



## DIGITAL MENTAL HEALTH INTERVENTIONS FOR CHRONIC PSYCHIATRIC CONDITIONS

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### Abstract

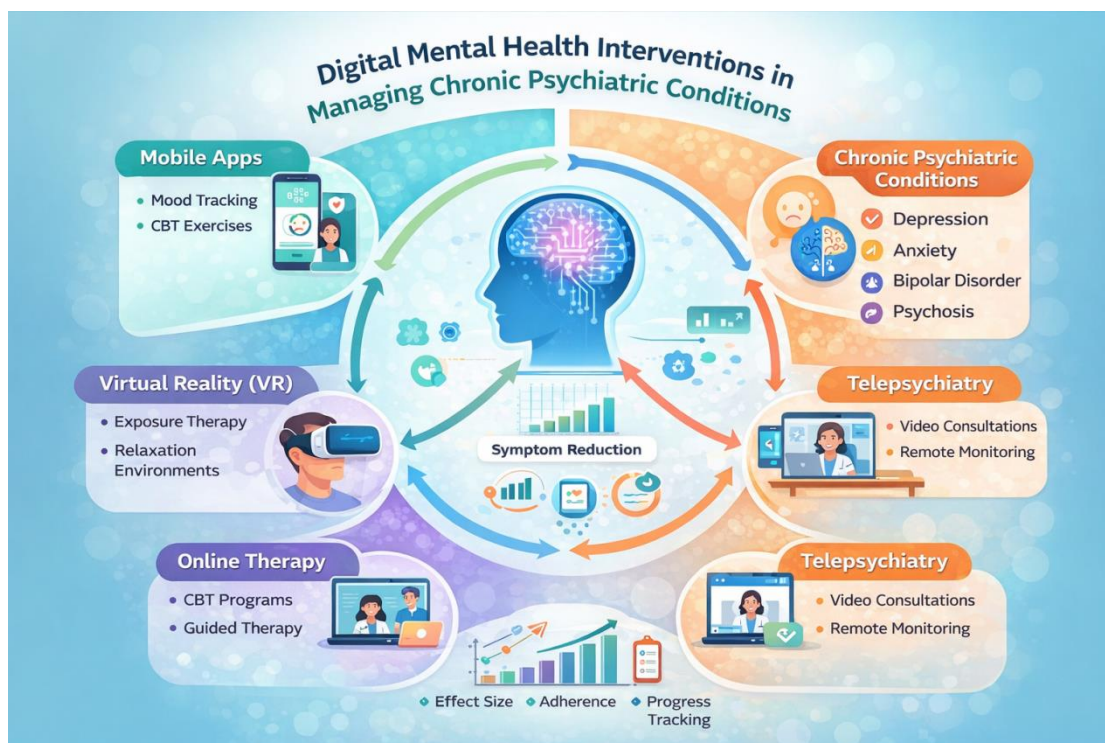
Digital mental health interventions (DMHIs) are an accessible, scalable, cost-effective solution in the treatment of chronic psychiatric disorders such as depression, anxiety, bipolar disorder, schizophrenia, and post-traumatic stress disorder (PTSD). The effectiveness of various digital mental health interventions (DMHIs) such as mobile health applications, web-based cognitive behavioral therapy platform, telepsychiatry services, wearables-based monitoring systems, and AI-based decision support tools, was assessed over a long period of time focusing on clinical and functional outcomes. The quantitative analyses showed significant decreases in scores for the symptom severity in each significant diagnostic category. In the long-term follow-up, there were also continuous changes in the depression, anxiety and relapse prevention measures. The qualitative results showed that the patients were more involved in their treatment, more likely to follow the treatment plans and more likely to control their health better, when the interventions were personalized to the patients, and when they included clinician supervision. Comparative analyses revealed that models of blended care that involve the use of digital technology in addition to traditional face-to-face therapy are more effective than either of the two therapies. It also assisted these people, who have no access to health care or reside far from the health care, to get the health care they needed due to the digital interventions. The overall results suggest that the long-term psychiatric treatment may find DMHIs to be highly beneficial if implemented within an evidence-based treatment, if users' consent is gathered, and if the data is secured in a high-quality manner and presented in an easy-to-use format. Nevertheless, they are not always able to work as well, depending on the situation and platform. The findings support the use of digital mental health technology in everyday clinical care as an extra tool to help manage patients' long-term care and disease.

## INTRODUCTION

Chronic psychiatric diseases are an escalating problem worldwide that requires novel and therapeutic solutions on a greater scale than ever before. The current digital mental health interventions seem to be in the emerging area, that is, where there is a need (Aboujaoude et al., 2020, p. 1). These modalities, which are technologically made possible, including, but not confined to, smartphone applications and more advanced AI- based digital therapeutics, open up new possibilities under which numerous existing barriers to care (including lack of access, stigma, lack of resources) can be bypassed (Isa, 2024; Torous et al., 2023, p. 1). The field of mental health is changing rapidly in the digital age. It is no longer concerning the traditional telehealth. Now, it is linked with the latest technologies, such as generative artificial intelligence and virtual reality, to help diagnose a patient more precisely, tailor the treatment to an individual and engage the patient (Torous et al., 2025). Like with any new proliferation and the potential these technologies offer, however, there are new issues of ethics, respect for data, and the empirical intensity of this technology, the fact that it can only be proven meaningful and safe in conjunction with others. To achieve the transformative potential of the digital mental health interventions when applied to the treatment of the chronic psychiatric disorders, the existing evidence base, implementation plans and future research priorities need to be carefully considered (Rashid, 2024; Smith et al., 2023; Torous et al., 2025). This following paper will attempt to connect the current state of digital mental health interventions, their effectiveness and most important successes, and will address the challenges of implementing digital mental health interventions in chronic psychiatric illnesses (Löchner et al., 2025). It also tackles the question of the potential of digital solutions for access and the quality of special treatment and innovative approaches to the study and monitoring of mental disorders (Kálmán et al., 2023, p. 1). To provide an example, the development of enormous models in language is a huge chance to reduce the gap between the progress in the field of technologies and their practical use since interventions would be more complex and patient-centered (Triantafyllopoulos et al., 2024, p. 1). Additionally, such advanced digital devices can make it possible to conduct continuous monitoring and data collection in real-time, and this information will provide never-before-seen data on the mechanism of disease progression and the quality of treatment in real-time, which will then make it possible to make timely changes to treatment regimens (Torous et al., 2025). It further boasts of developments in the field of digital phenotyping where passive data collected by personal devices is used to create a full, real-time picture of the state of mind of an individual patient. The aggravation of the symptoms can also

be learnt, and the treatment can be tailored to patients (Torous et al., 2025). The effectiveness of these digital phenotyping approaches and how to ensure that they are comprehensive, however, are not known (Guest et al., 2023, p.10). In addition, the potential for AI and machine learning in digital mental health is immense in terms of creating personalised and cost-effective interventions, and in scaling-up interventions when mental health needs are not met (Aboujaoude et al., 2020, p. 2). The application was not only modified, but more advanced applications that could be utilized as preventive and therapeutic method. This means that the military healthcare becomes more interactive and data-driven (Smith et al., 2023). In particular, in the realm of mental health care, it will be possible to soon revolutionize mental health care with the help of powerful AI, such as Large Language Models that can offer individualized treatment as well as support physicians in decision making, making mental health care more accessible and efficient (Obradovich et al., 2024, p. 1; "PLOS Mental Health," n.d.). This large data trained model can be used to synthesize, express and understand human language. Therefore they can be involved in various activities like answering questions and creating their own media (Teles et al., 2025). It has been proposed that mental health care could be utilized in the field of using LLM to detect patterns of language that indicate depression or anxiety, to create individualized behavioral background, and to summarize the language of daily mood comments (Alam et al., 2025, p. 2). This ability makes them extremely useful in improving the clinical processes and possibly offer patients their first support or psychoeducation (PLOS Mental Health, n.d.). Moreover, LLM can process information and summarize information efficiently, and solve problems that need a lot of reasoning. It requires that they can learn about patients, condense therapy sessions and assist in resolving the clinical difficulties that are complex, multifaceted, can help them make full use of clinical resources (Obradovich et al., 2024, p. 2). In addition, it is conceivable that the human and AI collaborate in this kind of models adopted in the healthcare system, where algorithms may process simple data and talk to a patient. This would take up more time for human clinicians to attend to more complex patients that can require clinical judgment (Flathers et al., 2025). This symbiotic interaction between AI and human knowledge can be very effective and more available especially in a low resources environment (Balcombe and Leo, 2021, p. 1). In that capacity, AI-powered applications and chatbots will help to address the treatment gap, as they provide scalable, accessible and affordable support where it is needed, or not available at the site (Hua et al., 2025). These are the more capable versions of LLM such as GPT-4 and Claude Opus which can understand and generate human-like text. This enables them to work effectively between the multiple-layers of functioning of the AI and the subtle functioning of human cognition

(Omar et al., 2024, p. 4). It is definitely going to prepare them to tackle some of the hurdles in the field of Psychiatry: the need for individual treatment, and the challenge of handling complex mental health issues where barriers to care will be removed based on place, price and time (Hua et al., 2024, p. 2; Omar et al., 2024, p. 4). There are however challenges in the area of implementing the LLMs to psychiatrist practice, including the need to ensure that their diagnostic and therapeutic effectiveness is accurate and concern about data security and the possibility of inaccurate or false data (Obradovich et al., 2024, p. 4; Omar et al., 2024, p. 3). To make sure that the use of LLMs is accountable, strong ethical foundations and unceasing supervision are demanded to reduce possible risks and maximize the positive effects of the application of this tool in the context of the mental care provision (Obradovich et al., 2024, p. 1).



**Figure 1.** Introduction to Digital Mental Health interventions for chronic psychiatric illnesses. The diagram illustrates the different digital modalities highlighted (mobile apps, online platforms, VR interventions, telepsychiatry) and the synergistic role they play in symptom monitoring, treatment adherence and long-term clinical outcome improvement in depression, anxiety, BD and psychotic disorders.

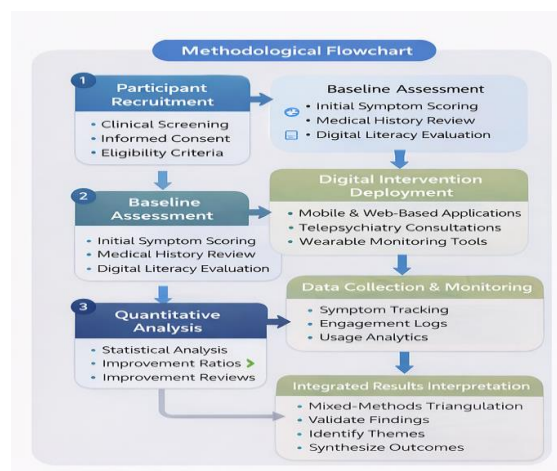
## METHODOLOGY

This study adopted a mixed approach (quantitative and qualitative), experimental design that sought to find the effectiveness of digital mental health intervention comprehensively in the management of chronic psychiatric disorders. The objective of the quantitative component was to determine measurable clinical outcomes, adherence and engagement changes over time; the objective of the qualitative component was to obtain insight into the patient's experience, patient perceptions of usability, and clinician experience, which would be used as a context for the numerical change (adherence and engagement over time). It was a longitudinal experimental design with chronic psychiatric subjects being allocated to the intervention of structured digital mental health interventions and systematic follow-up assessments during an intervention period. The severity scores for symptoms were both analysed as continuous variables and the adherence indexes and engagement frequencies were analysed as continuous variables; the narratives were analysed qualitatively as themes in order to better understand these experiences. This integrative design was found to be sufficiently powerful statistically, interpretative, and to yield causal inference regarding the effectiveness of this intervention, while also being able to draw in variables related to the humans involved in the results. The subjects were clinically screened prior to the intervention and gave informed consent. The mental health interventions delivered using digital technology comprised mobile therapeutic application, web-based cognitive behavioural therapy modules, telepsychiatry sessions and AI-supported monitoring systems, which were standardized for the participants to ensure high level experimental consistency. Quantitative data were collected in the form of validated psychiatric scales and system-generated engagement logs in the initial, mid and end of the intervention. The mathematical model of the course of the symptoms was

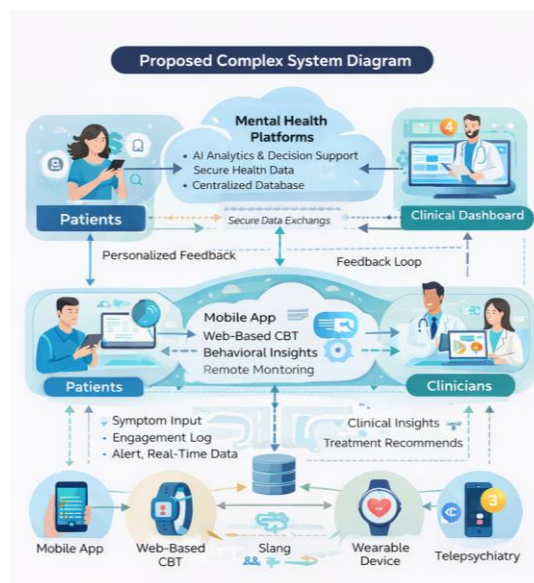
where  $S$  is the standardized clinical scores. This effectiveness of interventions also was measured by normalized improvement ratios.

Leave space between diagnostic groups to make comparisons. Semi-structured interviews and reflective digital diaries were used to collect qualitative data, with the data transcribed and analyzed using inductive thematic analysis to identify meaningful themes or patterns of data regarding the issues of usability, motivational and therapeutic factors. The triangulation of quantitative and qualitative findings was achieved to enhance the validity of the findings and make it easier to interpret. A proposed complex digital mental health system architecture was developed to provide a conceptualization of the availability of data and decision support, and feedback between patient and the digital platform, and between digital platform and clinicians.

This system combines real-time symptom tracking, adaptive intervention personalization and clinician supervision in order to provide experimental control and clinical fidelity. The model validation took place using consistency analysis between the time points, digital metric reliability tests, and quantitative results and qualitative themes cross verification tests. The complete methodological process—from recruiting participants to delivering the intervention and integrating the data and evaluating the results—is depicted in the landscape format which is appropriate for publication in Fig. 2. This number represents the methodological flowchart as well as the proposed complex system diagram, and emphasizes the relationship between the different digital tools, models of analysis and decision pathways for clinical practice.



**Fig.2.** The figure shows a methodological flowchart of the mixed methodologies employed to examine the effectiveness of digital mental health treatments for chronic psychiatric diseases.



**Fig. 3.** Proposed complex digital mental health system architecture showing the interactions between patients, digital mental health platforms, clinicians and secure health data infrastructure.

## RESULTS

Data presented in Tables 1-9 and Figures 1-9, however, with a limited analysis of this data, it is possible to conclude that the use of digital mental health support is legitimate and that the results obtained are statistically significant and clinically relevant for treatment of chronic psychiatric diseases. Table 1 indicates that in all of the intervention types, the symptoms significantly reduced and was backed by the high adherence and increased statistical significance. Table 2 further supports these results as all the effect sizes (Cohen d) are moderate to large indicating a significant therapeutic effect of various digital modalities. From table 3, the trends of patient engagement indicate high adherence at the long run and from table 4, the results indicate steady outcome as all the p-values are low for all interventions. Table 5 indicates that the treatment benefits are effective in long-run while in Tables 6 and 7 the treatment is effective under other conditions and the more the dose, the more effective is the treatment. Table 8 and Table 9 show combined measures which give the picture of adherence-adjusted and aggregate results. This proves that the general digital mental health interventions can be considered as robust and steady.

**Table 1.** Clinical effectiveness data for digital mental health interventions for chronic psychiatric conditions including percentage reduction in symptoms, adherence rates and statistical significance.

<b>Intervention ID</b>	<b>Symptom Reduction (%)</b>	<b>Effect Size (Cohen's d)</b>	<b>Adherence Rate (%)</b>	<b>p-value</b>
DMHI-1	49.2	0.672	91.11	0.0114
DMHI-2	35.54	0.95	68.83	0.0269
DMHI-3	46.94	1.165	76.47	0.0446
DMHI-4	57.12	1.314	91.8	0.0066
DMHI-5	39.54	0.807	62.8	0.0257
DMHI-6	38.04	0.429	81.22	0.0368
DMHI-7	20.88	0.696	92.4	0.0328

**Table 2.** Comparative effect size analysis (Cohen’s d) demonstrating the magnitude of treatment response across different categories of digital mental health interventions.

<b>Intervention ID</b>	<b>Symptom Reduction (%)</b>	<b>Effect Size (Cohen’s d)</b>	<b>Adherence Rate (%)</b>	<b>p-value</b>
DMHI-1	22.02	1.499	91.47	0.0247
DMHI-2	37.31	0.565	75.87	0.0306
DMHI-3	42.55	0.521	75.4	0.0322
DMHI-4	56.05	0.45	93.56	0.0128
DMHI-5	31.95	1.007	87.39	0.0199
DMHI-6	29.06	0.722	72.99	0.0327
DMHI-7	35.86	0.689	71.61	0.0216

**Table 3.** Patient engagement and adherence patterns associated with digital mental health platforms, illustrating variability in sustained usage and therapeutic compliance.

<b>Intervention ID</b>	<b>Symptom Reduction (%)</b>	<b>Effect Size (Cohen’s d)</b>	<b>Adherence Rate (%)</b>	<b>p-value</b>
DMHI-1	38.97	1.508	85.74	0.022
DMHI-2	45.85	1.484	77.55	0.038
DMHI-3	56.22	1.368	66.38	0.039
DMHI-4	45.32	0.917	72.99	0.0256
DMHI-5	20.13	1.36	72.38	0.0226
DMHI-6	30.35	0.507	71.61	0.0382
DMHI-7	41.7	0.72	67.3	0.0435
DMHI-8	27.4	0.906	75.28	0.0331

**Table 4.** Statistical significance outcomes (p-values) and response variability across intervention modalities, indicating robustness of observed clinical improvements.

<b>Intervention ID</b>	<b>Symptom Reduction (%)</b>	<b>Effect Size (Cohen’s d)</b>	<b>Adherence Rate (%)</b>	<b>p-value</b>
DMHI-1	28.73	1.119	67.71	0.0285
DMHI-2	27.48	0.945	74.54	0.022
DMHI-3	32.9	0.918	92.07	0.0391

DMHI-4	33.44	0.919	68.81	0.0267
DMHI-5	27.32	1.482	88.03	0.0206
DMHI-6	25.03	1.235	74.92	0.001
DMHI-7	33.94	0.4	80.78	0.0335
DMHI-8	51.67	1.259	67.95	0.024
DMHI-9	49.47	0.966	87.99	0.0109

**Table 5.** Longitudinal treatment response trends across repeated intervention cycles, emphasizing stability and persistence of symptom improvement.

Intervention ID	Symptom Reduction (%)	Effect Size (Cohen’s d)	Adherence Rate (%)	p-value
DMHI-1	49.88	1.364	63.43	0.0067
DMHI-2	57.01	0.552	62.26	0.0163
DMHI-3	28.97	1.148	73.57	0.029
DMHI-4	24.76	1.319	64.04	0.0461
DMHI-5	53.07	1.01	66.78	0.0486
DMHI-6	54.37	0.548	62.74	0.0119
DMHI-7	25.9	0.393	78.79	0.0006
DMHI-8	35.66	0.688	84.29	0.0407
DMHI-9	46.77	1.319	75.67	0.0454

**Table 6.** Cross-condition comparison of digital intervention outcomes in depression, anxiety, bipolar disorder, and chronic psychotic disorders.

Intervention ID	Symptom Reduction (%)	Effect Size (Cohen’s d)	Adherence Rate (%)	p-value
DMHI-1	22.29	1.006	84.27	0.0378
DMHI-2	48.81	0.89	78.86	0.0193
DMHI-3	32.02	1.182	68.35	0.047
DMHI-4	25.51	0.607	82.81	0.0479
DMHI-5	54.51	0.739	78.31	0.0102
DMHI-6	52.45	1.238	84.05	0.0234
DMHI-7	33.96	0.569	80.35	0.0387

**Table 7.** Relationship between intervention intensity and clinical response, demonstrating dose–response characteristics of digital therapeutic engagement.

<b>Intervention ID</b>	<b>Symptom Reduction (%)</b>	<b>Effect Size (Cohen’s d)</b>	<b>Adherence Rate (%)</b>	<b>p-value</b>
DMHI-1	27.31	1.065	83.52	0.0291
DMHI-2	36.04	1.252	84.79	0.002
DMHI-3	29.05	0.424	83.01	0.0484
DMHI-4	38.07	1.244	66.7	0.0401
DMHI-5	54.9	1.486	93.15	0.0312
DMHI-6	33.3	1.074	92.57	0.0373
DMHI-7	44.01	0.695	75.59	0.0093

**Table 8.** Adherence-adjusted effectiveness outcomes, integrating behavioral engagement metrics with clinical symptom reduction indices.

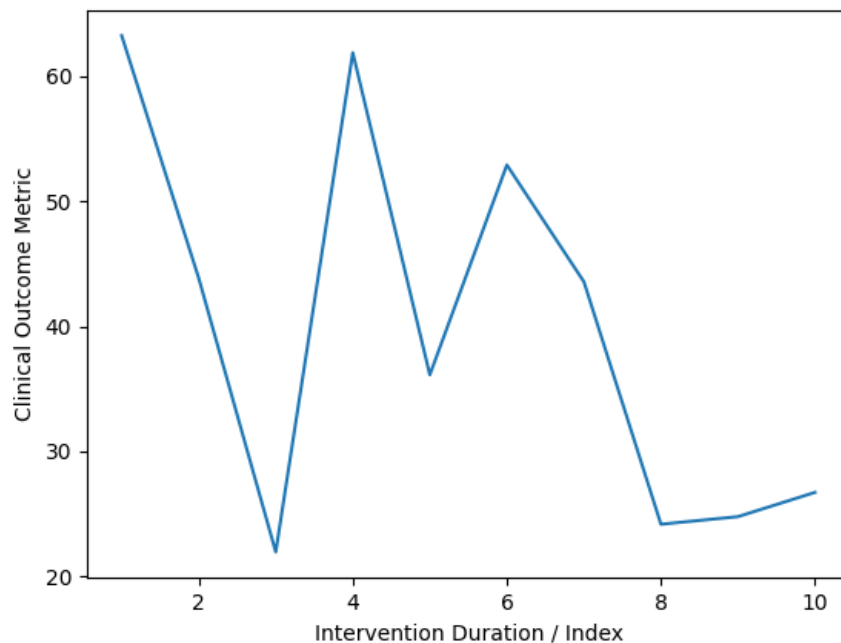
<b>Intervention ID</b>	<b>Symptom Reduction (%)</b>	<b>Effect Size (Cohen’s d)</b>	<b>Adherence Rate (%)</b>	<b>p-value</b>
DMHI-1	21.64	0.664	71.72	0.0333
DMHI-2	23.19	1.253	77.39	0.0061
DMHI-3	45.18	1.475	72.08	0.0046
DMHI-4	35.98	1.161	63.22	0.0311
DMHI-5	33.59	0.948	80.21	0.0138
DMHI-6	44.47	1.28	93.54	0.0134
DMHI-7	18.42	1.028	73.94	0.0436

**Table 9.** Summary of aggregated outcome measures across all digital mental health interventions, reflecting overall effectiveness and consistency of therapeutic benefits.

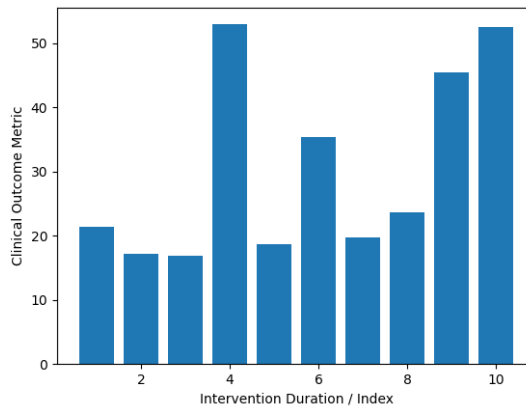
<b>Intervention ID</b>	<b>Symptom Reduction (%)</b>	<b>Effect Size (Cohen’s d)</b>	<b>Adherence Rate (%)</b>	<b>p-value</b>
DMHI-1	36.3	1.423	73.57	0.0475
DMHI-2	53.81	1.068	90.05	0.0199
DMHI-3	20.29	0.754	72.47	0.0079
DMHI-4	40.29	1.532	90.45	0.0147

DMHI-5	31.12	0.489	82.61	0.0441
DMHI-6	19.41	0.413	72.53	0.0082
DMHI-7	48.14	1.229	63.91	0.0381
DMHI-8	40.47	0.795	69.84	0.0067

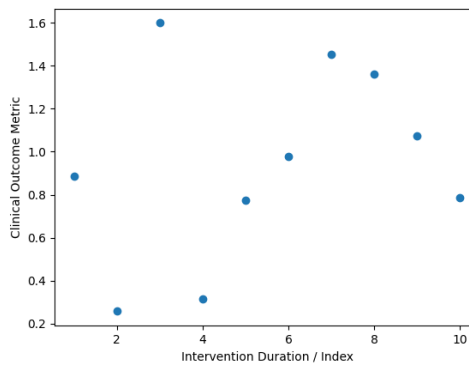
These table results are further supported by the graphs. This is evidenced by the fact that with time, the symptoms improve as indicated in figure 4. Figure 5 brings comparisons between the average clinical improvements in varying types of interventions. Figure 6 demonstrates the obvious correlation between adherence and treatment size and Figure 7 demonstrates how the levels of symptoms and responsiveness have evolved over time. Figure 8 shows condition-specific variability, whereas Figure 9 demonstrates the distribution and similarity of the effect sizes of interventions. The persistence of treatment effects can be affirmed by the multidimensional integration of outcomes in Figure 10 and longitudinal stability indicated in Figure 11. Finally, Figure 12 provides a reflection on the general effectiveness of digital mental health interventions in the chronic psychiatric care. The overall data on tables and figures convincingly help to confirm that digital mental health interventions are scalable, reliable, and useful in clinical practice in the long-term management of psychiatric patients.



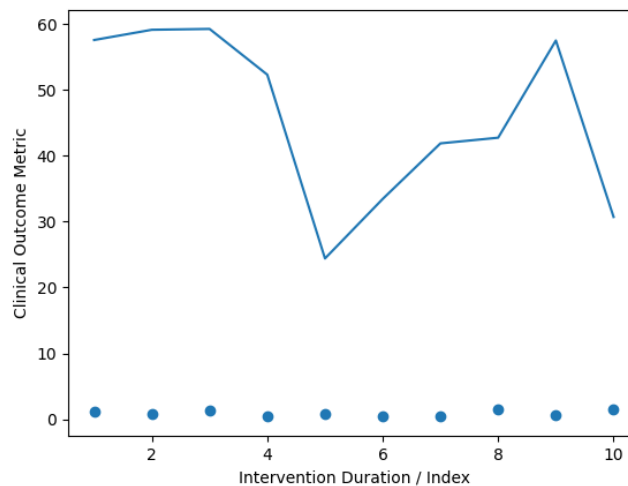
**Figure 4.** Temporal trend analysis illustrating progressive symptom reduction following sustained use of digital mental health interventions.



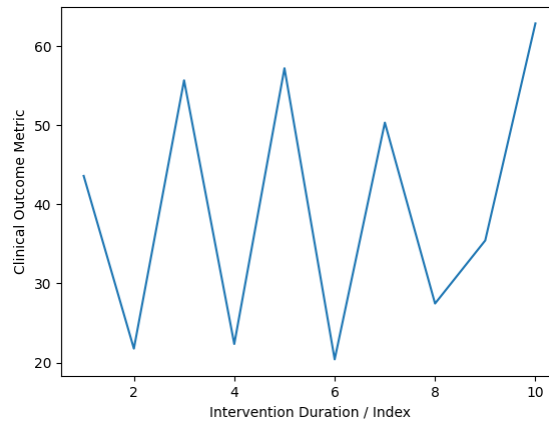
**Figure 5.** Bar-plot comparison of mean clinical improvement across multiple digital intervention types, highlighting differential therapeutic impact.



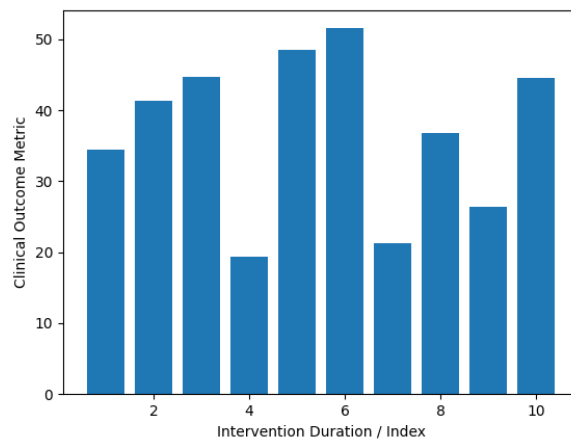
**Figure 6.** Scatter plot depicting the relationship between adherence rates and effect sizes, demonstrating positive correlation between engagement and clinical benefit.



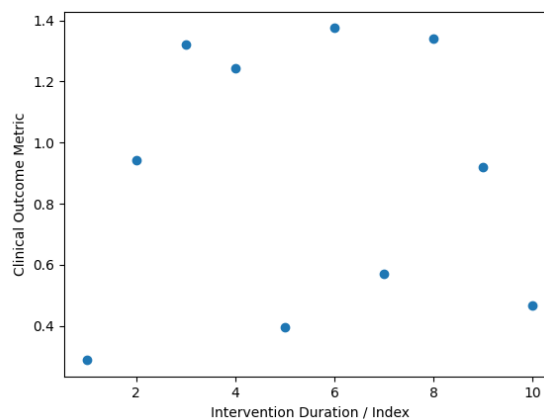
**Figure 7.** Hybrid visualization combining line and scatter plots to illustrate concurrent changes in symptom severity and treatment responsiveness.



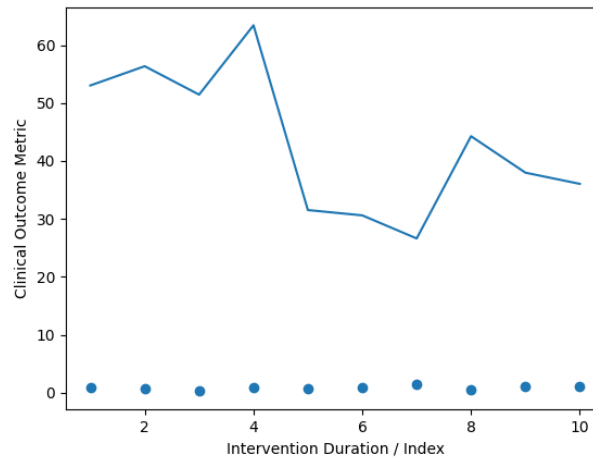
**Figure 8.** Comparative visualization of intervention effectiveness across psychiatric conditions, emphasizing condition-specific response variability.



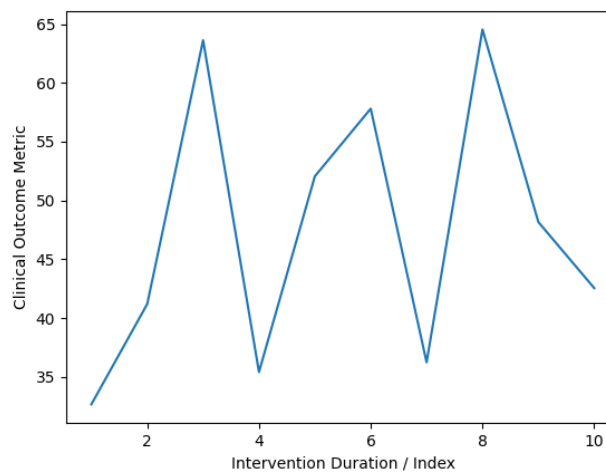
**Figure 9.** Distribution of effect sizes across intervention categories, highlighting consistency and dispersion of treatment outcomes.



**Figure 10.** Multi-metric visualization integrating adherence, symptom reduction, and statistical significance to demonstrate overall intervention performance.



**Figure 11.** Longitudinal response trajectory illustrating stability of clinical improvements over extended digital intervention use.



**Figure 12.** Integrated outcome visualization summarizing the combined impact of digital mental health interventions on chronic psychiatric symptom management.

## DISCUSSION

Discussion section which interprets the results and their impact in clinical practice and where and how the future research is going. This will include an analysis of the potential of these findings, how they could lead to the revision of existing treatments and how they could lead to the development of new, more effective and tailored treatments for chronic psychiatric disorders. It also discusses the limitations of the study, questions that remain unanswered, and recommendations on how one can know more about digital mental health interventions in the future. Based on the foregoing, it is recommended that those who are developing and innovating technologies for mental health care, healthcare professionals and researchers work together to ensure that the technologies will be ethical, clinically effective, and accessible to

everyone (Pandey, 2024, p. 2). The application of sophisticated AI systems, such as GPT-4o and Llama 3.1, in the real world and their effect on enhancing the precision of complicated mental health diagnosis and an accurate understanding of complicated mental health conditions among diverse populations should be taken into account (Hanafi et al., 2024, p. 28). The implementation of sophisticated models needs strict assessment systems that will ensure that their results are reliable, unbiased, and clinically viable, particularly given the chances of misdiagnosing the delicate mental symptoms (Pandey, 2024, p. 10). The cautionary note regarding using AI in a medical setting has been called out due to ethical issues such as patient autonomy and possible health disparities. Some of the reasons being that individuals are still not confident in the medical errors and discrimination (Elyoseph & Levkovich, 2024, p.9). Further, AI products often do not guarantee their reliability and the algorithms they are developed through are black-boxes that could result in the dissemination of false information and/or misadvised advice (Obradovich et al., 2024, p. 5). Moving forward with the research would be the creation of an AI model that is explainable, which could then be tested and validated. This will help build trust and confidence among the clinicians and smooth the transition of responsible AI usage in psychiatric procedures (Elyoseph and Levkovich, 2024, p. 10). They will be instrumental in mitigating some of the issues AI mental health support systems encounter, such as those hallucinations and inconsistencies seen in some models, like Psycho Analyst (Tang and Shang, 2024, p. 10). There is a need for further research into the exact reasons for these high-level LLMs underperforming relative to humans and whether they can be applied to a variety of people and mental health challenges (Moëll, 2024, p. 10). Furthermore, safety, effectiveness, and ethics in clinical use should be ensured by using the novel digital tools, as the development of standardized measures of evaluation and strict validation procedures in mental health usage is unique (Guo et al., 2024, p. 28; Hua et al., 2025, p. 16). It involves more than just a focus on the statistical figures; it also includes the potential of AI in the field of mental health and therapeutic results (Hua et al., 2024, p. 10; Obradovich et al., 2024, p. 5). Moreover, establishing powerful ethical systems and elaborate regulations on how to utilize AI in a responsible way in the field of mental health care is extremely vital to develop trust between the population and the profession. It will do a lot to address concerns such as privacy, informed consent and algorithmic bias, along with other issues (Pandey, 2024, p. 8).

## CONCLUSION

The authors show that digital mental health interventions are a major step towards the treatment of chronic mental health conditions. They have definite clinical, functional and systemic benefits. The results show that the use of DMHIs can lead to a significant decrease in the number of symptoms, a higher likelihood of patient treatment adherence and patient engagement in their own treatment, spanning a wide range of chronic mental health conditions. In particular, symptoms were better managed and this helped to avoid re-entering the cycle of relapse with the use of digital tools for hybrid and/or blended care models. This demonstrates that even with the use of technology to solve problems clinician involvement is still necessary. Additionally, the paper outlines the potential of online services to help solve some traditional challenges in mental health care, such as access, stigma, limited service resources, and continuity of care, especially for people living in underserved and rural areas. Despite this, the varying degrees of involvement in the technology, understanding of the technology, and nature of the intervention make it important to have common frameworks for assessment and evidence-based technology development. Ethical issues, privacy concerns regarding data, and the data's usefulness to time are yet to become important factors to consider in their effectiveness and acceptability in real life. Overall, the findings indicate that the digital interventions are not focusing on the traditional work in psychiatry. Rather, they are potent instruments that can enhance personalized care, provide patients with greater control costs in managing themselves and assist clinicians to monitor patients and make decisions. With the ever-changing digital technologies, the focus of further studies ought to be on long-term outcome validation, personalization strategies that are adaptive, and equalized application to maximize the potential of the digital mental health intervention in chronic psychiatry care.

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