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Desirability in Real-World Blended Care for Psychosis: Insights from the Development and Pilot Study of Digital NAVIGATE

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Abstract: *Blended care, a psychosocial intervention merging face-to-face therapy with digital tools, holds significant potential for enhancing psychosis treatment outcomes by extending access and increasing patient engagement with therapeutic materials. Recent blended care interventions for psychosis were solely developed within controlled research conditions, and an attempt to transition one of these interventions into real-world practice yielded inadequate engagement and effectiveness. This suggests that the development context of blended care may significantly impact its implementation potential. This study represents the first attempt to both develop and research a blended care intervention in a real-world setting, directly addressing the specific challenges and unmet needs within NAVIGATE, a coordinated speciality care program for individuals who have experienced a first-episode psychosis. Both clients and practitioners agreed on the potential benefits of integrating digital tools into NAVIGATE, and clients expressed a willingness to adopt them once available. However, when the digital program became available, clients' actual desire to incorporate it into their usual care was unexpectedly low. We observed a strong correlation between clients' expressed desire to use Digital NAVIGATE before engaging with it and their subsequent engagement with the digital tools. These findings highlight a distinction between clients' attitudes towards digital tools adaptation before being offered to use them, and their actual intention and desire to utilize such tools during the treatment they receive. These findings underscore the need to reassess current frameworks for developing and implementing digital mental health tools, particularly within existing mental health programs.*

Keywords: *acceptability; blended care; digital health; implementation; intervention; psychosis; real-world*

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1. Introduction

Improving access to effective early interventions for individuals experiencing psychosis is recognized as a mental health priority (Drake et al., 2020). Coordinated speciality care programs have emerged as a response to this challenge, emphasizing early and intensive intervention following a first-episode psychosis (Lieberman et al., 2019). One notable coordinated speciality care program, NAVIGATE, has demonstrated its advantage over standard mental health services by promoting prolonged treatment engagement, reducing psychiatric symptoms, enhancing the quality of life and social relationships, and increasing involvement in work and education over a two-year randomized follow-up period (Kane et al., 2015). The program also presented favourable outcomes sustained over five years (Robinson et al., 2020). Despite these advancements, enhancing the prognosis of individuals with psychosis remains challenging due to the complexity of these conditions and the prevalent issues of disengagement (Mascayano et al., 2021) and relapse (Bioque et al., 2022).

Blended care, a form of digital mental health intervention (DMHI), integrates traditional face-to-face (F2F) therapy with digital tools (Fairburn & Patel, 2017). It harnesses the accessibility and flexibility of digital platforms while preserving the interpersonal elements of in-person therapy, e.g. personalization and expressed empathy (Fitzpatrick et al., 2018; Kretzschmar et al., 2019). Blended care has demonstrated efficacy in treating various mental health disorders including depression, anxiety, and hoarding disorder (Fitzpatrick et al., 2018; Kooistra et al., 2019; Nakao et al., 2018; Witlox et al., 2021). Moreover, research suggests that in comparison to F2F treatments, blended care can optimize clinical time, foster treatment engagement, and enhance long-term treatment effects (Erbe et al., 2017; Kip et al., 2020; Richards & Simpson, 2015).

Blended care holds promise in addressing key challenges in the treatment of individuals with psychotic disorders, including disengagement with services and relapse prevention. Prior studies have demonstrated the potential of blended care to outperform standalone F2F interventions in reducing disengagement rates across substance abuse intervention services (Campbell et al., 2014; Christensen et al., 2014; Kiluk et al., 2012). Recent research also highlights the effectiveness of blended care in relapse prevention, significantly reducing hospitalization days per patient in the six months following initial hospitalization, when compared to standalone F2F interventions (Homan et al., 2019). Additionally, a previous study focusing on the ‘increased care at a reduced cost’ approach shows that combining digital tools with F2F treatment in a relapse prevention program for individuals with schizophrenia has demonstrated high utilization, acceptance, and user satisfaction (Baumel et al., 2016).

Incorporating digital tools into coordinated speciality care may also enhance the sustainability of achievements. For example, Ben-Zeev and colleagues (2016) showed that individuals with schizophrenia-spectrum disorders can engage with mobile interventions for up to 6 months post-hospital discharge, suggesting that such tools can serve as extended modules of coordinated speciality care, potentially maintaining its unique benefits. Recent research also showed that smartphone app use by individuals with schizophrenia or schizoaffective disorder decreased their reliance on F2F services (Ben-Zeev et al., 2019), indicating the capacity of digital tools to fulfill therapeutic needs typically addressed by in-person services. Lastly, a study on the usage patterns of a self-management smartphone app for individuals with schizophrenia revealed that out of 75,447 logins, 50.6% occurred during off-hours when clinics were closed (Achtyes et al., 2019). This underscores the potential of digital modules to extend and enrich F2F therapy by providing 24-hour access to therapeutic content, specifically when clinicians’ support is unavailable.

Currently, widespread success in implementing DMHI has not been extensively proven, and transitioning from controlled research conditions to real-world scenarios frequently results in diminished engagement with and abandonment of these tools (Borghouts et al., 2021; Greenhalgh et al., 2017). The sole attempt to implement blended care for psychosis, developed in a research setting, into routine clinical practice resulted in low engagement and an inability to replicate the positive clinical outcomes observed in research conditions (Farhall et al., 2023). The developmental

context of DMHI, particularly whether they are conducted in research conditions or real-world settings, may significantly influence their implementation success and the transition from research to everyday practice (Mohr et al., 2017a). In a recent systematic review, the authors reported that all blended care interventions for psychosis that were studied in recent years have been exclusively developed in controlled research conditions and were rarely assessed in real-world settings (Cohen et al., 2024).

To address this gap in the literature, the current study represents, to our knowledge, the first attempt to develop blended care for psychosis in a real-world setting, directly targeting the specific challenges and unmet needs of NAVIGATE's clients and practitioners. Our objective was to design digital tools that could seamlessly integrate with NAVIGATE's F2F treatment, thereby transforming it into a blended care intervention. Our particular focus was to explore whether developing a blended care intervention in a real-world setting could facilitate the successful adoption of digital tools and provide deeper insights into the challenges associated with implementing DMHI, especially concerning clients' desire to integrate it into their treatment regimen. We define desire as the willingness to experiment with the digital program as part of regular care, as evidenced by behaviours related to the intention of engaging with the intervention (e.g., agreeing to receive the intervention when offered). Furthermore, we aimed to assess the feasibility, usability, acceptability, and preliminary efficacy of incorporating digital tools into NAVIGATE's routine clinical practice. Lastly, we sought to determine whether this integration could enhance client satisfaction and foster increased engagement with the program.

2. Materials & Methods

2.1. Stage 1 – Development of Digital NAVIGATE

Understanding the Needs and Gathering Insights from Key Stakeholders. The development of Digital NAVIGATE followed the principles of a user-centered design process (UCD). At its core, UCD prioritizes understanding end-user experiences and informs the creation of interventions tailored to address these experiences within their specific contexts (Lyon & Koerner, 2016; Dopp et al., 2018; Vial et al., 2022). This approach enables end-users to play a key role in shaping the development process, which could lead to improvements in both usability and effectiveness. (Dabbs et al., 2009). In line with these principles, the initial stage of developing Digital NAVIGATE involved gathering and analysing feedback from NAVIGATE's clients and practitioners.

Feedback from clients was gathered through individual meetings, while feedback from practitioners was collected through both group and individual meetings. Both groups were asked about any unmet needs or challenges within NAVIGATE and for suggestions on how to effectively address these issues. Practitioners exhibited a strong interest in integrating digital tools with the treatment they provide. They stressed the importance of addressing clients' need for care and support between F2F sessions while acknowledging the clinical staff's limited capacity to fulfill it due to constraints like clinical time and resources. Additionally, practitioners identified several challenges, such as fostering client engagement and incorporating therapeutic goals and activities into clients' daily routines. They also reported difficulties in adhering to the treatment protocol due to the diverse therapeutic goals and needs of clients, as well as their varying attitudes towards the program's materials. Practitioners highlighted the necessity of a flexible approach that would afford them better control over the timing and amount of each treatment element, rather than adhering to a rigid protocol, as it better aligns with their service delivery approach. They suggested various ideas, including digital tools development for practicing relaxation and meditation techniques, assisting clients in documenting meaningful treatment-oriented activities between F2F sessions digitizing psychoeducational materials to make them more engaging and interactive, and enabling their delivery with more appropriate timing and dosage.

In a similar manner to the practitioners, clients expressed positive attitudes towards the concept of augmenting their care with digital tools they could use between clinic visits. They articulated a need for support between F2F sessions and a desire to maintain engagement with enriching activities offered by NAVIGATE in a temporary and limited capacity (e.g., a mindfulness workshop). Furthermore, clients requested an online platform with therapeutic content and information accessible as needed between F2F sessions. They also sought tools to help them stay active in their daily routines, set personal recovery-oriented goals, and receive reminders or ideas for meaningful activities.

Planning and Designing the Intervention. Through discussions and interviews with clients and practitioners, it became clear that while the NAVIGATE treatment was designed to follow a clear protocol, the diversity of clients in terms of their recovery phases and personal needs required a high degree of flexibility from the program's practitioners. As a result, the program's materials were often delivered in a more personalized manner, prioritizing specific content over covering all aspects, and frequently deviated from the stepped approach outlined in the manual. This realization highlighted that designing an intervention strictly adhering to the program's protocol, with a focus on enhancing specific sessions in a step-by-step manner, was less appropriate. It ultimately led us to design Digital NAVIGATE as an intervention comprised of several separate micro-interventions, which are highly focused interventions aimed at helping people achieve specific proximal targets (Baumel et al., 2020). Each micro-intervention was crafted to align closely with NAVIGATE's therapeutic approach and content and to be deliverable in various combinations tailored to the specific needs of each individual. The benefit of this approach lies in its ability to accommodate a diverse range of personal motivations and needs, as well as in empowering clients to identify and select the most suitable interventions for their individual goals and circumstances.

The Intervention. Three digital micro-interventions were designed: a Mindfulness Meditation Training, an Ecological Momentary Intervention, and a CBT Psychoeducation Micro-Course. Each micro-intervention was intended to span 7-10 days, with users maintaining continuous access to relevant materials even after completing the sessions. Figure 1 presents screenshots from each micro-intervention.

Mindfulness Meditation Training. Developed in alignment with the mindfulness sessions within the 'Building Resilience' section of the NAVIGATE manual, this micro-intervention was designed to instruct and facilitate the practice of a meditation technique that fosters improved mental resilience. Unlike the text-based mindfulness materials in the manual, this intervention enabled clients to interact with the materials in an interactive, guided, structured, and continuous manner. It consisted of audio recordings accompanied by short-loop videos presenting calming nature scenarios and self-report questionnaires to assess individuals' stress levels. The audio recordings began with an introductory segment on mindfulness and progressed through five training sessions, each building upon the previous one in complexity and depth.

Ecological Momentary Intervention. Inspired by the 'Finding Joy in Life' section of the NAVIGATE manual, this micro-intervention was dedicated to helping clients identify ways to enrich their lives with enjoyable experiences. It was crafted to evoke positive emotions in clients' day-to-day lives by increasing the frequency of activities associated with these experiences. Clients were asked to provide 2-4 daily reports detailing the activities they engaged in and the emotions they experienced. Following the assessment period, a report was generated containing insights derived from the data provided by clients. Subsequently, a goal was established and tested regarding behavioural changes aimed at promoting positive feelings.

CBT Psychoeducation Micro-Course. Based on the 'Coping with Negative Feelings' section of the NAVIGATE manual, this micro-intervention focused on acquiring strategies to enhance emotional regulation, particularly by examining automatic thought processes and updating maladaptive beliefs. It aimed to help clients learn and practice these materials while facilitating connections to their personal experiences. The intervention comprised four sessions dedicated to learning about common maladaptive thought patterns and the cognitive restructuring process aimed to correct them. Unlike simply reading the manual, this intervention enabled clients to engage with the materials in small, interactive segments.

Health Technology Coaching. The first author (MC), a licensed clinical psychologist, served as a health technology coach to support the effective use of digital intervention (Schueller et al., 2017). This role encompassed several key tasks: introducing participants to Digital NAVIGATE and each of the micro-interventions before their initiation, providing technical support throughout the intervention (including onboarding to the intervention system and transitioning between micro-interventions), and tracking users' progress while encouraging engagement through positive feedback (Baumel et al., 2018).

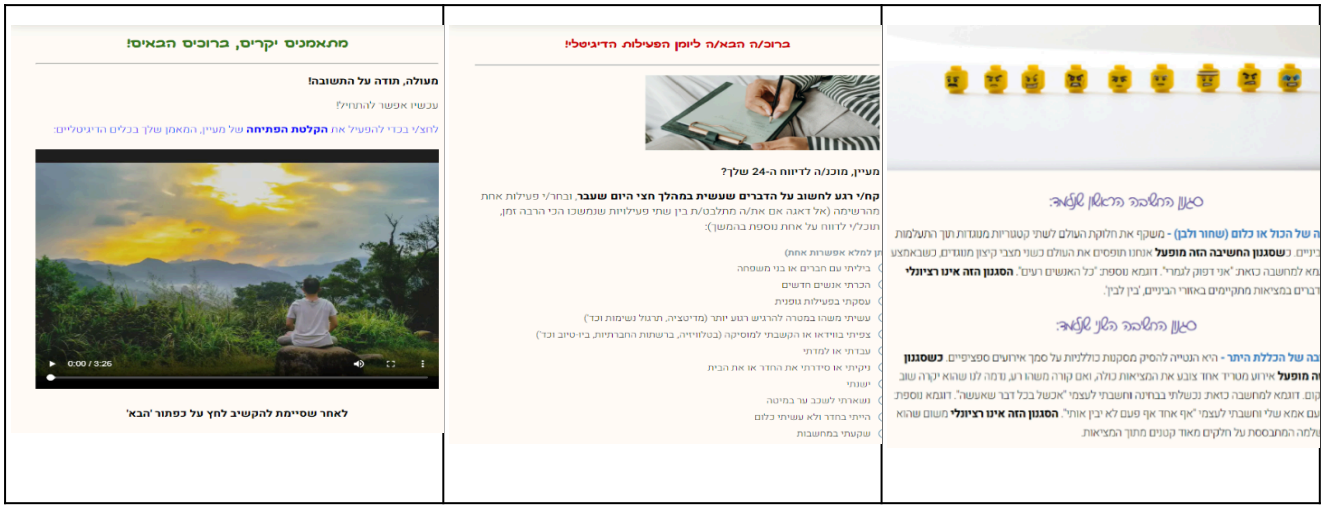


Figure 1. Exemplary screenshots taken from Digital NAVIGATE micro-interventions.
Note: The screenshot on the left is from the first chapter of the Mindfulness Meditations Training, featuring an audio recording of a guided meditation session accompanied by a looping animated image of moving clouds. The middle screenshot is from the Ecological Momentary Intervention, which prompts clients to report their activities over the past half-day by selecting from a list. The right screenshot provides information on two of the eight maladaptive thought patterns covered in the CBT Psychoeducation Micro-Course.

2.2. Stage 2 – Digital NAVIGATE Pilot

Participants and Design. A single-group, mixed-methods design was employed to evaluate the feasibility, usability, acceptability, and preliminary efficacy of Digital NAVIGATE. Clients were recruited from a NAVIGATE clinic in central Israel. The inclusion criteria were: (a) ages 18 to 40 years, (b) ability to provide informed consent, (c) experience of a first-episode psychosis, (d) fluency in Hebrew, and (e) ownership of a smartphone with internet access. Clients were excluded if they exhibited moderate or severe risk factors, such as suicidality.

Procedures. This study received ethical approval from the Faculty of Social Welfare and Health Sciences Review Board at the University of Haifa (Approval No. 089/22). The health technology coach attended a weekly team meeting at the participating clinic and introduced Digital NAVIGATE to the staff. During this meeting, he explained how digital tools could be integrated into ongoing treatments and detailed the aims and content of each micro-intervention. Following this introduction, practitioners presented the pilot study to eligible clients, based on the inclusion criteria. They provided basic information about the integration of digital tools into their treatment and the themes covered in Digital NAVIGATE's micro-interventions. Clients expressing interest in participating were scheduled for a video conference with the health technology coach to confirm their willingness to join the pilot and receive initial coaching on using Digital NAVIGATE. During these video conference sessions, the following procedures were conducted: (1) administration of pre-intervention measurements, (2) creation of a username and password for accessing Digital NAVIGATE's system, (3) training on how to use Digital NAVIGATE and basic information about the micro-interventions, (4) explanation of communication methods with the health technology coach, and (5) request for clients' consent to receive feedback from their practitioner regarding their engagement with the program.

Measures. Data on clients' satisfaction with NAVIGATE was planned to be measured pre- and post-intervention using the Client Satisfaction Questionnaire (CSQ-8; Larsen et al., 1979). Practitioners' assessments of clients' engagement in treatment were intended to be collected pre- and post-intervention using the Service Engagement Scale (SES; Tait et al., 2002). Post-intervention data on clients' acceptability and usability of the intervention were to be gathered using a usability and acceptability questionnaire, aligned with previous research (Baumel et al., 2016; Baumel et al., 2018; Baumel & Schueller, 2016). Additionally, the Digital NAVIGATE system passively collected data on clients' usage patterns and actively gathered data related to each micro-intervention.

The desirability aspects of Digital NAVIGATE, namely, the degree to which clients present behaviours related to the intention of experimenting with the intervention, were monitored during both the recruitment phase and the intervention itself. This examination focused on clients' initial consent to incorporate digital tools into their care once offered by their practitioner, reflecting initial desirability, and how this evolved once detailed information about the digital intervention was provided by the health technology coach, representing actual desirability. Furthermore, the degree of utilization and usage patterns of Digital NAVIGATE throughout the intervention were assessed to gauge clients' ongoing motivation for using the digital tools.

3. Results

3.1. Initial Desirability

Table 1 presents the practitioners' reports regarding clients' initial desire to engage with Digital NAVIGATE. During the study enrolment phase at the participating clinic, practitioners considered 16 out of 21 clients (76%) suitable for incorporating Digital NAVIGATE into their regular therapy regimen.

The remaining five clients were not invited to participate due to practitioners' observations of their limited involvement in the program or the presence of emotional challenges that might hinder their effective use of the intervention. Of the 16 clients offered the intervention, only three (14%) opted to receive it.

Table 1. Practitioners' Reports Regarding Clients' Initial Desirability in Using Digital NAVIGATE.

Number of Clients	Offered to Participate	Response	Comments
2 (10%)	No	N/A	Practitioners identified low overall levels of engagement with NAVIGATE
3 (14%)	No	N/A	Clients were new to NAVIGATE, and practitioners were concerned about emotional instability
3 (14%)	Yes	No	Clients experienced anxiety about trying new interventions or specific content within Digital NAVIGATE
4 (19%)	Yes	No	Clients were not interested in using digital tools or in the specific content of Digital NAVIGATE
6 (29%)	Yes	No	Clients felt too busy and reported a lack of emotional resources to receive an additional intervention
3 (14%)	Yes	Yes	N/A

Since only three participants began the intervention, the pilot's ability to fully explore research questions regarding usage, satisfaction, and preliminary efficacy was limited. Therefore, the reported results primarily focus on the desirability and engagement cycle, specifically highlighting the discrepancies between initial and actual desirability.

3.2. Actual Desirability, Usage, and Engagement

Table 2 provides insights into clients' actual desirability to use the intervention and their eventual engagement with Digital NAVIGATE.

Table 2. Indication of Clients' Actual Desirability during Initial Contact with the Health Technology Coach and Their Engagement with the Digital Intervention

Client ID	**Indications of Actual Desirability During Initial Meeting with the Health Technology Coach**	**Modules Initiated**	**Modules Completed**	**Number of Days and Time Spent logged-in**	**Comments**
15	- Did not read the informed consent letter before meeting with the health technology coach and urged skipping it to shorten the meeting. - Shared negative experiences from participating in another study and expressed concerns about the time and effort the current study would require.	Mindfulness EMI	None	2 discrete days, 2 logins total 0:10:35 (Mindfulness: 10:35)	- Reported difficulties integrating the mindfulness module into her daily routine. Despite agreeing to try the EMI module, stopped logging in and was lost to follow-up.
18	- Showed interest in the intervention during the initial meeting and asked questions about the modules and timeline.	Mindfulness EMI CBT	Mindfulness EMI CBT	23 discrete days, 24 logins total 1:04:55 (Mindfulness: 0:30:31, EMI: 0:09:35, CBT: 0:25:19)	- Did not log in initially for the EMI and CBT modules, citing being too busy during follow-ups. Completed the modules after they were reset. - Completed the post-intervention follow-up.

20	- Seemed distracted and disengaged during the initial meeting. - Expressed concerns about having enough time to engage with the digital intervention.	Mindfulness EMI	EMI	14 discrete days, 14 logins total 0:13:53 (Mindfulness: 0:6:35, EMI: 0:07:20)	- Expressed challenges relating to the content of the mindfulness module. Despite agreeing to try the EMI module, did not log in, citing being too busy during follow-ups. The module was reset twice before being completed on the third attempt. - Did not respond to the invitation to start the CBT module and was subsequently lost to follow-up.

During the preliminary meeting with the health technology coach, two clients declared they might not have sufficient time to engage with the digital tools. Throughout the intervention period, these two clients demonstrated minimal usage of the digital modules, as indicated by their infrequent logins, limited time spent on the platform, and their low module initiation and completion rates.

Additionally, both clients became unresponsive to the health technology coach's attempts at contact, eventually resulting in their loss of follow-up. In contrast, client ID 18 asked to begin using Digital NAVIGATE as soon as possible and subsequently exhibited consistent usage through the intervention. This client completed 100% of the modules, including all mindfulness and CBT micro-sessions, and actively participated in the follow-up interview.

Figure 2 illustrates the user journey within the platform across the desirability and engagement cycle. The figure indicates an 82.25% decrease (from 16 to 3) between potential users and those initially expressing a desire to experiment with Digital NAVIGATE (initial desirability). Furthermore, there is a subsequent 66.67% decrease (from 3 to 1) between initial desirability and actual desirability, with the latter reflecting clients' readiness to start using the intervention following detailed information from the health technology coach. Actual desirability closely correlates with usage and engagement patterns, emphasizing notable attrition at each stage.

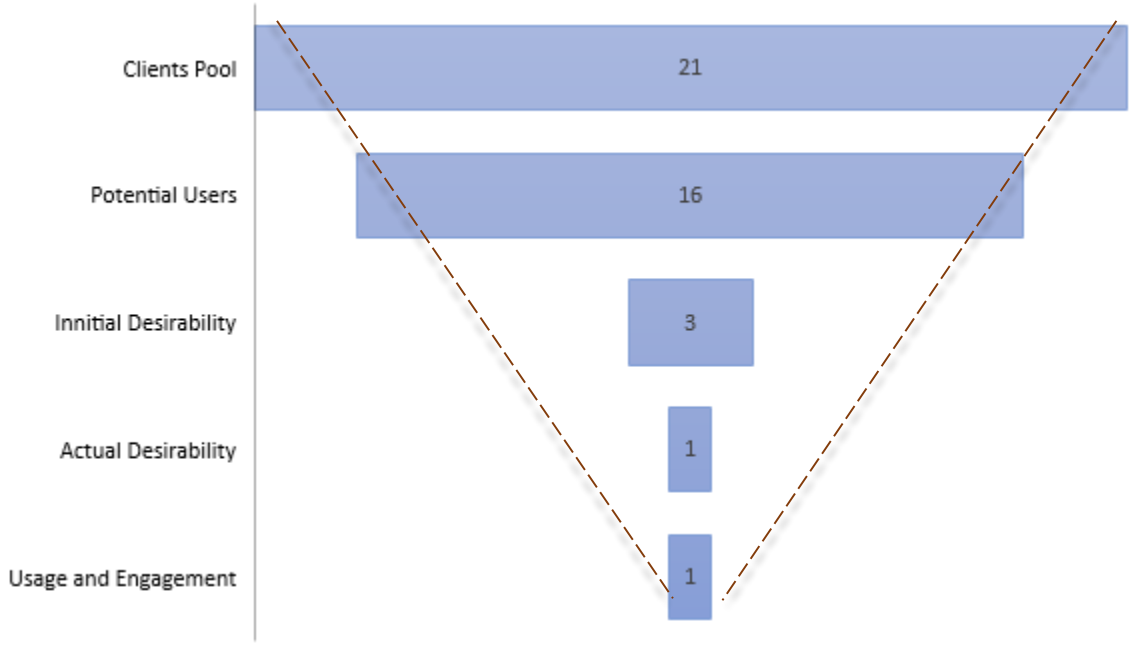


Figure 2. Funnel of Users within the Platform throughout the Desirability and Engagement Cycle.

4. Discussion

We developed a blended care intervention guided by UCD principles and feedback from NAVIGATE stakeholders regarding unmet needs and challenges within the program. Interestingly, despite positive attitudes from clients and practitioners towards integrating digital tools into NAVIGATE, only three of the 21 clients offered the intervention showed initial desirability in receiving Digital NAVIGATE, with only one client demonstrating actual desirability and subsequently sustained engagement. This suggests that the program's poor acceptability stemmed from a lack of desire to use it, evident before any actual usage occurred.

These findings align with existing evidence of the challenges in implementing blended care in real-world settings (Cohen et al., 2024). Previous studies have indicated that digital mental health tools, when integrated into routine clinical practice, often face low utilization rates and eventual abandonment (Borghouts et al., 2021; Greenhalgh et al., 2017; Mohr et al., 2017a). The modest desire shown by clients to use Digital NAVIGATE as part of their regular care, and the difficulties in recruiting them as participants for the pilot, reflect the findings of a recent study on integrating a digital tool into routine clinical practice (Farhall et al., 2023). These challenges may stem from the common approach of addressing recruitment obstacles in controlled research studies by expanding the pool of potential participants, thereby attracting individuals already interested in DMHI (Mohr et al., 2017b). However, since these individuals likely represent only a small portion of the broader population receiving mental health care, it is anticipated that there will be a limited interest in DMHI in real-world settings.

This study revealed significant disparities between potential indicators of acceptability – specifically, clients' and practitioners' favourable feedback on the idea of integrating digital tools to address unmet therapeutic needs – and clients' actual desire to use the digital intervention when given the opportunity. These gaps highlight the difference between individuals' attitudes toward the concept of digital intervention and their intended behaviour toward actually using digital tools (Savoia, 2019). Essentially, actual desirability appears to be a foundational aspect of an intervention's acceptability—the inclination to use a product and derive satisfaction from it. One possible explanation for the gap between acceptability and desirability is that clients' initial positive feedback toward using digital tools was partially driven by their perceptions of researchers' expectations and motivations, leading them to provide responses they thought would be well-received.

The challenges encountered in implementing Digital NAVIGATE suggest a need to re-evaluate existing frameworks for developing and implementing DMHI and specifically blended care. Our findings indicate that following guidelines that prioritize UCD and bottom-up development principles, which incorporate stakeholders' input in real-world clinical contexts (Mohr et al., 2017a), may only partially ensure the successful implementation of digital interventions. Moreover, this suggests that the conventional understanding of acceptability, primarily based on the target population's needs and the intervention's ability to address those needs (Park et al., 2022), may not fully predict the adoption and sustained engagement with the intervention.

Interestingly, actual desirability does not hinge on the full-fledged development of an intervention. Unlike other facets of acceptability, it does not rely on actual product usage. However, assessing clients' behaviour toward a novel intervention before it is available —akin to a "fake door" technique (Savoia, 2019)— raises ethical considerations that require further exploration. Therefore, future research could investigate various methodological approaches for incorporating desirability measurements into the developmental phase of blended care and other forms of DMHI, all while prioritizing ethical concerns.

5. Limitations

The study results should be considered in light of several limitations. Firstly, the study focuses on the development and implementation of a blended care model tailored for individuals who have experienced a first-episode psychosis—a group with unique characteristics and treatment challenges compared to those with other mental health disorders. Consequently, the principles and outcomes of developing and implementing blended care for other populations may differ. Secondly, only one service participated in the study, which limits the generalizability of the findings. The insights gained regarding the challenges in implementing Digital NAVIGATE may not fully capture the potential of implementing this intervention in other services that may vary across various aspects.

6. Conclusions

Successfully integrating digital tools into routine clinical practice remains a persistent challenge, even when following the principles of UCD and bottom-up development processes. A critical aspect may lie in distinguishing between indicators of acceptability and desirability and incorporating measures of the latter into the development process of bent care and other forms of digital interventions. This approach can provide valuable insights into the adoption potential of these interventions.

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Conflict of Interest: no conflict exists for all authors.

References

Achtyes, E. D., Ben-Zeev, D., Luo, Z., Mayle, H., Burke, B., Rotondi, A., Gottlieb J., Brunette M., Mueser K., Gingerich S., Meyer-Kalos P., Marcy P., Schooler N. & Robinson D., Kane J. (2019). Off-hours use of a smartphone intervention to extend support for individuals with schizophrenia spectrum disorders recently discharged from a psychiatric hospital. Schizophrenia Research, 206, 200-208. https://doi.org/10.1016/j.schres.2018.09.003

Baumel, A., Tinkelman, A., Mathur, N., & Kane, J. M. (2018). Digital peer-support platform (7Cups) as an adjunct treatment for women with postpartum depression: feasibility, acceptability, and preliminary efficacy study. JMIR mHealth and uHealth, 6(2), e38. https://doi.org/10.2196/mhealth.9482

Baumel, A., Correll, C. U., & Birnbaum, M. (2016). Adaptation of a peer based online emotional support program as an adjunct to treatment for people with schizophrenia-spectrum disorders. *Internet interventions*, 4, 35-42. https://doi.org/10.1016/j.invent.2016.03.003

Baumel, A., Fleming, T., & Schueller, S. M. (2020). Digital micro interventions for behavioral and mental health gains: core components and conceptualization of digital micro intervention care. *Journal of Medical Internet Research, 22*(10), e20631. https://doi.org/10.2196/20631

Baumel, A., Tinkelman, A., Mathur, N., & Kane, J. M. (2018). Digital peer-support platform (7Cups) as an adjunct treatment for women with postpartum depression: feasibility, acceptability, and preliminary efficacy study. *JMIR mHealth and uHealth, 6*(2), e38. https://doi.org/10.2196/mhealth.9039

Ben-Zeev, D., Buck, B., Hallgren, K., & Drake, R. E. (2019). Effect of Mobile Health on In-person Service Use Among People with Serious Mental Illness. Psychiatric Services, 70(6), 507-510. https://doi.org/10.1176/appi.ps.201800542

Ben-Zeev, D., Scherer, E. A., Gottlieb, J. D., Rotondi, A. J., Brunette, M. F., Achtyes, E. D., ... & Mohr, D. C. (2016). mHealth for schizophrenia: patient engagement with a mobile phone

intervention following hospital discharge. *JMIR Mental Health, 3*(3), e34. https://doi.org/10.2196/mental.6348

Bioque, M., Mezquida, G., Amoretti, S., García-Rizo, C., López-Ilundain, J. M., Diaz-Caneja, C. M., ... & Bernardo, M. (2022). Clinical and treatment predictors of relapse during a three-year follow-up of a cohort of first episodes of schizophrenia. Schizophrenia Research, 243, 32-42. https://doi.org/10.1016/j.schres.2022.02.026

Borghouts, J., Eikey, E., Mark, G., De Leon, C., Schueller, S. M., Schneider, M., ... & Sorkin, D. H. (2021). Barriers to and facilitators of user engagement with digital mental health interventions: systematic review. *Journal of medical Internet research*, 23(3), e24387. https://doi.org/10.2196/24387

Campbell, A. N., Nunes, E. V., Matthews, A. G., Stitzer, M., Miele, G. M., Polsky, D., ... & Wahle, A. (2014). Internet-delivered treatment for substance abuse: a multisite randomized controlled trial. *American Journal of Psychiatry*, 171(6), 683-690. https://doi.org/10.1176/appi.ajp.2014.13081055

Christensen, D. R., Landes, R. D., Jackson, L., Marsch, L. A., Mancino, M. J., Chopra, M. P., & Bickel, W. K. (2014). Adding an Internet-delivered treatment to an efficacious treatment package for opioid dependence. *Journal of Consulting and Clinical Psychology, 82*(6), 964-972.

Cohen, M., Roe, D., Savir, T., & Baumel, A. (2024). Blended care in psychosis–A systematic review. *Schizophrenia Research, 267*, 381-391. https://doi.org/10.1016/j.schres.2024.03.041

Dabbs, A. D. V., Myers, B. A., Mc Curry, K. R., Dunbar-Jacob, J., Hawkins, R. P., Begey, A., & Dew, M. A. (2009). User-centered design and interactive health technologies for patients. *Computers, Informatics, Nursing: CIN, 27*(3), 175-183. https://doi.org/10.1097/NCN.0b013e31819f7c7c

Dopp, A. R., Parisi, K. E., Munson, S. A., & Lyon, A. R. (2019). A glossary of user-centered design strategies for implementation experts. *Translational Behavioral Medicine, 9*(6), 1057-1064. https://doi.org/10.1093/tbm/iby119

Drake, R. J., Husain, N., Marshall, M., Lewis, S. W., Tomenson, B., Chaudhry, I. B., ... & Birchwood, M. (2020). Effect of delaying treatment of first-episode psychosis on symptoms and social outcomes: a longitudinal analysis and modelling study. *The Lancet Psychiatry*, 7(7), 602-610. https://doi.org/10.1016/S2215-0366(20)30147-4

Erbe, D., Eichert, H. C., Riper, H., & Ebert, D. D. (2017). Blending face-to-face and internet-based interventions for the treatment of mental disorders in adults: systematic review. *Journal of Medical Internet Research, 19*(9), e306. https://doi.org/10.2196/jmir.6588

Fairburn, C. G., & Patel, V. (2017). The impact of digital technology on psychological treatments and their dissemination. *Behaviour Research and Therapy, 88*, 19-25. https://doi.org/10.1016/j.brat.2016.08.012

Farhall, J., Castle, D., Constantine, E., Foley, F., Kyrios, M., Rossell, S., ... & Thomas, N. (2023). Using a digital personal recovery resource in routine mental health practice: feasibility, acceptability and outcomes. *Journal of Mental Health, 32*(3), 567-574. https://doi.org/10.1080/09638237.2022.2118688

Fitzpatrick, M., Nedeljkovic, M., Abbott, J. A., Kyrios, M., & Moulding, R. (2018). "Blended" therapy: The development and pilot evaluation of an internet-facilitated cognitive behavioral intervention to supplement face-to-face therapy for hoarding disorder. *Internet interventions*, 12, 16-25. https://doi.org/10.1016/j.invent.2018.02.006

Greenhalgh, T., Wherton, J., Papoutsi, C., Lynch, J., Hughes, G., Hinder, S., ... & Shaw, S. (2017). Beyond adoption: a new framework for theorizing and evaluating nonadoption, abandonment, and challenges to the scale-up, spread, and sustainability of health and care technologies. *Journal of Medical Internet Research, 19*(11), e8775. https://doi.org/10.2196/jmir.8775

Homan, P., Schooler, N. R., Brunette, M. F., Rotondi, A., Ben-Zeev, D., Gottlieb, J. D., ... & Meyer-Kalos, P. (2019). Relapse prevention through health technology program reduces hospitalization in schizophrenia. *bioRxiv, 626663*. https://doi.org/10.1101/626663

Kane, J. M., Robinson, D. G., Schooler, N. R., Mueser, K. T., Penn, D. L., Rosenheck, R. A., ... & Marcy, P. (2015). Comprehensive versus usual community care for first-episode psychosis: 2-year outcomes from the NIMH RAISE early treatment program. *American Journal of Psychiatry, 173*(4), 362-372. https://doi.org/10.1176/appi.ajp.2015.15050632

Kiluk, B. D., Devore, K. A., Buck, M. B., Nich, C., Frankforter, T. L., LaPaglia, D. M., ... & Carroll, K. M. (2016). Randomized trial of computerized cognitive behavioral therapy for alcohol use disorders: Efficacy as a virtual stand-alone and treatment add-on compared with standard outpatient treatment. *Alcoholism: Clinical and Experimental Research, 40*(9), 1991-2000. https://doi.org/10.1111/acer.13162

Kip, H., Wentzel, J., & Kelders, S. M. (2020). Shaping blended care: adapting an instrument to support therapists in using eMental health. *JMIR Mental Health, 7*(11), e24245. https://doi.org/10.2196/24245

Kooistra, L. C., Wiersma, J. E., Ruwaard, J., Neijenhuijs, K., Lokkerbol, J., van Oppen, P., ... & Riper, H. (2019). Cost and effectiveness of blended versus standard cognitive behavioral therapy for outpatients with depression in routine specialized mental health care: pilot randomized controlled trial. *Journal of Medical Internet Research, 21*(10), e14261. https://doi.org/10.2196/14261

Kretzschmar, K., Tyroll, H., Pavarini, G., Manzini, A., Singh, I., & NeurOx Young People's Advisory Group. (2019). Can your phone be your therapist? Young people's ethical perspectives on the use of fully automated conversational agents (chatbots) in mental health support. *Biomedical Informatics Insights, 11*, 1178222619829083. https://doi.org/10.1177/1178222619829083

Larsen, D. L., Attkisson, C. C., Hargreaves, W. A., & Nguyen, T. D. (1979). Client satisfaction questionnaire. *Evaluation and Program Planning*. https://doi.org/10.1037/t24699-000

Lieberman, J. A., Small, S. A., & Girgis, R. R. (2019). Early detection and preventive intervention in schizophrenia: from fantasy to reality. *American Journal of Psychiatry, 176*(10), 794-810. https://doi.org/10.1176/appi.ajp.2019.19080865

Lyon, A. R., & Koerner, K. (2016). User-centered design for psychosocial intervention development and implementation. *Clinical Psychology: Science and Practice, 23*(2), 180. https://doi.org/10.1111/cpsp.12154

Mohr, D. C., Lyon, A. R., Lattie, E. G., Reddy, M., & Schueller, S. M. (2017a). Accelerating digital mental health research from early design and creation to successful implementation and sustainment. *Journal of Medical Internet Research, 19*(5), e7725. https://doi.org/10.2196/jmir.7725

Mascayano, F., van der Ven, E., Martinez-Ales, G., Henao, A. R., Zambrano, J., Jones, N., ... & Dixon, L. B. (2021). Disengagement from early intervention services for psychosis: a systematic review. *Psychiatric Services*, 72(1), 49-60. https://doi.org/10.1176/appi.ps.201900375

Mohr, D. C., Weingardt, K. R., Reddy, M., & Schueller, S. M. (2017b). Three problems with current digital mental health research ... and three things we can do about them. *Psychiatric Services, 68*(5), 427-429. https://doi.org/10.1176/appi.ps.201600541

Nakao, S., Nakagawa, A., Oguchi, Y., Mitsuda, D., Kato, N., Nakagawa, Y., ... & Mimura, M. (2018). Web-based cognitive behavioral therapy blended with face-to-face sessions for major depression: randomized controlled trial. *Journal of Medical Internet Research, 20*(9), e10743. https://doi.org/10.2196/10743

Park, S. Y., Sigmon, C. N., Boeldt, D., & Sigmon, C. A. N. (2022). A framework for the implementation of digital mental health interventions: The importance of feasibility and acceptability research. *Cureus, 14*(9). https://doi.org/10.7759/cureus.29329

Richards, P., & Simpson, S. (2015). Beyond the therapeutic hour: An exploratory pilot study of using technology to enhance alliance and engagement within face-to-face psychotherapy. *British Journal of Guidance & Counselling*, 43(1), 57-93. https://doi.org/10.1080/03069885.2014.936824

Robinson, D., Schooler, N., & Kane, J. (2020). O4. 5. Long term effects of early intervention services for first episode psychosis: outcomes over five years from the recovery after a 1st episode of schizophrenia-early treatment program (RAISE-ETP). *Schizophrenia Bulletin*, 46(Suppl 1), S10. https://doi.org/10.1093/schbul/sbaa028.022

Savoia, A. (2019). The right it: Why so many ideas fail and how to make sure yours succeed. (No Title).

Schueller, S. M., Tomasino, K. N., & Mohr, D. C. (2017). Integrating human support into behavioral intervention technologies: The efficiency model of support. *Clinical Psychology: Science and Practic*e, 24(1), 27. https://doi.org/10.1037/h0101740

Tait, L., Birchwood, M., & Trower, P. (2002). A new scale (SES) to measure engagement with community mental health services. *Journal of mental health*, 11(2), 191-198. https://doi.org/10.1080/09638230020023570-2

Vial, S., Boudhraâ, S., & Dumont, M. (2022). Human - Centered design approaches in digital mental health interventions: exploratory mapping review. *JMIR Mental Health, 9*(6), e35591. https://doi.org/10.2196/35591

Witlox, M., Garnefski, N., Kraaij, V., De Waal, M. W., Smit, F., Bohlmeijer, E., & Spinhoven, P. (2021). Blended acceptance and commitment therapy versus face-to-face cognitive behavioral therapy for older adults with anxiety symptoms in primary care: pragmatic single-blind cluster randomized trial. *Journal of Medical Internet Research*, 23(3), e24366. https://doi.org/10.2196/24366