Factors affecting implementation of digital health interventions for people with psychosis or bipolar disorder, and their family and friends: a systematic review

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Summary

Digital health interventions present an important opportunity to improve health care for people with psychosis or bipolar disorder, but despite their potential, integrating and implementing them into clinical settings has been difficult worldwide. This Review aims to identify factors affecting implementation of digital health interventions for people affected by psychosis or bipolar disorder. We searched seven databases and synthesised data from 26 studies using the Consolidated Framework for Implementation Research. Attitudes and beliefs about interventions were crucial factors for both staff and service users, with negative attitudes and scepticism resulting in a lack of motivation to engage with interventions or complete them. The complexity of the interventions was a barrier for people with psychiatric symptoms, low premorbid intelligence quotient, or minimal information technology skills. The accessibility and adaptability of interventions were key facilitators, but insufficient resources, finances, and staff time were barriers to implementation. Interventions need to be user friendly and adaptable to the needs and capabilities of people with psychosis or bipolar disorder, and the staff who support their implementation. Service users and staff should cofacilitate the process of developing and implementing the interventions.

Background

Good-quality treatment and management for people with psychosis and bipolar disorder is complex and costly.[1,2] Digital health interventions (henceforth referred to as digital interventions), such as web interventions, mobile Health (mHealth), and telehealth, present an important opportunity to improve health care for this population. Digital interventions provide support and treatment for health problems via a platform or device; for example, a mobile application (app) or a website.[3] The support provided can be emotional, decisional, or behavioural, and can be delivered with or without facilitation by staff or peers.[3] With mobile device ownership increasing in people with psychosis and the majority of patients indicating that they are in favour of using mHealth for self-management,[4] investment and interest in digital interventions are growing. Emerging data suggest that digital interventions might be as effective as more traditional, non-technological self-help interventions[5,6] at improving symptom monitoring,[7] medication management,[8] and access to information and support.[9]

Mental health services are often designed to be family and friends oriented, and digital interventions could have an important role by providing support digitally when practical issues can impede access to conventional psychosocial interventions.[10,11] To date, trials have shown that online psychoeducation is useful and acceptable to relatives of patients affected by bipolar disorder[12] and schizophrenia.[9]

Despite their potential, integrating and implementing digital interventions into real-world clinical settings has been difficult worldwide, an indication of the evidence–practice gap.[13,14] For example, despite evidence suggesting that computerised cognitive behavioural therapy can be effective in treating depression and anxiety,[15,16] computerised delivery is not yet widely used in clinical practice,[17] and high prevalence of dropout have been reported when it is prescribed.[18] The need for implementation research to drive our understanding of how to promote uptake and integration of evidence-based digital interventions is clear.

A meta-review by Ross and colleagues[19] on the implementation of e-health found that key strategies for a successful implementation included planning, training and assessment of staff, and continuous evaluation and monitoring. Other factors identified were related to the characteristics of the intervention—its cost, complexity, and adaptability to the local organisation; the individual characteristics of the staff; and financial and legislative support for the digital interventions. A later systematic review, published in 2018,[20] concluded that the lack of success of e-health interventions across all health conditions was related to the high cost of the interventions, high staff turnover, and the additional workload of the intervention for the staff. Another systematic review[21] showed that three key determinants of successful implementation for the routine care of common mood disorders are: on an individual level, first the acceptance of the digital intervention by service users and professionals and second its appropriateness in addressing the individual's mental health problems; and on the organisational level, the availability and reliability of required technologies. To what extent the findings of these reviews will apply to people with serious mental health conditions is not clear and, to our knowledge, this is the first systematic review of factors affecting the implementation of digital interventions specifically for people with psychosis or bipolar disorder, and their family or friends.

The objectives of this Review were to identify the existing literature on the implementation of digital interventions for people with psychosis or bipolar disorder; to identify, summarise, and interpret key factors affecting the implementation of these interventions; and to provide recommendations for future implementations.

Methods

Design

This systematic review follows Cochrane guidance on conducting reviews[22] and the PRISMA guidelines.[23] The eligibility criteria for study inclusion were developed with the participants, interventions, comparators, outcomes, study design (known as PICOS) framework. The protocol was registered with PROSPERO, number CRD42017079447.

Inclusion criteria

Adult service users of digital interventions with a diagnosis of psychosis or bipolar disorder established by any recognised diagnostic criteria were included together since they are often managed by the same mental health services offering the same complex interventions. Family or friends of these service users who were also being supported by any adult mental health services were also included. A comparator or control group was not required. We included studies with any data on factors that affect the implementation of specific digital interventions for people with psychosis or bipolar disorder in mental health services. These factors could be at the level of individuals, organisations, or systems. We included all studies that collected primary (including qualitative) data with the aim of reporting on factors affecting the implementation of a digital intervention for the population meeting our inclusion criteria. In line with previous reviews relating to digital health, only papers published after Jan 1, 1995 (and until Oct 20, 2017), were included.[24,25]

Exclusion criteria

Digital health interventions that were screening or monitoring tools for psychiatrists or health professionals, but did not involve patients or family and friends directly using the intervention, were excluded. Digital interventions that were not yet in use, even in a research setting, were also excluded.
Abstracts that had been published only in conference proceedings or journals without full text were not included. We excluded studies with no qualitative or quantitative assessment on the association between the factors that affect implementation of the digital intervention and the degree of implementation, or those studies in which the factors that affect the implementation were reported only in the discussion section of the paper (panel, figure).

Data analyses

A data extraction form was designed for this study and piloted on three studies.[26–28] We chose not to conduct a quality appraisal for the studies included or to use this parameter as a basis for study selection because the published literature in this field is in its early stages; we wanted to be inclusive and we were not examining effect sizes.

A framework analysis method[29] that used the Consolidated Framework for Implementation Research (CFIR)[30] was used to guide the synthesis of the data by lead author (GA-A) using NVivo11. The CFIR is an overarching framework that has been developed to encompass all available implementation theories and provides a systematic way of identifying the factors that have been associated with implementation of interventions into practice. The framework is composed of five major constructs: intervention characteristics (eg, relative advantage, complexity, and cost); outer setting (eg, needs of patient group, external policies, and incentives); inner setting (eg, networks, implementation climate, and available resources); characteristics of individuals involved in implementation (eg, knowledge and belief about the intervention, self-efficacy, and individual stage of change); and the implementation process (eg, planning, engaging, and debriefing). In the CFIR, the implementation process also includes factors that affect the engagement of individual users, staff, and organisations. Therefore, we have included these factors in this Review.

To enhance its validity two researchers (JR and TM) independently coded a 15% subsample of qualitative data to the CFIR constructs using NVivo11. We then summarised the findings of the factors affecting implementation outcomes in a narrative synthesis. The findings from each construct of the CFIR were discussed and reviewed with the wider research team throughout the analysis; any areas of disagreement were discussed and the coding was manually refined until a complete agreement between reviewers was achieved.
We systematically explored variations between different populations in the important implementation factors, particularly service users with psychosis compared with those with bipolar disorder; service users compared with staff; and among the various types of digital intervention.[31]

Results

Identification of relevant studies

Searches of the seven electronic databases identified 3359 unique citations (figure). Of these, we excluded 3026 after screening the titles and abstracts because they did not meet the inclusion criteria. Of the 333 remaining, 26 studies, all from peer-reviewed literature, met the inclusion criteria.

Description of the studies included

The studies identified were published between 1995 and 2017, with 17 of them being published between 2015 and 2017.[26,27,32–46] The only study published before 2007 involved a telehealth digital intervention.[47] Most of the studies used mixed methods,[26,28,32–34,36,37,39–51] four used quantitative methods,[27,35,38,52] and two studies used qualitative methods.[53,54] The most common studies (16 [62%] of 26) were feasibility and acceptability trials,[32,33,37–46,49,51,52,54] eight (31%) were designed to look specifically at implementation,[26–28,34,47,48,50,53] and two (8%) were randomised controlled trials.[35,36] Eight (31%) of the studies included participants with schizophreniform disorders,[27,32,37,39,40,45,46,52] seven (27%) included patients with bipolar disorder,[26,35,38,42,43,50,54] and the remainder included both illnesses (42%).[28,33,34,36,47–49,51,53] None of the digital interventions targeted family or friends and most of the digital interventions (78%) had direct support from staff or peers in their delivery. Three of the studies used an implementation plan[26,34,53] and one study reported on the use of implementation theory.[26] All the papers were written in English. A summary of the included studies can be found in table 1.

Factors that influence implementation

All available data could be coded to one of the main CFIR constructs, and findings were consistent across different health-care settings and types of digital intervention. Quantitative data are shown in table 2 and a list of the CFIR constructs identified in each study is shown in the appendix.

Intervention characteristics

Relative advantage refers to an individual's perceptions of the advantage of implementing the digital intervention versus the alternative or current solution.[30] The main relative advantage reported of digital interventions was their accessibility to service users over non-technological approaches. Benefits of this accessibility included having interventions immediately available during a crisis[32] and the reassurance of having remote support perceived to be akin to talking to a doctor on a regular basis.[40] Users also spoke positively about being able to access the digital interventions independently, in their own time at home,[33] and sharing them with family and friends.[46,54] Staff spoke of a telehealth intervention being particularly suited to supporting patients who had a need or incentive to stay at home.[51]

Digital interventions were reported to aid communication and help build relationships between users and their medical team.[34,43,46,49] In a shared decision making intervention for psychotropic medication, users were able to disclose information that they felt uncomfortable or unable to tell a clinician directly; for example, about drug and alcohol relapse, pregnancy plans, wanting so-called hip hop abs, and general concerns about the use of medication.[49] A web-based digital intervention that was used both independently and then with a facilitator was reported to help guide discussions; one user reported: "[without the website] we wouldn't have had nearly as much to talk about".[46] However, other patients considered the use of digital interventions without any human support as impersonal,[40,42] saying that more emphasis should be "not [on] automation but a real life man with deep psychological problems".[40] Some users echoed this idea, saying they preferred face-to-face communication[46] and indicated that the younger generation was more accepting of digital interventions.[54]

A mindfulness app was found to be a welcome change from medication or face-to-face interactions in an inpatient unit, helping to relieve boredom and giving users a positive activity to focus on.[44] The privacy and anonymity of online digital interventions was reported as an advantage by some patients,[54] but fears about cybersecurity were also a barrier, with one person declining to take part in a study because of privacy concerns[49] and other users showing concern about privacy when using a digital intervention on a public computer.[54]

A key finding was the need for services to be able to adapt interventions so that they can work alongside or within existing infrastructures.[34,41] In a shared decision making intervention study, the absence of integration between the app and the existing information technology (IT) system meant that the clinicians were not aware whether individuals had used the app before their appointments.[41] This poor interoperability was overcome in another study in which prompts were incorporated into the existing electronic system to inform staff about which individuals were completing the intervention.[34] Poor adaptability meant some users found information in psychoeducational interventions too complex,[48] whereas other users felt the level was too simplistic, which was a reason for discontinuing the intervention.[50,54] Both staff and users commented on the importance of making interventions more patient-centred so that they could be tailored to the specific needs of the individual.[53] Although digital interventions are promoted as long term cost-saving opportunities, in the short-term, cost was considered an important implementation factor across all types of digital interventions, with lack of staff, training, space, and necessary equipment being attributed to a financial deficit.[42,47,48,51,53] Only one study completed a formal cost analysis,[51] but other studies reported on removing human facilitation to reduce cost[42] and on the effect of care providers agreeing to pay for the cost of implementation (uptake and sustainability) within private health-care systems.[26]

Many studies reported on a disparity between the IT skills required for the intervention and those skills the users and the staff have.[28,40,41,45,53] This disparity hindered the execution of the intervention, with users completing tasks slowly, requiring extra time with staff, feeling frustrated, and stopping the intervention.[39] High completion outcomes were achieved for smartphone interventions in users with a high functional assessment short test score, more years of smartphone usage, and high premorbid verbal intelligence quotient.[52]

Setting

The absence of a suitable infrastructure to support the delivery of digital interventions was reported across several studies as a major barrier to implementation. Infrastructure problems included limited access to computers, printers,[28,53,54] space,[26,36,53,54] equipment,[26,48,53] or Wi-Fi and internet.[44,48,53,54] Although cost was cited as a factor for these infrastructure problems, poor implementation planning across all types of interventions was a common issue reported in these studies.[36,48,53] The availability of staff trained to implement interventions was also limited by a lack of investment in their training, the high demands of their clinical workload, and a rapid staff turnover.[26,34,36,41 53]

Individual characteristics

Attitudes and beliefs about digital interventions were crucial implementation factors for both staff and users. Positive beliefs that the intervention would help management of symptoms,[40,44] enthusiasm and interest in the intervention,[28,36,53] trust in the team delivering the intervention, and the knowledge that it had been developed by other service users[42] were cited as factors in increasing end-user engagement. However, negative attitudes towards IT generally,[53] the preference for face to-face interventions, and lack of interest in digital interventions meant that although users could formally complete sessions, these sessions were less successful since users were more interested in browsing other websites, did not interact with staff during sessions, and did not use the available peer support.[28] From a staff perspective, the belief that the software was a well developed time-saving resource fostered a positive attitude that could in turn motivate users to be more responsive and more engaged in the intervention, [34,41,44,53] whereas scepticism and negativity were reported as barriers.[34,36,47,53] Some members of staff lacked IT skills and were reluctant to use digital technology in daily clinical practice,[53] whereas others recognised the importance and necessity for staff engagement from the onset of the process to support the successful implementation.[34,53] Facilitators included more information and training regarding the intervention and its expected benefits, more training on IT skills, and tailoring the digital intervention to the needs of the individual service user.[36,53]

Sociodemographic factors were also noted to affect implementation of digital interventions. Female users with schizophreniform disorder[27] or bipolar disorder[50] were more likely to engage with interventions than male users. White users were found to be more engaged with a mobile intervention for individuals with schizophreniform disorder than Hispanic and African American users.[27] In two studies, young people (<30 years of age) with psychosis or bipolar disorder were less likely to engage and complete the digital intervention than those who were older.[27,50] In a study with a mixed population, patients with a vocational education had more successful educational sessions than those without vocational education.[28] However, in other studies for individuals with bipolar disorder, no differences were found between completers and non-completers of an intervention regarding age,[35] and no significant correlations were found between compliance with the intervention and age or education level.[38]

Other patient factors related to the interplay between individuals' psychiatric illness and the interventions. In an inpatient setting, patients with more serious psychiatric symptoms took longer to complete sessions,[28,53] and people with schizophrenia had fewer successful sessions than patients with other mental health diagnoses.[28] In an mHealth study for individuals with schizophreniform disorder, non-completers were more likely to have severe negative symptoms than completers, but showed no difference in positive or depressive symptoms.[52] Some participants with bipolar disorder self-reported not adhering or having difficulty engaging with interventions when experiencing manic or depressive symptoms, whereas others spoke of being motivated to find solutions in online programs when depressed.[50,54] No association was shown between baseline symptoms of mania or depression for those with bipolar disorder and adherence to an mHealth intervention[35] and an online program.[50] Users with bipolar disorder also reported a reluctance to complete interventions as they expressed a fear that it would cause symptom exacerbation or relapse.[50] However, this reluctance was reported only among patients with psychosis and even then in a minority of cases; these users had paranoia about mobile devices[27] or required additional support after a virtual reality intervention.[37]

Engaging refers to attracting and involving individuals in the implementation process and use of the digital intervention through a combined strategy of education, training, and similar activities. It includes both strategies to promote engagement and outcomes related to engagement.[55] For digital interventions that involved staff support, enthusiastic clinicians would engage with the intervention and become familiar and confident with its use.[41] They would often remind service users to complete the intervention,[46,50] reinforce its importance, and provide regular guidance.[44] Digital intervention users were more likely to complete an intervention if staff were involved,[28] and if the intervention was introduced by a staff member who found it useful.[41] Even remote support, such as staff online support and infrequent telephone calls, was found to be essential to users remaining in the study and using the digital intervention.[42] Peer support offered by other service users was also found to be an effective method of improving engagement[48,50] and achieving higher adherence compared with unsupported interventions.[50]

Staff who thought the interventions fun or beneficial tended to prompt or encourage patients to use them.[36,41,44] Participants who did not engage in the interviews reported feeling unwell, worried that the digital intervention would exacerbate symptoms, or found the process tedious.[50] A greater number of lifetime psychiatric hospital admissions was associated with an increased likelihood of discontinuing the intervention.[27] The level of engagement with a mobile intervention was also shown to decline over time for all digital intervention users.[27]

Discussion

This systematic review identified and summarised factors affecting implementation of digital interventions for people with psychosis or bipolar disorder and interpreted these findings in the context of CFIR. The findings were

consistent across different health-care settings and digital intervention domains, with some variation of implementation factors between patients with bipolar or schizophreniform disorder. Multiple factors were important for implementation in all studies, with no single factor identified as the key barrier or facilitator. The Review did not identify any eligible studies looking at implementation factors of digital interventions for family or friends of people with bipolar or psychotic disorder, highlighting an important gap in the published literature. Research is being done to address this issue.[56] The majority of factors for effective implementation of digital interventions were centred at the level of the individual or the intervention. The complexity of the digital intervention was a barrier for people with psychiatric symptoms, low premorbid intelligence quotient, or low IT skills, as these often resulted in difficulty concentrating, engaging, and completing interventions. Female gender and being white were associated with more successful completion of interventions. People with bipolar disorder mentioned concerns on how digital interventions could affect their mental health, and a minority of people with psychosis became paranoid or had symptom exacerbation. The accessibility and adaptability of digital interventions were key facilitators, but their cost was a barrier. Although evidence to support the case for digital interventions making long-term savings is available,[57–59] the upfront costs for developing interventions and the ongoing delivery costs are likely to be important factors in services transitioning to more digital services.[60,61] The evidence in our Review regarding organisational and process factors that affect implementation for digital interventions was scarce. We recommend that future research examines the effects of organisational factors in the setting and health service providers ensure sufficient funds are in place to support implementation (panel).

The results of our Review are similar to other systematic reviews on e-health interventions examining implementation across a range of health-care systems.[19–21] All of these reviews found that the best conditions for successful implementation are when the digital intervention is user friendly, interoperable with existing systems, and adaptable to the local environment and the user. Additionally, they all cited cost as a key factor—indeed, one review found that this factor was the most frequently mentioned issue when interventions did not work.[20] Other common barriers among all studies were staff members' poor IT skills, negative attitudes toward digital interventions, and general resistance to change. Granja and colleagues[20] also cited similar barriers of high staff turnover, undermining of face-to-face communication, and high workload, with staff reporting that digital interventions were both time and resource intensive. Outer setting factors, such as external policies and incentives, were previously identified as important for the implementation of digital interventions, in addition to factors related to implementation planning.[19] By contrast, our Review found that studies that looked at this aspect of implementation were scarce. The absence of reporting, assessment, and thought around implementation reflects the fact that digital interventions for psychosis or bipolar disorder are not as established as those for physical or common mental health problems. Our data support the existing published literature on a person-based approach[62] for developing and tailoring the digital intervention to the needs of the individual; for example, building-in flexibility in the amount of human input required.[3] This person-based approach is of particular relevance to people with psychosis or bipolar disorder who might have less experience using digital technology or a degree of cognitive impairment.[63] Our findings also highlight the necessity for an improved understanding of how to tailor digital interventions to the needs of particular groups, such as black, Asian, and minority ethnic groups, men, or those with more severe psychiatric symptoms when designing digital interventions.[64,65]

To our knowledge, this Review is the first systematic study to examine key factors affecting implementation of digital health interventions for people with psychosis or bipolar disorder. The broad search strategy ensures a comprehensive review, but nevertheless the Review has limitations. Most of the studies identified were preliminary evaluations of the feasibility and acceptability of digital health interventions for this population rather than implementation studies. Further, none of the studies used CFIR and we retrospectively organised their findings into the framework. Also the wide variation in the methods, settings, and type of digital interventions might have affected the implementation. Therefore, whether findings are specific to particular settings or interventions remains uncertain. Moreover, the definitions of engagement were not consistent between studies, which restricts the extent to which meaningful comparisons can be drawn across studies. Finally, no data were reported on the representativeness of the study samples, restricting the generalisability of the results to the clinical population. Future studies should prioritise the following: establishing clear parameters for what constitutes effective engagement[66] in digital health interventions; use of implementation theory to inform the development and reporting of clear implementation plans; investigating the financial impact of implementation of a new intervention within their respective health-care systems;strategic use of qualitative and quantitative approaches to understand implementation factors; practice-based implementation studies; and the use of electronic health records to make comparisons between the personal attributes of the study and the target population.

Conclusions

Most of the implementation research summarised in this Review focused on individual level determinants, highlighting a clear need for better understanding of the contextual and organisational determinants of successful implementation. Digital interventions need to be user friendly and adaptable to the needs and capabilities of this population and the staff who work with them. Our research supports the need for human facilitation of digital interventions and the importance of including service users, staff, and implementation champions as early as possible in the implementation process. Although digital interventions are often promoted as cost-saving in the long run, their start-up and delivery costs are often overlooked, and

future studies should include cost-analyses. Studies reporting implementation of digital interventions for family and friends have not been published yet. Despite the identification of several studies for this Review, important questions remain regarding the optimum method of development and delivery for digital interventions for people with psychosis or bipolar disorder.

Contributors
All authors contributed to the protocol design. GA-A, TM, JR, and VA executed the search strategy and extracted the data. GA-A wrote the draft of the paper, which was revised and approved by all authors. All authors approved the final manuscript.

Declaration of interests
We declare no competing interests.

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