Original Paper: Technology is taking over the world. Early psychosis patients' perspectives of digital technology: qualitative analysis.

Author list:
Sandra Bucci1,2, Rohan Morris1, Katherine Berry1, Natalie Berry1, Gillian Haddock1, Christine Barrowclough1, Shôn Lewis1, Dawn Edge1

1Division of Psychology and Mental Health, School of Health Sciences, Manchester
2Academic Health Science Centre, University of Manchester, Manchester, United Kingdom.

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Corresponding author:
Dr Sandra Bucci. Senior Lecturer in Clinical Psychology. Division of Psychology and Mental Health, School of Health Sciences, University of Manchester. 
Address: 2nd Floor, Zochonis Building, Brunswick Street, Manchester. M13 9PL, UK
Email: sandra.bucci@manchester.ac.uk
Phone: +44 161 306 0422
Fax: +44 161 306 0406
Abstract

Background: Digital technology has the potential to transform how patients engage with mental health services. There is promising evidence regards feasibility, acceptability and efficacy of digital systems in psychosis. However, research to date has largely ignored patients' perspectives of these systems.

Objective: We explored early psychosis patients’ subjective views of mobile technology in the mental health setting.

Methods: Qualitative framework analysis on data from 21 semi-structured interviews with patients registered with early intervention for psychosis teams. Robust measures were taken to develop a stable framework, including member-checking, triangulation of analysis, independent verification of themes, and consensus meetings.

Results: Four themes were established a priori: acceptability of technology in mental health; technology can increase access to, and augment, mental health support; barriers to adopting digital solutions; data protection, privacy and security of information. Two themes were generated a posteriori: digital interventions as an adjunct to, or replacement for, usual care; empowerment, control and choice.

Conclusions: In the first study of its kind, early psychosis patients reported digital tools were an acceptable and accessible method for mental health support. Digital tools could enhance access to care by extending the reach of services to one's natural environment, facilitating honest communication. Digital systems were viewed as progressive, modern and relevant. Potentially de-stigmatising, they can overcome access barriers patients face within traditional service settings. Digital tools facilitate empowerment, affording patients meaningful choice and the opportunity to take active control of their healthcare. Concerns were expressed about the management of data security, safety and risk information.

Keywords: qualitative; psychosis; framework analysis; digital health; mHealth

Integration of technology into health services is becoming commonplace, primarily due to recent developments in hardware and connectivity. As well as facilitating direct contact between patients and clinicians1, 2 mHealth systems (e.g. largely via apps),
have been recently applied in the treatment of psychosis, with promising effects. Given that there is an inverse relationship between age and use of digital health technology, computer literacy, and mobile phone ownership/use, mHealth systems may be particularly advantageous when applied to an early psychosis population, which is particularly associated with high relapse rates. Levels of technology use in psychosis are similar to that of the general population, and psychosis patients express favourable attitudes towards mHealth-delivered interventions and self-help strategies. However, despite the potential advantages of the integration of technology into mental healthcare, few investigations have focused on patients' subjective perspectives of digital systems. Palmier-Claus et al. explored the views of 24 people with psychosis about the ClinTouch self-monitoring of symptoms app. Three key themes were identified: usability and familiarity with the technology, acceptability and integration of technology into daily life, and perceived impact of technology on healthcare. Another qualitative study with individuals experiencing psychosis reported that use of online resources to access mental health-related information was commonplace and many participants expressed positive attitudes towards the potential of mental health apps for self-management purposes. An in-depth understanding of the views of early psychosis patients has yet to be reported.

Key policy documents have set clear recommendations regarding closer involvement of patients in the development of digital innovations and how stakeholders wish to engage with digitally-enabled services (e.g. NHS Five year Forward View). In support of this, patient involvement during intervention development is associated with higher levels of engagement with m-health interventions for psychosis. This highlights the need to examine patients’ perspectives of digital health tools. The aim of this study was to engage with early psychosis patients to gain in-depth understanding of their perspectives and attitudes towards digital health interventions (DHIs) for mental healthcare. The study is part of a larger programme of work co-developing and testing an mHealth system with early psychosis patients. To our knowledge, this is the first study to qualitatively examine early psychosis patients' views about a digital health intervention delivered via a smartphone app. The study was a collaborative partnership involving clinical academics, clinicians and early psychosis patients who were all involved study design, topic guide development, and analysis and interpretation of data.

Method

Study design
This was a qualitative investigation nested within a broader research programme concerned with the development, feasibility and acceptability of a theory-informed smartphone application for early psychosis, Actissist\textsuperscript{22}. Data were gathered from semi-structured patient interviews (n=21). The study was funded by the Medical Research Council, UK and received ethical approval from the National Research Ethics Committee West Midlands – South Birmingham (14/WM/0118).

Participants
The study purpose was to identify participants who could provide insight into the phenomenon being studied rather than achieving a random or representative sample of the population. We therefore used a systematic, non-probabilistic sampling approach to recruit a purposive sample of patients registered with early intervention for psychosis services (EIS) across the North West of England. Recruitment was over a 22-week period. Study exclusion criteria were kept to a minimum in order to include a diverse range of views and experiences. Eligibility criteria were: i) ability to provide informed consent; ii) registered with EIS; iii) English speaking; and iv) consent to digitally record interviews and publication of de-identified data.

Procedures
A researcher contacted team managers and gave presentations about the study at service meetings. Subsequently, clinicians identified potential participants and gained consent to contact. A researcher met with participants either in their own home or at a convenient location. Following consent, semi-structured interviews were conducted using a topic guide (available on request) developed for the study based on review of the literature and Smith’s\textsuperscript{23} guidelines. The guide was refined in collaboration with an expert reference group consulting to the broader Actissist trial. Open-ended questions were designed to explore the following broad areas: i) participants’ use of technology generally; ii) views about receiving healthcare and psychological support via Smartphone technology; iii) whether mental health apps make sense in the context of patients’ daily lives; iv) incentives and barriers to use, v) equity and ethics, vi) privacy concerns, and vi) participants’ recommendations and requirements for a mental health app. All interviews were conducted by RM who was trained by an experienced clinician and academic (SB) and qualitative methodologist (DE). The order in which topics emerged was influenced by the topic guide, but not exclusively driven by it. Interviews were conducted as part of an iterative and inductive process of data collection and analysis\textsuperscript{24}. That is, as understanding of relevant issues developed, the topic guide was altered to focus the interview on emerging themes,
thus allowing the data itself to drive the development of relevant questions. For example, participants spontaneously spoke about the importance of the personification of a mental health app, resulting in the inclusion of a related question in the topic guide. With each additional issue raised, we re-contacted participants interviewed prior to the addition of new items to elicit views regarding such issues. Interviews were digitally-recorded and transcribed verbatim.

Data Analysis
Data were analysed using a Framework Analysis approach. Whilst sharing common features with other qualitative approaches (e.g. thematic analysis), Framework methodology makes explicit a visible, systematic process that allows for inclusion of both a priori and emergent concepts. Although non-linear and often condensed, data analysis involved the key stages described in Table 1.

**Table 1: Process for developing the Framework**

<table>
<thead>
<tr>
<th>Key stage</th>
<th>Description</th>
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<tbody>
<tr>
<td>1. Familiarisation</td>
<td>Listening to recordings, reading and re-reading transcripts, making analytical notes</td>
</tr>
<tr>
<td>2. Coding</td>
<td>Combination of <strong>deductive</strong> (using pre-defined codes based on the specific research questions) and <strong>inductive</strong> (using ‘open coding’ to identify any emergent information that might be relevant) approaches</td>
</tr>
<tr>
<td>3. Developing a thematic framework</td>
<td>Members of the research team develop an initial framework and compare codes assigned to the data after independently coding several transcripts. Researchers agree the set of codes to be assigned to subsequent transcripts. Subsequent iterations of developing the framework are shared with members of the wider research team and participants themselves. Researchers then continue to code remaining transcripts into the framework and constantly compare new data with the framework. Data are interpreted and summarised, new codes generated, redundant codes deleted, and overlapping codes merged and ‘member checking’ of framework occurs</td>
</tr>
<tr>
<td>4. Indexing</td>
<td>Framework is applied to the dataset</td>
</tr>
<tr>
<td>5. Charting</td>
<td>A ‘framework matrix’ (spreadsheet) for each emergent category across the whole dataset, using illustrative quotes is developed using Nvivo data management software</td>
</tr>
<tr>
<td>6. Mapping and interpretation</td>
<td>As emergent or a priori characteristics of, and differences between, the data are identified, connections between categories are ‘mapped’, facilitating exploration of relationships and theoretical concepts and generation of typologies</td>
</tr>
</tbody>
</table>

SB, RM and DE developed the initial framework. After independently coding several transcripts, the team compared the codes assigned to the data and agreed the codes to be assigned to subsequent transcripts. Subsequent iterations were shared with members of the wider inter-disciplinary research team and participants themselves, whose perspectives and queries were integral to refining the framework. RM and SB
continued to code all transcripts into the framework as described in Table 1. Through constant comparison of new data with the framework, data were interpreted and summarised, new codes generated, redundant codes deleted, and overlapping codes merged. We took a number of additional steps to enhance the methodological rigor of the study to minimise researcher bias: SB and DE scrutinized interviews and provided feedback and training to the interviewer to minimise any tendency to lead participants; a selection of transcripts were coded independently by authors GH and KB (who were independent to framework development) providing triangulation of analysis and independent verification; framework refinement and development of the analytical matrix was undertaken by all authors. Regular consensus meetings were held until a stable framework emerged. Participant feedback on the framework and subsequent findings (member verification) was sought from study participants. Data collection ceased when no further themes were advanced (i.e. data saturation26).

Results

Participant characteristics

Interviews lasted between 39 and 78 minutes. Tables 2 and 3 summarise demographic and clinical characteristics of participants.

Table 2. Demographic and clinical characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Total N</th>
<th>%</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, years (Mean, S.D., min-max)</td>
<td>26.33</td>
<td>5.14</td>
<td>16 - 34</td>
</tr>
<tr>
<td>Months registered with EIS (Mean, SD, range)</td>
<td>21.95</td>
<td>21.94</td>
<td>94</td>
</tr>
<tr>
<td>Male (n, %)</td>
<td>10</td>
<td>47.62</td>
<td></td>
</tr>
<tr>
<td>Employment, education or training (n, F/T)</td>
<td>11</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Cohabitants (Family/partner, other, none)</td>
<td>13</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>F/T = Full Time employment</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3. Use of technology and potential barriers to use

<table>
<thead>
<tr>
<th>Type of use reported</th>
<th>Number of participants / total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of the internet</td>
<td>21/21 (100)</td>
</tr>
<tr>
<td>Internet used fora:</td>
<td></td>
</tr>
<tr>
<td>Art Tools (browser based app)</td>
<td>1/21 (4.76)</td>
</tr>
<tr>
<td>Email</td>
<td>6/21 (28.57)</td>
</tr>
<tr>
<td>Gaming</td>
<td>5/21 (23.81)</td>
</tr>
<tr>
<td>News</td>
<td>5/21 (23.81)</td>
</tr>
<tr>
<td>Online Banking</td>
<td>1/21 (4.76)</td>
</tr>
</tbody>
</table>
Research/Studying 9/21 (42.86)
Self-help websites 1/21 (4.76)
Social Networking/Blogging\(^b\) 12/21 (57.14)
Video/audio streaming 9/21 (42.86)

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<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Own a mobile phone</td>
<td>-</td>
<td>20/21 (95.24)</td>
</tr>
<tr>
<td>Own a SP</td>
<td>-</td>
<td>18/20 (90)</td>
</tr>
<tr>
<td>Use of SP apps</td>
<td>-</td>
<td>18/18 (100)</td>
</tr>
<tr>
<td>SP apps used for:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Appointment reminders/ calendar</td>
<td>3/18 (16.67)</td>
<td></td>
</tr>
<tr>
<td>Art (including photography)</td>
<td>4/18 (22.22)</td>
<td></td>
</tr>
<tr>
<td>Banking</td>
<td>2/18 (11.11)</td>
<td></td>
</tr>
<tr>
<td>E-books</td>
<td>2/18 (11.11)</td>
<td></td>
</tr>
<tr>
<td>G.P.S.</td>
<td>1/18 (5.56)</td>
<td></td>
</tr>
<tr>
<td>Gaming</td>
<td>7/18 (38.89)</td>
<td></td>
</tr>
<tr>
<td>Health purposes (physical &amp; mental)</td>
<td>12/18 (66.67)</td>
<td></td>
</tr>
<tr>
<td>News</td>
<td>4/18 (22.22)</td>
<td></td>
</tr>
<tr>
<td>Shopping</td>
<td>3/18 (16.67)</td>
<td></td>
</tr>
<tr>
<td>Social Networking(^b)</td>
<td>9/18 (50)</td>
<td></td>
</tr>
<tr>
<td>T.V. guide</td>
<td>1/18 (5.56)</td>
<td></td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Literacy difficulties</td>
<td>-</td>
</tr>
<tr>
<td>Literacy improved on phone</td>
<td>7/21 (33.33)</td>
</tr>
</tbody>
</table>

SP = Smartphone; app =application
\(^a\) Not include SP app based access (e.g. gaming via a SP app)
\(^b\) Note that other internet uses (e.g. media streaming, research, gaming, shopping) often take place within the context of social networking sites and apps

Uptake of study participation was high, with 88% patients approached consenting to take part. Participants (10 male) had a mean age of 26 years and a mean length of 22 months of EIS involvement. All participants used the Internet, primarily for social networking (57%; n=12) and all, except one, owned and used a mobile phone (majority were smartphones; 90%). Two-thirds of those who owned Smartphones had previously used physical and/or mental-health related apps (67%). A third of the sample reported literacy difficulties; although, these participants reported finding information on a smartphone more accessible than paper-based approaches.

**The Framework**

We sought to explore participants' requirements and recommendations for an app for early psychosis, perceptions of digital health; incentives and barriers to the use and implementation of mHealth tools; and the impact of mHealth systems on disclosure of risk and governance issues. Therefore, four themes were established *a priori*: i. acceptability of technology in mental health; ii. technology can increase access to, and augment, mental health support; iii. barriers to adopting digital solutions; iv. data protection, privacy and security of information. Important themes were also generated from the data, which participants’ spontaneously described. Two themes emerged from the data *a posteriori*: vi. Can DHIs replace usual (face-to-face) care?
Acceptability of technology in psychosis and mental health

There was complete agreement across participants (n=21) that mobile technology is an acceptable and relevant way to gather information about, and access support for, mental health problems. Generally speaking, the idea of using smartphones to seek help was viewed as just as acceptable as traditional methods:

*I do think that [technology] is really good cause it's going to be accessible to people that will need the help. Some people don’t always want to speak outwards. It would be much easier on an app where I could take it with me anywhere at anytime and open it up and record how I am doing...*(Participant 15)
Technology was viewed as a good way of accessing help and support when needed, as participants reported often feeling restricted by traditional face-to-face service provision:

It’s not like a GP where you’ve gotta go up the road and then speak to him. [using technology] You can easily sit in your own home and read through the app...when I’m going to a GP…I’m silent (Participant 14).

There was a view (n=10/21 participants) that technology is progressive, modern and relevant and that mental health apps were a good way of ‘moving with the times’ and more in-keeping with how young people communicate daily with others. Making this link between communication styles day-to-day and engaging with health services that reflects current methods young people use to interact with each other, was viewed as positive and progressive of the mental health system:

I'm very good on computers so it's easier for me to type than it is for me to speak to someone. People these days are quite up on apps and stuff… (Participant 10).

Participants' expressed the view that technology has the capacity to be de-stigmatizing. Smartphones, as opposed to mental health settings, were viewed as inherently normalizing because the majority of people use and carry this technology:

You've got these people turning up at your front door and they've got their health things on round their necks...you might as well be wearing a sign really. One woman took me to [retail store] and told me she goes there with a lot of other service users. That made me incredibly anxious because I thought other people that work here are gonna know what her job is, whereas everyone uses an app these days innit? It's normal now (Participant 3).

However, not all participants shared this view; some participants described feeling embarrassed or uncomfortable using a mental health app in front of others:

If the app is asking you to pull it out every time you're in a social situation, it gets embarrassing and that can add to the anxiety you feel in a social situation (Participant 13).

Technology can increase access to, and augment, mental health support
In many instances, participants expressed the view that apps could overcome barriers to traditional service set-up and, in particular, would increase access to treatment/services as the use of the technology is not dependent on workers being
available at specific times. Support could be accessed in one’s naturalistic environment, at the point of need, and were therefore viewed as having high ecological validity:

…the mental health worker comes out only once a fortnight and usually there’s 13 days left where I’ve got no ideas, no help (Participant 17).

It’s accessible, you can use it anywhere, in any situation, it wouldn’t be like you’ve got to wait go to the doctors or anything like that… you can deal with it straight away (Participant 16).

Participants’ accounts suggested that technology could extend the reach of service delivery, circumventing resource limitations and reducing waiting times:

I think it would cut down on time that people will have to wait to see a health professional…some people wouldn’t need to see a professional face-to-face, they might just be able to deal with their issues via the app (Participant 11).

Furthermore, a few participants (n=6) commented on the fact that the secondary or related symptoms of psychosis (e.g. sleep problems, social withdrawal), or negative beliefs about technology itself, can make it difficult to attend traditional clinics, therefore potentially limiting one’s ability to use DHIs:

If you are someone that’s awake all night and you sleep all day or you struggle to leave the house then you’re going to struggle with face-to-face [contact] (Participant 8).

**Can Digital Health Interventions (DHIs) replace usual (face-to-face care) care?**

There were mixed views about whether mental health apps could be used as a stand-alone intervention or should be clinician supported. In general, participants felt there were a number of benefits to DHIs over face-to-face contact. Participants were positive about the ability of smartphone technology to keep track of their symptoms and experiences, which many thought would actually enhance their understanding of psychotic experiences.

I think it would be a great help because people would be able to see the warning signs very early on and go ‘hang on a second, this isn’t right, what do I need to do to help myself’ (Participant 16).

Also, DHIs seemed to give people the space to understand their experiences for themselves:
Sometimes it’s better when you’re on your own and you get to create your own opinions on how you’re feeling and understanding how you feel instead of being told how you feel (Participant 17).

Participants who had used symptom-monitoring apps in the past felt that the ability to track symptoms using smartphone technology facilitated feelings of empowerment and enhanced motivation in a way traditional face-to-face delivered healthcare could not facilitate:

You learn a bit more about yourself and how you’re actually feeling at that moment… it helped motivate me to improve (Participant 11).

Some younger participants identified that, as they have grown up with technology, they find digital means of communication easier than face-to-face methods:

For me personally, I’d rather talk online. You know, if people aren’t going to talk to someone [face-to-face] then with an app they can still deal with their problems (Participant 9).

It’s easier for me to type than speak cos I was brought up with computers (Participant 16).

The fact that an app was anonymous was appealing to some as direct clinician contact can reinforce a sense of failure if people have not completed therapy tasks or complied with medication:

You don’t feel guilty if you haven’t done your homework (Participant 6).

In addition, whilst many participants described the perceived value of talking to a clinician face-to-face, others did not share this opinion. For example, some participants said that they would feel much more comfortable using an app to support their mental health problems rather than talking to a member of their care team:

I think there’s one side of it that could really work which is kind of like the exercises… it could talk you through them, and actually not being in front of a person, you might do them more truthfully (Participant 7).

A few participants, however, felt that apps should be used as an adjunct to, rather than a replacement for, direct clinician contact so that they complement rather than replace clinician-supported care:
I think it would not replace one-to one talking therapy but I think there are aspects of [an intervention] which could be put into an app, which you could access in-between sessions of talking one-to-one with someone (Participant 7).

Some participants noted using an app, rather than seeing a clinician, might feel dismissive, as though they are not worthy of a clinician/therapist. There was cynicism among some participants, albeit the minority, that technology adoption across health services was a cost-cutting exercise, which would be detrimental to the healthcare people receive. All in all, if used in conjunction with a clinician, participants thought that apps could be helpful but they wanted control over how they use the app and with whom information is shared.

There’s some things I don’t share with my [clinician] that I don’t want him to know yet and for him to be able to find it in a diary, I wanna be able to say ‘actually can we skip that day, it’s a really personal day’ (Participant 9).

Of note, other participants said that if they knew that their information was shared with their care team they might interact with the app differently by being a ‘little less honest’, as evidenced by participant 21:

I would describe my symptoms as not as bad because I wouldn’t want my [clinician] worrying or thinking that the treatment wasn’t working.

Whilst some people thought that sharing of risk information would compromise trust and might affect the way they interact with digital technology (I would be more careful and less experimental, participant 8), many participants thought that their mental health was something private. On the whole, participants thought that reporting risk to their care team would be advantageous and potentially life-saving, leading to better focused care. However, by sharing the information most interviewees thought that this would change the way they interact with the app.

**Empowerment, control and choice**

The vast majority of interviewees believed that smartphone technology could facilitate a sense of ownership and control over the healthcare they receive:

… in mental health [services] you feel criminalized sometimes and I think with it [a mental health intervention] being on the phone it’s in your hands a little, it’s under your control a bit more, as opposed to feeling a bit like you’re under house arrest (Participant 14).
If I had an app I would have kept on top of [my mental health] a lot better. I don’t like scenarios where I feel my mental health is dictating my life and that is all that my life is, and that’s how it feels when you’re going to appointments all the time…an app would be just kind of enabling people to be empowered themselves, to take their care into their own hands. I think there’s a habit for people to be quite passive in their care. They think “the Dr. knows best” (Participant 2).

Common across interviewees was the belief that people should be given options about the healthcare they receive and treatment choice, which may differ at times. For example, some interviewees highlighted a stepped-care pathway, whereby an individual may choose to use an app at a specific point in time in their journey, with human contact important at other times:

If you’re at an all-time low then you might think right I need to actually speak to someone. If it’s sort of like creeping on and you’re just feeling a bit, just crying, then the app would be handy (Participant 5).

**Barriers to adopting DHIs**

A number of barriers to using technology-related mental health tools were identified. Some interviewees described the absence of a human quality and lack of emotional reassurance/feedback offered by apps as problematic; one’s ability to connect and interact with an app is limited:

Talking to somebody is very personal. You can get their instant reaction, their emotions and everything. When you’re opening up it’s crucial that you have somebody there to reassure you (Participant 20).

If you are talking to a machine, you know you’re talking to a machine, so if it tries to pretend it’s a human, even if you’re allowing yourself to go along…you are being degraded in a way (Participant 12).

Practical barriers, such as forgetting to turn on or charge the phone, losing or breaking the phone, could impact on engagement with digital tools. Furthermore, the concept of the ‘digital divide’, inequalities with regard to access to, use of, or provision for, information and communication technologies, was noted only by some participants; some people do not have access to smartphones, which would limit their ability to access DHIs. Indeed, even participants with access to a smartphone described that poor data allowance could prevent them from using the technology:
On my phone I only get like 1GB out of it which runs out quick (Participant 5).

**Data protection, privacy and security of information**

About two-thirds (N=16/21) of participants expressed concerns about data protection and information governance. However, participants’ fears about information safety could be allayed if the service reassured them about the safety and security of data. Many participants said that endorsement of a DHI by a valid institution (e.g. University, Health Service, mental health charity) would be sufficiently reassuring and would increase DHI uptake. However, a minority of interviewees said that they would prefer endorsement by individuals (e.g. care co-ordinator, Dr) rather than an organisation as ‘organisations have hidden agendas’ (Participant 13). Alternatively, a strong patient-service relationship in itself was sufficiently reassuring for some interviewees.

*I trust the early intervention team and people associated with it, so I would be fairly confident that it would be secure* (Participant 7).

Some participants identified that data stored both locally on the smartphone and on a server needs to be safe and secure. Some participants said that, ideally, data should be ‘locked’ on the phone, but if data was shared with the care team the server needs to be secure and private. On the whole, participants did not report concerns about clinical services gaining access to their data per se. Rather, concerns were expressed about data being linked to outside agencies (e.g. commercial search engines, iCloud, social networking sites):

*Storing it in iCloud wouldn’t be acceptable, storing it by email, sending it in email that is unencrypted isn’t the greatest way to share data. Those kinds of things should be addressed particularly as it is mental health and mental health has a strong taboo in society…if it was leaked it would be disastrous for the people involved* (Participant 15).

**Discussion**

In light of the inevitable adoption of a worldwide digital health service, this is the first study of its kind to qualitatively examine early psychosis patients’ perspectives of digital technology use for healthcare needs.

**Principal findings**

We found that, in an early psychosis sample, DHIs were just as acceptable as traditional methods for seeking information about, and support for, mental health
problems. Seven themes were evident. Firstly, participants felt that apps could enhance the accessibility of services by providing a platform for patients to be open and honest in a way they might not be able to be in traditional clinic-based appointments. These findings support previous assertions made by clinicians that the faceless and anonymous nature of DHIs may allow patients to be more open and honest about their experiences. Technology was not only viewed as a progressive, modern and relevant platform for healthcare, but also inherently de-stigmatising. Perceived stigma is a key barrier to engagement with mental healthcare services; provision of intervention delivery options that are de-stigmatising is therefore warranted.

Secondly, participants reported that DHIs could increase access to, and augment, support by extending the reach of services to one’s naturalistic environment, at the point of need, potentially circumventing lengthy waiting times. Although national guidelines recommend the provision of psychological therapies for early psychosis, factors such as a limited number of trained clinicians, service cost and resource pressures mean that many people who could benefit are often unable to receive timely access to evidence-based treatment. Our findings suggest patients find the implementation of DHIs in early psychosis services as an acceptable avenue for healthcare provision.

Views about whether DHIs could replace face-to-face contact were mixed. Some participants, particularly those who find the clinic environment threatening, indicated that DHIs could indeed replace clinician contact; creating a safe distance from a clinician facilitates openness and honesty about distressing experiences and facilitates empowerment. Previous studies have highlighted that both clinicians and patients view DHIs for people with severe mental health problems as empowering due to the transfer of control and power from the clinician to the patient and the opportunity for patients to take meaningful and active control over their healthcare needs. In contrast, traditional service settings have been viewed by some as disempowering due to the lack of shared decision-making and patient involvement in treatment. Findings highlight the potential utilization of DHIs for providing early psychosis patients the control and choice over treatment options and support the policy documents such as the NHS Constitution Pledge and Five Year Forward View to improve the provision of shared decision-making and promotion of patient choice within services.
Despite the promise of DHIs highlighted in the current study, some participants viewed apps as potentially invalidating; digital tools should complement, rather than replace, clinician contact. These findings support conclusions drawn by previous qualitative interviews with psychosis patients who used a symptom-monitoring app who described the need for clinician involvement and the potential benefits of mental health apps for facilitating patient-clinician communication. All in all, participants argued for choice about how DHIs could be used in the healthcare setting.

Furthermore, data security, safety and risk require careful consideration and management. We found that participant concerns around this issue could be allayed if endorsement of the system from a trusted source was given. DHIs were on the whole viewed as de-stigmatising, having the ability to enhance service user power, control and choice over the pathway of care received, reflecting the need for a patient-centred design approach so that DHIs are truly co-produced from the outset.

**Strengths and limitations**

This is the first study to explore early psychosis patients' views on the use of digital solutions for healthcare. Patients have highlighted important factors researchers and technical developers need to consider when designing and building digital systems in mental health. Our methodological and analytical approach was rigorous. We allowed the interview schedule to drive the development of relevant interview questions by regularly reviewing the interview schedule and the data gathered, allowing in-depth examination of relevant issues that were participant-driven. Our formal member checking process was exhaustive, ensuring that the views of all participants were thoroughly considered as new themes emerged.

Findings need to be considered in light of study limitations. Interviews were with an early psychosis group, who, based on the mean age of our sample and smartphone ownership rates, are considered 'digital natives', rendering the sample inherently familiar with smartphone technology. Participants were recruited in the context of a larger DHI trial and may have already held favourable views towards technology use; although examination of the themes suggest that patient were well versed in the pros and cons of DHIs for mental health. Previous experience with mental health apps and related products, negative experiences with traditional mental health services and socially desirable responding in interviews might have influenced views expressed by participants.
**Implications**

Until recently, early psychosis patient views on DHIs for mental healthcare have not been considered. This may be, in part, due to the fast-paced rate of digital technology adoption and the sense of urgency evident in the development of DHIs. This study provides a timely exploration of patient views and highlights the potential facilitators and barriers to adoption that must be considered during DHI development. First, the study highlighted that DHIs were acceptable to patients with early psychosis due to access via an app being de-stigmatising and normalizing and progressive, modern and relevant. These findings highlight the potential for healthcare apps to mirror the way people currently communicate in their routine day-to-day life. Nevertheless, DHIs require regularly updating to remain relevant. Further consideration must be given to smartphone access and data allowance prior DHI implementation to minimise digital exclusion. A smartphone loan scheme, supported funding or discounts for medical use warrant further consideration for DHI service adoption.

Participants placed significant emphasis on the importance of choice, particularly in relation to whether the DHI would be used in conjunction with, or as a replacement for, clinician-delivered care; at what point in the recovery journey a DHI/clinician contact could be used; and information sharing. Patient choice around, but not limited to, these issues should remain at the forefront of DHI development and implementation. The findings also highlight the need for focused consideration of data collection and storage, ensuring that patients are fully informed about such governance issues.
References


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Conflicts of Interest

Bucci and Lewis are directors of Affigo CIC, a not-for-profit social enterprise company spun out of the University of Manchester in December 2015 to enable access to social enterprise funding and to promote ClinTouch, a symptom-monitoring app, to the NHS and public sector.