**Applying the technology acceptance model to digital mental health interventions:
a qualitative exploration with adults with intellectual disabilities**

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Abstract

Introduction: Digital mental health interventions are on the rise; yet people with intellectual disabilities are not generally seen as their potential users. This study aims to explore the accessibility of two mainstream online mood-management programmes.

Methods: Using a qualitative study design, 12 adults with intellectual disabilities were interviewed while accessing moodgym and iFightDepression®. Thematic analysis was used to explore the programs' accessibility according to the technology acceptance model.

Results: The programs' ease-of-use was considered in terms of visual appeal, support needs, and essential skills for independent program use. Perceived usefulness concerned participants' understanding of the purpose and expected personal benefits associated with the interventions. Finally, intention to use and motivation to interact with the interventions were key aspects of participants' attitudes towards them.

Conclusion: Improving intervention accessibility is a first important step to ensure people with intellectual disabilities can understand the purpose and content of digital mental health interventions.

Keywords:

Intellectual disabilities, mental health, digital, accessibility, technology acceptance, qualitative research

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Background

With the rise of smart technologies and mobile internet, digital interventions are on the rise in all areas of life: from fitness trackers and lifestyle applications, to language learning and mental health. New applications and websites are published every minute and vie for the attention of new customers. But do their customers or users include people with intellectual disabilities? More specific: how accessible are well-established mental health digital interventions to people with intellectual disabilities?

The COVID-19 outbreak has put this question on the forefront as more support services are being offered remotely to comply with local restrictive measures and for safeguarding purposes (Bignal & Gouvier-Seghrouchni, 2020; Zaagsma, Volkers, Swart, Schippers, & Van Hove, 2020). Behind this ‘sudden onset forced digitisation’ lies a slow and steady increase in digital interventions designed specifically for people with intellectual disabilities. However, the needs and perspectives of people with intellectual disabilities as a digital tool’s end-users are not routinely acknowledged in the design and development process (Oudshoorn, Frielink, Nijs, & Embregts, 2020). Likewise, it is not yet standard practice to include family members, support workers or caregivers in the design or development process, despite them being expected to support with the implementation of such interventions in routine care (Oudshoorn et al., 2020). This is true both for tools designed to promote daily living or vocational skills, as well as digital mental health interventions.

Digital mental health interventions are more likely to concern blended-care type of interventions and will often include a third party, namely a mental health professional or a (trained) lay therapist, than other types of (assistive) technologies that people with intellectual

disabilities may use more independently. One such example is Fearless Me!©, a multimodal program for adolescents with intellectual disabilities and anxiety combining face-to-face group or individual support with access to an online platform for homework and to practice cognitive strategies (Hronis, Roberts, Roberts, & Kneebone, 2018). The contents of the program were adapted to the needs of children and adolescents with intellectual disabilities and developed with their parents, psychologists, and various health professionals.

Likewise, *Pesky Gnats: The Feel Good Island* is an online game to be used in cognitive behavioral therapy with adults with intellectual disabilities and anxiety or depression and which is an adaptation of the online game Pesky gNATs (Cooney, Jackman, Coyle, & Reilly, 2017). By contrast, the Healthy Mind website was designed to support people with intellectual disabilities who wish to improve their mental health, but it is not considered a tool to be used in face-to-face therapy (Watfern, Heck, Rule, Baldwin, & Boydell, 2019).

Similarly to the Feel Good Island, the website is an adaptation of an intervention originally developed for the general population, in this case an e-mental health platform for people with mild to moderate depression, anxiety and stress (Proudfoot et al., 2013). Vereenoghe and Westermann (2019) took a different approach and developed a new intervention without the blueprint of an existing intervention, instead adopting and adapting components of multiple evidence-based interventions for people with and without intellectual disabilities.

All four of these interventions are specifically adapted to the needs of people with intellectual disabilities and have to some extent included them, their caregivers or (mental) health professionals with experience with people with intellectual disabilities in their development. Whilst there is a place for digital interventions developed specifically for use by people with intellectual disabilities, their generally slower rate of development compared to interventions for the general population risks further increasing the digital divide at a time when people with intellectual disabilities themselves have shown more interest in and have become more adept at using digital technologies (Tanis et al., 2012). An alternative approach

could then be to increase the accessibility of mainstream digital interventions to people with intellectual disabilities.

In this study, we focus on two such interventions available in Germany: one website to be used as a self-help tool, namely moodgym (www.moodgym.de), and one to be used guided by a therapist as an addition to individual therapy, namely iFightDepression®. Both have a cognitive behavioral framework, in line with the current digital mental health interventions for people with intellectual disabilities, and focus on mood management and the treatment of depressive symptoms. The aim of this study is to explore the acceptability of these websites for adults with intellectual disabilities by observing and interviewing them whilst they navigate the respective websites. Using a thematic analysis approach, we aim to get insight in the perceived ease-of-use and perceived usefulness of the programs and explore the general attitudes of people with intellectual disabilities towards using digital media as a means to improve their well-being.

Methods

This study does not have a registered protocol. Instead, in our methods and results section we adhere to the structure and criteria provided by the „Consolidated criteria for reporting qualitative research“ (COREQ) for the transparent and comprehensive reporting of our study (Tong, Sainsbury, & Craig, 2007).

Study Design

Using a cross-sectional qualitative study design, adults with intellectual disabilities were interviewed and observed while using an online mental health intervention. Subsequent thematic analysis provided a qualitative exploration of the participants' experiences and expectations of accessing the respective interventions.

Research Team

Interviewer Characteristics.

The first and third author (LV and KB) collected the data for this study. At the time of data collection, LV was a junior professor with a PhD in clinical psychology, as well as degrees in both psychology and special needs education. KB was a graduate student in educational sciences. Both LV and KB previously conducted qualitative research, including interview studies, and have worked professionally in a non-academic context with people with intellectual disabilities. Both interviewers are female.

Relationship with Participants.

Prior to study commencement, the participants and LV had no knowledge of each other. Interviewer KB knew some of the participants through her voluntary work for one of the organisations where recruitment took place. LV disclosed her interest in researching and developing digital intervention for people with intellectual disabilities to potential participants.

Participant Selection

Recruitment Strategy.

We recruited participants using a convenience sampling approach. To this extent we contacted the managers of two residential living facilities, which each provided housing for around thirty people with mild to moderate intellectual disabilities. The facilities were run by the same organisation and located in different German cities with a population between 50-100.000 inhabitants. Following contact with the house managers, staff informed their residents of the study and acted as gatekeepers. Next, the researchers spoke directly to people interested in taking part and informed them about the purpose and procedures of the study, thereby using simple language and study information sheets in easy reading format. As convenience sampling is likely to result in participant selection or sampling bias, we ensured to recruit an equal number of male and female participants, within a broad age range and with varying degrees of affinity with computers and internet applications.

Non-participation.

Since staff members acted as gatekeepers, we have no information regarding the number of people informed about the study who did not wish to participate. We also did not collect data regarding the reasons for non-participation or terminating the study, as this was against the policy set out in the study information sheets that people did not have to give any reason for declining to participate or for withdrawing from the study.

Inclusion Criteria.

Only adults with an intellectual disability were eligible to participate. Both were confirmed for all participants as without this diagnosis and age criterion they would not have been able to receive the residential support services provided by the organisation through which we recruited.

Study Sample.

Thirteen adults with intellectual disabilities proceeded to give their informed consent, of which twelve completed the study (6 female and 6 male participants, mean age = 43.75 years). All twelve participants were employed in a sheltered workshop. Table 1 provides an overview of the sociodemographic characteristics of the interviewees.

Table 2. Sociodemographic characteristics of the study sample

Interviewee ID	Sex	Age (years)	Experience with digital media
N1	Female	45	None
N2	Female	35	None
N3	Male	54	Looking at pictures
N4	Male	53	None
N5	Male	52	None
N6	Female	59	None

N7	Female	30	Daily: Amazon, train company website, online games, weather information
N8	Male	36	Daily: Facebook, online games, football
N9	Male	33	Daily: Facebook
N10	Female	58	None
N11	Female	37	WhattsApp
N12	Male	33	General websites, Facebook, WhatsApp

Data Collection

Setting.

Interviews took place in a multifunctional room of the housing accommodation, or any other room chosen by the participant, without the presence of others. Repeat-interviews were not conducted, but for some participants the study took place over two days to reduce the study demands (e.g. time constraints or interviewee fatigue). Sitzings were generally limited to one hour.

Interviews.

Interview guides comprised the following themes: critical appraisal of the structure, design and content of the intervention in terms of website login areas, website navigation, website interaction, personal preferences and required support. To that extent, participants were first shown the homepage of either moodgym or iFightDepression ® and asked about their feedback on its appearance and its perceived proposed. Next, the researchers encouraged participants to navigate through the websites independently and prompted participants to talk

them through the actions. To enter the user area of each intervention, the researchers provided generic login details. Within the user area, participants were prompted to click through to some of the interventions' modules and were again requested to give their feedback whilst using the website.

Recording.

Interviews were recorded and subsequently transcribed at verbatim. Transcripts were then combined with field notes of observations made during the interview. Completed transcripts were not discussed with participants.

Data Saturation.

Upon reaching data saturation for one digital mental health intervention, moodgym, subsequent participants were shown the second digital mental health intervention, iFightDepression®.

Interventions.

Moodgym (www.moodgym.de) is a freely available online self-management program grounded in the principles of cognitive behavioral therapy and interpersonal therapy which can be used independently without the supervision or support of a mental health professional. It comprises five modules focusing on feelings, thoughts, developing alternative thoughts, reducing stress, and relationships. Virtual characters guide the user through online tasks. Meta-analytic evidence supports the efficacy of the program in reducing depressive symptoms and psychological stress, whereby treatment effects were higher when the program was used under the guidance of a therapist (Twomey & O'Reilly, 2017). The German version of this program has been evaluated in both in-patient (Dorow et al., 2018) and out-patient settings (Löbner et al., 2018, p317).

iFightDepression® (www.ifightdepression.com/de) was the second program reviewed in this study. It was designed to compliment patients with mild to moderate depressive disorders who are currently enrolled in psychological therapy and whereby the therapist

guides the use of the intervention. As with moodgym, the program is freely available (through a psychological therapist who received training in using the program) and has been used internationally. Central elements of the program focus on moods, workshops incorporating cognitive behavioural therapy techniques (such as behavioral activation, psychoeducation, and cognitive restructuring). The development of iFightDepression® was supported by the European Alliance Against Depression (EAAD) and has been evaluated in different European countries, with studies indicating positive treatment effects (Königbauer, Letsch, Doeblner, Ebert, & Baumeister, 2017; Oehler, Görges, Rogalla, Rummel-Kluge, & Hegerl, 2020).

Data Analysis

Theoretical Approach.

We analyzed the interviews thematically, using the approach set forward by Braun and Clarke (2006). This type of qualitative analysis would enable us to interpret instead of merely describe the data, which we considered important given the potential difficulties some participants might have in expressing themselves verbally. The theoretical flexibility of this method makes it suitable for exploring data that may be not so clearly defined or developed. Choosing a basic theoretical framework is nevertheless important, and here we opt to analyse the data against the backdrop of the technology acceptance model (Davis, Bagozzi, & Warshaw, 1989). Perceived ease-of-use, perceived usefulness and attitude are the three main components of the technology acceptance model that are relevant for our research question and which were used as a frame of reference from which the interview data were coded.

Coding.

Upon reading and re-reading the transcripts, the second author, FT, performed the initial coding of the transcripts. In this first step, codes for the smallest meaningful sequences of information were derived from the data. Codes were then discussed with the first author, LV. Next, authors FT and LV jointly developed and re-developed the coding tree. In this

second step, the codes were organised along the main themes identified in advance and derived from the technology acceptance model: perceived ease-of-use, perceived usefulness, and general user attitudes towards using digital media for mental health purposes. Participants were informed about these three main themes prior to participating in the study. They did not have the chance to provide feedback on the findings.

Software.

The authors used ATLAS.ti Version 8.4 to conduct the data analysis.

Research Ethics

The study received approval from the Bielefeld University Ethics Committee. Care was taken to ensure participants did not perceive their participation as having to complete a digital mental health intervention, but instead were invited to give their feedback on how they perceive the intervention's ease of use and potential usefulness.

Results

Four female and two male participants had no previous experience with using websites or online tools, and participants with online experience were generally younger (mean age = 37.2 years) than participants with no previous online experience (mean age = 50.3 years).

The thematic analysis of the data revealed a three-level structure. The three pre-determined overarching aspects of the technology acceptance model (i.e. perceived ease-of-use, perceived usability, and attitude towards health-related media usage for the purpose of improving well-being) were further clarified by seven sub-themes on a second level and six sub-themes on a third level (see figure 1).

Figure 1. Structure of the thematic analysis.

Perceived Ease-of-Use

Within this overarching theme of user-friendliness derived from the technology acceptance model, we identified three main sub-themes: visual incentives/appeal/stimuli for program interaction, support needs regarding essential skills for interacting with the program, and skills required for independent program-use.

Visual appeal for program interaction.

This covers all creative and structural components, e.g. graphical elements, text design and page composition, which might have an impact on program accessibility and visual appeal.

Pictures are an important graphical element for many users, as they instantly draw the attention and are easier for the participants to identify with. This is particularly true when participants experience a personal connection with them, as demonstrated by one participant remarking “I like riding bike,” (N3) upon seeing a picture with a cyclist on it.

For illustrating emotions, realistic pictures were preferred over generic drawings or symbols:

“ So [...] I would be happier, if it were real people, so [...] not just any people, maybe also, [...] you know or not, where you can tell by their body language or facial features [...] what they feel or what is going on with them” (N8).

Pictorial symbols are useful to support users in understanding texts. For example, one participant deducted the meaning of the words „free of charge“ as follows: “Pictures... because there is a lock, I can see that [...] crossed out [...] free of charge” (N12).

Other graphical elements such as arrows, to show connections between thoughts, feelings and interactions, are also supportive for understanding: “Feelings.... Thoughts.... Now If I, let’s say, have a bad thought, then I feel sad, and the interaction, I am angry. I freak out or something” (N10).

One participant voices the suggestion to add visual symbols like a camera or a cassette next to the texts to support understanding (N7).

Additional visual elements on the websites are diagrams, whose color coding, e.g. in green and red, helps with interpreting the diagrams: “I would say, this is good and this is shit [...]” (N10). Established mathematical symbols like plus and minus also support understanding: “He has [a] good feeling and Victoria has [...] [a] bad feeling [...] because ‘No problemo’ has [a] plus and Victoria only [has a] minus” (N11).

The accessibility of diagrams varied between users, with prior knowledge from other areas being helpful: “[...] it’s a diagram that is used for example for DAX and stock exchange things” (N8).

In terms of the structural text design, all literate participants expressed difficulties with the amount of text and long words:

“Whoa, a lot of text” (N4); “[...] long words are a problem for me [...] short words and such, I actually like them” (N12).

Asked about text design, the participants preferred easy reading formats: “I like those [words] printed in bold, because I think that these are the most important” (N12); “I would prefer bigger [letters]” (N7). Due to the challenging amount of text, several users suggested the programs should incorporate alternative media, like videos:

“[It] would be nice [to have] a video with this” (N12) also (N9).

Support needs regarding essential Skills for interacting with the Program.

In addition to the visual aspects discussed above, this theme covers a range of essential skills for users to have, should they wish to use the interventions independently. These include (i) reading and writing skills (literacy skills), (ii) ability to concentrate, (iii) perspective-taking skills for tasks involving social interactions, and (iv) willingness to work together on personal topics. As users cannot easily develop these skills at the time of enrolling in the intervention, they would require support from another person.

i. Literacy skills

These are crucial skills where all interviewed users required help, primarily in the area of text comprehension. As program contents were mostly text-based, foreign words and technical terms caused difficulties.

One user had difficulties understanding some English words: “Do you understand this word in English?” – “German, yes. But not English” (N4).

Several users better understood the text when they were read out loud.

To answer one of the build-in questionnaires about depressive symptoms, users would have to report whether they experienced any symptoms within the last 14 days. This revealed some difficulties with the sense of scale. One user was asked: “What are 14 days?” – “10 weeks [...] 10 days [...] 4 weeks?” (N4).

The varying terms and formats of the questionnaires and their response options led to various problems for some users:

“I do not know what they mean with this [...] I would like to have a ‘no’ and ‘I don’t understand’ [...] Because I don’t know what they mean by ‘I agree completely’ or ‘I somewhat agree’”(N12).

Faced with similar problems, another user proposed a simplified Likert-scale (“Yes, No, Maybe” (N7)) extended by the option “[I] don’t understand the question” (N7). Even most literate users required help with the open questions: “Oh, I do not know how [...] to write that” (N11). However, other participants appreciated the open questions (N8).

The inclusion of other sensory modalities was often suggested whenever text-related difficulties arose. For example: “If there would be speech [...] a spoken explanation” (N12). In addition to auditory support, participants also welcomed visual support: “With some texts I would like [to have] an explanation video [...] and pictures, too” (N12).

ii. Ability to concentrate

Both the amount of content and the cognitive complexity posed a challenge for the participants, with field notes indicating that participants required assistance to remain concentrated. Taking small steps and regular breaks were frequently used (e.g. N12).

One user speculated that they could not use the program more than twice a week for two hours, because of its cognitive demands (N10).

The presence of a support person also seemed to help with attention-regulation and with being able to remind participants of previously covered program content: “We filled it in together earlier. ‘What did you do yesterday?’” (interviewer) – “Ah right. [...] We already did this” (N3).

iii. Perspective taking and empathy

This theme includes all forms of support required concerning potential difficulties with program contents requiring participants to empathise with the thoughts, feelings and behaviors of another (virtual) person. For example, one participant found it difficult to empathise with the sample characters of the program (N12), whereas this was expected as part of a task revolving around social interaction.

Several users showed a high level of emotional investment when being exposed to the problems of the sample characters, whereas others found it difficult to grasp the demonstrative tone of the program: “Is this guy ‘No problemo’ serious? His positive attitude is too much for me” (N8).

Focusing on being able to independently complete the social interaction tasks, users requested modifications to the sample characters:

“Why Victoria? [...] Here is ‘No problemo’ again. [The name] is a little bit weird” (N8).

“So I would prefer it being not only about those two, but also about the problems of other people ... or couples or whatever” (N8).

iv. Willingness to work together on personal topics.

This theme relates to the willingness of people with intellectual disabilities to accept the assistance of a support person when engaging with the programs on issues that are personal to them. Participants might first try to complete exercises on their own before asking for support: “I fill it in then [...] and when [I’m] done I would [...] ask the support worker” (N3).

Skills required for independent Use of the Programs.

This subtheme includes skills and knowledge that can be more easily developed with regards to using the programs more independently. This is in contrast to the ‘predisposed skills’ referred to in the previous subtheme. Here, we consider skills such as: (i) general media competence and (ii) program-specific media competence.

i. General media competence.

Under general media competence, we understand the skills and application-related knowledge concerning basic technology and internet use. Here, previous experiences with the internet and other digital media play an important role, as do internet access and familiarity with digital media use, which varied widely between participants (see Table 1).

To some extent, general media competence could be observed, as in the case of a user explaining the function of ‘program settings’ in their own words: “[...] you can change different things here” (N3). One user showed that they were familiar with a communication app for mobile phones: “Voice Messages. Like in Whats-App, in a way” (N10). Others however had never been online on their own before (N1 and N2).

ii. Program-specific media competence.

In addition to general media competence, the use of these specific programs, moodgym and iFightDepression ®, may require more defined skills. This includes for example the ability to understand the ‘user log in’ function of a website:

Interviewer: “What would that mean; log in now?”

– “Hmm... What do I have to do? And say?” (N6)

One user mentions difficulties with the size of the input field (N8). Participants also commented on their ability to navigate and orientate themselves within the programs, which could be observed by their ability to switch between pages and click on text fields. Some users only required minimal assistance when navigating the programs. In this respect, on-screen colored feedback after clicking had a supportive effect: “I have clicked on it. What do we see now?” – “Red [Button][...]. What I see [now], it says worksheet” (N3). Meanwhile, this user demonstrated an independent control of the page navigation: “Look at the next thoughts. So now I have to click here again” (N8).

The ability to orientate oneself on the website is important for the overview of the program structure and the user information about where one currently is in the program. One user could orientate themselves very well on the start page: “I know [...] There is a page for [a] feelings module – [a] thoughts module [...] Workbook... [a] relationship module and [a] stress module” (N12). The same participant was also able to recognise the contents of previous sessions, which revealed a good overview of the program structure: “We already had all of this” (N12). However, one user wished the program provided a kind of summary for orientation purposes when logging back in and to show where they had previously stopped: “As a memory aid” (N8).

Perceived Usefulness

The second key element of the technology acceptance model – which guided our thematic analysis - refers to the perceived usefulness of the technology. Here, one expects a positive association between the perceived usefulness with the individual's eventual intention to use the technology. Our data revealed two aspects relating to the perceived usefulness of the digital mental health interventions: the presence of a general understanding of the purpose of the intervention and the anticipated personal benefit of using the intervention.

Understanding the Purpose of the Program

This theme reflects participants' more general understanding of online-based self-management programs and what they could achieve. For several participants the purpose of the programs was not clear. For example, when the interviewer reads a program description out loud to one of the participants, they indicated not to understand the words "Depression" and "Selbst-Management-Tool" (N3), which were prominently on the program homepage. Two other participants confirmed having difficulties with grasping the purpose of the program due to difficulties in understanding the accompanying text: "So it actually isn't suitable for... people, who are not good at reading?" (N1, N2). In contrast, a participant who could read very well, considered the program homepage to be self-explanatory and summarised the purpose as follows: "A [...] help page for people with depression" (N8).

Personal Benefit of using the Program

In addition to understanding the overall purpose of digital mental health interventions, participants also addressed the extent to which they could see using such programs themselves and explored whether they could imagine personally benefiting from them.

Some participants spontaneously expressed their own emotional concerns and their willingness to work through emotional topics. One participant noted in this context: "In the evenings I am sad [...] About my mum [...] because she is gone" (N5). Another participant

responded found the objective of the mood improvement program to be “important... [...] because I, sometimes I am homesick” (N3).

When considering the perceived usefulness of the programs for people with intellectual disabilities, some participants conceded that they are “also [suitable for] people who have a disability” (N10).

Attitude towards health-related Media Usage for the Purpose of improving Well-being

Finally, the interviews and field notes gave insight in participants’ attitudes concerning whether digital media can or should be used to improve your well-being. We observed a distinction between participants’ motivation to meaningfully interact with the programs and their expressed intention to use (mental) health-related programs in the nearby future.

Motivation for Program Interaction

This sub-theme included both explicit and implicit expressions of participants’ motivation to meaningfully interact with the programs. Several participants appeared to be interested in interacting with the programs, as voiced by one participant: “It is really fun with us, I like that” (N8). This participant showed a lot of enthusiasm when working with the sample characters: “Wow, I like that” (N8). Other participants also expressed their motivation in words: “I am up for it” (N10) – “I am up for it, too” (N11).

Participants who were considered to be having more difficulties with the program’s accessibility in terms of understanding program contents appeared less motivated to continue exploring the program as part of the study: “I don’t know [...] a little bit longer” (N5). Several participants became increasingly demotivated when being confronted with the amount of text on the different program pages. One participant attributed their frustration to themselves: “With me you cannot achieve anything” (N12).

For one participant, their motivation to interact with program appeared to be associated with the emotional exposure of some program tasks. Field notes indicated that this participant appeared close to being overwhelmed with the task. They also voiced their concern: “What makes me sad... I think [...] If it is ... when I [had a] bad question. I had to cry soon” (N3), followed by their desire to “only [want] the right questions” (N3).

Intention to use health-related Programs in the future

The last identified sub-theme concerned expressions regarding participants’ behavioral intentions of using (mental) health-related digital programs in the nearby future. Several participants had no such intentions, which is apparent from the following interaction:

Interviewer: “If we would not be here and you could use a laptop, would you use the [program] on your own again?”

– “Mm, not like this (laughing)” (N10 and N11).

In the context of personal mental health-related problems, participants were asked to consider whether they could imagine themselves using digital programs, either independently (as in moodgym) or guided by a mental health professional (as in iFightDepression ®). One participant read the following question from our interview schedule and immediately answered it:

“Can moodgym replace a doctor’s visit? So here I would immediately say no.

Because [it] is only the internet [...] a laptop cannot see you doing it, how you feel or how the body ... in what condition you are [...] a doctor can look at you better” (N8).

Another participant is unsure, about whether a medical doctor would be able to help them with mental health problems:

“Somehow I do not understand this [...] but I think, if you have depression and you go to the doctor. So, I think, it is actually [...] it is not [...] then that the doctor is somehow...” (N9).

Finally, when prompted whether they could imagine using the program themselves, only one participant indicated: “At some point, I believe so” (N7).

Discussion

This study aimed to explore the acceptance of digital mental health programs by people with intellectual disabilities from the perspective of the technology acceptance model. The focus was on identifying key aspects related to the user-friendliness or perceived ease-of-use and the perceived usefulness of an online self-help program and an online guided intervention for people who wish to improve their mood or for those with depressive symptoms, respectively. Together with exploring the attitudes of people with intellectual disabilities towards such interventions, this could give an indication of their general acceptance of, and their behavioral intention to use these technologies.

The majority of feedback received from participants during the study concerned the user-friendliness or perceived ease-of-use of the program. This component of the technology acceptance model represented indicators of the accessibility of the reviewed digital mental health interventions, moodgym and iFightDepression®, for people with intellectual disabilities. The perceived usefulness of the programs was less clear for several of the participants, in spite of being informed about the purpose of the programs as part of our participant information processes prior to their enrollment in the study. The perceived potential personal benefit of such programs was also not evident, as field notes of observations indicated that most participants experienced difficulties with understanding or using the programs at some point during the study, even when another participant indicated

they would also be suitable for people with a disability. At best, the general attitudes towards both programs were mixed, leaning towards a more negative reception. Together with the low-rated ease-of-use and usefulness, this warrants a critical appraisal of our findings in relation to our study design and previous research.

First, the negative perception of the programs' ease-of-use reflects their general accessibility. Long or complex words and text input field formats to on-screen questions were found to be particularly difficult to understand and engage with, which in turn reflected negatively on participants' motivation to continue the program. Participants were happy to suggest improvements and unanimously agreed that more audio-visual content to complement or replace verbal content was essential to improve their overall understanding and the accessibility of the programs. Optimising an intervention's ease-of-use might then be achieved by adopting guidelines to produce easier to read materials and accounting for the need of mediation (Buell, Langdon, Pounds, & Bunning, 2020; Karreman, Van Der Geest, & Buursink, 2007), employing universal design principles, and integrating other means to simplify the therapeutic concepts and methods (Hurley, Tomasulo, & Pfadt, 1998; Sheehan & Hassiotis, 2017).

This instantly feeds into the low perceived usefulness of the programs. It can indeed be expected to be difficult to imagine how a program might be able to benefit you if you cannot sufficiently grasp its content. In addition, the participants in this study were not recruited to represent people with previous experiences of mental health interventions, either online or in person. Consequently, participants may lack a frame of reference regarding the potential purpose of the programs, when they did not necessarily experience any symptoms of low mood or depression that could call for such interventions.

The more negatively pronounced attitudes towards using digital mental health interventions could be partially explained from this same perspective. Alternatively, they could be related to the programs that were shown to the participants, as neither interventions

was originally developed or designed for use by people with intellectual disabilities. Their needs as potential end-users were therefore largely left unaccounted for.

Study Limitations

The strength and scope of our findings are limited by certain aspects of our study design and research methods. Against what is generally expected in qualitative research, participants in our study did not have the opportunity to read the transcripts of their interviews or our interpretation of them. As the interviews focused on very concrete materials (i.e. the websites at hand) and to a far lesser extent on deriving meaning from participants' personal experiences, it was considered that the added demands of two extra meetings (one to review transcripts and one to review findings) outweighed the benefits.

Recruitment strategies focusing on residential housing organisations may also affect the potential generalizability of our findings. People with intellectual disabilities who live independently or using supported accommodation might have more adaptive skills to understand and engage with the programs or have more technological affinity required for navigating the online interventions.

Although we reviewed two different programs, a direct comparison was not the intention of this study. Instead, we strived to identify which aspects of the programs would reflect general characteristics of interventions developed for the mainstream population and that could be explored within our chosen theoretical framework.

A key limitation of our study is that, unlike in previous studies, our participants could be considered program reviewers rather than program users. Hence, none of the participants completed either intervention or were selected on the basis of having symptoms that the programs aimed to alleviate. Consequently, participant feedback centered more around the perceived ease-of-use of the interventions, as a more in-depth exploration of the perceived usefulness would likely have benefited from participants actively taking part in each program.

We decided against this based on ethical concerns, as we expected that a low user-friendliness and participants having difficulties understanding the intervention would negatively affect both their ability and motivation to complete the intervention and could their willingness to seek or accept the support of (mental) health professionals.

Interventions' End-Users

This brings us to consider if interventions that are specifically developed or adapted for use by people with intellectual disabilities would generally be more favourable when using the technology acceptance model approach. This case is most easily made for such interventions' perceived ease-of-use. *Pesky Gnats: The Feel Good Island* (Cooney et al., 2017), *Healthy mind* (Proudfoot et al., 2013; Watfern et al., 2019), *Fearless Me! ©* (Hronis et al., 2018), and *Pudelwohl* (Vereenoghe & Westermann, 2019a) all made efforts to reduce the amount of text to deliver their content, included many audio-visual components, and have included people with intellectual disabilities, language and speech therapists or other professionals working with people with intellectual disabilities to ensure the accessibility of the interventions and their ease-of-use were optimised.

Qualitative investigations of users' experiences and perspectives of digital mental health interventions provide insight in their user-friendliness and their perceived usefulness. For the *Healthy Mind* website, the intervention most similar to the websites used in this study, Watfern and colleagues (Watfern et al., 2019) also highlighted the necessity of accessible information for a positive user experience. When examining the ease-of-use of their intervention, they identified two design dilemmas concerning the need for repetition without losing user engagement, and how to incorporate different types of engagement. Meanwhile, Cooney and colleagues, extensively described participants' ability to engage with *The Feel Good Island* in terms of both mastery and struggle: participants reported gaining knowledge and understanding related to how to take better care of themselves or to develop more helpful

coping strategies, but some required physical or cognitive support to complete the tasks (Cooney, Jackman, Tunney, Coyle, & O'Reilly, 2018). This maps well onto the perceived usefulness and ease-of-use subthemes identified in our study. Participants' attitudes towards the program, as an indicator of participant motivation, was reflected in their 'Novelty' theme, which included participants' sense of pride and accomplishment for completing the online intervention.

Supported-interventions: facilitating Conversations and Alliances

One common theme across different research studies and interventions revolves around the inclusion of others: a support worker, care-giver, or (lay) therapist supporting or guiding individuals with an intellectual disability when using digital mental health interventions. Vereenoghe, Gega and Langdon (2017) already suggested that both people with intellectual disabilities and clinical psychologist would prefer using computers as a part of or adjunct to therapy, ideally in collaboration with a therapist. Watfern and colleagues (Watfern et al., 2019) also reported the relative importance of supported self-help and having support workers providing assistance, alleviating anxiety and facilitating conversations. The latter was also found by Cooney et al. (2018), who noted that some participants using their computer game talked more with their therapist app and likened the experience to conducting teamwork.

This begs the questions whether incorporating such support is an essential element in optimising the perceived usefulness and the eventual uptake of digital interventions for people with intellectual disabilities. In spite of some interventions being developed specifically for people with intellectual disabilities, cognitive or physical support was frequently required. But even participants who were able to complete program tasks independently may appreciate the availability of support. Given that guided or supported interventions appear to have positive effects on alliance building, alleviating program anxiety and facilitating

conversations, such interventions may find a wider audience than those developed for independent use.

However, mental health professionals, support staff or family caregivers may not have the technological affinity and media competence required to adequately support people with intellectual disabilities through using digital mental health interventions, or even in championing assistive technologies in general (Churchill & Hoogerwerf, 2013). It then is not surprising that Vereenoghe and Westermann (2019b) reported more difficulties in support workers compared to recruiting participants with intellectual disabilities.

Specific trainings for support workers and mental health professionals could then be useful to address the challenges associated with using digital mental health interventions. These can include personal attitudes towards and knowledge of such interventions in general, and understanding the impact their own technological media competence may have on those whom they support. Trainings could then instill a ‘positive risk taking’ approach, which Seale (2014) further characterises as adopting an attitude of openness to failure, developing shared decision-making processes, and being resource-oriented. Following a positive risk taking approach, people may become more aware of the possibilities and opportunities of digital mental health interventions for people with intellectual disabilities and could use them as a means to strengthen user-empowerment and autonomy. Targeting training to formal caregivers is important, as they have a strong impact on the opportunities of people with intellectual disabilities to use new digital tools (Heitplatz, Bühler, & Hastall, 2019). Similarly, Chiner and colleagues proposed that sensibilisation and psycho-education may be important, as they can counteract potential prejudice, of those who support people with intellectual disabilities, regarding the perceived benefits, risks, and safety of internet applications (Chiner, Gómez-Puerta, & Villegas, 2020).

Taken together, the acceptance of digital mental health interventions can be evaluated in terms of their perceived ease-of-use, perceived usefulness and users’ attitudes towards the

intervention. This maps well onto the different types of accessibility of an intervention, as identified by Gulliford and colleagues: availability, utilisation, relevance and effectiveness (Gulliford et al., 2002). In this respect, many of the factors that are found to hinder or facilitate people with intellectual disabilities when accessing traditional or specialist mental health services (Whittle, Fisher, Reppermund, Lenroot, & Trollor, 2018) might equally apply to their ability to gain access or use digital mental health interventions: for example, organisational factors, physical constraints, cognitive demands and knowledge of an intervention, and factors associated with training.

Of course, one type of intervention may never fit all. In all studies reported so far, some participants reported feeling left out, being unable or unwilling to engage with the intervention, or needing more sessions or support (Cooney et al., 2018; Vereenoooghe & Westermann, 2019b). Fortunately, participants are generally eager to suggest ways to improve user engagement and understanding. These suggestions also go beyond aspects of user-friendliness and reflect a need for user representation: for example, including wheelchair users as virtual characters in an intervention (Cooney et al., 2018), embedding videos where people with intellectual disabilities deliver the content or use sign language (Vereenoooghe et al., 2017). For future studies to fully explore the perceived usefulness of and users' attitudes towards an intervention, however, it is first required that the intervention is accessible: i.e. for participants to understand the purpose and content of the intervention.

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Conflicts of interest

The authors report no conflicts of interest.

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