Barriers to older adults' uptake of mobile-based mental health interventions

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Abstract

Background: To address increasing demand of mental healthcare treatments for older adults and the need to reduce delivery costs, healthcare providers are turning to mobile applications. The importance of psychological barriers have been highlighted in the uptake of mobile-based mental health interventions and efforts have been made to identify these barriers in order to facilitate initial uptake and acceptance. However, limited research has focused on older adults' awareness of these applications and factors that might be hindering their use.

Objective: The purpose of this study was to explore the perceived barriers that older adults experience in the uptake of mobile-based mental health interventions.

Methods: Semi-structured interviews were conducted with a sample of 10 older adults, 50 years or older (female $=$ 7, mean age $=$ 68 years), who experienced periods of low mood. National Health Service applications were demonstrated to facilitate conversation and explore participants' understanding of mental health and mobile-based mental health interventions. Thematic analysis was used to analyse the interview transcripts.

Results: The social ecological model was adopted as an organising framework for the thematic analysis which identified six distinct barriers to older adults' uptake of mobile-based mental health interventions: mental electronic-health (e-health) awareness, interaction with technology, discontinuation, 'seeing' facilitates therapeutic alliance, incongruent role of the general practitioner and privacy and confidentiality.

Conclusions: Older adults experience a number of barriers to uptake ranging from the individual level to a macro, organisational level. The practical implications of these barriers are discussed such as the need for increased awareness of mobile-based mental health interventions among older adults.

Keywords

Mobile health, e-health, barriers, older adults, mobile interventions

Background

Depression in older adults is an increasing concern for health services given its current prevalence for this group, and its predicted trajectory to be the leading cause of disease burden in higher income countries by 2030.[1] However, access to treatment for older adults remains low compared to other age groups, with estimates showing that 85% of older adults receive no support from the National Health Service (NHS) for depression.[2] Common barriers to face-to-face mental health treatment for older adults include stigma, perceived costs, mobility limitations, lack of specialised therapists, poor mental health literacy, and a perception that mental health illnesses are a natural part of ageing.[3–7]

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Those that do receive NHS support experience longer waiting times compared to working age adults.[8] Given that by 2021 the number of older adults in the UK is expected to rise by 12 percent, the health burden of older adults is likely to increase. As a result of increased demand and financial pressures, the NHS are exploring innovative methods to deliver mental healthcare at a low cost.[9] With the ubiquity of technology, the NHS have endorsed a number of mental health mobile applications (apps) through the NHS digital apps library.

Mobile-based mental health interventions (MMHIs) represent an opportunity to reduce the treatment gap for depression by overcoming some of the barriers to face-to-face therapy in older adults. They are more accessible and flexible than face-to-face therapy and can be used anonymously, which reduces the effects of stigma.[10] Emerging evidence from randomised controlled trials (RCTs) suggest that digital interventions can reduce depressive symptoms for older adults.[11,12] There is, however, limited understanding of how uptake and engagement among older adults can be achieved outside of a research environment.

Literature focusing on barriers for physical health interventions suggest that older adults experience physical/structural barriers when engaging with mobile-based interventions, such as access to/ownership of technology.[13] While these findings highlight the effects of the 'digital divide' in healthcare, the assumption of poor technology use among older adults as a structural barrier to uptake and engagement is challenged.[14] Technology use among older adults is increasing substantially,[15] with increased feelings of confidence in technology and readiness to use technology for health purposes,[16] and positive attitudes towards online interventions.[17] Coupled with the recent finding that there is no age based 'digital divide' for the effectiveness of mobile interventions,[17] it is not clear if assumed structural barriers are present. However, there are likely to be other factors preventing large-scale uptake of these interventions for older adults. Evaluating these barriers to uptake can inform strategies for increasing uptake of MMHIs in older adults.[18]

While older adults are underrepresented in literature surrounding digital mental health interventions,[19] research has investigated barriers to uptake in younger age groups. For instance, young adults who are already seeking help for mental health issues demonstrated negative attitudes towards MMHIs and a preference for face-to-face support.[20] Data privacy and confidentiality concerns influence perceptions of trust and acceptance,[21–23] and low awareness of available services is a barrier to help-seeking for mental health issues.[24] It is unclear if these psychological barriers apply to the rising number of older adults who are adopting new technologies. It may be that older adults engage with technology differently to other age demographics and may experience unique barriers.[21] Literature looking at barriers for MMHIs in older adults is scarce, however a recent qualitative study[25] explored older adult's perspectives on using digital technology to maintain good mental health. Five barriers were identified, three of which are related to concerns over technology use or the usability of technology. For example, the perception that technology is inferior to humans, usability issues and a fear of consequences may affect engagement with technology. However, it is noted within this study that limited technology experience limit the findings.

Given that Knowles et al. highlight the importance of psychological barriers in younger age groups, the current study was specifically interested in the psychological barriers that older adults may encounter in the uptake of digital interventions rather than structural barriers, such as technology ownership, by including participants who regularly use technology to account for this limitation.[26]

The research question was 'What are the barriers that older adults with access to technology face in the uptake of mobile-based mental health interventions?'.

Method

Participants

Participants were recruited from four older adult community interest groups in the North East of England. Inclusion criteria were: (a) retired; (b) English as their first language; (c) aged >50 years, in line with the World Health Organization (WHO) and Mental Health Foundation definition of later life;[2,27] (d) self-identify as having some understanding or use of technology and (e) had experienced a period of low mood within the last six weeks. Ten participants between the ages of 53–77 (mean=68, standard deviation (SD)= 7.76, seven females) were recruited. Data saturation, the point where no new codes are identified,[28] was reached in the analysis and therefore this was deemed an adequate sample size for the thematic analysis.[29] The majority of participants had obtained a bachelor's degree or higher and owned a smartphone with the ability to download apps. Table 1 provides an overview of the demographic profile of participants.

Procedure

The study was approved by Northumbria University Research Ethics Committee. Interviews took place on the university campus. The interview schedule was devised in line with study aims (see Appendix 1).

Table 1. Participants' demographic profile.

Participant number	Age	Education (highest award)	Post retirement career	Ownership of smartphone capable of downloading apps
1	77	Bachelor's degree	Project manager	Yes
2	76	Higher National Certificate (HNC)	Army Air Corps	Yes
3	69	Bachelor's degree	Probation officer	Yes
4	68	Bachelor's degree	Primary school teacher	Yes
5	77	Bachelor's degree	Bookshop assistant	Yes
6	53	Post-graduate degree	Access and inclusion consultant	No
7	71	Bachelor's degree	Physical education teacher	Yes
8	64	Bachelor's degree	Paediatric dietician	Yes
9	67	Foundation degree	Senior children's worker	Yes
10	60	General Certificate of Secondary Education (GCSE)	Secretary	Yes

apps: applications.

Table 2. Description of applications (apps) demonstrated to participants.

Application demonstrated to participants	Description of features
Ieso	This app provides instant messaging with a therapist trained in CBT. Communication is through text so the sessions can be reviewed at any time by the user.
My Possible Self	This self-help app delivers intervention through a number of learning modules to tackle unhelpful thinking (for example, 'Building happiness and wellbeing'). It also provides mood tracking and mood history and is based on CBT, problem-solving therapy, interpersonal therapy and positive psychology.
Catch It	Catch It is a self-help mood diary that uses CBT principles to encourage users to record and rate their mood, reflect on what the user is thinking and then prompts the user to think of a better way of dealing with the problem.

CBT: cognitive behavioural therapy.

Informed consent was given by all participants, after which they completed a demographic questionnaire.

The interview was split into two sections. Questions in the first section were devised in the interview schedule based on literature[24,25] to explore whether barriers to MMHI were also pertinent for older adults. These questions focused on sharing mental health information using technology (e.g. 'What are you attitudes towards sharing information about mental health using technology?'), familiarity with NHS services for mental health (e.g. 'Describe your familiarity with NHS services for mental health') and current knowledge of mental health treatments/interventions. During this phase, participants were asked about their current thoughts towards a mental health intervention that was delivered through a smart-phone and were asked to think about the benefits and drawbacks this might bring.

In the second phase of the interview, participants were shown examples of current NHS apps from the NHS apps library (Table 2), accompanied by an explanation of their features. Further questions then followed the demonstration of each app to explore

participant's thoughts and opinions of each app and participants were also encouraged again to think about the benefits and drawbacks now that they had been shown some available apps. This demonstration facilitated conversation about MMHIs and ensured participants understood what MMHIs are.

Interviews were audio-recorded and lasted between sixty and eighty minutes. A MacBook Pro laptop displayed the NHS apps store and a smartphone with some example apps pre-downloaded was used to demonstrate to participants some of the available apps on the NHS apps library for mental health.

Following completion of the study, participants were fully debriefed and given a £10 Amazon voucher as a thank you for their time. Audio recordings were transcribed verbatim by a professional service and checked for accuracy by JP. This resulted in resulted in 295 pages of transcribed text.

Analysis strategy

Thematic analysis using NVivo 11 followed the six steps outlined by Braun and Clarke in 2006.[30] This process was data-driven and conducted inductively.

Following transcription, JP read the transcripts several times and noted initial codes. Transcripts were then coded to identify features that were pertinent to the research question. All codes relevant to the research aims were considered to devise themes. Thematic maps were utilised in order to visualise and refine themes. Once themes were identified, they were defined and named. Finally, illustrative quotes were selected for each theme. Codes and themes were identified by JP and AD, and checked by SV and LC for quality.

Analysis

As barriers can be encountered at both the individual level (such as psychological factors), and the macro level (such as law and policy), this study utilised the social ecological model (SEM) as a framework to contextualise identified barriers and delineate each barrier's role within the wider society and environment.[31] The SEM comprises five levels: individual, which focuses on intrapersonal factors such as knowledge, attitudes, behaviour, awareness, self-concept and skills; interpersonal, involving social support, including family, friends and healthcare providers;[32] institution, shaped by the healthcare provider's rules, regulations and general attitudes towards research; community, concerning convenience and acceptance of an intervention, but also the relationship between organisations, charities and information groups within a defined area; and the public policy level regards the local, state and national laws and policies.[32,33]
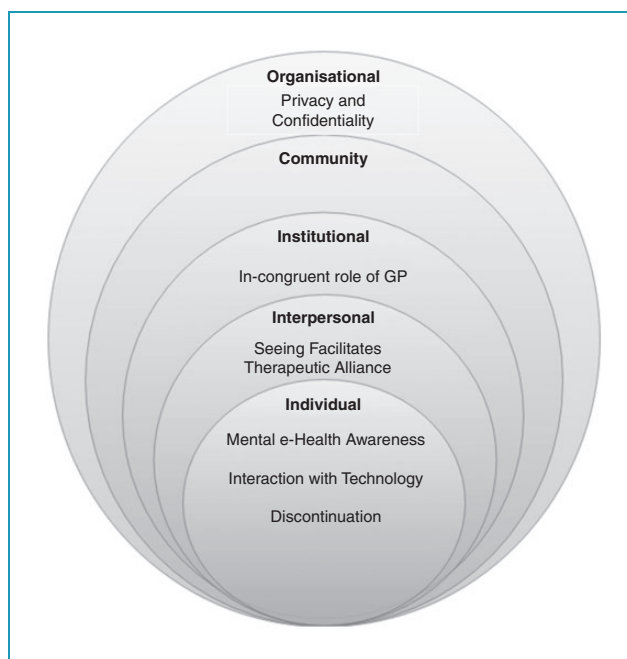

Figure 1. A social-ecological model of the barriers to uptake of mobile-based mental health interventions (MMHIs) for older adults.

Identifying barriers at the different levels of a user's social ecology provides an insight into the factors that currently pose the most barriers. This allowed identified themes to be organised from the micro, individual level, to the macro, organisational level.

Six themes were identified: Mental e-health awareness, Privacy/confidentiality, Seeing facilitates therapeutic alliance, Incongruent role of the general practitioner (GP), Discontinuation, and Interaction with technology (Table 3). These themes were mapped onto the SEM model based on the description of each level (Figure 1).

Individual level

Mental e-health awareness

Within the individual level, mental e-health awareness was the most common barrier throughout this study. This theme explores participant's lack of understanding or awareness of MMHIs, and how this may translate into potential barriers. This theme is comprised of two sub-themes: knowledge and trust.

Knowledge

'Knowledge' was a commonly mentioned barrier in the dataset as all of the participants described having no

Table 3. Summary of themes with examples of barriers to mobile-based mental health intervention (MMHI) uptake.

Theme	Number of participants contributing to the theme	Specific examples
Mental e-health awareness	10	• Older adults are not aware of MMHIs • Poor awareness effects trust
Interaction with technology	6	• Older adults may not have the skills required to effectively use the technology • Older adults may not be able to express themselves clearly through technology
Discontinuation	6	• Poor therapeutic progress may lead to discontinuation of use • The amount of perceived effort required may deter older adults.
Seeing facilitates therapeutic alliance	6	• Older adults showed preference for face-to-face contact • Being able to see the therapist induces trust
In-congruent role of GP	7	• Older adults see their GP as their first port of call for mental health concerns but have little trust in their ability to help.
Privacy and confidentiality	6	• Fears of who sensitive mental health data may be shared with is a concern for older adults

GP: general practitioner.

knowledge of MMHIs, or the NHS digital apps library, prior to the interview:

> P3: I'm really interested in the fact that the NHS website has apps, which I had no idea about. But then I've never looked so I wouldn't know.
> P5: I knew nothing. I have never looked to see what anything said online about depression, which I suppose is rather strange, really. Because if I hear of somebody with an illness, I will often look up their illness to see what it is.

It is important to point out that participants suggested that the demonstration of NHS-endorsed apps had increased their understanding of mobile-based interventions:

> P1: Yes, I, you've opened my mind to the fact that there is quite a lot out there which I was completely unaware of. And maybe I'm going to investigate ones where you don't need the GP to refer you to, just to have a look. You've stimulated my interest in that.

One participant suggested that the interview itself made them more willing to consider using in the future:

> P4: Erm it's made me more aware of what's out there. I've never delved into it so I've never known what was

there. So now I'm more interested if the need occurs, to use one. mmhmm definitely.

The data suggests that participants had positive attitudes towards MMHIs after the demonstration of apps increased their knowledge, as participants were not aware of MMHIs before participation in this interview.

Trust

The sub-theme of trust at the individual level explores two prominent points; trust in the intervention and a lack of trust in mobile apps in general. Firstly, participants presented a distrust of mobile-based interventions. For example, one participant felt as though they would not have faith in a digital intervention as they were not certain where it was getting its information from:

> P2: I would use it – yeah. I wouldn't have much faith in it though ... because I would be unsure of where this got the recommendations from. I'm feeding information into that and its making a decision and then it's giving me a result. Where does it get its information from to make that decision?

Furthermore, as well as distrust in the intervention itself, mistrust was also displayed due to the fact that

older adults were not able to identify 'who' they are engaging with:

> Interviewer: I think I heard you say a couple of minutes ago that you wouldn't trust it?
> P3: No I wouldn't, because it, it's a voice on a screen. It's like watching the television or going to the cinema – where does it come from? Who is it? How do they walk? What do they look like? No, I wouldn't have faith in anything like that.

This sentiment was also reflected in the context of discussing an existing app that provides an instant messaging chat with a trained therapist:

> P7: No. I don't think that would be for me at all.
> Interviewer: Okay. Why not?
> P7: I just don't like the idea of not knowing who I'm talking to.

Furthermore, distrust shaped negative attitudes towards apps among older adults. Despite access to a smartphone, the data suggests a negative attitude towards the use of apps, specifically ones that were not credible or endorsed by another source. Some reported not using apps due to simply having no interest in them in general, whereas others state that they would not download an app to benefit their mental health, unless it came with clear credentials:

> Interviewer: Would you download something if it had a benefit on your mental health?
> P1: Yes, if it came with the right credentials, I would've had to have heard about it from erh, I wouldn't see – well anyway I don't browse the app store, but if I saw 'mental health' or however you jazz it up, I wouldn't download it.

The same participant went on to say:

> P1: But if journalist's had talked about it on BBC breakfast saying 'hey there's a new app that makes you aware of, and how to handle your moods' well then I may be interested, it would spark my interest. I would then look into it.

This demonstrates how older adults require 'credentials' that reflects the authenticity of a trusted source. It also suggests that older adult's require signposting from other trusted media in order for them to seek out apps and be interested in using them. This indicates a general lack of trusted facilitators that are willing to recommend these apps to older adults, thereby facilitating their uptake.

Interaction with technology

Following the demonstration of the apps, older adults showed concerns over how the technology could present a barrier in multiple ways. Firstly, participants in this study had concerns over the technological skills required to effectively navigate and engage with the interventions:

> P5: It demands quite an ability to manage, you know, getting backwards and forwards and filling things in. So it does demand quite a lot of technological ability. I would find it quite difficult to answer some of the questions.

Secondly, technology as a medium to deliver a mental health intervention may be a barrier to effective engagement as older adults may not be able to express themselves as clearly through technology:

> P5: Again, I think the negative side is that half of the elderly population wouldn't be able to cope with the technology and many would not be able to express themselves very well.

Indeed, this is the participant's personal opinion of older adults and shows that even among older adults, perceptions of their age group may not be in line with current research on older adults' competencies with smartphone technology.[34] Although interaction with technology may still be a barrier for some, further investigation is required to investigate the true nature of this. It may be that older adults are not able to interpret their own thoughts coherently enough to be able to convey them through technology which may suggest a 'mental health literacy' or educational barrier rather than a technical inability. On the other hand, the issue may be technological and the participant was expressing an inability to express thoughts through technology as a medium.

Finally, one participant felt that if technology did not work properly it would actually add to the stress and therefore technical issues could interfere with clinical efficacy:

> P8: The fact that its technology and not everybody – like me. You know, if it doesn't work, I'm just going to – it doesn't work. I'm too stressed. It could add to the stress. It would add to my stress if I started doing it and it froze and I couldn't work it. That would just be stressful for me. So it may add to their stress.

Computer self-efficacy

This sub-theme represents perceived ability to accomplish tasks using a computer, previously found to be an

important contributor for uptake of digital cognitive behavioural therapy (CBT) for chronic pain.[35] Concerns arose around participants' perceived ability within themselves to be able to use the intervention correctly:

> P2: I don't know whether I would put the correct information in, to get the correct information out.
> P6: I don't trust myself to know how to use it.

This suggests that some older adults have doubts over how they may engage with a digital intervention for mental health caused by concerns over their own ability to use it. Much like perceived effort and intrinsic motivation, computer self-efficacy is also a major determinant of perceived ease of use in the technology acceptance model (TAM).[36] Of note, P2's comment showing concern over whether they're 'putting the correct information in to get the correct information out' provides an example of how a user's technical ability could impact on the clinical effectiveness of an intervention. If an older user has doubts over the information that they are providing then they may choose not to disclose things over concerns that it is not correct, or not relevant. This is specifically important for those older adults who have a poorer understanding of mental health – particularly depression.[7]

Discontinuation

This theme explores factors identified by participants that would cause older adults to cease engagement. Although these are not direct barriers to uptake, they pose as barriers to sustained use with an intervention which is equally important when interventions often require users to complete the entire content of the intervention.[37] There are two main sub-themes that were found within the data: unrealistic outcome expectation and perceived effort.

Outcome expectation

Outcome expectation refers to the therapeutic outcomes that participants expect from an intervention. In particular, participants felt that if they were not making enough progress while using the intervention, they would stop using it:

> P5: I suppose if you felt you weren't getting anywhere that what they suggested was inappropriate or something you couldn't do, or if you felt it was all going around in circles and not getting anywhere, you might be inclined to give up on it.

Another participant had similar views, but also suggested that they would stop using an MMHI if they were unable to gain a better understanding or education of their symptoms and how it might affect them:

> P3: If I felt I wasn't going anywhere, if I felt it was just a talking shop with no sort of, that it wasn't doing anything for me . . . or getting, or gaining understanding, or getting support that I need at any one particular time.

Ensuring that older adults have realistic expectations of an intervention, and the intervention being able to deliver results is important for older users to stop them seeing digital mental health interventions as 'a waste of time': P3 said 'I wouldn't plough on using something if I wasn't getting something out of it – no it would be a waste of time'.

While it appears that older adults want to be able to feel as though they are 'getting something out of it' and are making progress, it is important to manage these expectations so that results are not expected straight away. This is important in promoting adherence to mobile-based interventions and preventing discontinuation as number of sessions completed correlates with outcomes.[38]

Perceived effort

Participants' concerns over perceived effort are covered in respect to two aspects; time concerns and intrinsic motivation concerns. Firstly, participant's views towards perceived effort was reflected in their perception of how much time they thought would need to be invested into the intervention in order for meaningful engagement. There was a general consensus among the participants that they would not have the time to engage with it:

> P10: I don't think so. I suppose sometimes people might think, 'That's not for me', sort of thing, or, 'haven't got time to do it', even though you've got 24 hours a day to do it, you know?

Furthermore, participants also had concerns over the effort required to engage in a digital intervention for mental health reporting that they may be 'too lazy' or 'can't be bothered' to engage: P6 said 'I don't think I could be bothered to do all of that. Perhaps it's that I'm too lazy to do all of that, perhaps would be the more correct way of saying it'. This may suggest that older adults do not place much value or see little gain from using them and therefore may not see them as a worthy time investment.

Interpersonal level

'Seeing' facilitates therapeutic alliance

This theme refers to how participants saw a number of disadvantages to mental health interventions being delivered through technology rather than the traditional face-to-face method. Generally, older adults within the sample showed a preference for face-to-face interaction with regard to mental healthcare. This theme consisted of the following two sub-themes which will be explored below: 'Therapeutic disadvantages', and 'Seeing the therapist mitigates concerns of trust'.

Therapeutic disadvantages

There were varying degrees of experience with mental health services, as some participants had experienced face-to-face therapy or counselling in the past, and some had not. Therefore, it is possible that participants with experience of mental healthcare provided different insights or expectations of what a digital mental health intervention may be able to accomplish compared to those who had not. Nevertheless, among participants there was a preference for face-to-face interaction over the use of digital technology.

This sub-theme explores how participants felt as though a digital intervention may provide inferior mental healthcare due to a perceived absence of interpersonal communication. For example, one participant felt as though a digital intervention would be harder to engage with if the symptoms of depression were bad enough, whereas in face-to-face care the therapist would be able to provide encouragement:

> P5: Also, again, if you were feeling bad enough, an unwillingness to engage with it that with a person face-to-face, they would encourage you to speak out and be able to say things because they can see you and they can see your tone of voice, or hear your tone of voice. Some people might find that easier than dealing with something on a computer.

When discussing the negative aspects to mobile-based interventions, one participant felt that the absence of face-to-face communication in a digital intervention outweighed the 'trouble' of travelling to a traditional face-to-face therapy session as the therapeutic experience would be more 'genuine':

> P6: I would much rather go to the trouble of travelling to a therapy session, seeing somebody and talking to somebody face-to-face, rather than filling out a self-help manual...because you're more likely to get a...I feel, perhaps wrongly, you're more likely to get

a genuine answer or a genuine, not necessarily answer but, hearing.

Furthermore, a participant who had experienced face-to-face therapy felt as though by delivering an intervention through technology, it detracted from the therapeutic process. The participant suggested that non-verbal cues were unable to be picked upon which may have provided the therapist with insight into the issue at hand:

> P8: They pick up – for example, the therapist I had was just so clever. Even though I was speaking she would say things to me about the way my body was, my attitude, my posture, my expression that I wasn't aware of. Then she'd make me think again. She would help me delve deeper into the problem so that I would have a better understanding of it. Whereas if you were just doing...there wouldn't be that. So you might get superficial help but there wouldn't be that – I know it's a very, very emotional experience, counselling, but if it's going to help solve internal problems, then I think a good counsellor is invaluable as a face-to-face...that's helpful.

Seeing the therapist mitigates concerns of trust

Given participant's concerns over trust with MMHIs, the data also displays how face-to-face treatments facilitate trust. When confiding in someone to discuss sensitive issues such as mental health, participants felt that without the personal engagement it was difficult to decide whether they would trust the person they're engaging with:

> P7: I think that, if I'm going to confide in somebody about how I'm feeling mentally or emotionally, I've got to feel that I can have eye contact with the person, and I've got to get a sensation of trust; that, if I saw a person and I didn't take to them, I wouldn't tell them anything. Whereas if I thought they were okay and a really nice person, then I would open up a lot more.

Furthermore, within the context of an instant messaging service with a trained therapist, participants felt as though they would not be able to achieve the same level of trust between themselves and a therapist and that it was really something they could only judge through face-to-face contact:

> P7: I think I've got to have a face-to-face feeling about a person, because you're typing stuff in and they're typing stuff back, you haven't got a clue who they are; you haven't even got a clue if it's a man or a

woman, or anything. So I think I'm still old fashioned enough to want the personal contact.
P2: I would rather look somebody in the face, see their expression, and hear the change in their voice. It's too far in the future for me that, stuff like that.

Institutional level

Incongruent role of the GP

Participants in this study had conflicting views towards their GP's role in the treatment of mental health issues. Participants report seeing their GP as the 'first port of call' if they were to have a mental health issue and required help:

> P9: I think GPs are very pressed for time and depend- ing on – although I think you can probably book two appointments together if you knew that you wanted to talk for a lengthier time – I think that would be a first port of call really, to be able to talk face-to-face to somebody.

Despite this, many participants had somewhat neg- ative attitudes towards their GP and their ability to help with a mental health-related issue:

> P1: I don't know, if you go to see your GP and you're, y'know, I don't think it's going to often work. Because they have 10 minutes, they haven't read your file. If you're lucky they'll read it in two minutes that you're there. Erh they have to be pretty skilled to be able to do very much. But I'm not sure that would work too well – with one visit anyway. Say come back in three months is not going to help.

In particular, participants were concerned about the lack of time GPs were able to provide in appointments, which created concerns surrounding the GPs ability to help with a mental health-related issue:

> P5: They really don't have time, the GP. They know, if they read it all, my background, but that's about it. They would be interested to know what I thought had caused this particular downturn, but that's about it. They don't give advice.

Macro level

Privacy and confidentiality

Throughout the interviews, participants described con- cerns regarding the privacy and confidentiality of both

their information but also their 'self' and the need for anonymity when engaging with digital mental health disorders. This theme will first explore concerns sur- rounding privacy of information and then privacy of the 'self'.

Privacy of information

This sub-theme was a very prominent barrier across the data. Participants showed great concern over who had access to their data and information once it had been submitted to the intervention, and who was accessing it. Participants also demonstrated an understanding of cybersecurity insofar as websites can be hacked and information is not guaranteed safety if it is digitised:

> P3: Erm, I suppose this issue about confidentiality. Websites being hacked, people's personal details being hacked, y'know it's nothing, nothing is safe. Nothing is secure – and I know that, nothing on the web is 100% safe, it can't be. You'll always have people wanting to break systems because that's the nature of people. So I think that would be my main concern.

This becomes particularly pertinent when the infor- mation is related to mental health. Older adults per- ceive mental health information as sensitive and would be worried about sending that information through technology if they were unsure of who was accessing it:

> P6: Also, I don't trust the ... If I'm sending an email to somebody about something, then I don't know who else can see it. Anybody else in the world can see it ... If I was sending anything about my mental health issues, that's when I would begin to be really worried. That's what would stop me from sending any- thing about mental health.

Privacy of 'the self' (anonymity)

While some participants had very negative views towards sharing mental health information using tech- nology, for others, concerns of sharing information regarding mental health were mitigated through ano- nymity of their identity:

> P8: I would rather be anonymous, to be honest. I real- ise I can't be because of the way these things work. They have to have funding and they have to be accountable and things. If I was anonymous I would have been more inclined to access it. I still am a bit dubious about going in as 'me'.

These concerns are a barrier to older adults engaging due to the fact that stigma is a well cited barrier to older adults not seeking help for mental health issues.[39] However, digital mental health interventions have huge potential to mitigate the concern of stigma if they can be accessed anonymously.[18]

While the absence of privacy of one's identity could serve as a barrier for older adults, one participant also described how anonymity was important to ensure that MMHIs were accessible to people who are lacking in confidence:

> P10: I think in a way it could probably be quite anonymous if you could set up a username that it doesn't give personal details, or you might just have your – I suppose you could tailor it ... because I think it's a big step to go to something if you're lacking in confidence anyway.

General discussion

In line with the research question, these findings provide an insight into the barriers that are preventing scalable uptake of MMHI for older adults. Thematic analysis identified six main themes when investigating the barriers to implementation for older adults that can be applied to the five different levels of the SEM. Interestingly, the majority of the themes identified within this study fell into the individual level of the SEM, suggesting intrapersonal factors pose the largest barriers to large-scale uptake for older adults.

Awareness of the existence of mental health interventions and their benefits is currently a significant barrier as none of the participants in this study described having prior knowledge of digital mental health interventions, despite self-identifying as 'technology users'. This is a common finding throughout existing research not only in relation to older adults or specifically for depression interventions but for the uptake of mobile-based interventions across age groups.[40–43] Knowledge can also be a significant factor when forming attitudes towards MMHI[43] and predicting acceptance.[44] This barrier is arguably the most important as the other concerns presented become irrelevant if older adults are not aware of the availability of mobile-based interventions for mental health in the first place.

While computer literacy and technological skills are not a new barrier to older adult's engagement with digital mental health interventions, it remains an important factor in ensuring continued engagement. For example, previous RCTs suggest older adults are likely to have technical challenges accessing or engaging with digital CBT, as well as a need for more guidance and precise instructions.[19] Notably, Rozental

et al.[45] found that difficulty interacting with the intervention's interface and other technical problems can elicit negative psychological effects. Therefore, it is imperative for intervention providers to ensure that older adults are given a thorough demonstration of the intervention at uptake, but are also provided with technical support throughout engagement with the intervention to ensure continued use. Crabb et al. (2012)[19] recommend a demonstration of the intervention for older adults to provide technical and clinical support – this would also provide older adults with an opportunity to ask questions and ensure they have enough technical knowledge to start using the intervention. This is supported by the current findings as participants reported positive effects from the demonstrations of available apps. Technical training also improves older adult's self-efficacy in using computers and technology which is a promising way to overcome this barrier.[46]

Emerging literature suggests that MMHIs are effective in the reduction of symptoms for older adults.[47–49] However, it seems there is a perception among older adults that delivering the intervention through technology detracts from the therapeutic process and may result in a poorer therapeutic outcome. Participants also believed that the interventions required a lot of effort to use, despite previous literature identifying ease of access and low effort as advantages of MMHIs.[50,51] This is consistent with the notion that older adults may not invest time into something for which they do not see a clear benefit[52] and is supported by previous qualitative research in adults with depression identifying time and effort required as a perceived cost of digital mental health interventions.[53] Therefore, in order to increase uptake, it is important to ensure that older adults are informed of the clinical effectiveness of digital mental health interventions through trusted sources and have reassurance from testimonials by people in their age group.

Similarly, the incongruence of the GP's role could pose barriers for increased uptake. Given that one of the roles of MMHIs is to take pressure away from GPs, it may not be feasible to rely on them to increase uptake in older adults. However there may be scope for media, charities, voluntary sectors, adverts in clinics, organisations and websites to also play a role in raising awareness of these interventions among older adults.[54] Collectively, these sources could provide older adults with a wealth of 'trusted facilitators' of MMHIs which will help raise awareness of their existence. With reference to public health literature, the notion of relying on trusted facilitators reflects 'social prescribing', whereby third sector organisations bridge the gap and support primary care services through signposting and support.[55] However, further research

is required in this respect to ascertain whether older adults see these roles as 'trusted sources'.

The barriers identified may bring into the question the suitability of some types of mobile-based interventions for the older age demographic, specifically self-help or unguided interventions. While studies have found them to be effective in reducing symptoms of depression in older adults, with automated prompts,[3] the current study suggests that the type of barriers that older adults are experiencing may reduce the potential of self-guided treatments in England. Spek et al.[56] suggest that self-help is much easier to end or postpone treatment and places little responsibility on the user. As the results from this study suggest that older users may have little intrinsic motivation to continue using or complete an intervention for mental health it is likely that older adults have a high propensity to drop out. However, Spek et al.[56] also suggest that telephone calls from a clinician provide support leading to increased completion rates. Hence, behavioural prompts or nudges may be required for older users to maintain high motivation and ensure continued use of an intervention.

Qualitative literature in this area has consistently found concerns with privacy and confidentiality of information to be a potential barrier digital intervention use for people with mental health problems.[53,57] Given that privacy concerns have been identified as a reason for discontinuation of an intervention[58] failure to consider privacy concerns can cripple the scalability of uptake in older adults. Furthermore, Torous et al.[59] found that a concerning number of mental health apps do not have privacy policies available for users, and posits that users with low levels of health literacy are likely to misinterpret app privacy policies – particularly concerning for the older adult demographic who have lower health literacy than other age demographics (Monafo et al).[60] There is currently insufficient privacy protection around personal health information and there is a lack of knowledge and expertise around cybersecurity in online mental healthcare.[61] This finding has been supported by interviews with therapists, who have raised concerns over data protection and data security.[62] Research also shows that older adults are very cautious when it comes to sharing health information in social networks using technology – particularly information specifically relating to mental health as they classify mental health information as sensitive.[63]

Finally, across all levels of the social ecology, trust was a significant factor in a number of the constructed themes within this study. Trust is highlighted as a significant barrier to the uptake of MMHIs for younger adults,[24,59] and so this suggests that trust is a pervasive sentiment cutting across age groups in relation to intervention uptake. The importance of trust was highlighted at an individual level as the user's trust towards the intervention or the app was identified as an important issue. But also, at a more institutional level, trust was important in regards of who actually recommends the app. Participants suggested that their GP and the NHS were trusted sources and also require some kind of recommendation from these trusted sources to facilitate use. This resonates with the concept of trust transference theory which, although it was developed in the context of consumerism, suggests that trust between a known entity can be transferred to an unknown entity.[64] The application of trust transfer theory within the healthcare setting is scarce. However, the analysis of the current study suggest that older adults may feel anxious about using a digital intervention for mental health without a recommendation and suggests that endorsement from the NHS or being on the NHS website may not be enough to mitigate these concerns for some participants. Therefore, it is specifically the role of the GP that older adults place a greater amount of emphasis on, which makes sense given that trust in the GP increases with age.[65] This also links to the theme of mental e-health awareness and may place added value on the advice of their GP for mental health-related issues – specifically for digital mental health interventions, as older adults have a significant gap in knowledge and awareness of mobile-based interventions and so may rely on the expertise of their GP to fill this gap for them.

While a number of barriers were identified within this study, none of the themes fit into the community level of the SEM framework. It is likely that community level barriers are currently experienced by older adults in the uptake of MMHIs. However as stigma still has a prevalent effect on older adults in terms of help seeking and disclosure of mental health conditions.[39] It is likely that lack of older adults' conversation around mental health in general means that there is lack of opportunity to share information about mental health in a general sense, but also as information sharing about mood-related apps. Furthermore, given the definition of the community level,[33] it is unlikely that the participants in this study have an understanding of the relationship between organisations and charities within their area, meaning that community level barriers were not explored in the current data set.

Limitations

This study was among the first within the research area to qualitatively investigate MMHIs for depression within the older adult demographic. The qualitative approach utilised within this study provide rich insight

into uptake barriers for older adults and, by consulting potential users of mobile-based interventions for mental health, provides a strong base in which to develop further insight into uptake of MMHIs. However, qualitative methods are inherently subjective and due to time restrictions, the sample size was limited. While this is a limitation of all qualitative research, a sample of size of 10 participants for thematic analysis is considered adequate for thematic analysis.[29]

This study was based on investigating potential barriers to uptake of digital mental health interventions and while every effort was made to recruit a purposive sample to enable interviews to take place with participants for which an app may have been useful, there are some limitations. Firstly, the participants had not undertaken a course of digital CBT or any type of self-help intervention. Therefore, opinions presented are based on participant's initial perceptions following a demonstration of a select few different mobile-based interventions available on the NHS website. While this means that evidence is not based on personal experience of a digital intervention, it was necessary to recruit from a non-clinical sample to investigate the potential of mobile-based interventions within a general sample of older adults who are potential users of the NHS apps library along with self-help interventions. As a result, insight was gained into the awareness of mental health interventions among this sample. Nevertheless, it may well be that if participants who had no understanding of technology had been included in the sample, different barriers may have been found within the data. Second, the term 'low mood' means different things for different people and therefore more objective measures should be used.

Furthermore, it may be noted that there is a lack of extensive focus on the facilitators of uptake of MMHIs for older adults. Factors that facilitate the uptake of MMHIs play an important role in increasing their use, however the data in this study identified very limited facilitators for older adults. Participants identified that MMHIs are more accessible with regards to the fact that they are immediately available and elicit greater control, however this finding was far outweighed by the barriers presented in this article.

Finally, this study also had demographic limitations in that participants were from high educational status groups and there were no participants over 80 years of age. While limited conclusions can be decisively drawn, this study contributes vital information to an underrepresented area of research and future work will be welcome to build upon the findings discussed by conducting a large-scale analysis to explore the extent that these perceived barriers may influence attitudes or willingness to use a MMHI.

Practical implications

The main implication is the lack of awareness that older adults have towards MMHIs and suggests that for older adults, being unable to see how the app may benefit the user may act as a barrier preventing uptake as recognising the perceived benefit of a MMHI can sometimes be missed. Therefore, acceptance facilitating interventions,[23,43] should explicitly communicate the benefits each digital intervention has and how engaging with a digital intervention may lead to improvements.

Furthermore, the sub-theme of 'negative attitudes towards apps' is important in two ways. Firstly, it highlights that older adults may have different attitudes towards apps in general and apps that specifically target mental health. Secondly, this sub-theme poses significant questions with regard to raising awareness of these apps. For example, if older adults are not browsing the apps store then there is no opportunity for them to find these apps by themselves. This raises questions of where is best to signpost these interventions to older adults?

An absence of trust in MMHIs, or the information that is being provided, also highlights a need for increased education in older adults to outline how these apps work, the science behind them, and how they change cognition. It does however, demonstrate that older adults are able to appraise and evaluate the content of these interventions – even if based on a faulty perception of them. The ability to appraise and evaluate interventions is a key aspect to e-health literacy.[66] However, if appraisal is based on incorrect or lack of knowledge, it can lead to inaccurate conclusions being drawn by older adults which may affect their willingness to use such technologies.

Finally, it is clear that education surrounding privacy and confidentiality of information from both user and the professional perspectives is required. There is also a need for clearer policies surrounding data protection which are easily understood by therapists and users alike, with consideration given as to how older adults may access and understand this information.

Conclusion

This study aimed to identify barriers that older adults may face in the uptake of MMHIs. Through thematic analysis, six barriers have been identified in this study: Mental e-health awareness, Seeing facilitates therapeutic alliance, Privacy and confidentiality, Incongruent role of GP, Discontinuation, and Interaction with technology. Some of these findings provide qualitative support for barriers identified in existing literature and extend the findings to older adults. This study also provided an insight into the role of trust that older adults

require in the uptake of a digital intervention and the combination of a recommendation from a GP and NHS accreditation could potentially facilitate uptake for older adults.

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Appendix 1. Interview schedule

Questions

Technology use.

1. Please tell me about the types of technology you use?
   a. What are your reasons for using them?
2. Please describe any issues or difficulties you have encountered when using technology.
3. If an issue arose regarding your technology, how would you go about finding support or advice?
   a. Why would you use this resource?
   b. Does this affect your confidence in using this technology?
4. What is your interpretation of mental health?
5. Among older adults, what do you think the attitude toward mental health is?
   a. What has formed these attitudes?
6. How would you go about seeking information about mental health?
7. How do you think depression is treated?
8. What are your attitudes towards sharing information about mental health using technologies which could be accessed by qualified members of the health service?
9. Describe your willingness to learn how to use new or different technology if it had a benefit on your mental health?
10. What is your familiarity with NHS services for mental health?
11. What is your current knowledge of mental health treatments/interventions?
    a. Are you aware of any that use technology or the Internet?
12. What are your thoughts towards a mental health intervention that was delivered through technology? Such as a mobile based app or the Internet?
    a. Why?
    b. What benefits do think this might bring?
    c. What negative aspects are there to this?
    d. For it to be useful to you, what would it include?
    e. Delivered through Internet vs seeing face to face?

Task

Show screenshots from NHS apps library for apps relating to depression and low mood. Ask questions from Q12 again.