</sup>

## EXPLORING THE IMPACT OF DIGITAL INNOVATIONS ON PSYCHIATRIC REHABILITATION

Recent research has undertaken a thorough investigation into the viability and effectiveness of digital interventions in managing a spectrum of mental disorders.<sup>[22-24]</sup> In the ongoing era of digital transformation, mental health care and psychiatric rehabilitation services are undergoing a rapid metamorphosis, driven by substantial datasets, formidable computing capabilities, network-driven information dissemination, and the emergence of mobile and virtual technologies. The global burden arising from mental disorders is undeniably profound, both in terms of health and societal impact.<sup>[25]</sup> A recent study, led by the World Health Organization, estimated a staggering annual cost of approximately US\$1 trillion due to lost productivity attributed to depression and anxiety disorders. This epoch of digital technologies is demonstrating significant potential in not only assessing mental health but also in delivering effective interventions.<sup>[26-28]</sup> In addition, digital technologies have the potential to widen the reach of mental health-care services, providing cost-effective access, especially beneficial for marginalized demographics and the elderly. It encompasses diverse facets, such as employing innovative measurements to gauge the efficacy of conventional interventions aimed

at alleviating stress and anxiety in special-needs children, awareness regarding advanced virtual reality (VR) technologies in psychiatric care, and an in-depth analysis of factors that hinder or facilitate technology adoption in psychiatric rehabilitation. The exploration delves into the strategic integration of digital technology into clinical practice, with an unwavering focus on delivering superlative, efficient, and timely mental health care, always prioritizing the individual's unique needs.<sup>[29-31]</sup>

The efficacy of this digital revolution within the realm of health care is largely contingent on the collaborative efforts of key stakeholders, encompassing clinicians, therapists, and service users. This concerted drive is imperative to realize a value-driven, effective, and sustainable transformation.<sup>[32-34]</sup> Consequently, a comprehensive understanding of the attitudes and perceptions of frontline personnel emerges as a crucial imperative. According to a survey notable proportion exhibited a favorable stance toward VR technology, considering it acceptable 84%, suitable as a mental health intervention 69%, and potentially feasible for seamless integration into mental health services 59%. Within the realm of mental health care, digital platforms offer an unparalleled avenue for the incorporation of digital technologies, promising expanded access and improved service delivery. However, despite the optimism expressed by frontline personnel, there exists a notable chasm between enthusiasm and practical familiarity with VR treatments in mental health. Successful integration of digital technologies in mental health necessitates a comprehensive strategy encompassing tailor-made training programs and resource development, aimed at addressing knowledge and skill gaps. Furthermore, the establishment of evidence-based practice guidelines is indispensable to navigating the ethical and safe application of therapeutic VR technology.<sup>[35-37]</sup> In addition to the exciting realm of VR technology, progress in mobile communication and AI holds tremendous potential for revolutionizing mental health care by offering real-time, up-to-date information dissemination. Ecological Momentary Assessment (EMA) and ecological momentary intervention (EMI) methodologies, facilitating repeated,

momentary data sampling, stand as powerful tools enabling time-sensitive interventions within ecological contexts over a short duration.<sup>[38-40]</sup> The ongoing endeavors aim to explore the effects of psychosocial interventions delivered through this application on the physical and psychological well-being of individuals with mental disorders across diverse age spectrums. This confluence of EMA, EMI, and AI presents an alluring prospect for a personalized paradigm of mental health care.<sup>[41-44]</sup> In summation, the evolving landscape of digital mental health interventions and technological innovation is dramatically reshaping psychiatric rehabilitation and mental health care. These advancements hold the promise of amplifying the efficacy of treatments, expanding accessibility, and optimizing patient outcomes.<sup>[45-47]</sup>

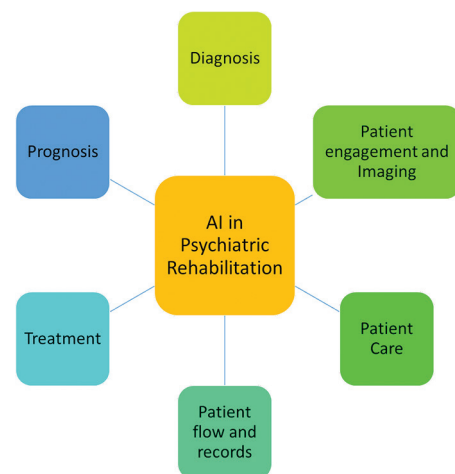
## METHODOLOGY

The 5 major areas where AI is been utilized for psychiatric care are as follows:

1. Assessment in health care
2. Chatbots and applications in health care
3. Software in rehabilitation
4. Video games applied to mental disorders
5. Neuromodulation and mental disorder.

### Chatbots and Applications in health care

The weight of mental illness affects individuals, societies, and nations at large. The onset of



**Figure 1:** Role of artificial intelligence in psychiatric rehabilitation

**Table 1:** List of AI-based technologies and their utilization in various psychiatric disorders

Sr. No	Technology	Application	References
1	Cogmed	Improves working memory and attention. It has been used in various psychiatric populations, including individuals with attention-deficit/hyperactivity disorder (ADHD) and acquired brain injuries	[72]
2	Therachat	An app designed to support therapists and clients in between sessions. It allows clients to track their moods, thoughts, and behaviors, as well as communicate with their therapists.	[73]
3	SuperBetter	The online platform that gamifies mental health stability. It provides individuals with challenges and tasks aimed at building resilience and coping skills	[74]
4	Cogstate	Computerized cognitive assessments are used in clinical trials, research, and health care. It assesses various cognitive domains and has been applied in psychiatric research involving conditions such as schizophrenia and depression	[75]
5	Talkspace	Online therapy platform that connects individuals with licensed therapists through text, audio, and video messages. It is designed to provide convenient access to therapy services	[76]
6	Mindfulness Apps (e.g., Headspace, Calm)	These apps provide guided mindfulness and meditation exercises, which are often used as adjuncts to psychiatric therapy for stress, anxiety, and mood disorders.	[77]
7	VirtualRehab	enhance motor and cognitive skills through interactive and engaging activities	[78]
8	Motion Analysis Cortex	used in rehabilitation to track and analyze a patient's movement during various exercises	[79]
9	BioSleeve	helps individuals regain hand and arm functionality after neurological injuries. The device captures muscle activity and movement, which is then used to control virtual objects in games and exercises designed for rehabilitation.	[80]
10	EndeavorRx	A prescription video game aimed at improving attention function in children with ADHD disorder. It is an approach to managing symptoms by engaging players in tasks that challenge their memory.	[81]
11.	SPARX	Help adolescents manage symptoms of depression and anxiety. It uses principles of cognitive behavioral therapy (CBT) to teach coping skills and provide a supportive environment for players	[82]

COVID-19 introduced an unparalleled challenge for medical practitioners—ensuring accessible care during a pandemic. To tackle exacerbated psychiatric symptoms and support existing mental health conditions, therapeutic tools utilizing SMS text messaging and messaging devices are under exploration. Woebot, an automated conversational app accessible through Facebook Messenger and mobile apps, automates CBT processes. It manages anxiety, depression episodes, and cognitive distortions.<sup>[29]</sup> A trial with 70 subjects showed Woebot significantly reduced depression compared to e-book reading.<sup>[30]</sup> Chatbot interaction boosting engagement could contribute to better outcomes and increased sponsorship.<sup>[31]</sup> Tess, available as a texting service, coaches emotional distress, replicating therapeutic conversations.<sup>[32]</sup> In a similar vein, avatar therapy employs novel methods to engage users. Replika, a smartphone app, fosters self-understanding.<sup>[33]</sup> Avatar Therapy uses computer-generated faces to empower schizophrenia patients to control distressing voices.<sup>[34]</sup> Apple's Siri engages with ASD children, aiding social interaction development.<sup>[35]</sup>

## Software in Rehabilitation

The field of psychiatric rehabilitation strives to empower individuals with mental illnesses to regain control over their lives, develop essential skills, and reintegrate into their communities. Software applications have emerged as potent tools in this endeavor, offering unprecedented benefits such as accessibility, scalability, and customization.<sup>[48]</sup> Following are the categories of Software in Psychiatric Rehabilitation:

- A. Therapeutic Applications: Include mindfulness and meditation apps, CBT platforms, VR exposure therapy, and emotion regulation exercises. These applications empower individuals to engage in therapeutic practices independently, supplementing traditional therapy and fostering continuous progress.<sup>[49]</sup>
- B. Telehealth Solutions: Telehealth software has redefined the accessibility of mental health services, particularly for individuals facing geographical or mobility constraints. Through video conferencing and messaging platforms,

mental health professionals can conduct therapy sessions, assessments, and follow-ups remotely. Telehealth bridges the gap between providers and clients, ensuring consistent care and support.<sup>[50]</sup>

- C. **Data Management Systems:** Efficient data management is integral to psychiatric rehabilitation programs. Software solutions for data collection, progress tracking, and outcome measurement streamline the rehabilitation process. These systems facilitate collaboration among multidisciplinary teams and enable evidence-based decision-making, ultimately elevating the quality of care delivered.<sup>[51]</sup>

### **Video Games Applied to Mental Disorders**

Video games, traditionally viewed as forms of entertainment, are now being recognized for their therapeutic potential in the realm of mental health. As mental disorders continue to pose significant challenges, innovative approaches are sought to complement conventional treatments.<sup>[52]</sup> Video games for mental disorders include Cognitive training games, such as Lumosity and CogniFit, which offer engaging exercises designed to address cognitive deficits associated with mental disorders.<sup>[53]</sup> VR Exposure Therapy games have shown promise in exposure therapy for anxiety disorders, phobias, and PTSD.<sup>[54]</sup> Games such as “Spider World” and “Fear of Heights VR” enable controlled exposure to feared stimuli, facilitating desensitization and anxiety reduction.<sup>[55]</sup> Mindfulness and relaxation games, including “Journey” and “Flowy,” guide players through relaxation techniques, deep breathing, and meditation exercises.<sup>[56]</sup> These games offer potential benefits for stress reduction, anxiety management, and emotional regulation. Video games with social interaction components, like “Minecraft” and “Second Life,” provide platforms for practicing social interactions and enhancing social skills.<sup>[57]</sup> These games are particularly relevant for individuals with social anxiety and autism spectrum disorders.<sup>[58]</sup>

The incorporation of video games into mental health interventions enhances user engagement and

motivation due to their interactive and immersive nature.<sup>[59]</sup> Personalization options enable tailored interventions, and the inherent reward systems in games can reinforce positive behaviors and progress.<sup>[60]</sup> Future Directions: The future of therapeutic video games for mental disorders holds promising opportunities with advances in technology, such as AI-driven adaptive games and neurofeedback integration, which could enhance the precision and efficacy of interventions. Further research collaborations between game developers, mental health professionals, and researchers are needed to establish the credibility and effectiveness of these interventions.<sup>[61,62]</sup>

### **Neuromodulation and Mental Disorders**

AI algorithms analyze diverse patient data to develop personalized treatment plans, optimizing the selection of neuromodulation techniques based on individual profiles and responses.<sup>[63]</sup> AI models predict relapse risks and treatment outcomes, aiding clinicians in devising proactive strategies to prevent relapses and optimize neuromodulation protocols.<sup>[64]</sup> Cognitive training applications enhance the efficacy of neuromodulation by tailoring interventions to individual cognitive deficits, promoting optimal neural plasticity.<sup>[65]</sup> Advanced AI techniques analyze neuroimaging data to identify dysfunctional brain networks, guiding the selection of targeted neuromodulation sites.<sup>[66]</sup> AI algorithms optimize stimulation parameters in real time, adapting DBS settings based on fluctuations in neural activity and symptom severity.<sup>[67]</sup> The integration of AI and neuromodulation enables precise tailoring of interventions, enhancing treatment outcomes by considering individuals accordingly and response patterns.<sup>[68]</sup> Algorithms identify subtle changes in neural patterns, allowing for early detection of symptom exacerbation and timely intervention.<sup>[69]</sup> AI Driven neuromodulation including data handling and management can have certain ethical implications if not handled well.<sup>[70]</sup> Effective integration of AI and neuromodulation demands clinician training to interpret AI-driven insights and adapt interventions accordingly.<sup>[71]</sup> Figure 1 represents a wide array of activities that

revolve around Artificial Intelligence and elucidate the interplay of Psychiatric Rehabilitation and A.I. Table 1 incorporates role of various AI based applications currently being used and also describes the list of software used for psychiatric rehabilitation.

## CONCLUSION

AI stands as a cornerstone of the upcoming digital revolution. In this study, we had a glimpse of what is to come in the next few years and will drive healthcare systems to adapt their structures and procedures to advance in the provision of mental health services. The landscape of mental health services is being redefined on a global scale by digital technologies. This study mainly introduces the development of AI and the current plight of mentally ill people in the world. The forthcoming journey entails bridging the knowledge-implementation gap, refining deployment strategies, and harnessing technology's transformative potential to offer comprehensive mental health support.

## AUTHOR CONTRIBUTIONS

PV- Study Conception and Literature Review.  
SK- Data Collection and Fabricating article.  
Md.AS- Proof Reading and Plagiarism.

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There are no sources of funding to declare.

## CONFLICT OF INTEREST

The author(s) declare no conflict of interest.

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