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DIGITAL MENTAL HEALTH INTERVENTIONS: ASSESSING THE EFFICACY OF AI-BASED THERAPY FOR GENERALIZED ANXIETY DISORDER

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Abstract
This research paper investigates the efficacy of AI-based therapy in managing Generalized Anxiety Disorder (GAD) and compares its effectiveness with traditional therapist-led Cognitive Behavioral Therapy (CBT). With the increasing prevalence of anxiety disorders and limited access to professional mental health services, AI-driven interventions have emerged as a promising alternative. However, their therapeutic potential, long-term impact, and ethical implications remain underexplored. The primary objective of this study is to evaluate AI-based therapy's ability to reduce GAD symptoms, assess patient engagement and adherence, and examine ethical considerations related to digital mental health interventions. To achieve this, the study employs mixed-methods research design, incorporating both quantitative and qualitative approaches. A randomized controlled trial (RCT) was conducted with 200 participants diagnosed with GAD, divided into two groups: one receiving AI-based therapy and the other undergoing traditional CBT. Standardized anxiety assessment tool, the GAD-7 scale measured symptom changes in pre- and post-intervention scores. Additionally, user engagement data (session completion rates, dropout rates) and qualitative feedback from participant interviews offered insights into patient experiences and satisfaction. By analyzing the effectiveness and limitations of AI-driven mental health interventions, this research contributes to the evolving landscape of digital mental healthcare. The findings would inform clinicians, policymakers, and AI developers on the role of artificial intelligence in mental health treatment, highlighting its potential to enhance accessibility while addressing ethical and therapeutic challenges.

INTRODUCTION

Mental health disorders, particularly Generalized Anxiety Disorder (GAD), are increasingly prevalent worldwide. Traditional therapeutic approaches such as Cognitive Behavioral Therapy (CBT) and pharmacological treatments have proven effective (Mursaleen & Ali, 2015; Mursaleen & Ali 2023; Mursaleen, Shaikh, & Imtiaz, 2025), yet accessibility and affordability remain major concerns. In recent years, Artificial Intelligence (AI)-based digital interventions have emerged as a potential solution for bridging the mental health treatment gap. AI-powered therapy, including chatbots, cognitive

restructuring tools, and digital cognitive-behavioral interventions, has gained attention for its scalability and accessibility. However, the efficacy of these interventions in treating GAD remains a critical research gap (Mursaleen, 2023; Asmatullah et al., 2024; Mursaleen, Khan, Sohail, & Batool, 2024; Tariq et al., 2023). This study aims to assess the effectiveness of AI-based therapy for individuals with GAD, comparing its outcomes with conventional therapeutic methods. It will explore user engagement, symptom reduction, and long-term effectiveness, providing empirical evidence for the role of AI in mental health treatment.

In recent years, mental health disorders have become a global crisis, with anxiety disorders ranking among the most prevalent psychological conditions (Mursaleen, Shaikh, & Imtiaz, 2025). Generalized Anxiety Disorder (GAD), characterized by excessive worry, persistent fear, and emotional distress, affects millions worldwide, significantly impairing daily functioning and quality of life. Traditional treatment methods such as Cognitive Behavioral Therapy (CBT) and pharmacological interventions have proven effective, yet their accessibility remains a major challenge due to financial constraints, therapist shortages, and social stigma. These barriers necessitate innovative solutions to bridge the mental healthcare gap (Mursaleen, 2023).

The advent of Artificial Intelligence (AI) has opened new avenues in digital mental health interventions. AI-driven therapy, delivered through chatbots, mobile applications, and digital cognitive restructuring tools, offers an accessible, scalable, and cost-effective alternative to conventional therapy. AI-powered mental health platforms such as Woebot, Wysa, and Replika have gained traction, providing structured, evidence-based interventions designed to support individuals struggling with anxiety (Fitzpatrick et al., 2017). However, despite the growing use of AI in mental healthcare, its efficacy in treating GAD remains underexplored, raising critical questions about its therapeutic effectiveness, user engagement, and long-term impact. This research is significant for multiple stakeholders, including mental health professionals, AI developers, healthcare policymakers, and individuals suffering from GAD. The study will provide empirical data on AI-based therapy's effectiveness, informing decisions on its integration into mainstream mental healthcare. Additionally, it will contribute to ethical discussions surrounding AI in psychology, highlighting potential risks and proposing guidelines for responsible AI use. This research may offer insights into whether AI can supplement traditional therapy, reducing the burden on mental health professionals and expanding access to care for clinical psychologists. For technology developers, the findings will help refine AI-driven mental health solutions, ensuring they align with clinical standards and ethical principles. Finally, for individuals experiencing anxiety, this study will assess whether AI-based therapy can serve as a reliable and accessible self-help tool.

In short, this study will focus on AI-driven therapy for Generalized Anxiety Disorder and will not extend to other mental health conditions such as depression or PTSD. The research will compare AI-based interventions primarily with Cognitive Behavioral Therapy (CBT) rather than pharmacological treatments. Additionally, while the study will analyze short-term efficacy, long-term effects will not be extensively covered. Future research could build upon these findings by conducting longitudinal studies on AI therapy's sustainability. AI-driven mental health interventions have the potential to revolutionize mental healthcare by offering accessible and scalable solutions for individuals suffering from anxiety disorders. However, their effectiveness, ethical implications, and role in therapy require thorough investigation. By systematically evaluating AI-based therapy for GAD, this study aims to provide valuable insights into its benefits, limitations, and future role in mental healthcare. The findings will contribute to the ongoing discourse on digital mental health, shaping future innovations in AI-driven psychological support.

Significance of Research

This research holds substantial significance in the fields of mental health, artificial intelligence, and digital healthcare. By assessing the efficacy of AI-based therapy for Generalized Anxiety Disorder (GAD), this study contributes to the ongoing discourse on the role of technology in mental health treatment.

Millions of people worldwide lack access to mental health services due to factors such as high costs,

stigma, and a shortage of trained therapists. AI-based therapy offers a scalable, cost-effective alternative that can reach individuals who might not otherwise seek help. This study will provide empirical evidence on whether AI-driven interventions can serve as viable substitutes or complements to traditional therapy. Moreover, with the rise of telemedicine and digital health platforms, AI-based therapy is becoming an integral part of mental healthcare. This research will help refine AI-driven interventions by identifying their strengths, limitations, and areas for improvement, ultimately contributing to the development of more effective mental health technologies. Furthermore, despite the increasing use of AI in mental health, there is limited large-scale empirical research on its effectiveness compared to human-led therapy. This study will fill this gap by systematically evaluating AI's impact on anxiety symptoms, patient engagement, and long-term treatment outcomes. If AI-based therapy proves effective, it could lead to the development of hybrid mental health models that integrate AI tools with human therapists, enhancing both accessibility and treatment quality. The findings from this research will provide insights into how AI can complement, rather than replace, traditional therapeutic approaches. AI-driven mental health interventions are still evolving. This study's findings will inform future AI development, helping technology companies and healthcare innovators design more personalized, responsive, and effective digital mental health solutions. For individuals experiencing anxiety, AI-based therapy could serve as an accessible self-help tool, providing immediate support and coping strategies. This research will help determine whether AI can empower individuals to manage their anxiety more effectively and independently.

TAR tools like Applicant Tracking Systems (ATS), artificial intelligence (AI), and chatbots help manage large applicant pools, reduce administrative burdens, and allow human resource professionals to focus on strategic tasks like decision-making and candidate engagement. Automation and process efficiency within TAR are also examined, with algorithms like Natural Language Processing (NLP) and Natural Language Generation (NLG) enhancing productivity and identifying the best-fit candidates. TAR tools also enhance the quality of hiring decisions by providing objective insights to mitigate biases in recruitment, leading to more informed and equitable hiring practices. The study highlights the need for transparent, well-designed systems that ensure fairness and maintain the confidence of candidates and recruiters, ultimately driving organizational success. (Surahio, Rashidi, Nadeem, 2025)

In short, this study is significant not only for mental health research but also for the broader fields of AI ethics, healthcare policy, and digital health innovation. By assessing AI-based therapy's efficacy and limitations, this research will pave the way for more effective, accessible, and ethically responsible mental health interventions in the digital age.

Problem Statement

While AI-based therapy is increasingly integrated into mental healthcare, there is limited empirical evidence on its effectiveness compared to traditional therapeutic approaches. AI-driven interventions claim to provide real-time psychological support, but can they match the depth, empathy, and adaptability of human-led therapy? Furthermore, concerns regarding data privacy, ethical implications, and the risk of emotional detachment in AI-driven therapy warrant thorough investigation. This study aims to assess whether AI-based therapy is a viable alternative to traditional therapy for GAD by evaluating its effectiveness in symptom reduction, user engagement, and patient adherence. The research will also examine ethical considerations and potential risks associated with AI-driven mental health interventions.

Research Questions

How effective are AI-based digital mental health interventions in reducing GAD symptoms?

How do the outcomes of AI-based therapy compare with traditional face-to-face therapy?

What factors influence user engagement and adherence to AI-based interventions?

What ethical and privacy concerns arise in AI-driven mental health treatment?

Research Objectives

To evaluate the efficacy of AI-based digital therapy in reducing symptoms of Generalized Anxiety Disorder.

To compare AI-based therapy with traditional therapeutic interventions, particularly CBT.
To analyze patient engagement, adherence, and satisfaction with AI-based therapy.
To explore the ethical considerations and potential risks associated with AI-driven mental health interventions.

Literature Review

The advent of digital mental health interventions has revolutionized the landscape of mental health treatment (Shahzad et al, 2023; Mursaleen, Kamrani, & Zia, 2024), particularly in the management of Generalized Anxiety Disorder (GAD). AI technologies in mental health primarily utilize tools such as chatbots, cognitive-behavioral therapy (CBT) modules, and machine learning algorithms to offer tailored therapeutic experiences (Fitzpatrick et al., 2017). One of the most significant advancements in AI for GAD management is the development of AI-based CBT platforms. A study by Andersson et al. (2014) highlighted that AI-driven CBT has been shown to be effective in reducing anxiety symptoms, with results comparable to traditional therapy. In their study, participants who engaged in AI-based CBT reported significant reductions in GAD symptoms after completing the intervention, emphasizing its potential as an accessible and scalable alternative to conventional therapies (Andersson et al., 2014). These findings were reinforced by Hollis et al. (2015), who noted that AI platforms offer patients greater accessibility, affordability, and anonymity, particularly for those unable or unwilling to access traditional in-person therapy. Despite the promising results, limitations of AI therapy persist. While AI-driven therapies can effectively target anxiety symptoms, they are often criticized for lacking emotional intelligence, which is a key element in human-led therapeutic interventions (Stoll et al., 2018). User engagement also remains a challenge. According to Fitzpatrick et al. (2017), dropout rates in digital therapy platforms are substantially higher compared to traditional CBT. This may be due to the impersonal nature of AI-driven interactions, which may hinder the development of the therapeutic alliance that is crucial for long-term treatment adherence and emotional healing (Gould et al., 2019). In comparison, traditional CBT, while effective, can be constrained by factors such as cost, availability, and the stigma associated with seeking help for anxiety (Cuijpers et al., 2016). AI-based therapies have the potential to mitigate these barriers, especially when integrated into hybrid models that combine human therapist support with AI guidance. Several studies suggest that AI could enhance the effectiveness of CBT when used alongside human interventions, by offering personalized feedback, monitoring progress, and providing real-time coping strategies (Kuhn et al., 2019). Furthermore, the ethical implications of AI in mental health have been explored extensively in recent years. Privacy concerns, particularly in the collection and storage of sensitive patient data, remain a significant barrier to broader adoption (Yuan et al., 2020). Researchers like Karr-Wisniewski et al. (2021) have stressed the need for clear data privacy regulations to ensure that digital mental health interventions remain trustworthy. Furthermore, the ability of AI platforms to respond to mental health crises, such as suicidal ideation, is an area of ongoing development. Current AI models often fail to recognize signs of acute distress, which raises concerns about their efficacy in high-risk populations (Miklowitz & Porta, 2019).

Research Methodology

This study used a mixed-methods approach, incorporating both quantitative and qualitative analysis. A randomized controlled trial (RCT) has been conducted to assess the effectiveness of AI-based therapy. The sample for this research was comprised of 200 adults diagnosed with Generalized Anxiety Disorder (GAD) who were divided into two groups. Group A received AI-based therapy (e.g., an AI-powered chatbot providing CBT) and Group B that received traditional therapist-led CBT. The data had been collected through pre- and post-Intervention assessments. Standardized anxiety scale (GAD-7) had been used to measure symptom severity before and after therapy. User Engagement Analysis was performed for session completion rates, response times, and dropout rates. Qualitative feedback was also taken from participants through interviews and survey questions that provided insights into user experience, satisfaction, and perceived effectiveness. The data was analyzed through both qualitative and

quantitative methods. In quantitative approach, the mean reduction in GAD-7 scores between AI-based therapy and CBT groups was compared by utilizing independent samples t-test. In qualitative method, thematic analysis was used to interpret participant feedback and engagement patterns. AI-based mental health interventions hold significant promise in addressing the growing burden of anxiety disorders. By systematically evaluating their efficacy, this research was intended to contribute to the evolving landscape of digital mental health solutions. The findings provided implications for policymakers, mental health practitioners, and technology developers seeking to integrate AI into mental healthcare.

Discussion & Analysis

This study employed mixed-methods integrating quantitative and qualitative approaches to assess the efficacy of AI-based therapy for Generalized Anxiety Disorder (GAD). A randomized controlled trial (RCT) was conducted with 200 participants, divided into two groups: one receiving AI-based therapy and the other undergoing traditional Cognitive Behavioral Therapy (CBT). Standardized anxiety assessment tool, the GAD-7 scale provided pre and post-test scores on symptom severity before and after the intervention. Additionally, user engagement data and qualitative feedback through interviews provided insights into patient experience and satisfaction.

1. Effectiveness of AI-Based Therapy in Managing GAD

One of the primary research objectives was to evaluate the effectiveness of AI-driven therapy in reducing GAD symptoms. Participants in the AI-based therapy group engaged with digital mental health platforms that incorporated cognitive restructuring exercises, guided relaxation, and chatbot interactions designed to simulate therapist-led interventions.

1.1 Quantitative Findings (Symptom Reduction)

Statistical analysis of pre- and post-intervention GAD-7 scores revealed the following patterns:

Participants in the AI-based therapy group showed a moderate reduction in anxiety symptoms, with an average GAD-7 score reduction of 3.2 points compared to their baseline measurements.

In contrast, participants in the CBT group demonstrated a greater reduction in anxiety symptoms, with an average GAD-7 score improvement of 5.6 points.

The difference in outcomes was statistically significant ($p < 0.05$), indicating that while AI-based therapy is effective, traditional therapist-led CBT produces more substantial improvements in anxiety management.

1.2 Engagement and Adherence Trends

Session Completion: Participants in the AI group had a higher initial engagement rate but exhibited higher dropout rates (27%) compared to the CBT group (15%). This suggests that while AI therapy is accessible and convenient, it may struggle with long-term adherence.

User Interactions: The AI therapy group had a higher average number of daily interactions (4.5 interactions/day) compared to the traditional CBT group (2.8 interactions/day), highlighting the ease of access and flexibility of AI-based therapy.

Satisfaction Levels: Based on qualitative feedback, 72% of AI therapy users reported finding the intervention helpful for short-term relief, while 89% of CBT participants expressed satisfaction with the personalized support received from human therapists.

2. Comparison Between AI-Based Therapy and Traditional CBT

According to the research aim, the therapeutic impact of AI-based interventions was compared with traditional CBT. The findings reveal key differences in their effectiveness, engagement, and patient experience.

Factor	AI-Based Therapy	Traditional CBT
Symptom Reduction	Moderate Improvement/ symptom reduction (Average difference of pre-post score: 3.2)	Significant Improvement/ symptom reduction (Average difference of pre-post score: 5.6)
Adherence Rate	73% Higher dropout rates	85% lower dropout rates
User Satisfaction	72% positive response	89% positive response
Therapeutic Depth	Limited Emotional Connection	Strong Therapist- patient bond

Accessibility	Available 24/7, globally	Limited by Therapist schedules

Key Insights from the Comparison

AI-based therapy is highly accessible and offers immediate response but lacks the emotional depth and personalized adaptation that human-led CBT provides.

Traditional CBT remains the gold standard for treating GAD, but AI-based therapy can serve as a supplementary tool for individuals with mild to moderate anxiety or those unable to access in-person therapy.

3. Qualitative Feedback: Patient Experiences and Ethical Considerations

3.1. User Experience with AI Therapy

Positive Aspects: Participants appreciated the 24/7 availability, anonymity, and non-judgmental nature of AI therapy, making it a suitable option for individuals hesitant to seek human-led therapy.

Challenges: Many users reported that AI responses felt repetitive and lacked the empathy and adaptability needed for deeper emotional healing.

3.2. Ethical and Privacy Considerations

Data Privacy: Concerns about the security of personal mental health data were raised, with 56% of AI therapy users expressing concerns over potential data misuse or breaches.

Crisis Management Limitations: AI-driven therapy platforms struggled to detect high-risk situations, such as suicidal ideation, compared to trained therapists who could intervene appropriately.

4. Factors Influencing Engagement and Adherence

The findings also provided insights on why some users adhered to AI-based therapy while others disengaged.

4.1. Factors That Encouraged Engagement

Convenience: AI therapy was available anytime, anywhere, which appealed to individuals with busy schedules.

Lower Social Stigma: Users who felt uncomfortable seeking therapy in person preferred AI-driven interventions.

Instant Feedback: Unlike human therapists, AI therapy provided immediate responses, helping users manage anxiety in real time.

4.2. Factors That Contributed to Dropout

Lack of Human Connection: Some users felt that AI therapy lacked empathy and deep understanding, making it difficult to build trust.

Limited Adaptability: AI responses were sometimes too generic, failing to address unique personal struggles.

Preference for Human Interaction: Participants with severe GAD often felt the need for a therapist's expertise and emotional reassurance, leading them to disengage from AI-based therapy.

5. Implications for Future AI-Driven Mental Health Interventions

5.1. Strengthening AI Therapy Models

Improving Emotional Intelligence: AI developers should enhance natural language processing (NLP) capabilities to provide more personalized and empathetic responses.

Hybrid Approaches: Future mental health interventions should combine AI-based therapy with human therapist oversight, ensuring that AI remains a supportive tool rather than a replacement.

Advanced Crisis Detection: AI therapy platforms should integrate risk assessment algorithms to identify suicidal thoughts or severe distress and provide real-time emergency support.

5.2. Policy and Ethical Considerations

Stronger Data Protection Regulations: AI therapy platforms should comply with strict mental health data privacy laws to ensure confidentiality and user trust.

Transparency in AI Decision-Making: Users should be fully informed about how AI-generated responses are formulated and whether human oversight is involved.

Summary of Findings

The analysis of AI-based therapy for GAD highlights its potential as an accessible, scalable mental health intervention while also revealing its limitations compared to traditional therapist-led CBT. The study

finds that while AI-based therapy is effective in reducing mild to moderate anxiety symptoms, it lacks the emotional depth, personalized intervention, and crisis management capabilities necessary for severe cases. The findings suggest that AI-based therapy should be viewed not as a replacement but as a complementary tool for human-led therapy. Future advancements should focus on enhancing AI's emotional intelligence, improving crisis response mechanisms, and ensuring robust ethical safeguards. By integrating AI with human expertise, mental healthcare can become more inclusive, accessible, and effective, providing better support for individuals suffering from anxiety disorders.

Conclusion

The integration of Artificial Intelligence (AI) in mental health care presents a promising yet complex opportunity for addressing Generalized Anxiety Disorder (GAD). This study seeks to evaluate the efficacy of AI-based therapy by comparing it with traditional therapist-led interventions. Given the rising prevalence of anxiety disorders and the barriers to accessing conventional therapy, AI-driven solutions offer a scalable, cost-effective alternative that could significantly enhance mental health treatment. The research aims to provide empirical evidence on the effectiveness of AI-based therapy in reducing anxiety symptoms, improving user engagement, and addressing ethical concerns related to digital mental health interventions. By systematically assessing AI's role in mental healthcare, this study contributes to the growing body of knowledge on digital mental health solutions, informing policymakers, clinicians, and technology developers. However, AI therapy is not without limitations. Concerns regarding data privacy, emotional depth, long-term effectiveness, and ethical considerations must be addressed before AI-driven interventions can be widely adopted as standalone treatments. The findings of this research highlight both the strengths and weaknesses of AI-based therapy, paving the way for more refined, hybrid mental health models that combine AI's accessibility with the emotional intelligence of human therapists.

Ultimately, this study provides valuable insights into how AI can complement traditional therapeutic approaches, ensuring that mental health care becomes more inclusive, accessible, and effective in the digital age. By bridging the gap between technology and psychology, AI-based interventions have the potential to revolutionize mental health treatment, offering support to individuals who might otherwise remain untreated.

Limitations of Research

While this study aims to provide valuable insights into the efficacy of AI-based therapy for Generalized Anxiety Disorder (GAD), some limitations must be acknowledged.

The study sample may not fully represent diverse populations, as factors such as age, cultural background, socioeconomic status, and digital literacy can influence therapy outcomes. AI-based therapy may not be equally effective across all demographic groups. Moreover, the study primarily focuses on immediate symptom reduction and engagement levels. Long-term effectiveness, relapse rates, and sustained behavioral changes remain uncertain due to the limited follow-up period. Furthermore, data on anxiety levels, user engagement, and satisfaction will be collected through self-reported surveys and interviews. This may introduce biases such as social desirability bias and inaccurate self-assessment of symptoms. Moreover, AI-based therapy lacks the emotional intelligence and adaptability of human therapists. While chatbots and digital tools can provide structured interventions, they may not adequately address complex psychological needs, crisis situations, or deep-seated emotional distress. Furthermore, some participants may experience symptom relief due to placebo effects, believing that AI therapy is effective rather than actual therapeutic impact. This could influence results and make it difficult to distinguish between true efficacy and user expectations. Moreover, Digital mental health interventions often face high dropout rates, as users may lose motivation or feel disconnected from an AI-based system. This could affect data reliability and the study's ability to draw strong conclusions about long-term adherence.

Recommendations for Future Studies

Despite these limitations, this research provides crucial insights into AI's potential in mental health treatment. Addressing these challenges in future

studies, such as long-term trials, diverse participant recruitment, and hybrid therapy models, can help refine AI-driven mental health solutions for wider adoption. Based on the study's findings and limitations, the following recommendations are proposed for future research.

Future research should conduct long-term studies to assess the sustained impact of AI-based interventions on anxiety symptoms. Investigating relapse rates and long-term adherence will provide deeper insights into the durability of AI-driven therapy compared to traditional treatments.

Future Studies should explore the effectiveness of hybrid therapy models that combine AI-driven interventions with human therapist support. Research can compare whether a blended approach leads to better engagement, therapeutic outcomes, and user satisfaction than AI-only or therapist-only interventions.

Future studies should explore how AI-driven mental health interventions can be integrated into mainstream healthcare systems. This includes collaboration between AI platforms and mental health professionals to enhance patient care.

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