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The qualities of patients interested in using a game-based digital mental health intervention for depression: a sequential mixed methods study

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Abstract

Background Digital interventions are typically evaluated by their effectiveness and engagement, while the characteristics of patients who perceive them to be attractive have remained poorly understood. This challenges user-centered intervention development but also presents an avenue to improve intervention efficacy and engagement. Our objective was to characterize people to whom game-based interventions appeal to with a focus on their mental health backgrounds and prior digital game experiences.

Methods We performed a sequential mixed methods study with adults suffering from major depressive disorder (MDD) who participated in a randomized controlled clinical trial studying the effectiveness of a game-based digital intervention for depression. First, randomly chosen participants were interviewed ($N = 22$), and the transcribed data were analyzed inductively. Then, focusing on the themes established through the interview data, we triangulated the findings using complementary questionnaire data ($N = 445$).

Results The interview data yielded four themes that we illuminated with quantified questionnaire data. (T1) The participants had enduring and diverse psychiatric symptomology: 73% had been diagnosed with a comorbid disorder in addition to depression. (T2) Participants had received at least some treatments that had not led to full remission of depression. 92% currently received therapeutic support, psychiatric medication, or both. (T3) Many participants had close relationships with digital gaming and played actively: on average, for 13 h a week on various gaming platforms and in various genres. (T4) Some participants used gaming to manage their psychiatric symptoms, and 76% found that playing helped them feel better.

Conclusions Identifying and characterizing people attracted to game-based therapeutic interventions can catalyze intervention development and improve their efficacy. We found that game-based interventions have appealing potential across diverse psychiatric symptoms and for people with prior or existing treatments. Game-based interventions may appeal particularly to active players and offer a promising alternative to the self-treatment usage of entertainment games.

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Introduction

"This kind of a game is a low threshold treatment without chemical substances. Very interesting experiment. I hope it succeeds." Carrotisgood

"Help. This reminds me of how a depressed person sinks further into immobility; the screentime causes them neck and shoulder aches, they become addicted to playing for nights on end, lose their daily rhythm, eat chips while playing, and gain even more weight… that is everything bad." Mlop

Contrasting comments on a national news article in Finland [1] on the studied game-based digital mental health intervention, Meliora, translations by the authors

Game-based digital mental health interventions (gDM-HIs) challenge the traditional approach to mental health treatment that consists of interpersonal therapeutic interaction with a mental health professional and pharmacological therapies. Currently, game-based interventions are actively developed for a variety of clinical indications, including depression [2–4], anxiety [5], ADHD [6], among others [7]. However, research on the efficacy of gDMHI has remained inconclusive, and few commercial therapies exist.

New healthcare interventions are primarily assessed for their effectiveness: their raison d'être. We assert that the effectiveness of treatments is preceded by user engagement and interest and that these factors are critical to understand in innovations that may divide opinions and appeal only to a part of the population (Fig. 1). Only those who are interested, capable, and competent in trying out and using new health technologies may show interest in participating in such studies [8]. In contrast, typical reasons *not to* participate in technology-driven health studies include lacking confidence in using computers and mobile phones or not having internet access [9]. The findings indicate that participants in effectiveness studies are a self-selected group and do not represent the population as a whole.

Despite the considerable understanding of the importance of user-centricity in the development of digital interventions [10, 11], there is surprisingly little research on to *whom* digital interventions appeal [12], and an
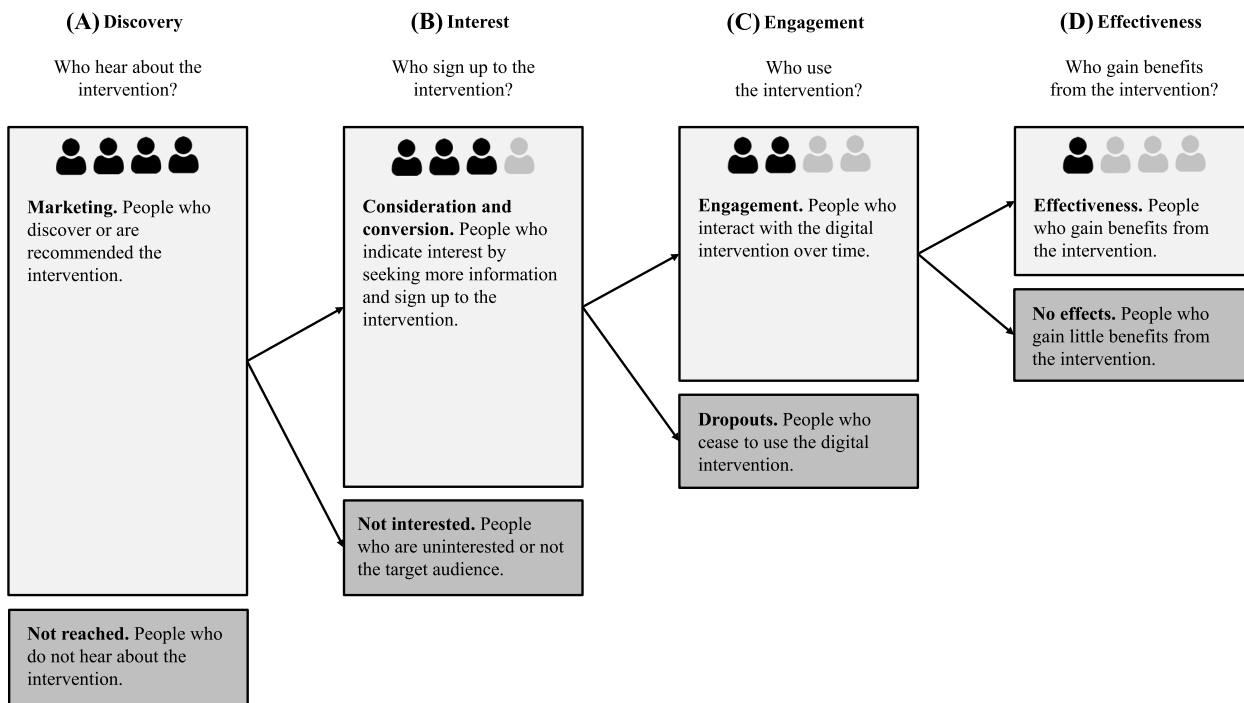

(A) Discovery

Who hear about the intervention?

Marketing. People who discover or are recommended the intervention.

Not reached. People who do not hear about the intervention.

(B) Interest

Who sign up to the intervention?

Consideration and conversion. People who indicate interest by seeking more information and sign up to the intervention.

Not interested. People who are uninterested or not the target audience.

(C) Engagement

Who use the intervention?

Engagement. People who interact with the digital intervention over time.

Dropouts. People who cease to use the digital intervention.

(D) Effectiveness

Who gain benefits from the intervention?

Effectiveness. People who gain benefits from the intervention.

No effects. People who gain little benefits from the intervention.

Fig. 1 A conceptual model describing the prerequisites of digital intervention effectiveness

even scarcer understanding of the potential user population for game-based interventions. Neglecting to ensure a good product-user fit may have costly consequences when the new technology is deployed in real-world environments [13, 14]. To address this knowledge gap, we aimed to understand to whom game-based interventions appeal (column B in Fig. 1) by studying the participants in an ongoing randomized controlled trial (RCT) assessing the efficacy of a video-game-like digital intervention in the treatment of major depressive disorder (MDD). Our model describes how receiving benefits from a digital intervention requires (A) hearing about it, (B) becoming interested in it, and (C) engaging in interaction with it. At each step, a subset of users will drop out (dark gray area). (D) With sufficient engagement, a subset of users will gain mental health benefits. The following model is conceptual, and the box sizes do not indicate quantity.

Prior research on depression and its treatments

Depressive disorders, alongside anxiety disorders, are the most common mental disorders. The WHO estimates that 3.8% of the global population—280 million people—suffer from the former [15]. The prevalence of depressive disorders in women (4.5%) is greater than that in men (3.0%) [15]. Depression has broad adverse effects on education, marital stability, employment, and parenting [16], as well as high economic costs [17]. The age of onset of depression varies considerably [18, 19]. Early-onset depression is associated with higher vulnerability factors, more chronic symptoms, different depressive symptomatology, and higher comorbidity than late-onset depression [20]. Depression and anxiety coexist as often as half of all cases [21, 22]. Other common comorbidities include post-traumatic stress disorder (PTSD) and personality disorders, and the risk of comorbidity increases with depression severity [23]. Most patients recover from depression within a year, but the disorder has a high relapse and reoccurrence rate, and for many the symptoms become chronic [17].

Depression includes a range of symptoms. The Diagnostic and Statistical Manual of Mental Disorders Text Revision (DSM-5-TR) takes a polythetic approach to MDD, where a person needs to have experienced at least five of the nine possible symptoms in two weeks, one of them being either depressed mood or diminished interest or pleasure [24]. The other seven symptoms include significant weight loss or gain, or changes in appetite; insomnia or hypersomnia; psychomotor agitation or retardation; fatigue or loss of energy; feelings of worthlessness or excessive guilt; diminished ability to think or concentrate; and recurrent thoughts of death. This leads to an abundance of symptom combinations [25]: in a study of 1500 patients, the subjects met the criteria for

MDD in 170 different ways [26]. It has been suggested that MDD is not a single entity [27, 28] but a spectrum of overlapping disorders [29]. Recent scholarly research on psychopathology is turning from distinct disorders to considering them as an interactive, transdiagnostic network of symptoms [30, 31]. This approach could facilitate understanding regarding, for instance, the centrality of specific symptoms [32]. Transdiagnostic approaches have also led to unified treatment protocols that show promise in addressing the commonalities that may supersede the superficial differences between disorders [33–35].

Adult MDD is typically treated with either psychotherapy, pharmacological therapy, or a combination of the two [36]. However, it is estimated that more than half of all clinical cases do not receive treatment [37–39]. Although treatments exist, they are not equally available and accessible, and young or old age, male gender, marginalized ethnicities, and low educational status are associated with diminished help-seeking [40]. While often effective, the existing human-resource-intensive therapies face challenges in addressing increasing needs. To complement the current modes of treatment, digital mental health interventions (DMHIs) are actively being developed, and there is growing evidence of their effectiveness, although it appears that the results are better in clinical than in real-world environments [41].

Game-based interventions and their users

Game-based interventions use elements from video games to achieve health aims and are actively researched for depression [2]. They include gamified interventions and serious games [42]. The latter often resemble commercial games [43, 44] and are correspondingly divisible into genres [45–47]. Game-based interventions have a dual-fold objective: to be engaging—entertaining, motivating, and interesting—and effective in reducing the symptoms of the targeted clinical indication. Thus, game-based interventions aim to combine *game value* with *therapeutic value* [48]. However, few studies have offered insight into the relationship between the two factors. One study categorized players into four clusters: players of most genres, single-player games, FPS/action games, and casual games [49]. People suffering from depression could belong to any of these groups exhibiting variance in their game preferences. Overall, the users of game-based interventions are poorly described and understood in the scholarly literature.

In contrast, the research on commercial video games and their players is more expansive. Playing video games is common: more than 50% of people play video games [50–52]. Digital games are popular entertainment, especially for younger generations, the average weekly hours played dwindles as a function of age [52].

The most popular gaming platforms are mobile, PC, and game consoles [50, 51]. In addition to the platform, video games are divided into genres that reflect substantial differences in what the players enjoy doing [53, 54]. By the uses and gratifications approach [55], people actively use media to fulfill their needs, and genres help do that.

Research questions

Our research seeks to fill a significant knowledge gap in the digital health literature: to whom do game-based interventions appeal? To answer this question, we studied adults who have expressed their interest by participating in an RCT investigating the effectiveness of a new gDMHI for MDD, *Meliora*. We focused on two domains: the experienced clinical need the intervention seeks to alleviate and the game-based medium through which the intervention is delivered. This led to two specific research questions:

1. What kinds of mental health backgrounds do participants interested in game-based interventions have?
2. What kinds of video game experiences do participants interested in game-based interventions have?

We defined "mental health background" as the participants' account of their symptomatology, disorders, and treatment history. "Video game experiences" were defined as the subjective account of one's history with gaming, including different gaming platforms, game genres, and reasons for playing.

Methods

Research design

Our mixed methods study included mixed data collection and sequential mixed data analysis [56]. The interview data were analyzed inductively, and the analysis guided the "questions asked" from the questionnaire data [57]. Thus, the two datasets complemented each other: the questionnaire gave perspective to the qualitative findings without claiming full commensurability [56]. This research was a substudy of a randomized, double-blinded, comparator-controlled clinical trial studying the effects of a game-based digital mental health intervention on MDD. The study received approval from the Helsinki University Hospital (HUS) research ethics committee (HUS/3043/2021) and the Finnish Medicines Agency Fimea (FIMEA/2022/002976), and the study conforms with the Declaration of Helsinki. The clinical trial was registered on ClinicalTrials.gov (NCT05426265) on 21/06/2022 [58], and the present substudy has been pre-registered in OSF.io (9q2kx) on 10/10/2022 [59].

Participant recruitment and evaluation

The participants were recruited in Finland through partner organizations, including HUS Psychiatry and Turku University Hospital, and online platforms such as Facebook and email recruitment letters. Following the recruitment link, the participants were guided to a website landing page (Fig. 2). Proceeding further, the possible participant was provided with comprehensive information about the study. The study inclusion criteria were as follows: being 18–65 years of age, having depression, having treatment contact, having sufficient eyesight,
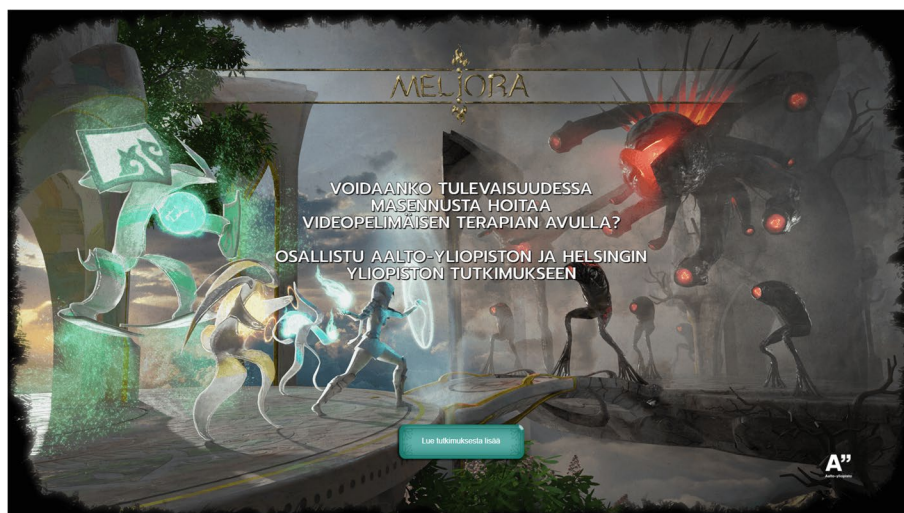

Fig. 2 The website landing page creates the first impression of the intervention. The landing page communicates the aim of the study and allows a first glance at intervention aesthetics. The translation of the text: "Meliora. Can depression be treated with a video game like therapy in the future? Participate in a study by Aalto University and Helsinki University. Read more about the study."

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having a suitable personal computer, and having an email address and a phone number for study-related communication. The exclusion criteria were suicidality; addiction to digital games; psychotic disorders; pregnancy; nursing; inability to consent; being an inmate or forensic patient; and having neurological disorders (Additional file 1). All participants signed the informed consent form digitally. The study data focus on a period between the start of the study in July 2022 and the end of January 2023. During this time, 716 participants signed up for the study.

For context, Finnish mental health services consist of numerous actors that range from primary and secondary healthcare to social services. Mental health services are primarily organized publicly in health centers and psychiatry clinics in outpatient setting [60–62]. Digital self-help materials and prescription digital therapies are nationally available [63]. Mandatory private occupational healthcare provides short-term psychological support to the employed population. For long-term psychosocial support, psychotherapy can be reimbursed for up to three years, and it is offered by private psychotherapists [64]. A range of third-sector actors offer, for instance, peer support through local associations [65]. Rehabilitative work is a legislation-defined service that aims to improve the patient's well-being and capacity to be employed [66]. Support people, provided by social services, are trained adults who support children, youth, young adults, and families in everyday life [67].

After digitally indicating their interest and consent to participate in the study, the participants were contacted by a clinical subject coordinator (CSC), including the second and third authors. The CSC evaluated whether the participant met the inclusion criteria through a phone interview. MDD diagnosis was assessed with the Mini-International Neuropsychiatric Interview [68] module A, Major Depressive Disorder, (a Finnish translation 6.0.0.). The most common exclusion reasons were not fulfilling the MDD diagnostic criteria ($n=63$; 75%), not having mental health care contact ($n=6$; 7%), not having sufficient language skills ($n=4$; 5%), and not having a suitable computer ($n=4$; 5%). After the interview and initial online questionnaires, the CSC accepted eligible participants for the study. The 24-week intervention study commenced with the participants randomized into one of three groups (Fig. 3). Two participants withdrew from the study, and wanted their data to be excluded.

Interview data and analysis

To be eligible for the interview, the participant had to have explicitly indicated their interest in participating in the interview study during the sign-up process and had to have interacted with either the active device or comparator for at least one hour. A random sample of 20

participants who met these criteria was drawn from the interview database in October 2023 and contacted via email. If they did not respond, a follow-up email was sent one week after the first email. Most participants ($N=16$; 80%) responded and were interviewed. After nine interviews, it was found that the interviewees had played *Meliora* substantially: on average, for 19.2 h (SD = 13.6 h; range 1.2–45.2 h) during a period of 47.2 days (SD = 20.4 d; range 14–67 d). To avoid biasing the sample to include the most compliant and engaged participants, we drew a third sample randomly from those who had played the game for more than 45 min but less than five hours. Ten further participants were contacted, of whom five (50%) responded and were interviewed. In addition, one interviewee indicated their interest directly to the CSCs and was contacted and interviewed. This led to a sample of 22 (71%) interviewees from the 31 participants contacted.

The first author conducted the semi-structured interviews remotely in Finnish via Zoom software between October and November 2022 using an interview guide (Additional file 2). He is a licensed clinical psychologist and a game designer. The interviewer was blind to the interviewee group and conscious of not affecting blinding. The interviews were recorded with explicit verbal consent from the interviewee. The interviews were, on average, 48 min (range 30–68 min), totaling 17.5 h. This study focused on the first part of the interview: the participants' background, comprising, on average, 49% of the interview (range 31–66%). After each interview, an analytic memo was written to facilitate preliminary data sensemaking [69]. The interviewer found that the data started to accumulate repeating content ("saturate") after some 12–15 interviews but decided not to cancel the participation of any invited interviewees for potential findings. The interview and questionnaire sample demographics are described in Table 1.

Our inductive analytical approach adopts a six-phase thematic analysis process [71], with less weight on the reflexive element due to our semi-positivistic epistemology. The first (interviewing) author transcribed the data and became intimately familiar with the participants' accounts, removing their identifying information and using number identifiers thereafter. Then, the first author analyzed the dataset in ATLAS.ti 22 software (ATLAS.ti GmbH), focusing on the research questions and emphasizing a descriptive (semantic) over interpretive approach. This produced 701 individual codes. Higher-order themes were iteratively searched, reviewed, and defined through the process, providing a first version. Then, the interview data were examined to ensure that the themes captured the variance in participant experience, represented the whole dataset, and were distinct and internally coherent. To further facilitate the analysis,
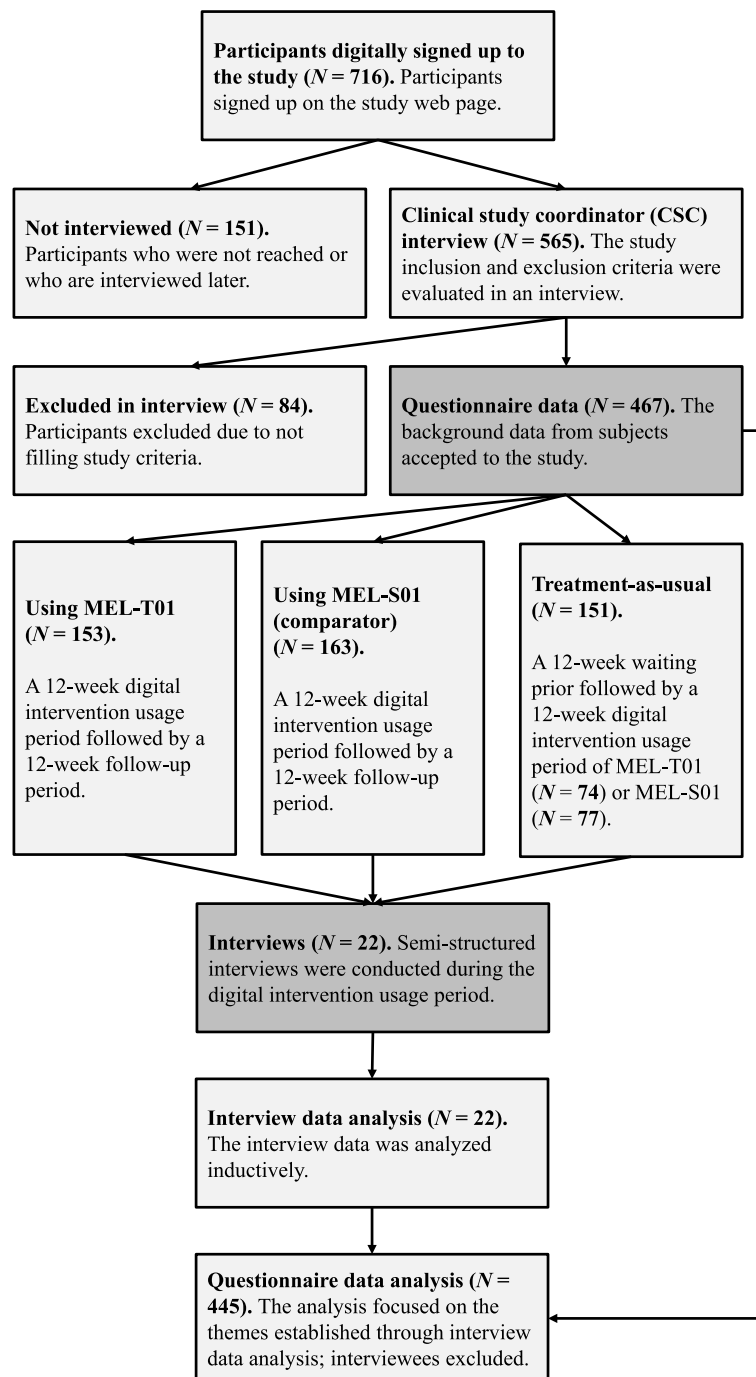
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                        ┌─────────────────────────────┐
                        │ Participants digitally signed up to │
                        │ the study (N = 716). Participants   │
                        │ signed up on the study web page.    │
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Fig. 3 The participant flow in the sequential mixed methods research. The clinical subject coordinators (CSCs) confirmed that the participants (*N* = 467) met the study inclusion criteria. Then, a sample of participants (*N* = 22) were interviewed, and the remaining participants' questionnaire data (*N* = 445) were analyzed

the first and fourth authors met several times to reflect on and refine the categories. The analysis yielded four themes, each with 2–3 subthemes, which described the participants' symptoms, treatments, gaming, and the link between video games and mental health.

The questionnaire data and analysis

After the interview data analysis, the pre-collected questionnaire data were drawn from the research database, including all participants accepted to the study between the 11th of July 2022 and the 31st of January 2023 (*N* = 445,

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Table 1 Demographics of the study participants (*N* = 467). The sequential mixed methods study comprises an interview sample (*N* = 22) and a questionnaire sample (*N* = 445)

Variable	Interview sample (*N* = 22)		Questionnaire sample (*N* = 445)	
	N	%	N	%
Gender				
Female	17	77	255	57.3
Male	5	22	152	34.2
Other	0	0	24	5.4
Trans	0	0	7	1.6
Missing	0	0	7	1.6
Age				
18–29	7	32	189	42.5
30–39	12	55	149	33.5
40–49	2	9	72	16.2
50–65	1	5	34	7.6
Missing	0	0	1	0.2
Highest education				
Primary education (9y)	0	0	39	8.8
Secondary education (12y)	16	73	263	59.1
Bachelor's	5	23	84	18.9
Master's	1	5	51	11.5
Licentiate or Doctorate	0	0	8	1.8
Life status				
Student	8	36	128	28.8
Short or long-term sick leave	5	23	110	24.7
Full-time working	4	18	87	19.6
Part-time working	0	0	47	10.6
Unemployed	3	14	40	9.0
Retired	2	9	32	7.2
Parental leave	0	0	1	0.2
Relationship status				
Relationship or married	16	72	253	56.8
No relationship	5	27	157	35.3
Other	1	5	24	5.4
Missing	0	0	11	2.5
PHQ-9 [70][a]	Average 15.2 (SD = 4.0)		Average 15.7 (SD = 4.8)	
Hours of digital games played per week	12.0 (SD = 8.7)		13.0 (SD = 12.6)	

[a] A higher PHQ-9 score indicates more severe depressive symptoms and a score of 15–19 indicates "moderately severe" depression [70]

interviewed participants were excluded). The interview and questionnaire samples appeared similar regarding background variables (Table 1). The four themes established through the interview data analysis were considered against the background questionnaire (Additional file 3) consisting of three domains: demographics, self-indicated mental health status, and measures of gaming behavior that converge partially with the Finnish Player Barometer [72]. Not all themes that emerged from participant interviews could be addressed through the background questionnaire data, such as the onset of mental

health symptoms, prior treatment history, and which symptoms the participants aimed to alleviate by playing entertainment video games. The approach to the statistical analysis was descriptive, offering quantification that complements the qualitative analysis of the interview data. The questionnaire data were analyzed using Excel software (Microsoft) and focused on the following questions:

- Which psychiatric comorbidities did the participants self-indicate, and what were their prevalence?

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- What treatments did the participants participate in?
- Which video games did the participants play, and on which platforms?
- What positive and negative effects did the participants find playing video games had on them?

Results

Interview data results

The participants had an extensive history of depression and other debilitating psychiatric symptoms and disorders. Their symptomatology was enduring and varied substantially. Almost all had been offered psychiatric medication and therapeutic contact, and those with more severe symptoms often received a spectrum of additional therapies. The participants had prior experience with video games; many considered gaming their hobby, while others played more casually. Many used gaming to manage their symptoms and reflected on the distinction between healthy escapism and unhealthy avoidance (Fig. 4). Two interview-data based case vignettes further illustrate the four themes (Additional file 4). The quotes were translated into English and referenced with the interviewee number and transcription paragraph (e.g., #5:30).

Theme 1: enduring and diverse psychiatric symptomatology

The participants had experienced challenges with their mental health for numerous years, often over a decade. A considerable majority described that their symptoms had started already in their teens, or latest, in their early adulthood, before the age of 25. One participant explained: *"I have suffered from mental health issues probably my whole life"* (#5:30). Only three participants indicated that their symptoms began later in adulthood. Since starting, the symptoms had been present intermittently or continuously. One participant reflected on her over 20-year history with depression: *"This depression, or the predisposition to it, has never completely gone away."* (#21:46). These psychiatric problems and challenges in mental well-being had considerably influenced the participants' lives.

There was substantial variance in the participants' clinical phenotypes and treatment needs. The participants' challenges included, for instance, painful loneliness, challenges integrating into society, shame, and emotional volatility. In psychiatric terms, the participants' depressive symptoms—typically a lack of energy, anhedonia, low mood, and self-criticism—were comorbid with a breadth of (neuro)psychiatric disorders. The most common symptom mentioned was anxiety. *"I get anxious easily and intensively. For me, anxiousness and depression go hand in hand,"* explained one participant (#10:26).
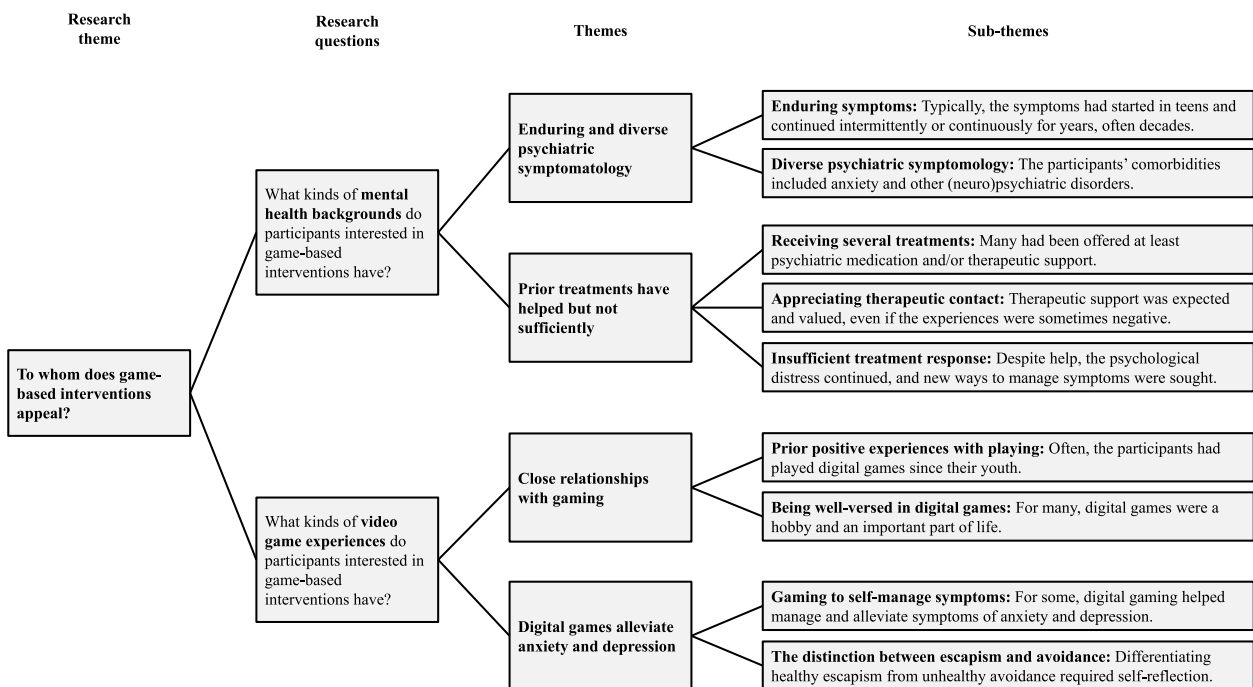

Fig. 4 The inductive analysis of interview data (*N* = 22). The analysis established four themes that answer the two research questions. The subthemes described each theme in detail

In addition, the participants' mentioned comorbidities included ADHD, autism spectrum disorders, bipolar disorder, burnout, borderline personality disorder, eating disorders, learning difficulties, obsessive–compulsive disorders, other personality disorders, panic attacks, postpartum depression, psychological trauma, and Tourette syndrome.

Theme 2: prior treatments have helped but not sufficiently

Many participants had repeatedly sought help over the years and participated in various treatments, which had been insufficient in fully addressing their distress. Usually, the participants had been offered at least psychiatric medication and/or therapeutic contact, including longer psychotherapy. Practically all participants had received more than one type of treatment, indicating the self-perceived need for alleviating symptoms. Participants whose symptoms were more severe and diverse received more expansive therapies. For instance, the treatments of a participant who suffered from depression and borderline personality disorder (BPD) included psychiatric medication, extensive psychotherapy, dialectical behavior therapy, electroconvulsive therapy, and hospitalizations.

Most of the participants sought and appreciated interpersonal therapeutic contact and psychotherapy. Extensive psychotherapy supported them through difficult times, helped them make sense of their symptoms, allowed the verbalization of feelings, and provided insight into negative thinking patterns. However, despite years of therapy, participants continued to have symptoms that impaired them. One participant, for instance, explained how therapy had helped them repair their self-esteem but did not remove their existential depression:*"Now I know that I can [perform at my studies], but I still don't know why I should."* (#11:74). While therapy was considered beneficial, it also appeared insufficient and was associated with negative experiences including challenges in finding a therapist; not considering the therapist or their approach helpful; and regarding the extent of therapy inadequate. One participant had tried to participate in therapy four times but always quit because of the anxiety it induced. Medication, likewise, divided opinions. Many had a positive response to them; others did not, had a partial response, or experienced side effects. One participant was against medication on principle.

Many participants complemented the healthcare-offered services with other activities. Some studied mental health or joined patient associations, but more exceptional means were also used. One participant explained that they had found help from yoga and psychedelics. Digital tools and interventions were likewise used, with modest benefits. Mental health apps were used to track and manage symptoms and to gain encouragement. However, many found it challenging to maintain their usage over time. Some failed to find online courses and digital interventions interesting to begin with; others received some benefits from them. Interestingly, several participants considered that they already mastered the digital intervention content, at least on a cognitive level, because they had spent years reflecting on themselves in different therapies and were well-read on mental health. For them, digital materials were *"elementary"* (#12:92) and did not offer anything new.

Generally, the participants had gained some benefits, coping methods, and insights from prior treatments but not full recovery (as indicated by the fact that they fulfilled the study inclusion criteria). Some had a pragmatic mindset to the study and wished to gain at least some help from it while contributing to science. Others appeared almost desperate to find help: *"Every stone must be turned"* (#3:34), and *"There is nothing left to lose"* (#5:100), they described.

Theme 3: close relationships with gaming

Nearly all participants had prior positive experiences with video games, and many were drawn to the study specifically due to its game-based nature. Many had started playing video games in their youth and considered that gaming had turned into a long-term hobby over the years. Others found that their playing had recently dwindled due to external reasons, such as family responsibilities, which limited their opportunities for recreation. Only one participant did not play digital games at all.

The majority of participants valued gaming as a dear hobby. They played video games frequently, often almost every day. One participant explained: *"My playing is pretty versatile. I play all sorts of games from role-playing to action games and shooters. I have a gaming PC, PlayStation 4, and Switch."* (#9:46). Gaming formed an integral part of their life, and for some, it was even an identity question: *"I am, in quotes, a gamer"* described one participant (#18:102). Playing offered them significant experiences: an outlet for creative expression, aesthetic pleasure, a way to spend time with family and friends, and feelings of competence: *"When you finally get the diamond-level kill, the feeling of success is awesome."* (#20:122). The pervasiveness of playing was also indicated by it extending outside the digital to board games as well as tabletop and (live-action) role-playing games.

The experiences of hobbyists contrasted with casual players in whose lives video games played a lesser role. *"I started playing Ingress with my ex-boyfriend, and we occasionally played together,"* (#2:85) reflected one participant. *"I play when I don't have anything else to do. Sometimes I get cravings to play Minesweeper,"* (#10:159) considered another. For the more casual players, playing

was one way to spend time among others, and their playing was often driven by social circumstances. However, for most participants, gaming was a long-term, integral part of life.

Theme 4: digital games alleviate anxiety and depression

Many participants used video games not only as a means to relax but also as a method for coping and self-management of symptoms. Gaming can help break free of repetitive, ruminating thoughts, and be *"a way to reset the day,"* described one participant (#17:113). It could also help control anxiety attacks: *"It is a coping mechanism for me. I focus my attention and thoughts on something other than the situation. I have used this for a very long time. Previously, I read a lot. Today, it is mostly playing,"* reflected one participant (#16:208). Gaming also offered some safe space without bullying. In this sense, the participants' escapism fostered a sense of control over their environment, where gaming provided them with *"comfort"* (#9:102) and *"a safe haven"* (#18:141). Thus, video games were not something that happened to the player but activities they used for creating meaningful and helpful experiences.

The participants experienced a relationship between their playing and their psychiatric symptoms. Losing interest in gaming could indicate depression: depressive apathy lowered the participants' interest in their hobby. On the other hand, playing may also alleviate depression. Some participants described that video games were among the few things that motivated them and gave them enjoyment even when they were feeling down. One player found that when their well-being plummeted, playing Candy Crush was the only thing they could do—until they felt better. Another player described that playing helped them fight depression: *"Stereotypically, people tend to think that depression is caused by playing. For me, it has been the opposite. It is something meaningful to do when nothing else is; it has brought me some joy."* (#13:122) Thus, playing was self-associated with mental health benefits; some even explicitly called it *"therapy"* (#20:94).

However, the immersive power of games can also lead to problems, and some participants reflected on the fine line between healthy escapism and unhealthy avoidance. Some sought to distinguish the two by noticing when they played. Playing became avoidance when it occurred on time allocated for work and other responsibilities, whereas hobby gaming took place during free time. Others found that they discerned the two from their motivation to play. Playing was avoidance when its emotional aim was to escape negative feelings and problems, whereas healthy escapism gave a breather from the issues and energy to process them. However, the distinction was not always easy to make as the motivations became intertwined, such as for one participant who noticed that gaming reduced anxiety and not-playing increased it. They actively reflected on the topic in therapy to better understand their coping mechanisms. In general, understanding the functions that playing served required insight into one's thoughts, emotions, and motivations.

Questionnaire data results

The questionnaire data expanded and quantified the themes established through the interview data: psychiatric comorbidity, treatments, digital gaming, and the relationship between mental health and video games.

Theme 1: psychiatric comorbidity was common

The participants commonly suffered from other mental disorders alongside MDD. Using a list of common psychiatric disorders, the participants indicated that they had been diagnosed with, on average, 1.3 other disorders in addition to depression (Fig. 5). The variance in the participant disorder profiles was also exhibited by 67 comorbidity combinations, of which 15 were present in five cases or more. The three most common were depression with anxiety disorder (AD) ($N=82$; 18.4%); depression with AD and social anxiety (SA) ($N=26$; 5.8%); and depression with AD and ADHD ($N=15$; 3.4%). The participants could also indicate other disorders in an open field where the most common mentions were post-traumatic stress disorder (PTSD) and obsessive–compulsive disorder (OCD). In contrast to the common psychiatric comorbidity, 141 (31.7%) participants indicated none of the listed disorders, and also considering the open-field answers, 121 (27.2%) participants stated no psychiatric comorbidities.

Theme 2: the participants received a range of treatments

The participants received or participated in a range of treatments. Their treatment contacts included public sector psychiatry clinics ($N=176$; 39.6%), occupational health ($N=112$; 25.2%), private sector, such as psychotherapists ($N=79$; 17.8%), student healthcare ($N=79$; 17.8%), substance abuse clinic ($N=51$; 11.5%), and third sector ($N=10$; 2.2%). The participants could choose multiple treatment contacts. Most participants ($N=359$, 80.7%) had therapeutic support contact: either supportive conversations with a mental health professional ($N=252$; 56.6%) or long-term psychotherapy ($N=146$; 32.8%). Medication was often combined with therapeutic support (Fig. 6). Most participants ($N=238$; 53.5%) took SSRI, SNRI, a tricyclic antidepressant, or Vortioxetine medication. Many participants also engaged in other forms of rehabilitation, treatment, and self-help,
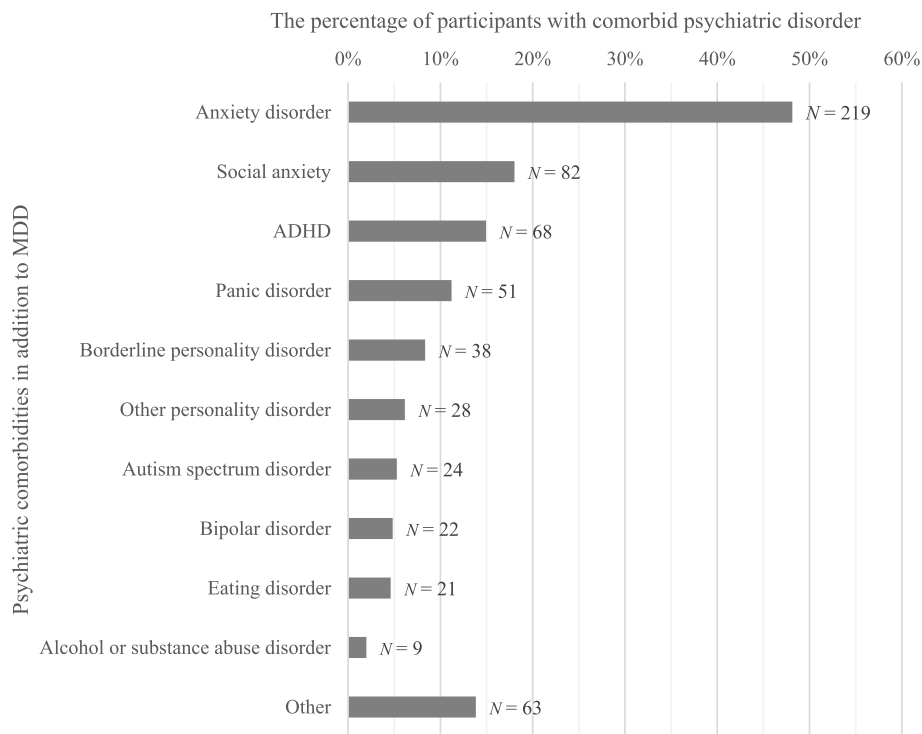
The percentage of participants with comorbid psychiatric disorder

Fig. 5 Participants interested in a game-based intervention and suffering from MDD (*N*=445) were often diagnosed with other psychiatric disorders. The category "other" included answers to an open question
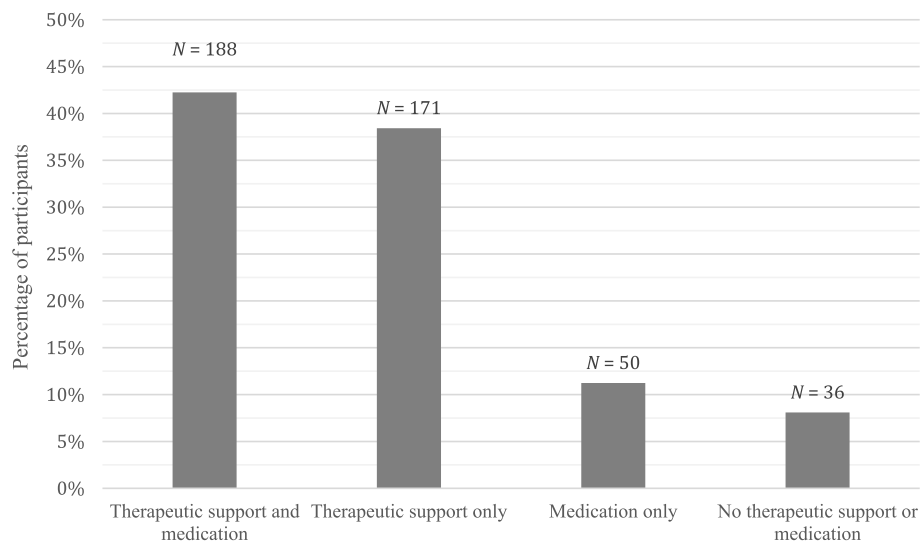
Fig. 6 Participation in other modes of therapy does not exclude interest in a game-based intervention. Those interested in game-based interventions (*N*=445) often received therapeutic support, medication, or both

including exercise (*N*=169; 38.0%), mindfulness (*N*=77; 17.3%), occupational therapy (*N*=18; 4.0%), light therapy (*N*=17; 3.8%), rehabilitative work (*N*=17, 3.8%), and meetings with a support person (*N*=16; 3.6%).

Theme 3: active gaming on different platforms and genres
The participants were active video game players. Here, we define "active" as a daily or weekly activity. On average, the participants played video games weekly for

13.0 h (SD = 12.6 h; range 0–60 h). However, the playtime differences were considerable. A tenth of the participants did not play digital games at all (*N* = 51; 11.5%), and many played 1–10 h (*N* = 206; 46.3%), 11–20 h (*N* = 104, 23.4%), or more than 21 h a week (*N* = 84, 18.9%). The most popular gaming platforms were mobile, PC, and game consoles (Fig. 7). Many participants actively played games in several genres (avg = 2.3, SD = 1.9) on more than one platform (avg = 1.6, SD = 1.0). The variance in participants' playing preferences was also reflected in the games and game series played. A majority (*N* = 397, 89.2%) mentioned the game they had played the most in the last month. They comprised 210 different games and game series, the most popular of them being *The Sims* (*N* = 19, 4.3%), *Pokémon* (*N* = 15, 3.4%), *Overwatch* (*N* = 14, 3.1%), *Genshin Impact* (*N* = 12, 2.7%), *Solitaire* (*N* = 9, 2.0%), *League of Legends* (*N* = 9, 2.0%), *Stardew Valley* (*N* = 7,

1.6%), *Candy Crush* (*N* = 7, 1.6%), and *World of Warcraft* (*N* = 7, 1.6%).

Theme 4: games helped participants feel better

Most participants endorsed that playing digital games helped them ease negative feelings [in Finnish: "helpottaa pahaa oloa"] "repeatedly" or "rarely" (*N* = 336; 75.5%). For some participants, gaming was related to harm regarding time usage (*N* = 79; 17.8%), money (*N* = 18; 4.0%), and relationships (*N* = 19; 4.2%), and they had challenges limiting their playtime (*N* = 66; 14.8%). The participant's gaming-related attitudes were favorable. Most participants (*N* = 382, 85.8%) fully or partially agreed with the statement that gaming is beneficial, with only a minority (*N* = 74, 16.6%) agreeing that digital gaming is harmful. The positive experiences and attitudes regarding gaming were understandable, considering that most participants
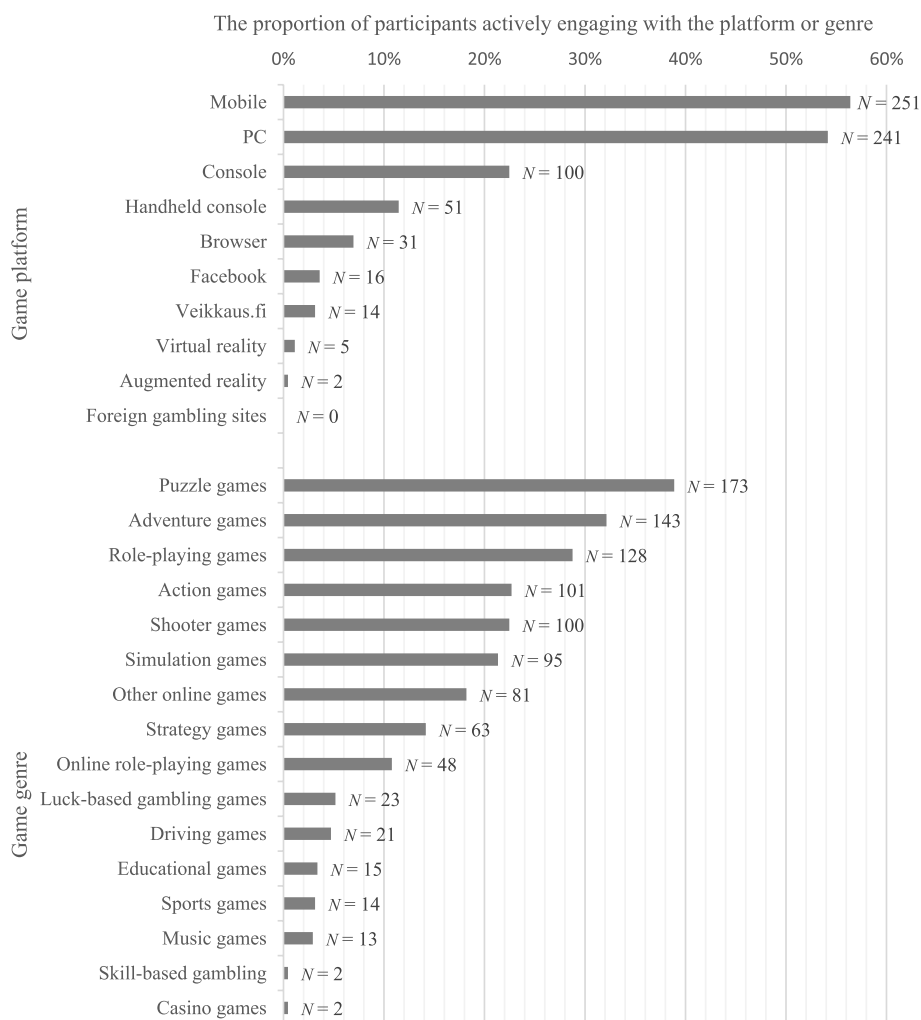

Fig. 7 Those interested in game-based interventions (*N* = 445) actively played digital games in different genres on many game platforms. Here, we defined active as a daily or weekly activity. Veikkaus.fi is the website of a government-owned company that operates all gambling in Finland

were active players and significant gaming-related problems were a study exclusion criterion.

Discussion

Principal findings

Innovations that challenge existing practices may divide opinions and attract a self-selected user group. Our research creates a vital understanding of adults with confirmed MDD interested in a game-based intervention. Our research shows that the intervention appealed to participants with enduring depressive symptoms and diverse psychiatric comorbidities. Most participants were versed in video games and played them actively. For some, there was also an existing link between video games and mental health, as they used gaming to manage and cope with the symptoms of depression and anxiety.

Game-based interventions are attractive across disorders

Generally, users expect digital intervention content to be personalized [73] and relevant to them [74], which is challenged by substantial variance in real-world clinical phenotypes. In our study, most participants (72.8%) indicated one or more comorbid conditions, most frequently anxiety disorders, and also ADHD, BPD, PTSD, and autism spectrum disorders. This finding is aligned with previous studies that have found psychiatric comorbidity common [17, 21, 23, 33]. For instance, Barlow et al. [33] reported that 76% of patients have comorbid disorders in addition to a principal anxiety or mood disorder. From the game-based intervention perspective, our findings indicate that the approach is attractive to people suffering from various disorders and not merely to a limited clinical subpopulation.

The variance in the participants' symptomatology is at odds with disorder-specific interventions and may reduce the relevance and appropriateness of the content [11]. To ensure relevance, there are at least two superficially opposite approaches: personalization and the one-size-fits-all model [75]. It has been suggested that the intervention content may be modularized to increase individualization [11, 76]. In this scenario, those with challenges with sleeping could opt-in to sleep hygiene modules, whereas those with motivation to improve their exercise habits could focus on increasing physical activity, and this approach has also been empirically explored [77]. On the other hand, a shift of focus toward the commonalities between disorders has been suggested [33]. Emotional disorders—including MDD, dysthymia, generalized anxiety disorder (GAD), panic disorder, OCD, social phobia, and PTSD—may have underlying similarities that could be addressed. Transdiagnostic interventions, such as the unified protocol, have shown promise in analog [34] and digital formats [78]. The common coexistence of depressive and anxiety symptoms invites further efforts in designing, developing, and researching interventions that could alleviate both conditions.

Participants have a history of prior treatments

The game-based intervention under examination attracted participants with long-term symptoms, extensive prior treatment history, and who had previously participated in various treatments. In the interview data, no participants showed recent-onset symptoms. This may reflect the early onset of psychiatric symptoms [18] and that those who suffer from their first disorder episode rely on established rather than experimental treatment options. Additionally, noteworthy was the discovery of a subgroup with substantial knowledge of mental health, also called mental health literacy [79]. Earlier, a review found that higher psychological literacy was associated with higher engagement with digital interventions [74]. Our research makes a contrasting finding: participants with high-levels of mental health knowledge prefer advanced materials, which calls for intervention personalization.

Many participants had extensive treatment histories, yet the treatments had been insufficient, which is aligned with previous research [17, 33]. Only 8% of participants had no therapeutic contact or psychiatric medication at the study onset, and the participants looked for new ways to manage and alleviate their symptoms. Thus, rather than a game-based approach reaching new populations through their appealing potential, as has been suggested [80], game-based interventions may augment existing modes of treatment or have the potential to prevent relapse.

Participants are active video game players

Practically all participants had experience in video games, and many were well-versed in them. According to the Finnish Player Barometer 2022 [52], Finns play on average 8.5 h per week, 4.5 h less than our participants. Thus, the intervention particularly attracted those who already played video games, suggesting that participants were selecting the intervention partially based on familiarity. As familiarity and positive attitudes are associated with a proclivity to use, it may be suggested that also other forms of therapy, such as animal-assisted therapy, art therapy, psychodrama, mindfulness, and yoga, may appeal to those with at least somewhat positive personal or second-hand attitudes or experiences with them. However, the trend was not without exceptions: the intervention also attracted a subgroup of participants who did not play video games (13%). Their needs are essential to bear in mind in intervention development, as they may, for instance, need more comprehensive tutorials than

experienced players. Additionally, appealing mainly to existing players does not make the intervention a niche because gaming enjoys broad appeal [50, 51].

Our research points out that game-based interventions appeal to players broadly: the participants played actively, on average, more than two genres ranging from puzzle, shooter, and online role-playing games. The gaming platforms included mobile devices, PCs, and consoles. This finding complements an earlier study, which suggested that depressed participants play games in various genres [49]. Thus, game-based interventions could be delivered in several genres if their execution is sufficiently high quality. In the future, we will examine whether genre preference is associated with intervention engagement and effectiveness.

Using video games as psychiatric self-help
Our research also contributes to the discussion regarding video games' healthy and unhealthy use [81]. Previous research has found that commercial video game playing can help individuals recover from work, relieve stress, allow relaxation [82, 83], and mitigate symptoms of anxiety and depression [84, 85]. Gaming can offer *"a positive distraction"* from excessive ruminative preoccupation with the self, a factor that exacerbates and maintains depressive symptoms [86]. On the other hand, it has been found that an avoidant coping strategy is associated with problematic gaming [87] and that participants may use online games *"as a maladaptive coping strategy for dealing with adverse emotions"* [88]. Thus, playing may also be counterproductive; emotional avoidance that suppresses emotional responses and maintains depressive symptoms [33].

Our research finds that depressed individuals who wish to use a game-based intervention may already actively use video games to manage their psychiatric symptoms. 76% of our participants found that playing helped them feel better, which speaks to the self-perceived value that playing offers to those suffering from mental health challenges. However, not all gaming was motivated by self-help but by recreational aims, and some participants were conscious of the distinction between the two. However, making the separation requires substantial insight into one's emotional processes, which is among the key challenges in depression and associated disorders. This finding suggests that it is important to educate players on, for instance, how digital gaming could be used to work against depressive action tendencies such as passivity and withdrawal [33]. Further research is needed to understand the who, what, and how questions regarding self-help usage of commercial entertainment games and the therapeutic use of designed game-based interventions.

Limitations
The inclusion process and criteria need to be considered when interpreting the study results. All participants fulfilled the MDD diagnostic criteria at the time of inclusion, demonstrating at least moderately severe symptoms, which was likely associated with the finding that participants have enduring symptoms and psychiatric comorbidities. If those whose depressive symptoms were less severe ($N=63$) would not have been excluded, this factor may have been reflected in later onset and shorter duration of symptoms as well as fewer comorbidities. Another inclusion criterion to consider is the requirement for ongoing mental health treatment contact. The question is particularly significant considering whether game-based interventions have the potential to narrow the treatment gap by reaching underserved groups, as has been suggested [80]. However, our study only included participants who had a healthcare treatment contact, which was confirmed in the CSC interview. The study exclusion criteria also included self-indicated gaming addiction, which may have biased the sample toward participants with a healthier relationship with digital games.

The scientific nature of the study and the credibility of university and healthcare institutions may have contributed to the participant's decision to take part in the study. Therefore, the evidence is not directly comparable to the so-called real-world evidence created in competitive commercial media environments. However, the study provides more robust evidence than a mere market study, as the participants exhibited a behavioral commitment to the intervention. It is also worth considering the cultural context. Finnish society, including healthcare, leads the European digital economy and society index [89], and many citizens are familiar with and use digital health solutions [90]. However, a previous comparative study of four countries found little difference in participants' willingness to participate in digital interventions [91] implying that the study's results could apply at least to digitized Western societies.

Conclusion
Our research is founded on the notion that the users partaking in a novel, innovative intervention may be a self-selected group. Moreover, those who are initially attracted to the intervention—the only people who have the potential to benefit from it—may be different from those who end up gaining benefits from its use (Fig. 1). Our study complements the necessary effectiveness-focused research by illuminating the underlying user needs and preferences and how the intervention can serve them.

Using a mixed methods approach, we offered insights into people who indicate interest in using a novel

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game-based mental health intervention. Our research demonstrated that game-based interventions can attract participants with long-term and diverse symptomatology, including those with experience but insufficient response from previous treatments. The intervention appealed to active digital game players and may propose an alternative to self-help through entertainment games. The results encourage a transdiagnostic, user-centered approach to intervention development.

Abbreviations

AD	Anxiety disorder
ADHD	Attention deficit hyperactivity disorder
BPD	Borderline personality disorder
CSC	Clinical subject coordinator
DMHI	Digital mental health intervention
DSM-5-TR	The diagnostic and statistical manual of mental disorders text revision
GAD	Generalized anxiety disorder
GDMHI	Game-based digital mental health intervention
HUS	Helsinki University Hospital
MDD	Major depressive disorder
OCD	Obsessive-compulsive disorder
PD	Panic disorder
PHQ-9	Patient health questionnaire
PTSD	Post-traumatic stress disorder
RCT	Randomized controlled trial
SA	Social anxiety
TAU	Treatment as usual

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s44247-023-00037-w.

Additional file 1. Study participation criteria.

Additional file 2. Interview guide.

Additional file 3. Background questionnaire.

Additional file 4. Case vignettes.

Authors' contributions
The contributions are listed using the CRediT statement by Allen, O'Connell, and Kiermer [92]. LL: Conceptualization, methodology, investigation, writing – original draft, writing – review and editing, visualization, project administration. AS: Investigation, data curation, software. MV: Investigation, writing – review and editing. VMK: Writing – review and editing, supervision. SP: Supervision, writing – review and editing. JMP: Funding acquisition, supervision, writing – review and editing. All authors reviewed the manuscript.

Availability of data and materials
The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
The study received approval from the Helsinki University Hospital (HUS) research ethics committee (HUS/3043/2021) and the Finnish Medicines Agency Fimea (FIMEA/2022/002976), and the study conforms with the Declaration of Helsinki. Informed consent was obtained from all subjects.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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