

# The Use of Artificial Intelligence in Depression and Anxiety: A Comprehensive Meta-Synthesis

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**Abstract** –The advent of Artificial Intelligence [AI] offers promising new avenues for various mental health conditions such as anxiety and depression. This study synthesizes various research findings to explore AI's role in depression and anxiety. Through an extensive literature review and critical synthesis, this meta-synthesis examines the effectiveness, challenges, and future prospects of AI applications in treating or diagnosing anxiety and depression. The findings reveal that AI-assisted interventions can provide significant benefits, including accessibility, affordability, and personalized care. However, challenges such as ethical considerations and the need for human interaction persist. This study advocates for a balanced integration of AI into mental health services, underscoring the importance of further research to optimize AI's potential in this field.

**Keywords** – Artificial Intelligence; Meta-Synthesis; Mental Health; Student Transitions; Digital Therapy Tools; Depression

## I. INTRODUCTION

Stepping out of one's comfort zone and transitioning from a familiar lifestyle to new phases like high school or college can naturally induce feelings of depression and anxiety among students. Anyone who has experienced living in a dorm during high school years or university years knows that transitioning from a comfortable home life to living in a small dorm room with four/five others, managing daily chores alone, and navigating new academic and social challenges can understandably lead to feelings of depression and anxiety among students. This is usually compounded by financial pressures and a lack of time, effort, or money to seek professional help, leaving many to turn to the ever-present internet for support. Artificial Intelligence [AI] therapy tools could offer timely assistance in such scenarios. The research question in the current study is as follows: *How can AI be leveraged to tackle depression and anxiety?* As the aim of any research should be to apply the research to serve humanity, this study aims to critically explore both the potential benefits and drawbacks of AI usage in treating anxiety and depression through a thorough review of the literature.

Acknowledging that traditional literature reviews tend to simply list relevant studies based on set criteria, the intention here is to go beyond mere literature review with summarization. Thus, the approach of meta-synthesis has been selected as the methodology. This strategy will steer the analytical process, enabling not just the aggregation of findings from various studies but also their critical and interpretative synthesis. Such a comprehensive approach promises deeper insights into the intricacies of AI's role in

mental health care, specifically depression and anxiety, fostering a nuanced comprehension that extends beyond the typical scope of a literature review, towards a holistic and critical examination of the subject matter.

Before delving into the examination of relevant research and analysis, it is crucial to define key concepts, namely depression and anxiety, as they are significant components of mental health discussions. This foundational step ensures a clear understanding of the scope and context of the investigation, facilitating a more focused and informed analysis of how AI can be applied to treat and manage these mental health conditions.

Anxiety and depression cover a wide range of psychological well-being aspects, including individuals' emotions, thoughts, and behaviors as well as their ability to cope with life's stresses and recover from adversity. Understanding these specific conditions, depression and anxiety, is vital as they significantly affect mental health. Depression is defined as a mood disorder characterized by feelings of despair and loneliness, often accompanied by a lack of activity, loss of concentration and motivation, guilt, social withdrawal, sleep disturbances, and even physical harm and suicidal tendencies. [1]

Anxiety, on the other hand, is defined as a feeling of sadness, nervousness, or difficulty about something with an uncertain outcome. It can manifest physically with symptoms like tension and increased pulse rate. This condition may stem from concern over potential problems or a desire mixed with doubt and uneasiness. Anxiety can also refer to the specific causes of these feelings. [1]

Within the realm of AI, the integration of Artificial Intelligence in addressing depression and anxiety represents a pivotal and innovative tool that aids both clients and mental health professionals, including psychologists and psychotherapists. In the current meta-synthesis research, it is hypothesized that AI's ability to analyze big data can easily lead to personalized care strategies, enhance therapeutic outcomes through predictive analytics, and provide support through accessible, affordable, fast, private, and reliable digital platforms. The current study aims to test this hypothesis through meta-synthesis. This approach aims to critically present diverse viewpoints including the researcher's, identify existing gaps, understand the pros and cons, and synthesize the relevant literature to make sense of it comprehensively. Furthermore, it seeks to raise new questions to stimulate further research in the relevant field.

## II. MATERIALS AND METHOD

In the current study, firstly, the research question was established as, "*How can AI be leveraged to tackle depression and anxiety?*" Subsequently, thorough background research was conducted using various resources, including library databases and Google Scholar. It was hypothesized that there are diverse AI approaches to addressing depression and anxiety. This paper not only examined the methodologies of these research works but also implemented a methodology to test the hypothesis. The current study confirmed that AI can be utilized in various methods to tackle depression and anxiety. These methods are summarized and analyzed in the later sections of this paper, leading to a drawn conclusion. Finally, the findings are presented.

In this critical paper, systematic review delineating the utilization of AI within the domain of depression and anxiety, a methodological framework grounded in meta-ethnography, which is mostly used in healthcare, is adopted. By embracing meta-synthesis, which is called meta-ethnography by Noblit and Hare, this inquiry endeavors to transcend mere data retrieval, affording a sophisticated platform for both data collection and analytical scrutiny [2, 3, 4]. The meta-synthesis approach, distinguished by its adeptness at accommodating cumulative synthesis through inductive reasoning, constitutes the analytical backbone of this study.

This methodological choice is predicated upon the healthcare nature of the current study as well as the predominantly qualitative nature of the extant research identified within the expansive repositories of the Texas A&M University Library databases and GoogleScholar. Essentially, a meta-ethnographic study delves into the examination of insights derived from primary qualitative studies, aiming to develop novel theories, models, or processes [5]. To achieve a more comprehensive critical synthesis, in the current study, it is posited that incorporating both qualitative and quantitative research studies would be beneficial

for thoroughly examining the issue of AI usage in treating depression and anxiety. Accordingly, while this critical thinking study may not solely rely on previous qualitative research, incorporating quantitative research, meta-synthesis is instrumental in achieving the study's objectives. This method focuses on the depth of data found in the resources and enriches it through critical analysis. Therefore, the research includes both quantitative and qualitative studies, enriching the work with diverse perspectives and insights.

In alignment with this methodology, the present study endeavors to introduce AI models tailored for addressing depression and anxiety. Underpinning the investigative journey is the rigorous adherence to Noblit and Hare's seminal seven-stage meta-ethnographic methodology. The researcher meticulously adapted the seven prescribed stages proposed by Noblit and Hare [2], as further refined by France et al. [5], for implementation in the present study, as delineated in Figure 1. Noblit and Hare describe meta-synthesis, meta-ethnography, as a method designed to make literature reviews more insightful by critically analyzing various descriptions of events or situations. As stated by Noblit and Hare, it involves systematically comparing different studies to identify overarching themes, discussing our research in the context of others' work, and combining findings from multiple studies to gain new insights.

This methodological blueprint acts as the guiding light for the complex process of data synthesis, enabling a thorough exploration of the diverse aspects of AI applications in mental health care, specifically depression and anxiety research.

Table 1. Seven stages used in this study inspired by Noblit and Hare's meta-synthesis

Stage	Description	How to Utilize
1	Getting Started	The researcher in the current study began by clearly defining the research question and objectives and familiarize himself with the literature on the topic to gain insight into existing knowledge and gaps.
2	Deciding What is Relevant	The researcher identified key themes, concepts, or phenomena relevant to the research question and then determined inclusion and exclusion criteria for selecting studies to ensure relevance and alignment with research objectives.
3	Reading Studies	The researcher conducted a systematic review of primary research studies related to the research question and then carefully read and analyzed each study, extracting relevant data and identifying common themes or patterns.
4	Deciding How Studies are Related	The researcher compared and contrasted findings across different research studies to identify relationships, similarities, and differences. Then, he determined how each study contributes to the overall understanding of the research topic.
5	Translating Studies	The researcher translated the findings of each study into a common language or framework and looked for overarching themes or concepts that emerge from the individual study findings.
6	Critically Synthesizing Translations	The researcher used critical thinking skills to synthesize the translated findings to develop new insights, theories, or models and then identified overarching themes or patterns that emerge from the collective data to address the research question.
7	The Expression of the Critical Thinking	The researcher presented the synthesized findings in a critical, coherent and structured manner and used clear and concise language to articulate the key insights and implications of the study.

Table 1 outlines the seven steps this essay follows, aligning perfectly with this assignment's requirements. Initially, it summarizes the basic methods and results of the studies, then critically presents their methods and interpretations of their data.

## III. RESULTS

The specified keywords, namely AI, Artificial Intelligence, Depression, Anxiety, Mental Health, and Therapy, were utilized to conduct searches across libraries worldwide via the Texas A&M University Library and GoogleScholar web pages including Google search and ChatGPT, aiming to identify pertinent studies. The initial search yielded 320 records. The results were subsequently refined to include only Downloadable Articles and Downloadable Archival Materials within the last six years, spanning from 2019 to 2024. It's noteworthy that the search was also restricted to "peer-reviewed" sources, only the exception of a relevant dissertation. Subsequently, the 21 results retrieved from Libraries Worldwide were meticulously scrutinized, following title and abstract screening, ensuring that only those directly relevant to the topic of interest were retained, while any irrelevant ones were systematically excluded. After irrelevant or duplicate records were removed, there was a total of 12 records left. These findings were then successfully retrieved from library databases through title searches. The process of locating the necessary data was not straightforward but rather resembled a spiral journey, akin to detective work. The findings deemed pertinent to the scope of the research were then compiled and presented in Table 2 for comprehensive reference.

Table 2. Peer-Reviewed Articles on AI Applications in Depression and Anxiety

Research Number	Research	Basic methods	Results
Research 1 [6]	Ashish, M., Andrea, N. N., Jose, H. V., Thiago, M., Diego, D. C.,; James, J. G. (2021). Acceptability and effectiveness of artificial intelligence therapy for anxiety and depression (Youper): longitudinal observational study. <i>Journal of Medical Internet Research</i> , 23(6), 26771. <a href="https://doi.org/10.2196/26771">https://doi.org/10.2196/26771</a>	<i>Longitudinal Observational Study</i>	Youper users rated the app highly (mean 4.36 stars, SD 0.84), and 42.66% (1927/4517) of users were retained by week 4. Symptoms decreased in the first 2 weeks of app use (anxiety: $d=0.57$ ; depression: $d=0.46$ ). Anxiety improvements were maintained in the subsequent 2 weeks, but depression symptoms increased slightly with a very small effect size ( $d=0.05$ ). A higher proportion of successful emotion regulation attempts significantly predicted greater anxiety and depression symptom reduction.
Research 2 [7]	Sheykholeslami, N. (2022). Emotion AI in Mental Healthcare : How can affective computing enhance mental healthcare for young adults? (Dissertation). Retrieved from <a href="https://urn.kb.se/resolve?urn=urn:nbn:se:kth:diva-319800">https://urn.kb.se/resolve?urn=urn:nbn:se:kth:diva-319800</a>	<i>Comparative study and quality assessment and interviewing experts</i>	This research indicates that a complete replacement of face-to-face therapy is not yet imaginable because the human factor is considered inevitable in a therapy setting. However, most experts interviewed for this research stated that AI-based apps in mental healthcare can be seen as an additional supportive tool or coach on the side while seeing an actual therapist in face-to-face sessions, either in person or through video calls, providing helpful content and exercises. In addition, these tools can bridge the waiting time between therapy sessions or function as a preventive solution for young adults.
Research 3 [8]	Alanezi, F. (2024). Assessing the effectiveness of ChatGPT in delivering mental health support: a qualitative study. <i>Journal of Multidisciplinary Healthcare</i> , 17, 461–471. <a href="https://doi.org/10.2147/JMDH">https://doi.org/10.2147/JMDH</a>	<i>Semi-structured interviews within a quasi-experimental design</i>	Eight positive factors (psychoeducation, emotional support, goal setting and motivation, referral and resource information, self-assessment and monitoring, cognitive behavioral therapy, crisis interventions, and psychotherapeutic exercises) and four negative factors (ethical and legal considerations, accuracy and reliability, limited

	.S447368		assessment capabilities, and cultural and linguistic considerations) were associated with the use of ChatGPT for mental health support.
Research 4 [9]	Thomas, K., Corina, R. R., Nancy, E. W., Vikas, K., Nan, L., Joshua, M. S., Ben, S. G., Emily, A. K., Jillian, A. J., Philip, Y., Lesley, E. S., Olu, A. A.; Jun, M. (2022). Design and formative evaluation of a virtual voice-based coach for problem-solving treatment: observational study. <i>Jmir Formative Research</i> , 6(8), 38092. <a href="https://doi.org/10.2196/38092">https://doi.org/10.2196/38092</a>	<i>2 therapy sessions are analyzed with 2-tailed paired t tests and semistructured interviews are analyzed qualitatively</i>	Participants found Lumen to provide high pragmatic usability and favorable user experience, with marginal task load during interactions for both Lumen sessions. However, participants experienced a higher temporal workload during the problem-solving session, suggesting a feeling of being rushed during their communicative interactions. On the basis of the qualitative analysis, the following themes were identified: Lumen's on-demand accessibility and the delivery of a complex problem-solving treatment task with a simplistic structure for achieving therapy goals; themes related to Lumen improvements included streamlining and improved personalization of conversations, slower pacing of conversations, and providing additional context during therapy sessions.
Research 5 [10]	Venkatesan, A., Rahimi, L., Kaur, M., Mosunic, C. (2020). Digital cognitive behavior therapy intervention for depression and anxiety: retrospective study. <i>JMIR Mental Health</i> , 7(8), 21304. <a href="https://doi.org/10.2196/21304">https://doi.org/10.2196/21304</a>	<i>Linear mixed-effects modeling is applied in the study, which employed a digital cognitive behavior therapy program</i>	We observed a significant positive effect of program time on improvement in depression ( $\beta=-0.12$ , $P<.001$ ) and anxiety scores ( $\beta=-0.10$ , $P<.001$ ). At the end of the 12-week intervention, we observed an average reduction of 3.76 points (95% CI -4.76 to -2.76) in PHQ-8 scores. Further reductions in depression were seen at program month 6 (4.75-point reduction, 95% CI -6.61 to -2.88) and program month 9 (6.42-point reduction, 95% CI -8.66 to -6.55, $P<.001$ ). A similar pattern of improvement emerged for anxiety, with a 3.17-point reduction at the end of the 12-week intervention (95% CI -4.21 to -2.13). These improvements were maintained at program month 6 (4.87-point reduction, 95% CI -6.85 to -2.87) and program month 9 (5.19-point, 95% -6.85 to 4.81). In addition, greater program engagement during the first 12 weeks predicted a greater reduction in depression ( $\beta=-0.29$ , $P<.001$ ).
Research 6 [11]	Spiegel, B. M. R., Liran, O., Clark, A., Samaan, J. S., Khalil, C., Chernoff, R., Reddy, K.; Mehra, M. (2024). Feasibility of combining spatial computing and AI for mental health support in anxiety and depression. <i>NPJ Digital Medicine</i> , 7(1), 22–22. <a href="https://doi.org/10.1038/s41746-024-01011-0">https://doi.org/10.1038/s41746-024-01011-0</a>	<i>Debriefing interviews and inductive thematic analyses</i>	Utilizing GPT-4 for AI-driven therapy, XAIA engaged participants with mild-to-moderate anxiety or depression in biophilic VR environments. Speaking with an AI therapy avatar in VR was considered acceptable, helpful, and safe, with participants observed to engage genuinely with the program. However, some still favored human interaction and identified shortcomings with using a digital VR therapist. The study provides initial evidence of the acceptability and safety of AI psychotherapy via spatial computing, warranting further research on technical enhancements and clinical impact.

Research 7 [12]	Hao, L., Huaming, P., Xingyu, S., Chenzi, X.,; Meng, Z. (2022). Using AI chatbots to provide self-help depression interventions for university students: a randomized trial of effectiveness. <i>Internet Interventions</i> , 27, 100495. <a href="https://doi.org/10.1016/j.invent.2022.100495">https://doi.org/10.1016/j.invent.2022.100495</a>	<i>An unblinded randomized controlled trial</i>	Participants were all university students (undergraduate students (n = 31), postgraduate students (n = 52)). They were between 19 and 28 years old (mean = 23.08, standard deviation (SD) = 1.76) and 55.42% (46/ 83) female. 24.07% (20/83) participants were lost to follow-up. No significant group difference was found at baseline. In the intention-to-treat analysis, individuals in the chatbot test group showed a significant reduction in the PHQ-9 scores (F = 22.89; P < 0.01) and the GAD-7 scores (F = 5.37; P = 0.02). Follow-up analysis of completers suggested that the reduction of anxiety was significant only in the first 4 weeks. The WAI-SR scores in the chatbot group were higher compared to the bibliotherapy group (t = 7.29; P < 0.01). User feedback showed that process factors were more influential than the content factors.
Research 8 [13]	<b>Abd-alrazaq, A., AlSaad, R., Aziz, S., Ahmed, A., Denecke, K., Househ, M., Farooq, F., &amp; Sheikh, J. (2022). Wearable Artificial Intelligence for Anxiety and Depression: Scoping Review. <i>Journal of Medical Internet Research</i>, 25.</b> <a href="https://doi.org/10.2196/42672">https://doi.org/10.2196/42672</a> .	<i>Scoping Review through narrative synthesis</i>	Of the 1203 studies identified, 69 (5.74%) were included in this review. Approximately, two-thirds of the studies used wearable AI for depression, whereas the remaining studies used it for anxiety. The most frequent application of wearable AI was in diagnosing anxiety and depression; however, none of the studies used it for treatment purposes. Most studies targeted individuals aged between 18 and 65 years. The most common wearable device used in the studies was Actiwatch AW4 (Cambridge Neurotechnology Ltd). Wrist-worn devices were the most common type of wearable device in the studies. The most commonly used category of data for model development was physical activity data, followed by sleep data and heart rate data. The most frequently used data set from open sources was Depresjon. The most commonly used algorithm was random forest, followed by support vector machine.
Research 9 [14]	Eichenberg, C., Beutel, M., Johnson, D., Fiske, A., Henningsen, P., Buyx, A. (2019). Your robot therapist will see you now: ethical implications of embodied artificial intelligence in psychiatry, psychology, and psychotherapy. <i>Journal of Medical Internet Research</i> , 21(5). <a href="https://doi.org/10.2196/13216">https://doi.org/10.2196/13216</a>	<i>Qualitative thematic review</i>	From an ethical perspective, important benefits of embodied AI applications in mental health include new modes of treatment, opportunities to engage hard-to-reach populations, better patient response, and freeing up time for physicians. Overarching ethical issues and concerns include: harm prevention and various questions of data ethics; a lack of guidance on development of AI applications, their clinical integration and training of health professionals; ‘gaps’ in ethical and regulatory frameworks; the potential for misuse including using the technologies to replace established services, thereby potentially exacerbating existing health inequalities. Specific challenges identified and discussed in the application of embodied AI include: matters of

Research 10 [15]	Shiri, S.-S., T, D. C., Sarah, E. H., Jacob, D. H., Jennifer, M. B., Eyal, G.,; Steven, D. H. (2023). Effects of an artificial intelligence platform for behavioral interventions on depression and anxiety symptoms: randomized clinical trial. <i>Journal of Medical Internet Research</i> , 25, 46781. <a href="https://doi.org/10.2196/46781">https://doi.org/10.2196/46781</a>	<i>Intention-to-treat approach. The primary outcomes included the feasibility and acceptability of the AI platform. Secondary outcomes included changes in depression and anxiety scores as well as treatment attendance, satisfaction, and perceived helpfulness.</i>	risk-assessment, referrals, and supervision; the need to respect and protect patient autonomy; the role of non-human therapy; transparency in the use of algorithms; and specific concerns regarding long-term effects of these applications on understandings of illness and the human condition.
Research 11 [16]	Brooke, A., Britt, K., Suzanne, M., Shaun, W., Denise, C. (2023). Evaluation of various support intensities of digital mental health treatment for reducing anxiety and depression in adults: protocol for a mixed methods, adaptive, randomized clinical trial. <i>Jmir Research Protocols</i> , 12, 45040. <a href="https://doi.org/10.2196/45040">https://doi.org/10.2196/45040</a>	<i>Mixed Methods, Adaptive, Randomized Clinical Trial</i>	A total of 72 patients were approached, of whom 47 (67%) agreed to participate. Participants were adults (34/47, 72% women and 13/47, 28% men; mean age 30.64, SD 11.02 years), with 23 randomized to the AI platform group, and 24 to TAU. Participants in the AI group attended, on average, 67% (mean 5.24, SD 2.31) more sessions compared to those in TAU (mean 3.14, SD 1.99). Depression and anxiety symptoms were reduced by 34% and 29% in the AI platform group versus 20% and 8% for TAU, respectively, with large effect sizes for the therapy delivered with the support of the AI platform. No group difference was found in 2-month treatment satisfaction and perceived helpfulness. Further, therapists using the AI platform submitted their progress notes, on average, 55 hours earlier than therapists in the TAU group ( $t=-0.73$ ; $P<.001$ ).
Research 12 [17]	Su, S., Wang, Y., Jiang, W., Zhao, W., Gao, R., Wu, Y., Tao, J., Su, Y., Zhang, J., Li, K., Zhang, Z., Zhao, M., Wang, Z., Luo, Y., Huang, X., Wang, L., Wang, X., Li, Y., Jia, Q., ... Xu, Y. (2022). Efficacy of artificial intelligence-assisted psychotherapy in patients with anxiety disorders: a prospective, national	<i>A Prospective, National Multicenter Randomized Controlled Trial Protocol</i>	The primary outcome measures are for anxiety (Generalized Anxiety Disorder-7) and depression severity (Patient Health Questionnaire-9). Measures of working alliance, health status, health resources, preferences, self-efficacy, and motivation will be used for secondary outcomes. Qualitative methods will be used to explore participant and therapist experiences of video chat assessment and treatment, participant reasons for withdrawal and nonengagement, and therapist training and implementation experiences. Data collection commenced in November 2020 and was completed at the end of March 2022.

multicenter randomized  
controlled trial protocol.  
Frontiers in Psychiatry, 12.  
[https://doi.org/10.3389/fpsyt.  
2021.799917](https://doi.org/10.3389/fpsyt.2021.799917)

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All twelve research papers present different research designs, as detailed in the Methods section of Table 2. Some of these studies are qualitative, describing how AI can be used to address depression and anxiety, while others are quantitative, analyzing the situation in terms of correlations, among other aspects. By reviewing and selecting research papers that employ a variety of methods, the goal was to strengthen the current study and address the limitations inherent in different research methods.

Table 2 also presents different ways of using AI for depression and anxiety. As stated in various articles or as commonly known, the use of AI in managing depression and anxiety can encompass different applications, such as chatbots, virtual therapists, and AI-driven algorithms. These systems are designed to help people manage their mental health and well-being by offering personalized recommendations, therapeutic interventions, or simulating human-like interactions to address mental health concerns. Below discuss the emerging themes where many concepts converge.

Research 1 [6] presents "Artificial intelligence therapy" which refers to the use of AI technologies in the field of mental health treatment and therapy and concludes that Youper, which is a well-known mobile app that uses artificial intelligence therapy for the treatment of depression and anxiety, offers an affordable, self-managed treatment option, broadening access to mental health care. The data confirms its acceptance and efficacy in alleviating symptoms of anxiety and depression, advocating for its further evaluation through a randomized clinical trial. On the other hand, Research 2 [7] concludes that while AI-based applications cannot fully replace traditional in-person therapy due to the essential human element in therapeutic settings, they are valuable as supplementary tools. Experts believe these digital solutions can support ongoing therapy by offering additional resources and activities, help reduce wait times between sessions, and serve as preventive measures, particularly for young adults. Those two articles and all others below not only offer important information on the topic from various perspectives, but they also advise further investigation with various research designs, such as a randomized clinical trial research design.

While Research 3 [8] concludes that ensuring the effective deployment of AI-based tools like ChatGPT for mental health support necessitates a thorough evaluation of ethical, reliability, accuracy, and legal issues, alongside the development of effective strategies to address these challenges, Research 4 [9] concludes that Lumen facilitates cognitively realistic exchanges in administering behavioral therapy. The study led to improvements in Lumen, such as lessening the conversational burden, enhancing the natural flow of dialogue, and bolstering privacy and security measures. While additional studies are necessary, these encouraging results suggest Lumen's capability to offer tailored and readily accessible mental health support, addressing a void in conventional mental health care.

Research 5 [10] concludes that digital tools can lead to sustained and significant enhancements in managing anxiety and depression. Initial active engagement with digital mental health interventions seems to be a key factor in achieving these positive outcomes. Nonetheless, the study's conclusions are tempered by challenges such as participant dropout after the intervention and the limitations inherent in its retrospective observational design. On the other hand, Research 6 by [11] concludes that GPT-4 powered AI therapy through VR environments is an effective and safe approach for treating mild to moderate anxiety and depression, with users positively engaging with the AI avatar. Despite the overall acceptance, a preference for human interaction remains, highlighting areas for improvement in digital therapy experiences and underscoring the need for further investigation into its clinical efficacy and technological advancement.

While Research 7 [12] concludes that the self-help depression intervention delivered by the chatbot demonstrated superiority over basic bibliotherapy, achieving greater reductions in depression and anxiety,



as well as fostering a stronger therapeutic alliance with participants, Research 8 [13] concludes that wearable AI holds significant potential in delivering mental health services for managing anxiety and depression, enabling users to conduct preliminary assessments of these conditions. Additional reviews are necessary to quantitatively aggregate data on the performance and efficacy of wearable AI technologies. Considering its promise, there is a compelling case for technology firms to increase investment in wearable AI solutions for addressing anxiety and depression.

As is often the case in research, even though the topic is the same, the focuses differ. For example, Research 9 [14] concludes that researchers believe that embodied AI holds considerable potential within mental health care, yet it necessitates additional investigation to tackle the ethical and societal challenges it presents. The findings underscore the importance of future studies aimed at refining research and clinical methodologies in this innovative domain. It highlighted the need for future research directions and offered recommendations for areas urgently requiring clear ethical guidelines. While Research 9 focuses on the ethical and societal challenges, Research 10 [15] focuses on the usage of AI in alleviating primary symptoms. Its randomized controlled trial showed that therapy augmented by Eleos Health led to better outcomes in treating depression and anxiety and higher patient retention rates than treatment as usual (TAU). This indicates that integrating AI-based behavioral treatment platforms into community clinic mental health services can more effectively alleviate primary symptoms compared to conventional therapy methods.

Finally, Research 11 [16] concludes that their pioneering adaptive trial, utilizing mixed methods, investigates the relative effectiveness of varying intensities of self-help and therapist-assisted dMH programs delivered through video chat for individuals experiencing depression or anxiety. The expected outcomes could influence how dMH interventions are implemented. On the other hand, Research 12 [17] concludes that their trial in China could significantly improve anxiety disorder treatment by integrating AI-assisted psychotherapy with medication, addressing psychotherapy's limited availability and enhancing overall treatment efficacy.

In synthesizing the findings from a total of 12 studies included in the meta-synthesis, on the use of AI in treating depression and anxiety, it is evident that digital interventions present a promising avenue for mental health support. The studies reviewed span a range of methodologies, from longitudinal observational studies to randomized clinical trials, offering insights into the effectiveness, acceptability, and ethical considerations of AI-driven therapies. After reading all those selected data, the following 4 overarching themes that emerge from the individual study findings appeared:

- 1- Effectiveness & Acceptability
- 2- Supplementary Role of AI
- 3- Challenges & Limitations
- 4- Future Directions.

*Theme 1. Effectiveness and Acceptability:* AI-based interventions, such as therapy apps and AI chatbots, have demonstrated significant reductions in symptoms of depression and anxiety. For instance, Youper users reported a high app rating and a notable decrease in symptoms over the first few weeks of use. Similar positive outcomes were observed in interventions using digital cognitive behavior therapy and AI-assisted psychotherapy, with sustained improvements over several months. (Research 1, 5, 7)

*Theme 2. Supplementary Role of AI:* While AI-based applications have shown promise, the consensus among experts suggests that they should not replace face-to-face therapy but rather act as supplementary tools. These digital solutions can offer additional support between sessions, serve as preventive measures, and help bridge therapy gaps, particularly for hard-to-reach populations. (Research 2, 4, 10, 11)

*Theme 3. Challenges and Limitations:* The studies highlight various challenges associated with AI in mental health services, including ethical concerns, the importance of human interaction, and the need for technical enhancements. Despite the positive effects, there is a clear recognition of the limitations of AI applications, underscoring the need for careful consideration and ongoing research to address these issues. (Research 3, 9)

*Theme 4. Future Directions:* The reviewed research emphasizes the potential of AI to revolutionize mental health care by providing accessible, personalized, and efficient support. However, it also calls for further studies to explore the long-term effectiveness, user engagement strategies, and integration of AI tools into traditional therapy models. (Research 6, 8, 12)

Even though the findings varied, showing either a positive impact on reducing symptoms of depression and anxiety or no significant effect, as a supplementary aid to therapy, AI has proven beneficial, enabling therapists to complete their work more efficiently than before.

This investigation has also underscored the variety of AI-driven treatment methods, such as digital cognitive behavior therapy, for anxiety and depression. Meanwhile, some studies focused exclusively on AI's diagnostic capabilities for mental health conditions.

#### IV. CONCLUSION

The study proved that there are various ways to use AI to tackle depression and anxiety, either diagnostic or treatment. All those AI-driven interventions offer a valuable resource for addressing depression and anxiety, complementing traditional therapeutic approaches by claiming their support with their accessibility, affordability, quality, and personalized support. In terms of effectiveness and acceptability, it can be stated that as people learn to integrate AI assistance into their daily lives, the more they understand and become accustomed to using it, the more successful AI tools will be in addressing anxiety and depression issues. This offers considerable hope to students and anyone in need of free or affordable, fast, and accessible AI support for resolving their anxiety and depression issues.

On the other hand, there are still some issues to discuss. For example, Youper, which is very popular, is only available on the App Store. Someone who does not have an iPhone or iPad cannot use it. This situation underscores the broader issue of digital divide and inequality that affects many parts of the world, especially the developing countries. The prohibitive cost of smartphones and the lack of affordable internet access mean that many students are unable to take advantage of the mental health applications available. This challenge underscores the importance of not only developing AI tools but also ensuring their accessibility to those who need them most. It advocates for innovative solutions, such as offline functionalities or partnerships with educational institutions, to offer these tools for free or at a reduced cost. Thus, a new question can be posed: Is it possible to create AI tools that are accessible to everyone, including people without Internet access or expensive devices like laptops or smartphones?

As it is clear that mental health care is crucial for maintaining our physical health, the potential of AI to provide this support, especially in environments where face-to-face professional help is either inaccessible or unaffordable, strongly resonates. Thus, the current study highlights the urgent need for accessible, affordable, fast, and more effective mental health AI support with fewer ethical concerns. Moreover, further research can be suggested to evaluate the effectiveness of AI relative to specific treatment approaches, such as cognitive behavioral therapy, rather than making broad generalizations about its efficacy.

The other issues mostly revolve around whether humans prefer human assistance. However, the literature states that while these technologies cannot replace the critical human element in therapy, they serve as important tools in the broader mental health care ecosystem.

It is evident that addressing these technological and socioeconomic barriers is crucial. Ensuring that mental health support is accessible to all, regardless of their financial situation or access to technology, could significantly influence the wellbeing of communities. By integrating these considerations into the development and deployment of AI-assisted mental health tools, researchers can work towards a more inclusive and empathetic society. Accordingly, students living in dorms and facing financial difficulties in affording face-to-face professional help can obtain AI-based help. As AI continues to evolve, its integration into mental health services promises to enhance care delivery and outcomes for individuals struggling with depression and anxiety.

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