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Hybrid mHealth care: Patient perspectives of blended treatments for psychosis. A systematic review

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ABSTRACT

Background: mHealth interventions use mobile and wireless technologies to deliver aspects of healthcare, and have been extensively employed in mental health research, showcasing their potential to address the significant treatment gap. While numerous studies underscore the advantages and functionalities of mHealth, challenges persist regarding patient uptake and sustained engagement among individuals with psychosis spectrum disorder. This review aims to explore individual-level barriers and facilitators to engagement with hybrid digital systems, which involves the integration of digital tools alongside in-person care.

Method: Four electronic databases (Medline, Web of Science, CINAHL, and PsychINFO) were systematically searched to identify hybrid digital interventions for psychosis spectrum disorders. Studies that only reported the efficacy of the interventions were excluded. 16 studies were included in the final review.

Results: Six themes were identified in this review, including mHealth as a tool to aid communication, the central role of the therapist, an increased sense of support through the provision of digital support, allowing greater insight into auditory hallucinations, enabling technologies and barriers to engagement.

Conclusions: This review demonstrated the factors impacting engagement in hybrid interventions for psychosis spectrum disorder. By identifying barriers and facilitators, the findings could offer valuable guidance for the design of innovative digital interventions. These findings also underscore the importance of prioritising trustworthiness in digital systems. Future research should focus on establishing and implementing trustworthy digital systems to enhance engagement and effectively integrate mobile health into conventional healthcare practices.

1. Introduction

The rapid development of digital interventions to support mental health over the past decade has brought new opportunities and challenges to the sector. The American Psychological Association states that we are in "the age of digital interventions" (Weir, 2021), accelerated by the COVID-19 pandemic, which forced the world to transition to new working conditions almost overnight (Dwivedi et al., 2020; Iivari et al., 2020). Mobile health (mHealth) is an emerging area of electronic health (eHealth), which uses mobile and wireless technologies, such as the use of apps and SMS, to enhance the delivery and outcomes of healthcare (Istepanian, 2022). A growing body of literature has explored the use of mobile applications, wearable devices, and short messaging services to enhance communication, collect data, deliver interventions, monitor patient progress, and facilitate the adherence to persistent mental health conditions and chronic disease management (Bond et al., 2023; Bombard et al., 2018; Istepanian et al., 2007).

According to The National Library of Medicine, between 1.5 and 3.5 % of people will meet diagnostic criteria for a Psychotic Spectrum Disorder (PSD; Calabrese and Al Khalili, 2024), which includes schizophrenia and other psychotic disorders. Despite Early Intervention Psychosis services (EIP), psychotic relapse and disengagement remains high, with positive clinical outcomes not sustained 5 years after treatment (Bertelsen et al., 2008; Mayoral-van Son et al., 2016; Robson and Greenwood, 2022). Additionally, the untreated rate, or treatment gap reported in schizophrenia, and other non- affective psychoses was 32.2 % (Kohn et al., 2004). More recently, it is estimated that about one-third of patients with psychosis disengage from services before completing

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their treatment (Polillo et al., 2022). mHealth may be able to bridge the current treatment gap by providing a flexible and inexpensive treatment alternative. They may be particularly crucial to provide consistent and individualised support once individuals have been discharged from specialist settings, to reduce relapse. This aligns with the NHS movement towards 'supported self-management' in the treatment of long-term mental health disorders (NHS England, 2020), allowing mental health treatment to be accessed independently. Insufficient self-management, low health literacy, and limited activation have been associated with elevated costs, long-term and worsening symptoms of mental illness, and heightened multi-morbidity within healthcare. Implementing evidence-based digital interventions aimed at enhancing self-management has been reported to reduce susceptibility to relapse and reliance on services (Lean et al., 2019; Naslund et al., 2015), particularly when used alongside standard care (Renzi et al., 2022; Seow et al., 2023).

Several studies have highlighted the benefits of mHealth, including extending the reach of interventions (Grossman et al., 2020), reducing waitlists to executive care (Naslund et al., 2015), and overcoming the stigma attached to accessing traditional services (Lal & Adair, 2014). mHealth has been reported to successfully support self-management of psychotic and mood disorders (Ben-Zeev et al., 2019; Naslund et al., 2015). A 2019 meta-analysis identified 66 randomised controlled trials of app-supported smartphone interventions for mental health problems. Clinical outcomes for the management of depression, generalised anxiety, and stress levels were significantly improved in comparison to the control group (Linardon et al., 2019). However, literature about the use of mHealth applications designed for people with PSD is limited. A recent literature review conducted by Rus-Calafell and Schneider (2020) summarised the use of digital technologies to improve psychological treatment outcomes in early psychosis. Likewise, Maechling et al. (2023) specifically evaluated the therapeutic effectiveness of a singular type of technology - mobile smartphone applications, in managing patients with First Episode Psychosis (FEP). The studies included suggested interventions to be feasible, acceptable, and engaging, as well as improving clinical outcomes such as psychotic symptoms. However, neither review explored hybrid interventions and were limited to the context of FEP.

However, mHealth interventions have encountered challenges in patient uptake and maintaining engagement, largely due to lack of motivation for self-guided interventions, limited human like qualities, and not being tailored to individual need (Arnold et al., 2020; Gire et al., 2017). While an abundance of studies has investigated the feasibility and efficacy of mHealth interventions, limited studies have explored how mHealth could be integrated with face-to-face interventions to enrich care. Hybrid health care refers to the combination of digital tools with in-person care, allowing patients to have more control in managing their health, yet still under the support of a clinician (Chan et al., 2014; Hilty et al., 2018).

Considering the global effort to integrate mHealth into traditional mental health care, understanding patient perspectives on the possible barriers and facilitators to engagement with hybrid digital systems is imperative in developing accessible interventions (Saleem et al., 2021). Individual use of and engagement with digital tools is still an emerging area of research in serious mental health problems, particularly with disorders such as psychosis which may come with unique barriers such as negative attitudes, suspicion and poor attention and memory. Moreover, existing research has not yet reported on the specific perceptions and experiences which may be encountered in hybrid digital intervention within this population. For the purpose of this review, hybrid care is defined as a mix of digital and face-to-face or blended interventions, including consistent and regular care from a physician or mental health professional.

Therefore, this review aims to understand the individual-level barriers and facilitators for individuals experiencing Psychosis Spectrum Disorder in engaging with hybrid digital systems, and to explore strategies for promoting trust and enhancing engagement in the integration of mHealth and traditional health care.

2. Materials and methods

2.1. Search strategy

The literature search was conducted in two phases. The initial phase comprised of the researcher screening titles and abstracts against the inclusion criteria. Full text screening was then carried out on the selected studies during phase two. Four electronic databases were systematically searched: Medline, Web of Science, CINAHL, and PsychINFO. All articles searched up until March 2024 were included in our search. The full search terms can be found in Appendix A.

The reference list of primary studies was also hand searched to identify any potentially appropriate studies (Purssell and McCrae, 2020). Search results were imported into EndNote (bibliographic software) and any duplicates were removed. The remaining papers were then imported into Rayyan (Ouzzani et al., 2016), to screen potentially relevant titles and abstracts following the PRISMA (Moher, et al., 2009) chart for quality assurance.

2.2. Eligibility criteria

We included research of any study design, written in English, and that had been featured in a peer reviewed journal. Book chapters, reviews, meta-analyses, abstracts submitted to conferences and hypothetical interventions were not included. Studies were included if they met the following criteria: contained original empirical data; hybrid care (a mix of digital and face-to-face or blended interventions); the digital element utilised mobile interventions (including the use of apps, online browsers and text messages); if the entire sample consisted of participants diagnosed with a psychotic disorder, or results were categorised by diagnosis according to the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association, 2013) or International Classification of Diseases (ICD; World Health Organization, 2019) were over the age of 18 years old; and focused on patient perspectives of the service. Studies with mixed populations where it was not possible to isolate results based on the specific population or if they included a mixed population of severe mental illness; reported exclusively on the efficacy of the intervention; or if the only in-person element of the intervention was guidance on the digital application.

2.3. Quality appraisal

The Mixed Methods Appraisal Tool (MMAT; Hong et al., 2018), sections 1 and 5 were chosen to assess the quality assessment of the included studies. The MMAT was utilised to understand the quality of the included research and identify potential flaws in the methodology, not to exclude papers. Using the ENTREQ statement guidelines (Tong et al., 2012) to enhance transparency, data was thematically analysed, pooled, and uploaded to NVIVO v14 qualitative data analysis software. MMAT results showed that all studies included appropriate detail to inform the qualitative synthesis, as there were no major concerns regarding the quality of the included research. The findings of the included papers were coded deductively with emphasis on findings related to participants feedback, acceptability, and feasibility. The original search of the electronic databases was conducted by FG and CQ, any records with conflicting ratings were resolved through consultation with EPC. Data was extracted from post-intervention interviews and questionnaires, and the narrative synthesis was guided and supported by recommendations from Popay et al. (2006), employing a textual approach. Once reviewed among the research team, Braun and Clarke's (2006) thematic analysis approach was used to extract, code, and organise similar codes under broad headings. These were further developed into five broad themes. Narrative synthesis was chosen rather

than a meta-analysis as the aim of this review was to understand patient perspectives of hybrid interventions, rather than their efficacy.

3. Results

3.1. Study selection

A total of 16 papers were included in the systematic review. Reasons for exclusion were primarily due an absence of an in-person presence throughout the intervention and did not explore patient perspectives of the intervention. Fig. 1 depicts the systematic review process followed.

3.2. Study characteristic

The key characteristics of the included studies are summarised in Table 1.

3.3. Narrative synthesis

An inductive approach was taken to derive themes and patterns from the primary data, adhering to the primary studies own interpretations. Nineteen codes were originally identified, which were used to generate six analytic themes: (1) Tool to Aid Communication; (2) Central Role of the Therapist; (3) Increased Sense of Support; (4) Greater Insight into Voices (auditory hallucinations); (5) Enabling Technologies; (7) Barriers to Engagement. A narrative discussion of each theme is provided below.

3.4. Tool to aid communication

A recurrent theme throughout the studies is the use of digital interventions as a tool to aid communication during in person sessions. Notably, several studies revealed that participants reported that the use of hybrid mHealth influenced the speed of developing therapeutic relationships, facilitating participants to confine in their therapist. Findings from Bell et al. (2020) found that the integration of daily reflections through Ecological Momentary Assessment (EMA) enhanced the participants ability to recall and effectively communicate their symptoms to their therapist at a later date, further emphasising the digital applications role in facilitating patient self-reflection and communication. Likewise, therapists were viewed as 'supportive guides' for both therapy and the digital intervention, which was even suggested to aid and improve overall engagement. Additionally, the review elucidated the challenges posed by exclusive online communication, as participants reported experiencing more frequent miscommunications when relying solely on digital platforms.

Participants reported the challenges around sharing sensitive information in person (Greenwood et al., 2022; Steare et al., 2021; Sedgwick et al., 2021). However, participants expressed a sense of reduced judgment when inputting data into telemedicine apps, appreciating the opportunity to communicate without fear or criticism.

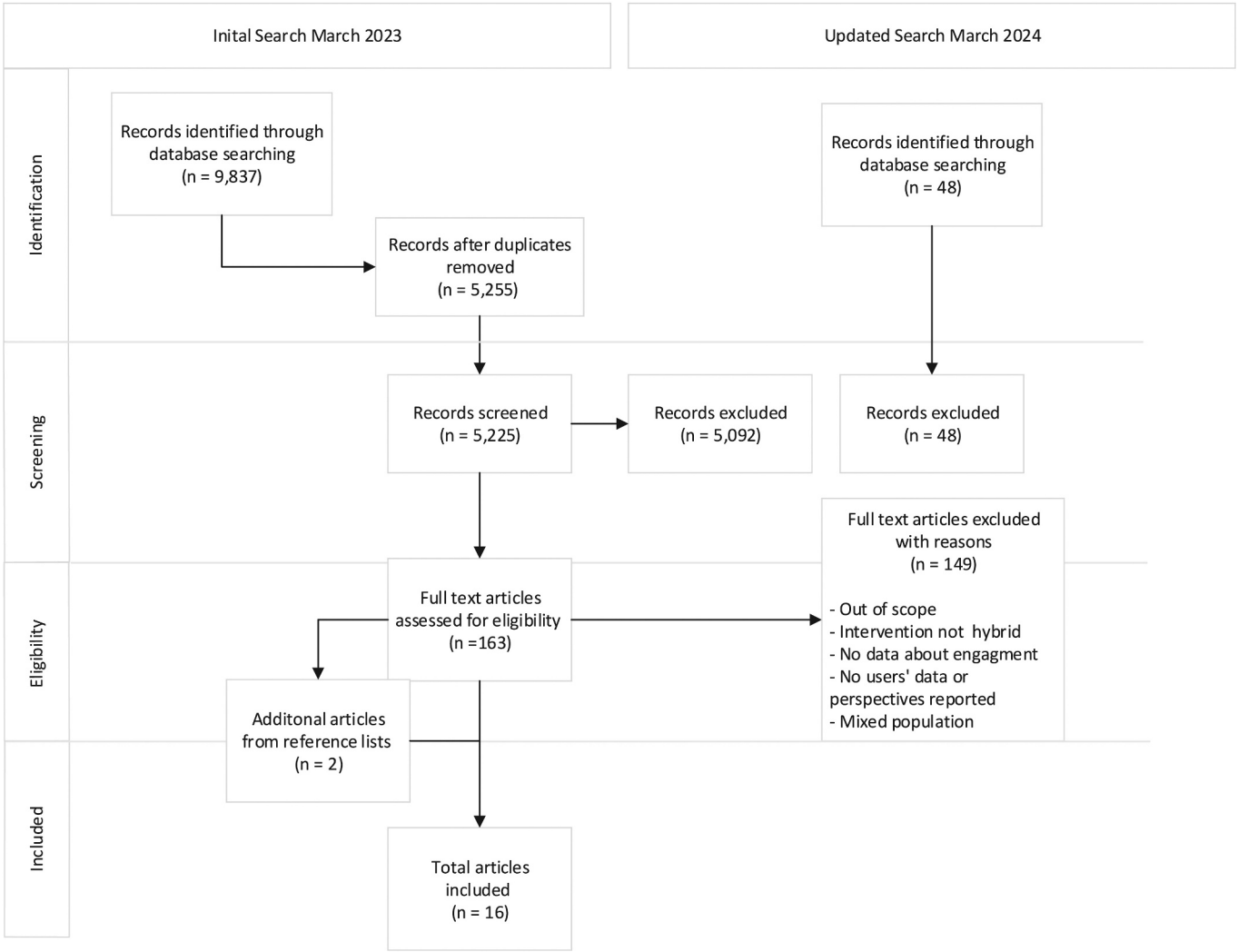

Fig. 1. *PRISMA* flow diagram of systematic review search strategy and study inclusion.

Table 1
Study characteristics of all included studies looking at participant perspectives of hybrid mHealth systems.

Author	Sample	Participants	Location of study	Aim of intervention	Intervention/ digital platform	In-person contact	Length of intervention	Design	peer support
Bell et al., 2020	17	Schizophrenia; schizoaffective disorder	Victory, Australia	Aim of EMA was to monitor for functional analysis and identify coping strategies which were then supported by personalised EMI reminders.	EMA/I; MovisenXS Smartphone	Standard clinical care including medication and case management.	4 weeks	RCT	N/A
Almedia et al., 2019	9	Schizophrenia spectrum disorder	Porto, Portugal	The use of evidence-based modules, including symptom monitoring, problem solving, anxiety management and goal setting.	weCope Smartphone	Standard clinical care including medication and case management.	8 weeks	Survey	N/A
Ghaemi et al., 2022	112	Psychosis spectrum disorder	US	Aimed to reduce PANSS score through self-management of symptoms. Use could be either prompted or on demand.	PEAR-004	Standard clinician-directed care.	12 weeks	Randomised, sham controlled blind trial	N/A
Green et al., 2023	5	First episode psychosis	Boston, US	Applications were tailored to each patient's individual "prescription" of actives, including mindfulness, cognitive restructuring activities and psychoeducational activities.	MindLAMP Smartphone	Digital navigators to offer flexible technical support. TAU with patient's clinician.	4 weeks	Survey	N/A
Greenwood et al., 2022	22	Schizophrenia; Psychosis spectrum disorder	South England, UK	SlowMo aimed to encourage participants to 'slow down' and reframe their mindset to reduce paranoia.	SlowMo Online Browser	Clinical care by therapist who would aid engagement with both the therapy and the technology.	24 weeks	RCT	Vignettes and video stories of peers with lived experience.
Kannisto et al., 2015	403	Psychosis spectrum disorder	Turki, Finland	Increase medication adherence through tailored SMS reminders.	Tailored SMS Mobile Phone	Outpatient care from psychiatric hospitals.	12 months	Cross sectional survey	N/A
Kasckow et al., 2016	51	Schizophrenia; schizoaffective disorder	Pittsburgh, US	Use of a telehealth system that aimed to facilitate symptom assessments and communication.	Health Buddy Mobile Phone	Standard intensive care monitoring including twice weekly phone calls and standard VA monitoring.	16 weeks	Randomised to ICM conditions	N/A
Kreyenbuhl et al., 2019	7	Schizophrenia	New York, US	Aimed to improve adherence to antipsychotic medication and to track positive symptoms.	MedActive Smartphone	Outpatient care from psychiatric hospitals.	2 weeks	Survey	N/A
Ludwig et al., 2021	19	Schizophrenia spectrum disorder	North Carolina, US	Access to digital platform that delivers personalised evidence-based psychoeducation materials social media platform to foster social connections.	Horyzonz Online Browser	Paired with Horyzon moderator who contacted weekly to monitor risk and goals-oriented development.	12 weeks	Survey	'The Café' and 'Talk it Out' online forums.
McEnery et al., 2021	10	Psychosis spectrum disorder	Melbourne, Australia	Provided individually tailored interactive psychosocial interventions to alleviate social anxiety.	EMBRACE Online Browser	Paired with a clinical and peer moderator for twice weekly contact and monitor clinical status.	8 weeks	RCT	Peer moderator.

(*continued on next page*)

Table 1 (*continued*)

Author	Sample	Participants	Location of study	Aim of intervention	Intervention/ digital platform	In-person contact	Length of intervention	Design	peer support
Moore et al., 2020	12	Schizophrenia or schizoaffective disorder	Melbourne, Australia	Aim to use EMA to facilitate self-monitoring and self-management of voices and enhance communication with therapist.	EMA/I Smartphone	Four therapist sessions spread over intervention to reflect on voices and coping strategies.	8 weeks	RCT	N/A
Schlosser et al., 2018	22	Schizophrenia; schizophreniform; schizoaffective disorder	California, US	PRIME uses evidence-based real time interventions which aim to help participants overcome the daily obstacles and improve health outcomes.	PRIME Online Browser	Motivation coaches who adopted evidence based interventions to support goals-oriented development	12 weeks	RCT	Virtual peer community.
Sedgwick et al., 2021	14	Psychosis spectrum disorder	London, UK	Designed to deliver relevant homework and tasks to patients between social cognition group therapy sessions.	GRASP Smartphone	Four sessions with community mental health team, facilitated by trainee and assistant psychologist.	3 weeks	Mixed methods approach	Peer element through group therapy.
Steare et al., 2021	21	Psychosis spectrum disorder	London, UK	Aimed to deliver self-management tools to help patients to identify and prevent relapse.	My journey 3 Smartphone	Standard clinical care with additional support for supported self-management components.	7 weeks	RCT	N/A
Valentine et al., 2020	10	Psychosis spectrum disorder	Melbourne, Australia	Access to digital platform that delivers personalised evidence-based psychoeducation materials social media platform to foster social connections.	Horyzons Online Browser	Standard clinical support and additional contact with a key moderator through the digital platform.	18-20 months	RCT	Peer moderator, online social network.
Xu et al., 2019	139	Schizophrenia	Liuyang, China	Aimed to improve patient adherence to medication through SMS reminders and education.	LEAN Mobile Phone	Enrolled into and regular contact with the community mental health programme, 686.	6 months	RCT	N/A

3.5. Central role of the therapist

11 out of the included 16 studies placed high value on therapeutic relationships and the role of the therapist in their recovery. While the applications used in hybrid interventions were highly regarded, there remained a belief that its effectiveness depended on the human element. Valentine et al. (2020) highlights a central theme regarding the importance of information sourced from clinicians compared to the app itself. Participants consistently regarded information conveyed by their clinicians as more significant, underscoring the continued centrality of the healthcare professional's role in the patient's journey.

3.6. Increased sense of support

Another noticeable trend in the literature was an increased sense of support using telemedicine apps when compared to traditional practice (Bell et al., 2020; Greenwood et al., 2022; Schlosser et al., 2018; Sedgwick et al., 2021; Steare et al., 2021; Moore et al., 2020; Kasckow et al., 2016). Participants reported an increased sense of support between in person sessions when engaging with digital applications, which were even seen as akin to talking to a medical provider (Kasckow et al., 2016). A recurring sentiment among participants was the sense of forming a bond with the application used, a participant in Moore et al.'s (2020) study described the application as a 'lifeline' outside of therapy hours. The synthesis of this review suggests that digital interventions serve as valuable aids in enhancing interpersonal connections, as well as improving the overall therapeutic outcomes and participants well-being.

Additionally, the significance of fostering a sense of community and the value of peer support within the context of mental health and well-being was prevalent in five of the studies examined in this review. While not exclusive to hybrid applications, several applications had built in features to contact and interact with peers, which were among the most well-received features of their respective intervention. In two of these studies, participants expressed a desire for enhanced peer interaction with other users to increase their overall sense of support (Almedia et al., 2019; Steare et al., 2021).

3.7. Greater insights into voices (auditory hallucinations)

Using the visual analogue scales, Bell et al. (2020) assessed participants awareness of patterns in auditory hallucinations. Their initial analysis revealed a statistically significant difference in awareness

between the SAVVy intervention group and treatment as usual group. Participants in the treatment group reported an enhanced ability to objectively examine their voice experiences and develop constructive coping strategies, such as making connections between auditory hallucinations and their own thoughts, which in turn allowed them to identify and manage their triggers.

Similarly, participants expressed having greater control over their voice related experiences when using an mHealth application. Features specific to monitoring hallucinations within the app were deemed as particularly valuable as participants were able to understand the relationship between their activities and hearing voices, which appeared to contribute to the participants sense of control in their recovery (Greenwood et al., 2022; Moore et al., 2020; Steare et al., 2021; Valentine et al., 2020). Ecological Momentary Assessments (EMAs) were employed as a monitoring tool for auditory hallucinations in three of the included studies. Moore et al. (2020) illuminated the potential of EMA as a means to capture the nuances and experiences of auditory hallucinations in real time, allowing participants more accurate recognition and awareness of voice related hallucination experiences. Additionally, EMA was effectively employed in Kreyenbuhl et al.'s (2019) study, with a response rate of 80 %, allowing participants to create formulations of voices which then informed intervention strategies between their clinicians. However, it is worth noting that one participant reported that their voices didn't like the reduced engagement but did like being monitored (Moore et al., 2020). Further highlighting the multifaceted relationship between individuals and auditory hallucinations. Tailored interventions and ongoing support from a mental health professional may be key in monitoring this unique relationship.

The ability to objectively view auditory hallucinations was generally reported across the included studies. Participants were able to look at their experiences of voices constructively and dissect them, enabling individuals to gain a deeper understanding of their experiences with auditory hallucinations (Bell et al., 2020; Greenwood et al., 2022; Steare et al., 2021). Additionally, Greenwood et al. (2022) found their app enabled participants to slow their thinking down and effectively integrate these skills into their daily life to manage their voices related hallucinations. However, results varied due to cognitive ability, with some participants requesting the delivery of speed to be adjusted, highlighting the need for interventions to be flexible and adaptive to accommodate individual differences in cognitive abilities and preferences.

3.8. Enabling technologies

Confidence levels and need for technical support and guidance was highlighted across 6 studies, underscoring the role of ongoing technical assistance in maximising the efficacy and usability of mHealth intervention apps. While the interventions were generally well-received and easy to use (Ghaemi et al., 2022; Kannisto et al., 2015; Xu et al., 2019), some individuals expressed the need for more robust support to fully comprehend and utilize the features of the application they were using.

Kreyenbuhl et al. (2019) found that 57 % of participants felt that they needed technical support, highlighting the significance of providing ongoing assistance to facilitate engagement with the intervention. Similarly, participants reported the positive impact of a moderator's active guidance throughout the intervention, emphasising the importance of personalised support and suggestions to optimise the features of the app (McEnery et al., 2021). Likewise, participant expressed similar sentiments arguing that they were not able to use the application to its full capacity (Green et al., 2023; Steare et al., 2021).

Digital assistance was primarily provided by clinicians or coaches who acted as supportive guides to help participants understand the technology, however, on occasion clinicians lacked familiarity with the technology themselves (Steare et al., 2021). Green et al. (2023) implemented the AACCS framework, which emphasises ongoing care to support the integration of technology into treatment and ensures the sustainability of the technology through specialist-trained digital navigators. While the majority of participants agreed that the application was easy to use, finding the application complicated had a negative impact on the interventions. As such, incorporating personalised guidance, technical support, and ongoing assistance may contribute significantly to the navigation of the app's functionalities and overall effectiveness of each intervention.

3.9. Barriers to engagement

Several barriers to engagement with the digital element of the interventions were identified. Aforementioned, mHealth holds promise in the treatment of serious mental illness, yet concerns about data protection, privacy, and security may hinder patient willingness to use the technology, impacting treatment outcomes. Participants expressed concerns regarding information governance and harboured fears of surveillance which at times made them reluctant to use the app (Sedgwick et al., 2021; Steare et al., 2021). Barriers such as paranoia and self-consciousness were also identified, hindering the use of the app in public settings (Greenwood et al., 2022). In addition, practical challenges emerged, including untimely prompts during participants' work or sleep, as observed in several studies (Bell et al., 2020; Kannisto et al., 2015; Xu et al., 2019). Similarly, participants noted that prompts and reminders became repetitive or overwhelming over time, expressing a preference for personalised cues and emphasising their confidence in managing without them (Moore et al., 2020).

4. Discussion

Unlike other systematic reviews or meta-analyses that have explored remote psychosocial interventions across various mental health or physical disorders, this narrative specifically focuses on hybrid digital interventions for patients with PSD. A growing evidence base suggests that digital interventions have been associated with symptom reduction (Gottlieb et al., 2017), including a reduction in severity of auditory hallucinations (Granholm et al., 2012) and improvements in self-reported self-efficacy and depression (Schlosser et al., 2018), however a recurring observation in the majority of these reviews is the potential benefit derived from incorporating an in-person therapeutic component.

Systematic and meta-analytical reviews most commonly demonstrate that interventions with therapeutic guidance yield superior effects compared to those with solely technical guidance, and significantly outperform unguided interventions in terms of adherence (Musiat et al., 2022). To our knowledge, this is the first review to explore the perceptions, experiences, and perceived trust of using hybrid digital mHealth interventions in patients with PSD. Overall, six themes were evident within this review.

The central role of the therapist and the role of human support was highlighted among the included studies. The perceived effectiveness of the various interventions was closely linked to the strength of the therapeutic alliance. The existing literature suggests a potential causal relationship between therapeutic alliance and outcomes in various psychological modalities. However, it's important to recognise that differences in interpersonal processes underlie the conceptualisation of many disorders. These distinctions may influence the impact of therapeutic relationships on treatment outcomes. For example, impaired social functioning and interpersonal coordination is thought to be an essential feature of PSD. Individuals undergoing psychosis were found to attend more sessions when they reported a robust therapeutic alliance (Tremain et al., 2020); underscoring the crucial impact of the therapeutic relationship on the success of mental health interventions (Henson et al., 2019). Likewise, systematic reviews in this area found evidence that therapeutic alliance was related to greater treatment adherence (Shattock et al., 2018), as well as symptom management and hospitalisation (Browne et al., 2019a, 2019b). Several studies included both a treatment and control group, providing a comparative basis for

evaluating this impact. Bell et al. (2020) highlighted a large effect size favouring the treatment group, particularly in terms of coping and awareness of patterns with voices. Similarly, Schlosser et al. (2018) reported greater anticipated pleasure and an increased likelihood of future social interactions with positive outcomes following the PRIME intervention, highlighting the importance of combining the application with in-person support.

Although some participants doubted the app's success without the in-person component of the intervention, others shared that they had formed a meaningful connection with the app and even preferred it over support from a mental health professional. The mixed perspectives underscore the numerous ways individuals engage with and benefit from digital mental health interventions. Interestingly, recent research suggests that therapeutic alliance can be replicated in the digital context, particularly in apps which are fully automated (Tong et al., 2022). However, a key factor in digital therapeutic alliance is thought to involve being able to share information with a mental health professional outside the typical therapy window. A notion which was support by several of the included studies (Bell et al., 2020; Greenwood et al., 2022; Moore et al., 2020; Schlosser et al., 2018; Valentine et al., 2020). Additionally, participants generally perceived information delivered by a healthcare professional as more reliable, a sentiment aligning with the Supportive Accountability model (Moher et al., 2009), which states that human support enhances adherence to mHealth interventions by fostering accountability through trustworthiness and expertise. Therefore, entirely self-guided mHealth interventions may overlook the intricate dynamics and complexities of therapeutic alliance which are augmented by in-person interactions.

Individuals across the included studies expressed diverse viewpoints on whether digital interventions aimed at treating PSD could serve as a substitute for in-person interactions with a mental health professional. Participants viewed the applications as inherently destigmatising and felt that communication via the app allowed them to communicate without fear of judgment. This observation is consistent with the findings of Bucci (2018), where individuals who had undergone the Actissist intervention, reported feeling more comfortable than when engaging in face-to-face discussions with a clinician. Fear of judgment and stigma emerges as a prominent factor contributing to dropout and disengagement in early intervention psychosis services (Polillo et al., 2022). While stigma is not limited to PSD, public stigma associated with schizophrenia and psychosis has one of the worst mental representations in the general population (Valery and Prouteau, 2020). This notion has also been supported by clinicians who agreed that the faceless nature of internet and mobile health care may allow service users to be more honest about their experiences (Berry et al., 2018).

Mental health professionals played a crucial role in facilitating the relationship and bridging the gap between participants and the digital intervention. Clinicians were able to gain valuable insights into participants' symptoms by utilising daily digital trackers. This capability potentially led to earlier and more effective interventions, as service users did not have to rely on retrospectively recollecting symptoms but could capture their experiences in the moment. The active involvement of clinicians not only facilitated a smoother integration of the digital intervention into the participants' mental health journey but also allowed for a more timely and targeted response to emerging symptoms, enhancing the overall effectiveness of the intervention.

Several of the studies included in this review used EMA methodology to collect data on participants' affective states and cognitions. Participants found EMA features most helpful when personally relevant and tailored to their stage of recovery, often enhancing therapeutic relationships (Berry et al., 2018). Meanwhile, the most commonly cited reason for disengagement was due to lack of relevant content and receiving prompts at inconvenient times. The challenges of EMA methodology, such as burden and participant fatigue, have been acknowledged in prior studies (Dao et al., 2021; Burke et al., 2017). To address these issues, the implementation of context-aware systems capable of delivering engaging and personalised prompts holds promise for reducing drop-out rates.

Peer interaction significantly facilitated engagement in the interventions, the five studies that incorporated peer support consistently ranked it as one of the most positively received features. Peer support is recognised by the NICE guidelines and identified as a key strategy in the self-management of psychosis. The opportunity for social facilitation and social comparison is an important tool to aid and increase acceptability and engagement with an intervention (Biagianti et al., 2017). However, it is worth noting that the NICE guidelines recommend utilising an intentional peer support framework, to formalise the process of peer support and ensure the service user and peer are getting adequate support.

Technical issues and concerns regarding privacy were identified as barriers in this review. 11 of the studies relied on the use of mobile devices for effective engagement with the intervention. Research indicates that individuals with persistent psychiatric disorders are less likely to use smartphones (Young et al., 2020), and report negative feelings such as paranoia when using digital devices (Gay et al., 2016). Bucci (2018) found that 76 % of participants had concerns over data security and privacy, with specific worries about data stored locally on a smartphone and ensuring the server was secure and protected from leaks to outside agencies. Therefore, data security and safety, particularly on smartphones, requires careful consideration and management to optimise usability and engagement.

The increasing prevalence of technology-related fears, driven by concerns about data security and system credibility, extends beyond psychosis research to the broader population (Mason et al., 2014). While organisational credibility of the application is not addressed in depth within the studies in this review, a review conducted by Mackert et al. (2016) reported that participants with lower levels of eHealth literacy tended to exhibit lower levels of trust in government or health technology companies yet were more inclined to place trust in healthcare providers. Similarly, privacy and security concerns have also been raised among people with bipolar disorder, with most concerns related to securing handset devices and third-party data sharing. While the incorporation of credible features was found to enhance the strength of the therapeutic alliance in 10 of the included articles, limited information on privacy and trust were provided throughout this review. Only three studies recognised fear of surveillance and paranoia as barriers in their retrospective analyses, with none delving into the factors influencing trust in the interventions.

4.1. Limitations

Consistent with best practices, the articles were reviewed by two independent reviewers following recommendations of the PRISMA statement. However, while a thorough search of multiple databases was conducted some articles have been missed, and research with null or inconclusive findings may not be accessible because of publication bias.

4.2. Implications

While the patient-centred care initiative is ubiquitous in healthcare systems and research, few studies have specifically focused on psychosis service users' views of digital systems (Berry et al., 2018). Berry et al. (2018) highlighted that while digital health interventions have a relatively high acceptability rate for individuals with serious mental health conditions, acceptability is complex and requires continual focus in this area. The findings of this review generally highlighted the positive effects of using digital interventions in collaboration with face-to-face support can have, including improved communication, enhanced therapeutic relationships, and increased clinical insight and support. However, participant's beliefs regarding the effectiveness of digital interventions without the input of a clinician were mixed, unsure whether a standalone digital intervention would have the same clinical

outcome. Participants should therefore have an active role in choosing how mHealth should be used and to what extent within their care. Moreover, the lack of personalised, relevant content was identified as a barrier to engagement. Green et al. (2023) supported this by suggesting that versatile, patient-centred support guided by digital navigators may help overcome implementation barriers. Further consideration should be given to explore the perceived effectiveness and relevance of the intervention for each individual or demographic. Long-term engagement rates of hybrid mHealth were not specifically addressed, given the constraints of varying follow-up durations among the studies included. Consequently, it remains uncertain whether engagement endured over an extended period. Subsequent research should explore post-trial obstacles and facilitators. Furthermore, only one study within the scope of this review was carried out in a low-income country, as highlighted by Xu et al. (2019). The potential disparities in socio-economic and technological contexts across different regions, especially those that may lack access to the internet or technological devices, underscores the need for more inclusive research that encompasses a broader range of global settings to better inform healthcare strategies and interventions. Finally, future research should focus on considerations for trustworthy digital systems, including understanding what makes digital systems trustworthy and how to best implement this to enhance engagement.

5. Conclusion

This review highlighted several factors influencing engagement in hybrid interventions, including the presence of a mental health professional, provision of digital support, technical assistance to facilitate sessions, personalised support, and concerns surrounding data security and privacy. However, several of the barriers and facilitators to engagement identified in the study were not exclusive to hybrid approaches. Notably, concerns like the fear of surveillance and supportive factors such as peer support transcended the hybrid context, demonstrating their relevance in both digital and in-person settings. While acceptance rates for eHealth interventions for PSD generally align with other target populations, addressing multifaceted engagement issues requires consideration of patient, intervention, and system-level factors. Moreover, the review noted a scarcity of studies offering details on how trust was actively promoted among participants. This gap underscores the need for further research to explore the specific factors that individuals perceive as trustworthy when engaging in hybrid mHealth interventions used to treat PSD. Overall, this review highlights hybrid digital interventions' acceptability and potential impact in this population, offering valuable insights for the development of interventions and the integration of digital health into conventional healthcare practices.

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CRediT authorship contribution statement

F.T. Greenway: Writing – original draft, Conceptualization. **M. Weal:** Supervision. **E.C. Palmer-Cooper:** Supervision, Conceptualization.

Declaration of competing interest

All authors declare that they do not have competing interests in the manuscript and there is no financial interest to report.

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Appendix A. Search terms

Population	(Psychosis OR psychotic OR schizophren* OR delusion* (deluded) OR schizoaffective)
AND	
Intervention	(Online OR mobile OR web* OR digital* OR computer* OR tech* OR Mhealth OR “artificial intelligence” OR tele* OR virtual OR internet OR smartphone).
AND	
Outcome	(engag* OR adher* OR attrition OR dropout (“drop out” OR “drop-out”) OR Experience* OR Perspective* OR Feedback (feedback) OR uptake OR adopt* OR acceptab* OR perception*)

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