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Artificial Intelligence and Cognitive Behavioral Therapy: A New Direction in Mental Health Care - A Systematic Literature Review

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ABSTRACT

Artificial Intelligence (AI) is transforming mental healthcare by improving the accessibility, personalization, and efficiency of psychological interventions. Among various psychotherapeutic approaches, Cognitive Behavioral Therapy (CBT) has emerged as one of the most suitable frameworks for AI integration due to its structured, evidence-based nature. This systematic literature review (SLR) synthesizes current evidence on the application of AI in CBT, with particular emphasis on conversational agents, machine learning, natural language processing (NLP), and personalized mental health interventions. The review was conducted following the PRISMA 2020 guidelines, using peer-reviewed studies retrieved from Scopus, PubMed, Web of Science, PsycINFO, IEEE Xplore, and ScienceDirect. Studies published between 2015 and 2025 that examined AI-assisted CBT interventions for mental health were included. The findings indicate that AI-powered chatbots and intelligent decision-support systems can effectively deliver psychoeducation, cognitive restructuring, behavioural activation, and continuous symptom monitoring, leading to improvements in depression, anxiety, stress, and treatment engagement. However, challenges related to data privacy, algorithmic bias, explainability, and the limited ability of AI to establish therapeutic relationships remain significant barriers to widespread clinical implementation. The review concludes that AI should complement rather than replace mental health professionals. Future research should focus on explainable AI, culturally adaptive interventions, long-term clinical evaluation, and ethically responsible deployment of AI-assisted psychotherapy.

Keywords: Artificial Intelligence, Cognitive Behavioral Therapy, Machine Learning, Mental Health, Natural Language Processing

Mental health disorders have become a major global public health concern, affecting individuals' emotional well-being, quality of life, and productivity.

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According to the World Health Organization (WHO, 2022), approximately one in eight people worldwide lives with a mental disorder, with depression and anxiety being among the most prevalent conditions. Despite the growing demand for psychological services, access to timely and evidence-based mental healthcare remains limited due to shortages of trained professionals, financial constraints, geographical disparities, and persistent social stigma (WHO, 2022). Consequently, digital technologies have gained increasing attention as potential solutions for improving the accessibility and delivery of mental health services.

Artificial Intelligence (AI) has emerged as one of the most transformative technologies in modern healthcare. AI refers to computer systems capable of performing tasks that typically require human intelligence, including learning, reasoning, decision-making, language processing, and pattern recognition (Russell & Norvig, 2021). Recent advances in machine learning (ML), natural language processing (NLP), and large language models have expanded the application of AI across various healthcare domains, including disease diagnosis, clinical decision support, personalized medicine, and mental health care (Topol, 2019; Jiang et al., 2017). In psychology, AI is increasingly being utilized for early detection of mental health problems, symptom monitoring, risk prediction, and delivery of digital therapeutic interventions (Beg et al., 2024).

Among evidence-based psychotherapies, Cognitive Behavioral Therapy (CBT) is considered particularly suitable for AI integration because of its structured, goal-oriented, and standardized therapeutic framework. Developed by Beck (1976), CBT focuses on identifying and modifying maladaptive thoughts and behaviours that contribute to psychological distress. Through techniques such as cognitive restructuring, behavioural activation, self-monitoring, and problem-solving, CBT has demonstrated effectiveness in treating depression, anxiety disorders, stress-related conditions, and several other psychological disorders (Beck, 2011; Hofmann et al., 2012). Its structured nature makes CBT highly adaptable to digital platforms and AI-assisted interventions.

Recent technological developments have facilitated the emergence of AI-powered CBT applications, including intelligent conversational agents and mental health chatbots such as Woebot, Wysa, and Youper. These systems employ machine learning and natural language processing to engage users in interactive conversations, monitor mood, provide psychoeducation, guide cognitive restructuring exercises, and encourage behavioural activation. Unlike conventional computerized CBT programmes that follow fixed treatment pathways, AI-assisted systems can personalize therapeutic content according to users' emotional states, behavioural patterns, and treatment progress, thereby improving engagement and accessibility (Fitzpatrick et al., 2017; Farzan et al., 2025).

Although the integration of AI with CBT offers considerable opportunities, important concerns remain regarding its clinical effectiveness, ethical implications, transparency, privacy, and long-term sustainability. Existing studies report encouraging outcomes for reducing symptoms of depression and anxiety; however, substantial variation exists in research designs, AI technologies, participant characteristics, and outcome measures (Zhong et al., 2024; Villarreal-Zegarra et al., 2024). Furthermore, AI systems cannot fully replicate empathy, therapeutic alliance, ethical judgement, and contextual understanding that characterize human psychotherapy. Therefore, a comprehensive synthesis of current evidence is necessary to evaluate both the potential and limitations of AI-assisted CBT.

Accordingly, the present systematic literature review aims to synthesize recent evidence regarding the application of Artificial Intelligence in Cognitive Behavioral Therapy. Specifically, the review examines AI-powered chatbots, machine learning, natural language processing, clinical effectiveness, ethical challenges, and future directions. By integrating findings from multidisciplinary research, this review seeks to provide researchers, clinicians, educators, and policymakers with a comprehensive understanding of how AI is reshaping evidence-based psychological interventions.

This review contributes to the growing literature on Artificial Intelligence in psychotherapy by systematically synthesizing recent evidence on AI-assisted Cognitive Behavioral Therapy. Unlike previous reviews focusing on a single AI technology or specific mental disorders, the present review integrates evidence related to AI-powered chatbots, machine learning, natural language processing, clinical effectiveness, and ethical considerations within a single framework. The findings provide researchers, clinicians, and policymakers with an updated understanding of current developments, research gaps, and future directions in AI-enabled mental healthcare.

Research Objectives

The present systematic literature review aims to synthesize existing evidence on the integration of Artificial Intelligence (AI) into Cognitive Behavioral Therapy (CBT). The specific objectives are:

1. To examine the current applications of Artificial Intelligence in Cognitive Behavioral Therapy.
2. To identify the role of AI technologies, including chatbots, machine learning, and natural language processing, in supporting CBT interventions.
3. To evaluate the clinical effectiveness of AI-assisted CBT in improving mental health outcomes.
4. To examine the ethical, legal, and practical challenges associated with AI-assisted psychotherapy.
5. To identify research gaps and propose future directions for AI-enabled Cognitive Behavioral Therapy.

Research Questions

Based on these objectives, the review addresses the following research questions:

- RQ1. How is Artificial Intelligence currently being applied in Cognitive Behavioral Therapy?
- RQ2. What roles do AI-powered chatbots, machine learning, and natural language processing play in CBT interventions?
- RQ3. How effective is AI-assisted CBT in improving mental health outcomes?
- RQ4. What ethical and practical challenges are associated with AI-assisted Cognitive Behavioral Therapy?
- RQ5. What are the major research gaps and future directions in this field?

METHODOLOGY

Research Design

This study employed a Systematic Literature Review (SLR) design to synthesize existing evidence on the application of Artificial Intelligence (AI) in Cognitive Behavioral Therapy (CBT). The review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) guidelines to ensure a transparent, systematic, and reproducible review process (Page et al., 2021). The review aimed to identify, evaluate, and synthesize peer-reviewed studies examining AI-assisted CBT interventions, their clinical effectiveness, technological advancements, and associated ethical challenges.

Search Strategy

A comprehensive literature search was conducted across six electronic databases: Scopus, PubMed, Web of Science, PsycINFO, IEEE Xplore, and ScienceDirect. Studies published between January 2015 and March 2025 were considered to capture recent developments in AI-assisted psychotherapy. The search combined keywords using Boolean operators, including: "Artificial Intelligence", "Cognitive Behavioral Therapy", "Machine Learning", "Natural Language Processing", "Mental Health", "Psychotherapy", and "Chatbots". Reference lists of relevant review articles were also examined to identify additional eligible studies.

Table 1

Search Strategy

Database	Keywords Used
Scopus, PubMed, Web of Science, PsycINFO, IEEE Xplore, ScienceDirect	("Artificial Intelligence" OR "Machine Learning" OR "Natural Language Processing" OR Chatbot*) AND ("Cognitive Behavioral Therapy" OR CBT) AND ("Mental Health" OR Psychotherapy)

Eligibility Criteria

Studies were included if they:

- were published in peer-reviewed journals between 2015 and 2025;
 - were written in English;
 - examined AI applications in Cognitive Behavioral Therapy or AI-supported psychological interventions; and
 - reported empirical findings, systematic reviews, or meta-analyses relevant to mental health.
- Studies were excluded if they were conference abstracts, editorials, dissertations, book chapters, non-English publications, or focused on AI applications unrelated to psychotherapy.

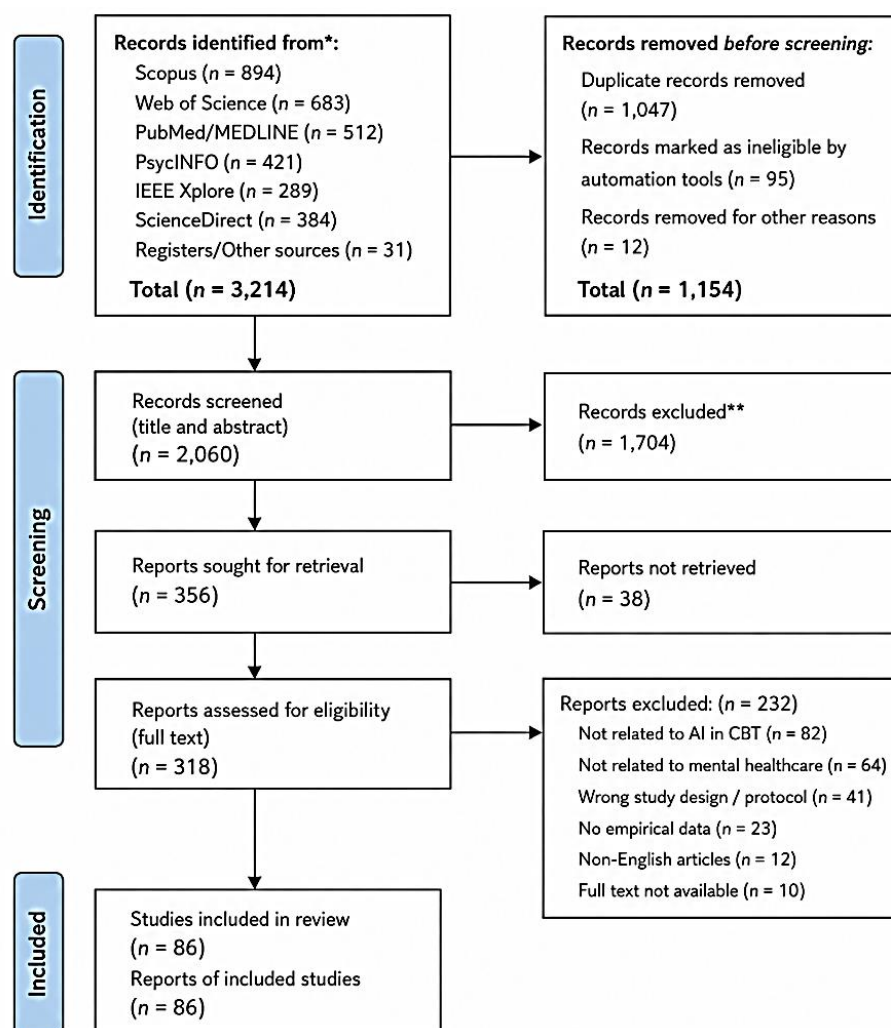
Table 2
Inclusion and Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
Peer-reviewed journal articles	Conference abstracts
English-language publications	Editorials and opinion papers
Published between 2015–2025	Book chapters and dissertations
AI applications in CBT or psychotherapy	Studies unrelated to mental health

Study Selection and Data Extraction

The study selection process followed the PRISMA 2020 framework. After removing duplicate records, titles and abstracts were screened against the eligibility criteria. Potentially relevant articles underwent full-text assessment, and studies meeting all inclusion criteria were retained for qualitative synthesis. Relevant information extracted from each study included author(s), publication year, country, study design, AI technology, target population, intervention characteristics, and key findings. The extracted evidence was synthesized thematically to identify major trends in AI-assisted Cognitive Behavioral Therapy.

Figure 1. PRISMA 2020 Flow Diagram



RESULTS

Following the PRISMA 2020 screening process, the eligible studies were reviewed and synthesized thematically. The included studies examined various applications of Artificial Intelligence (AI) in Cognitive Behavioral Therapy (CBT), including AI-powered chatbots, machine learning-based personalization, natural language processing (NLP), clinical effectiveness, and ethical considerations. Table 3 presents the characteristics of representative studies included in this review.

Table 3

Characteristics of Representative Studies Included in the Review

Author(s)	Year	Study Design	AI Technology	Mental Health Focus	Major Findings
Fitzpatrick, Darcy, & Vierhile	2017	Randomized Controlled Trial	Woebot (AI Chatbot)	Depression & Anxiety	AI chatbot significantly reduced symptoms of depression and anxiety among young adults.
Inkster, Sarda, & Subramanian	2018	Observational Study	Wysa Chatbot	Depression & Stress	Users reported improved emotional well-being and high engagement with chatbot-based CBT.
Abd-Alrazaq et al.	2020	Systematic Review	AI Chatbots	Mental Health	Chatbots showed potential for improving mental health, although stronger clinical evidence was recommended.
Page et al.	2021	PRISMA Guideline	Review Methodology	Systematic Reviews	Updated PRISMA 2020 guidelines improved transparency and reporting quality.
Beg et al.	2024	Narrative Review	AI in Psychotherapy	General Mental Health	AI supports psychotherapy through NLP, ML, and conversational agents but raises ethical concerns.
Zhong et al.	2024	Systematic Review & Meta-analysis	AI Chatbots	Depression & Anxiety	AI chatbot interventions demonstrated significant short-term improvements in depression and anxiety.
Farzan et al.	2025	Systematic Review	AI-assisted CBT	Mental Health	AI enhances accessibility and personalization but should complement rather than replace therapists.

AI-Powered Chatbots in Cognitive Behavioral Therapy

AI-powered chatbots represent the most extensively studied application of Artificial Intelligence in Cognitive Behavioral Therapy. These conversational systems employ natural language processing and machine learning algorithms to simulate therapeutic conversations, deliver psychoeducation, facilitate cognitive restructuring, encourage behavioural activation, and monitor users' emotional well-being. Popular AI-based platforms such as Woebot and Wysa have demonstrated promising outcomes in improving access to psychological support while reducing barriers associated with traditional face-to-face therapy (Fitzpatrick et al., 2017; Inkster et al., 2018).

The reviewed studies consistently indicate that chatbot-assisted CBT is particularly effective for individuals experiencing mild to moderate symptoms of depression and anxiety. Users reported high satisfaction due to immediate availability, anonymity, and ease of access. However, the evidence also suggests that chatbots should function as supportive tools rather than substitutes for professional therapists, particularly in cases involving severe mental illness or suicide risk (Abd-Alrazaq et al., 2020; Zhong et al., 2024).

Machine Learning for Personalized Cognitive Behavioral Therapy

Machine learning (ML) has emerged as an important component of AI-assisted Cognitive Behavioral Therapy by enabling personalized psychological interventions. Unlike conventional computerized CBT, ML algorithms analyse behavioural patterns, symptom severity, treatment adherence, and user interactions to recommend individualized therapeutic strategies. The reviewed studies suggest that ML can support symptom prediction, relapse prevention, and adaptive treatment planning, thereby improving the efficiency and responsiveness of digital mental health interventions (Topol, 2019; Farzan et al., 2025).

Recent evidence also indicates that ML-based systems can identify individuals at risk of treatment dropout and recommend timely interventions to improve engagement. Despite these advantages, concerns remain regarding algorithmic bias, limited transparency, and the need for diverse training datasets. Consequently, current evidence supports the use of ML as a clinical decision-support tool rather than an autonomous therapeutic system (Beg et al., 2024; Topol, 2019).

Natural Language Processing and Emotion Recognition

Natural Language Processing (NLP) enables AI systems to understand and analyse users' language during therapeutic interactions. NLP-based applications identify emotional expressions, negative thinking patterns, and cognitive distortions, allowing AI-assisted CBT platforms to provide personalized therapeutic feedback. Several studies have demonstrated that NLP can facilitate continuous mood monitoring and early identification of depressive and anxiety-related symptoms, thereby enhancing the effectiveness of digital psychotherapy (Beg et al., 2024; Zhong et al., 2024).

However, the reviewed literature also highlights important limitations. Emotional expression varies across cultures and individuals, making accurate interpretation difficult in some contexts. Therefore, NLP-based systems should complement professional clinical judgement rather than replace therapist-patient interactions.

Clinical Effectiveness of AI-Assisted CBT

Overall, the reviewed literature indicates that AI-assisted CBT produces favourable outcomes for individuals experiencing mild to moderate depression and anxiety. Randomized controlled trials and systematic reviews consistently report improvements in symptom reduction, psychological well-being, treatment adherence, and user engagement following AI-supported interventions (Fitzpatrick et al., 2017; Zhong et al., 2024).

Nevertheless, the evidence also demonstrates considerable methodological heterogeneity across studies, including differences in AI technologies, intervention duration, participant characteristics, and outcome measures. Consequently, while AI-assisted CBT represents a promising approach, current evidence suggests that it is most effective when integrated with therapist-guided care rather than delivered as a fully autonomous intervention (Farzan et al., 2025).

Ethical Challenges and Future Directions

The integration of AI into psychotherapy raises important ethical, legal, and practical concerns. The reviewed studies consistently identify data privacy, confidentiality, algorithmic bias, explainability, and accountability as major challenges affecting the implementation of AI-assisted CBT. Since these systems process sensitive psychological information, maintaining secure data management and transparent AI decision-making is essential for responsible clinical practice (Beg et al., 2024).

Future research should focus on large-scale randomized controlled trials, culturally adaptive AI models, explainable artificial intelligence (XAI), and stronger ethical governance frameworks. The literature consistently supports the development of hybrid human–AI models, where AI enhances accessibility, efficiency, and personalization while qualified mental health professionals remain responsible for clinical judgement, empathy, and crisis management (Farzan et al., 2025).

Table 4

AI Technologies and Their Applications in Cognitive Behavioral Therapy

AI Technology	Primary Application in CBT	Reported Benefits	Key Limitations
AI Chatbots	Psychoeducation, mood monitoring, cognitive restructuring	Improved accessibility, user engagement, and self-management	Limited empathy and crisis management
Machine Learning	Personalized treatment planning and symptom prediction	Adaptive interventions and relapse prediction	Algorithmic bias and limited explainability
Natural Language Processing	Emotion recognition and cognitive distortion detection	Personalized feedback and continuous monitoring	Difficulty interpreting contextual and cultural language
Predictive Analytics	Risk assessment and treatment adherence	Early identification of relapse and dropout risk	Requires high-quality longitudinal data
Generative AI	Conversational support and self-help guidance	Immediate responses and scalable psychological support	Risk of inaccurate or inappropriate responses without human oversight

DISCUSSION

The present review demonstrates that Artificial Intelligence has emerged as a valuable adjunct to Cognitive Behavioral Therapy by improving the accessibility, scalability, and personalization of evidence-based psychological interventions. Across the reviewed studies, AI-powered chatbots, machine learning, and NLP consistently supported core CBT components such as psychoeducation, cognitive restructuring, behavioural activation, and symptom monitoring. These findings align with the broader movement toward digital mental healthcare, where technology is used to extend, rather than replace, conventional psychological services (Beg et al., 2024; Farzan et al., 2025).

The evidence further suggests that AI-assisted CBT is particularly beneficial for individuals with mild to moderate depression and anxiety, especially in situations where access to mental health professionals is limited. However, the review also highlights that current AI systems cannot replicate the therapeutic alliance, empathy, contextual understanding, and ethical judgement provided by trained clinicians. Therefore, the most effective approach appears to be a hybrid care model, in which AI enhances routine therapeutic processes while mental health professionals retain responsibility for diagnosis, treatment planning, and crisis intervention (Fitzpatrick et al., 2017; Zhong et al., 2024).

Despite encouraging findings, several research gaps remain. Many studies included relatively small samples, short intervention periods, and limited cultural diversity, restricting the generalizability of findings. Future investigations should emphasize multicentre randomized controlled trials, standardized outcome measures, explainable AI, and culturally sensitive intervention designs. Addressing these issues will strengthen the evidence base and facilitate the responsible integration of AI into routine psychological practice.

CONCLUSION

Artificial Intelligence (AI) is reshaping the delivery of Cognitive Behavioral Therapy (CBT) by improving the accessibility, personalization, and scalability of evidence-based psychological interventions. The findings of this systematic literature review indicate that AI-powered chatbots, machine learning algorithms, and natural language processing technologies can effectively support core CBT components, including psychoeducation, cognitive restructuring, behavioural activation, and symptom monitoring. These technologies have shown promising outcomes in reducing symptoms of depression and anxiety while increasing user engagement and expanding access to mental health services, particularly in resource-constrained settings (Fitzpatrick et al., 2017; Zhong et al., 2024).

However, the review also highlights that AI cannot replace essential human elements of psychotherapy, such as empathy, therapeutic alliance, ethical judgement, and crisis management. Challenges related to data privacy, algorithmic bias, transparency, and clinical accountability remain significant barriers to the widespread adoption of AI-assisted CBT (Beg et al., 2024). Therefore, AI should be viewed as a complementary tool that enhances the efficiency of mental healthcare while qualified mental health professionals continue to provide clinical expertise and patient-centred care.

Overall, the future of AI-assisted Cognitive Behavioral Therapy lies in the development of ethical, explainable, and culturally adaptive hybrid care models that combine technological innovation with professional psychological practice. Continued interdisciplinary research and rigorous clinical evaluation will be essential for ensuring the safe, effective, and responsible integration of AI into mental healthcare.

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