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# UNLOCKING DIGITAL MENTAL HEALTH: USER INSIGHTS ON MOBILE APPS, VR, AND WEB-BASED-PLATFORMS FOR PSYCHOSIS: A SYSTEMATIC REVIEW

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**Abstract**

Background: Despite of the significant advancements being made in the development of the digital mental health interventions or DMHI's for various mental disorders, there is an evidential void in the progression of digital therapeutics for severe mental illnesses. While evidence exists on the use of digital interventions for psychosis, there is no comprehensive review addressing the differences between types of interventions and user experiences. This review synthesizes both qualitative and quantitative data, including previously unexamined comparisons of VR/AR interventions to thoroughly research on the diverse experiences psychosis patients have with the use of an array of different digital interventions.

Methods: A systematic review of articles was conducted related to user experiences of DMHI's for people with psychosis published between 2015-2024 using google scholar, JSTOR, science direct and PLOS.

Results: A thematic synthesis of 20 studies conclusively devised 6 themes relating to different experiences of digital tool usage including; reliance anchor, facets and features, engagement, machine vs. man synergy, self-direction and destigmatization.

Conclusions: The findings suggest that individuals with psychosis had a higher preference for using mobile applications in comparison to web-based platforms and had a greater disposition towards immersive VR stimulations. In addition, the participants reported the best experiences with apps that offered personalized features, psychoeducation, self-management tools, therapist support, scheduling reminders, and a user-friendly design. A common barrier to the usability and engagement for all DMHIs was the users' prior experience with technology. The effectiveness and experiences of the various digital interventions as per user reviews have been discussed along with the potential inadequacies that arose that can be rectified for the development of future technology-based interventions.

**Keywords:** Digital mental interventions. Psychosis. Synthesis. Experiences. Technology. Qualitative. Quantitative

## Introduction

Recent research by Mental Health America (MHA) suggests that an analysis was conducted using a mental health screening test on over more than 6.5 million people worldwide in 2023 and the results revealed that 79% of the people residing in the U.S. scored positive for the prevalence of a mental

health condition. The results showed that the people were at a high-risk rate for anxiety and psychosis. [1]

As defined by APA, psychosis is an abnormal state of detachment from reality and causes severe impairments in the sufferers' higher brain functions including cognition, perception and affect. It is manifested in the form of behavioral abnormalities such as delusions and hallucinations.[2] Psychosis can be a disruptive symptom of many psychotic disorders, including many severe mental illnesses including schizophrenia and bipolar disorder. While many psychological and pharmacological interventions have been used to manage psychosis, the use of digital therapeutics for severe mental illnesses like psychosis is a relatively novel phenomenon.

The emerging ideology of digital mental health has been defined as the application of digital health technology for the assessment, support and treatment of mental health concerns. This includes a cluster of technological interventions including smartphone applications, virtual/augmented reality systems, web-based platforms, wearable devices and consumer neurotechnologies. [3] The digital mental health interventions undergoing a leaping progression since over a decade now, their efficacy is being tested worldwide for an array of mental, neurological psychiatric disorders on children as well as youth and the adult population. The technological advancements positing towards mobile health (mHealth) and electronic mental health (eMH) pave a way towards eradicating the barriers associated with the traditional therapeutic interventions.

While many researches have proven the effectiveness of digital mental health interventions for other mental disorders; some literature has also evidenced them as being effectual for individuals diagnosed with psychosis despite of the stereotypical notions behind this idea. People with severe mental illnesses or SMI's are not preferred to be included to access digital mental health resources due to the stereotypes and perceived barriers to its support in comparison to the people with other disorders like mood or anxiety disorders. Thus, this issue is of marked significance as the facilitators, barriers and effective types of digital therapeutics for this population needs to be highlighted for achieving success. Evidence has been reviewed for their experiences of using digital interventions (smartphone applications, wearable devices and webs-platforms) within psychosis using qualitative studies but no comprehensive review is available to address the potential differences between types of the digital interventions used and aligning the user experiences with the type of digital approach used has also not been researched. [4]

This review provides a synthesis of studies that adopted both qualitative and quantitative research design to analyze the experiences of users suffering from psychosis using digital mental health interventions. It also includes VR/AR reality as an intervention that prior reviews on this topic did not incorporate. Thereupon, it intends to provide a thorough review of how people with psychosis engage with DMHI's and their experiences, preferences and perceptions after its usage. The major research question that this review aims to answer is; How do people with psychosis experience the various digital mental health interventions differently in terms of their barriers and effectiveness?

## Methods

This systematic review used the PRISMA (Preferred Reporting Items for Systematic reviews and Meta-Analyses) guidelines and checklist.

### Inclusion criteria

Studies were included if they had participants who were diagnosed with psychosis or schizophrenia and both of these are categorized as SMI's or severe mental illnesses. Moreover, studies that explored digital mental health interventions delivered via smart phones, web-based platforms or computer stimulated modeling (VR) that pertain to assist with symptom monitoring and management to enhance well-being were included. The studies were included if they used a qualitative, quantitative or mixed methods approach that aimed to explore and investigate user experiences, satisfaction, acceptability, and perceptions about the digital mental health interventions used.

**Exclusion criteria**

Studies that enrolled participants with any other psychotic disorder or SMI were excluded. Those studies that aimed to gauge care-giver or layman perspectives were also excluded. Among all the studies, those that intended to investigate perceptions of DMHI's before their implementation through survey research designs were also not included. The studies that solely focused on telehealth or informational websites were eliminated too.

**Search strategy**

Many search engines were used in this study in order to conduct a comprehensive search. The databases that were used for this systematic review included google scholar, PLOS, JSTOR and science direct. For the population, the search terms were: psychosis OR schizophrenia OR psychosis experience OR psychosis patients. The next terms were about the digital mental health intervention: DMHI's OR mHealth OR e-mental health OR Apps OR web platforms OR Virtual reality/augmented reality OR VR therapy OR mobile apps OR technological devices OR Digital therapeutics. The search terms for the experience were: user experiences OR psychosis patient perspectives OR participant experiences OR user perspectives OR utility OR feasibility OR satisfaction OR outcomes. Only the articles that were published in English language between the years 2018-2024 were included. However, no search limits were set on the type of research design, location or age group.

**Data screening and study selection**

The figure 1 illustrates the process of study selection. 35 studies were identified from the literature search. During the selection process, 3 articles were eliminated due to content duplication. 8 articles didn't meet the inclusion criteria and the rest of the 5 articles were not included because they had low temporal validity, which is a type of external validity that examines generalizability of the findings across time. A total of 20 studies were included in the final review.

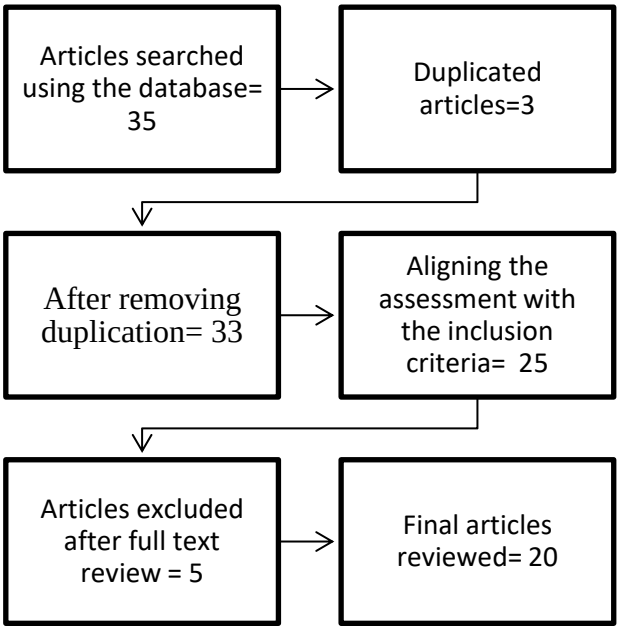


**Figure 1. PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses)**

**Data extraction**

The information that was extracted from the studies included the author, year of publication, intervention used, country, study design, data collection method, the findings, sample size and the age bracket of the participants. The information retrieved were cross checked by 2 independent reviewers.

**Table 1- summary of studies included in this review**

| Study | Sample, N | Type of study | Data collection method | Age range (years) | Country | Intervention | Results |
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| Participants' experiences of AVATAR therapy for distressing voices: a thematic qualitative evaluation (Rus-Calafell et al., 2022) | 14 | Randomized control trial | Semi-structured interviews | Above 18 | UK | Avatar therapy | The use of technology into the therapeutic process was well accepted and all the participants were satisfied with creating and interacting with the avatar. Some participants showed concerns about their data security. |
| Virtual reality (VR) therapy for patients with psychosis: satisfaction and side effects (Freeman et al., 2023) | 122 | Clinical trial | Structured questionnaires | 16 and older | UK | Virtual reality | The patients with psychosis valued being given the opportunity to use VR as a therapy tool that posed them with little side effects. It made the participants feel optimistic and satisfied. |
| Views of young people with psychosis on using virtual reality assisted therapy. A qualitative study (Holgersen et al., 2022) [15] | 16 | Intervention development qualitative study | Semi-structured interview | 13-18 | Norway | VR assisted CBTp | The familiarity of youth with technology makes VR an acceptable tool as it creates a less threatening immersive environment with fewer social risks. Exploring acceptability of VR in youth can enhance user engagement. |
| Co-design of avatars to embody auditory hallucinations of patients with schizophrenia (García et al., 2021) [12] | 49 | Cross sectional, multi center | Structured questionnaires | 26-58 | Europe | Co-design of avatars | Participants found the system as useful but they felt that the avatar creation process was somewhat difficult. They wanted to converse with the avatar due to the element of control, ease of use, acceptance and credibility. |
| A Feasibility and Acceptability Trial of Social Cognitive Therapy in Early Psychosis Delivered Through a Virtual World: The VEEP Study (Thompson et al., 2020) [34] | 20 | Single-arm, non-randomized proof of concept study | Semi-structured interviews and structured questionnaires | 18-45 | UK | Social Cognition and Interaction Training' (SCIT) delivered virtually | The DMHI had a high satisfaction and acceptability score. Participants stated that it was safe and immersive. They did face technical issues but appreciated the support person who was present. Individual sessions were preferred more than group ones. |
| Acceptability and experience of a smartphone symptom | 10 | Qualitative analysis | Semi-structured interviews | 16-65 | China | Smartphone symptom monitoring App (YouXin) | Most of the participants found the app as easy and connected with it. |

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| monitoring app for people with psychosis in China (YouXin): a qualitative study (Zhang et al., 2024) [35] | | | | | | | The self-monitoring option was perceived as rewarding but they recommended adding more symptom domains to the app, refining the results layout and making it more engaging through gamification. |
| Digitally supported CBT to reduce paranoia and improve reasoning for people with schizophrenia-spectrum psychosis: the SlowMo RCT (Garety et al., 2021) [13] | 22 | Qualitative analysis | In-depth Interviews | 20-64 | UK | Slowmo- a blended digital therapy (App) | Participants felt stuck prior to this intervention and they developed a positive relationship with the app, experienced greater engagement and positivity towards their lives. Their paranoia improved, they could relate to the vignettes and wanted a therapist to support their learning on the app. |
| The EMPOWER blended digital intervention for relapse prevention in schizophrenia: a feasibility cluster randomized controlled trial in Scotland and Australia (Gumley et al., 2022) [9] | 73 | Randomized control trial | Self-report measures, | Above 16 | Scotland and Australia | EMPOWER blended digital intervention (App) | There was a high rate of engagement, acceptability and usability. They showed data privacy concerns. The app was interesting in terms of learning and had credibility as per the participants. The adverse events were monitored to respond to their needs. Fear of relapse was also lower in the empower group. |
| Development and Long-Term Acceptability of ExPRESS, a Mobile Phone App to Monitor Basic Symptoms and Early Signs of Psychosis Relapse (Eisner et al., 2019) [20] | 14 | Qualitative analysis | In-depth interviews | 22-57 | UK | Express-Mobile App | Regular calls from the researcher were essential to increase app engagement and participants believed that self-monitoring was a supplement to in person appointments. Patients showed a willingness to utilize a weekly symptom monitoring app, understanding the potential benefits. |

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| Early Psychosis Service User Views on Digital Technology: Qualitative Analysis (Bucci et al., 2018) [36] | 21 | Framework analysis | Semi-structured interviews | 14-65 | UK | EISs (early intervention for psychosis services) | There was a complete agreement on mHealth intervention to augment the traditional approach to therapy as it would facilitate them with a sense of empowerment and control. However, barriers included lack of emotional reassurance, digital divide and data protection concerns. DHMI's were destigmatizing. |
| Experiences of a Digital Mental Health Intervention from the Perspectives of Young People Recovering from First-Episode Psychosis: A Focus Group Study (Lal et al., 2023) [37] | 9 | Focus group study | Focus group interviews | 18-34 | Canada | DMHI- Horyzon | Participants found the app as an easy to use, reliable and a helpful tool to develop their coping strategies, for regular recovery tips, self-improvement and building a connection with one-self as well as others. There is a need to include content for psychoeducation options to customize it as per one's language and lifestyle. |
| "I wanted to do more of the homework!"— Feasibility and acceptability of blending app-based home work with group therapy for social cognition in psychosis (Sedgwick et al., 2021) [38] | 14 | Pilot study (mixed methods approach) | Semi-structured interviews and structured questionnaires | 18-65 | UK | Brief blended intervention (group therapy plus app) | Adherence to the app's tasks was good and so was the attendance on the group sessions. The importance of face-to-face therapy was recognized. Some participants showed suspicion with technology. Some preferred frequent prompts while others wanted to stay on their own pace. The participants found the blended intervention as acceptable and feasible. |
| Blended Digital and Face-to-Face Care for First-Episode Psychosis Treatment in Young People: Qualitative Study (Valentine et al., 2020) [10] | 10 | Qualitative analysis | Semi structured interview | 19-28 | Australia | Blended digital and face to face therapy- Horyzon | As per the participants, the intervention provided enhanced accessibility, continuity, consolidation and posttherapy support to the them. However, they viewed the digital intervention as a supplement. Data privacy concerns |

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| | | | | | | | existed, but people also suggested the use of chatbots for fulfilling their therapeutic needs. Mood tracking as per the participants would assist them. Barriers to usage included social anxiety and low motivation levels. |
| Technology-Based Psychological Interventions for Young Adults with Early Psychosis and Cannabis Use Disorder: Qualitative Study of Patient and Clinician Perspectives (Tatar et al., 2021) [14] | 20 | Qualitative analysis | Focus group interviews and semi-structured individual interviews | 18-35 | Canada | TBPIs (Tailoring new technology based psychological interventions) | The clinicians considered TBPI's as a useful addition to overcome structural barriers. To increase patient engagement, it is essential to offer social reinforcers. To combat the social isolation a blend of digital and face to face communication is essential. Personalization and avoiding repetition of content was preferred. |
| The acceptability, usability and short-term outcomes of Get Real: A web-based program for psychotic-like experiences (PLEs) (Stafford et al., 2015) [21] | 12 | Mixed methods research | Online surveys and semi structured interviews | 18-30 | Australia | On track get real web-based program for psychotic like experiences | The program had a moderate to high acceptability and perceived usefulness for the participants. They gained a self-awareness and better coping skills to accept their experiences. Personalization was demanded. Symptom monitoring option was valuable and they preferred to use the app for a shorter duration. It prevented symptom exacerbation. |
| A Serious Game for Young People with First Episode Psychosis (OnTrack>The Game): Qualitative Findings of a Randomized Controlled Trial (Jankowski et al., 2022) [18] | 16 | Randomized control trial | Qualitative interviews | 16-30 | United states | On track, the game | Participants reported relatability to the videos and the content of the game. Also, they felt hopeful for recovery along with decreased self and public stigma. As the app encouraged the participants to identify their social support sources their understanding regarding the importance of social support increased. They felt empowered. |

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| Service User Experiences of Integrating a Mobile Solution (IMPACHS) Into Clinical Treatment for Psychosis (Austin et al., 2021) [30] | 16 | Mixed methods research | Semi-structured qualitative interviews | 18-36 | Denmark | Improving Availability and Cost-effectiveness of mental Healthcare for Schizophrenia through mHealth (IMPACHS) | It was accepted by the participants and they found it to be a readily accessible tool that gave them daily reminders of the therapy tasks, beneficial for their cognitive deficits. The self-monitoring element helped them understand their illness better. The meaningful sharing of the information and flexibility in usage of the app enhanced engagement in Considered as a useful source with psychotherapy. |
| A novel smartphone-based intervention targeting sleep difficulties in individuals experiencing psychosis: A feasibility and acceptability evaluation (Taylor et al., 2022) [16] | 15 | Mixed methods approach | Semi-structured interview and structured questionnaire | 16-65 | UK | Smartphone based CBT intervention | The familiarity with technology showed that the intervention was feasible, routine friendly. Some were dissatisfied with some of its nonmodifiable elements like too much content and engagement on the app declined over time. Participant engagement on the reminders was low. Vouched for the need of a therapist guidance. There was an improvement in the participants' sleep patterns, paranoia as well as overall wellbeing. |
| A pilot digital intervention targeting loneliness in young people with psychosis (Lim et al., 2019) [19] | 12 | Mixed methods approach | Semi-structured interviews | 17-25 | Australia | +CONNECT, a digital smartphone app | The app was beneficial in reducing loneliness. The positive reinforcement element led towards greater feasibility of the app and majority of the participants found the app to be useful, fun to use, gave them a positive outlook for their future and helped them develop better social connections with other people. |

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| Recovery After Psychosis: Qualitative Study of Service User Experiences of Lived Experience Videos on a Recovery-Oriented Website (Williams et al., 2018) [32] | 36 | Qualitative analysis | Semi-structured interviews | 19-64 | Australia | The SMART interactive website | The option to engage with the videos of lived experiences on the website was the most vital element of their web usage. Relatability helped them build resilience. However, some participants felt drained to hear about other people's experiences and wanted to escape. Assistance of a worker who guided the participants was valued. . |

## Results

We used the PRISMA screening process to select the articles and a total of 20 studies were included in this review. The following themes emerged from the analysis of the research studies.

### Theme 1: Reliance anchor

People suffering from psychosis might have paranoid ideations making them feel suspicious towards everything around them. [5] This idea is also often framed into a stereotypical generalization that individuals with an SMI like psychosis are skeptical towards novel interventions that include technological elements [6]. However, our analysis revealed that all the participants showed an openness to experience for every kind of digital mental health intervention. Acceptability and reliance emerged as the central themes.

From valuing the opportunity to undergo VR therapy, to having a faith in the avatar creation process as being a credible part of the therapeutic module, to their willingness to monitor their symptoms on the app since the very beginning phase and the element of perceived usefulness before the intervention are the findings that deviate from the usual commonplace ideas, we hold about the users' experience of DMHI who has psychosis. This reliance can also be attributed to the prior familiarity that the participants had with technology i.e., most of the psychosis patients owned their own personal devices i.e., smartphones. [7] Therefore, a high level of acceptance was shown by all the users.

### 1.1 Data privacy implications

Data safeguarding concerns were a common concern put forth by the participants of some of the DMHI users specifically VR therapy, EMPOWER app and some digital blended therapies. [8, 9, 10] Majorly, their concerns were centered around the idea that who would have access to the data that they share.

### Theme 2: Facets and features

All the DMHI's ranging from mobile applications, virtual reality stimulations to the web-based platforms had some distinct features that the participants used and gave their remarks on. The commonalities between participant reviews of the characteristics of the DMHI's were noted.

### 2.1 Personalization

This idea refers to customizations and modifications that could be made on the digital interventions. While this wasn't a common ideology for the VR therapy, the participants who used the smartphone and web applications considered the customization and being able to tailor the options on the app as per their preferences as a highly focal avenue. For example, user views included the suggestion that the Horyzon app should have an option where participants can tailor the content as per their language

and lifestyle.[11] While some participants preferred frequent prompts and notifications and greater content on the apps, others emphasized on the need for autonomy to continue with their pace and lesser content on the platforms based on the variations in their symptoms and triggers.

**2.2 Seamless navigation/ user friendly vibe**

Also referred to as the feasibility factor, it refers to the ease in terms of intervention usage and its accessibility. The DMHI's having an element of ease increased the participants' adherence to them. Participants were satisfied to have access to readily available, reliable and flexible resources provided within the digital therapy programs.

**Theme 3: Engagement**

The DMHI's had elements that kept the participants with psychosis engaged, committed and employ consistency on their tasks on a routine basis. The VR stimulations were immersive, similar to real life and co-designing the avatars made VR therapy a captivating treatment module for the participants. [12] For the apps, some of the participants reported that refining the layout and adding gamification elements could improve their engagement levels. Some apps used vignettes that added onto the relatability aspect. [13] While some interventions like TBPI's used social reinforcers which assisted the individuals with psychosis in staying on track with the digital therapy practices. [14] This shows that engagement is a crucial element to consider when planning DMHI's for psychosis patients.

**Theme 4: Man vs. machine synergy**

In the era of digital age, despite of the remarkable advancements being made in the field of mental health, there is a huge void that only humans can fill. This was the notion put forth by majority of the DMHI users who acknowledged this idea that the digital therapy modules are not a replacement but an augmentation strategy to the traditional therapy approach that can in collaboration enhance therapy outcomes.

**4.1: Human aid and therapeutic alliance**

Participants were of the view that the DMHI they used to help them build a rapport with the clinician who had access to their data. This meaningful data sharing strengthened their alliance. Alongside, they felt that the presence of another individual who assisted them in navigating the operations, solving technical issues, helping them with self-reflection and provided utmost support was very beneficial. For some interventions, the participants even asked for additional support, pointing it out that they need a therapist who can guide and support them [13, 16] Since psychosis patients also suffer from social isolation issues, this puts them in a state of dire need for the clinician's presence. [17] The lack of emotional reassurance in the interventions also posits towards the similar idea, which was an explicitly stated concern by the participants. Some apps also encouraged the participants to identify their social support sources and making them learn how impactful it was to have connections in an interesting manner. [18]

**Theme 5: Self-direction**

The participants reported feeling a sense of control and empowerment over the interventions. The way they could monitor their symptoms and progress themselves, co-design their avatars, complete their therapy tasks on their own and track their mood made them feel that they were capable of managing their disorder and mood fluctuations associated with it. Being able to relate to the videos, vignettes and stories shared by other people with psychosis as well as given the avenue to form a social connection with them also added to the participants' sense of empowerment. [19]. However, this wasn't true for all the participants since some of them reported experiencing social anxiety being on the app. [10]

### 5.1: Future orientation

The review also reveals that using the DMHI's gave the participants a sense of hope, confidence and optimism towards their future and life in general along with satisfaction. [19, 20] This can be due to the layouts of their treatment progress e.g. graphical representations of symptom improvement and as a result, due to the fulfilling experiences of using the DMHI's.

### Theme 6: Destigmatization

The use of DHMI's proved to be an approach that shackled the taboos' that posed a hindrance to seeking help. The ease of instant accessibility, safeguarding of privacy concerns and normalization of help seeking behavior was all provided to the participants under the umbrella of DMHI's. Participants stated that they felt stuck prior to having access to DMHI's. [13] The preconceived notions of social risks that the psychosis patients had with real-life interactions were eradicated with the use of VR stimulation. [15] The digital apps and platforms provided the participants with an insight on their illness and helped them build a self-connection eliminating the stigmatization barrier helping them stay focused on their therapeutic process in their safe place. [11, 21, 18]

## Discussion

This systematic review is a comprehensive addition to the literature that explores the experiences of people suffering from psychosis using digital therapeutic tools. There were 6 themes synthesized from the studies that indicated the effectiveness of using DHMI's for those diagnosed with psychosis or schizophrenia and how these digital therapeutic sources can be refined for enhancing treatment outcomes.

The recent findings iterate that patients diagnosed with psychosis tend to use technology in a similar manner in comparison to the undiagnosed, normal population. [22] Although not all, but a majority of those suffering from psychosis or schizophrenia have benefitted from the use of electronic health as suggested by research that they find it easier to comply to therapeutic tasks assigned to them online by clinicians. [23] Therefore, these findings have shaken the dilemma that people with psychosis don't trust and rely on technological interventions due to suspicion and novelty factors. Moreover, the data privacy concerns were a concern put forth and thus is a barrier that needs to be addressed in the future technological progressions in digital health by providing full explanation to the patients on who will be able to access their data and how will the system ensure that their confidentiality is not breached neither will their information be misused. It was reported in the current review that the psychosis population, suffering from a severe mental illness relied on, accepted and valued the digital therapeutic interventions.

Research suggests that there is a dire need to understand the factors within the interventions tend to increase the patients' engagement, what are their underlying interests and preferences for an effective implementation of the digital interventions in mental health. [24] The most pertinent factors reported by the participants included being given the option to personalize the apps and platforms according to their preferences and revered the simplicity and ease of use aspect of the interventions. Making these interventions interactive, customizable and immersive would increase participant engagement and adherence as reinforced by prior researches as well.

Moreover, digital therapy takes away the element of rapport building and the absence of human interaction creates a void, since a therapeutic relationship is like the scaffolding of the therapy process. [25] This emerged as one of the most significant themes in our review as majority of participants stated that they valued the support staff, the clinician and the therapist who assisted them and provided emotional reassurance. This was an ideology posed by the participants which guides us to acknowledge the fact that digital therapeutics can only supplement the traditional therapy modules and never be a substitute to it. This has been reported in many studies that instigate user preferences

of digital and traditional therapeutics that participants tend to show a high willingness to have collaborative care with both kinds of services. [26] Since psychosis patients' experience feelings of self-isolation, this adds onto the notion of external clinician support.

Consistent with the findings reported prior to this review, such innovative interventions have the capacity to encourage self-management of the symptoms among psychosis patients by giving them the platform to take control over their illness with autonomy. With being able to view their symptom progression or retrogression on an app or web platform and following on the therapy tasks assigned to them all by themselves makes them feel empowered and responsible. Furthermore, they also built their own social connections and viewing other people's stories who had similar experiences provided them with the element of relatability and validation. This posits towards the framework that online social networks are crucial for patients with psychosis to help them combat social isolation and future interventions whether it's an app or website, must include a feature enabling social interactions. [27] In addition to this, the technology-based interventions also provided the participants with an optimistic future orientation and this is evidenced by prior researches that state how TBIs or tech-based interventions are effective for quality-of-life outcomes in patients with psychosis. [28]

A severe mental illness like psychosis has forever been portrayed in a derogatory manner to engrave a negative, stereotypical connotation in people's minds. This leads to stigmatization towards people with psychosis which becomes a barrier for them to access traditional therapy services in rehabilitation centers or clinics. Research suggests that people with chronic psychosis are at high risk for self-stigmatization, leading to a self-concealment of their diagnosis. [29] Hence, DMHI's provide the patients with psychosis a treatment window that is accessible without having to experience the burden of stigma and unnecessary suffering, as evident by one of the themes that emerged in this review.

Additionally, the effectiveness and user experiences of digital therapeutics will further be discussed in the light of the differences between their types i.e., virtual/augmented reality, smartphone applications and web-based platforms. The virtual reality-based therapy had the highest reported effectiveness for immersive VR stimulations and the participants reported the avatar creation process as profoundly helpful. [12] There was a high participant retention rate, satisfaction, engagement and promising results that led the participants to improve their psychosocial functioning and auditory hallucinations. It posed them with minor after effects, mainly stimulator sickness and mild headaches. This shows that VR/AR therapy interventions are beneficial to reduce positive symptoms in schizophrenia and psychosis.

While, the mobile applications focused on the overall, routine management of the symptomatology they are more convenient for the self-management of the illness. Within the apps, those that gave the options to personalize the features, provided the material on psychoeducation, self-management, therapist support, assisted the participants in recall through scheduling and reminder functions and had simplicity in terms of the layout and content were the ones that the participants reported the most positive experiences for. Most of the apps, including IMPACHS, app4independence, +Connect, ExPRESS and ExpiWell had these features [30, 31, 20, 19, 16.]

In comparison to this, the web-based platforms had a relatively lower preference as reported in one of the types of research on the platform HoryzonsCa. [11] However, for some web platforms like SMART the participants reported that interaction with other people with similar experiences helped them build hope for recovery and battle with feelings of social isolation. [32]
The common barrier in terms of usability and engagement for all the DMHI's was prior experience to technology. This posits towards the idea of digital divide where only those people with psychosis who had knowledge about technology and ease of access to it benefitted the most from all the 3 types of interventions. Thus. suggests that the digital therapeutic interventions must be able to bridge this

divide through supplementary material to assist those who don't have the edification and exposure to digital devices and technology which becomes a barrier for them to engage and benefit from DHMI's whether VR therapy, mobile apps or web-based platforms.

**Limitations and suggestions**

This review should not be considered in isolation from its methodological limitations and under inclusion of information. Firstly, the current review didn't include psychosis patients belonging to diverse ethnic backgrounds which affects its external validity. Moreover, this paper also failed to include studies that addressed the digital ethics mandatory to be highlighted when using digital therapy interventions for a psychosis population, which is a severe mental illness. The review also didn't include studies that researched on the user experiences of wearable digital devices and artificial intelligence tools like Fitbit watches and chatbots.

The themes generated in this review and the discussion on the potential differences between the various types of digital mental health interventions can inform the clinicians and software developers of their effective implementation and in addressing the technical and content related flaws associated with each digital therapy tool. Future therapeutic interventions can be improved in terms of their features, layout and engagement by adding or altering the modules as per user preferences for improved treatment outcomes.

**Conclusion**

Using digital mental health interventions or blended digital care poses many benefits to patients with psychosis in terms of enhanced therapeutic effectiveness, accessibility and self-management of their illness. Future research on digital mental health interventions on psychosis can focus on emerging concepts of DMHI's like the poly digital approach. [33] This can be used for developing relevant apps, platforms and tech-based stimulations for population with severe mental illnesses in various parts of the world along with bridging the digital divide.

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