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What do adults living with obesity want from a chatbot for physical activity? – a qualitative study

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Abstract

Background Regular physical activity helps to reduce weight and improve the general well-being of individuals living with obesity. Chatbots have shown the potential to increase physical activity among their users. We aimed to explore the preferences of individuals living with obesity for the features and functionalities of a modern chatbot based on social media, Artificial intelligence (AI) and other recent and relevant technologies.

Methods In this study, we used qualitative methods. Focusing on individuals' preferences for a chatbot to increase physical activity, we conducted both individual interviews and focus groups with nine adult patients staying at Evjeklinikken, a Norwegian rehabilitation clinic for individuals living with morbid obesity. The interviews were fully transcribed and then analysed inductively using thematic analysis.

Results Participants preferred motivational features such as social support, goal setting, physical activity illustrations, monitoring of physical activity behaviour and outcomes, and feedback, prompts and reminders. They also preferred features for connecting and synchronising with smartwatches and training device apps. Participants wanted a chatbot that is easy to use and allows for human assistance when needed. Regarding personalising the chatbot, the participants wanted to choose the language, number of messages, and turn functionalities on and off.

Conclusions Co-designing chatbots with potential users is essential to understand their specific needs and preferences. We gained valuable insight into a diverse set of features and functionalities relevant to designing physical activity chatbots for individuals living with obesity. Behaviour change techniques are equally important as personalisation features and the option for synchronising with third-party devices. In future work, we will consider the collected needs in the development of a physical activity chatbot to ensure acceptance and adherence to the digital health intervention.

Keywords Chatbot, Social media, Physical activity, Obesity, Behaviour change, Interview, Focus group

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Background

Millions of premature deaths globally can be attributed to obesity [1]. In addition to being a major health problem worldwide, obesity is a risk factor for most chronic and life-threatening conditions such as diabetes, cardiovascular disease, and cancer [1, 2]. Obesity is caused by or associated with one or more of the following: environmental, sociocultural, physiological, medical, behavioural, genetic, and epigenetic factors [3–6]. The prevalence of obesity is high among the global population and has tripled in some European countries over the last four decades [7]. In 2019, about 14% of Norwegian adults were defined as obese [8], and the prevalence of obesity is expected to continue increasing, leading to dire health and economic consequences [9]. According to the World Health Organization, the recent increase in obesity is primarily associated with increased consumption of high-fat and -sugar foods and increasing physical inactivity and sedentary lifestyle [2]. However, evidence suggests that healthy lifestyle behaviours, including physical activity, significantly prevent excessive weight gain [3–6], particularly in instances when obesity is a result of behavioural factors.

Medically, various treatment options exist for obesity that focus on weight loss and maintaining a healthy body weight over time. A combination of dietary changes, physical activity, and behaviour therapy is considered one of the most effective ways of managing obesity [3, 6, 10, 11]. Regular physical activity has both mental and physical benefits for individuals of all ages and health conditions [12]. The physical activity recommendation for adults is at least 150 min of moderate or 75 min of vigorous physical activity per week to achieve health benefits [13]. For the purposes of weight loss, adults are advised to engage in 200 to 300 min of moderate to vigorous physical activity per week [10, 13–15].

Previous research has shown that regular physical activity effectively manages and treats obesity in terms of weight loss [4, 6, 10, 11, 15]. Even though regular physical activity helps reduce weight and improves one's general well-being [6, 16], it still proves challenging for the adult population, including individuals living with obesity, to engage in physical activity [6] and maintain weight loss in the long term [3]. A study conducted among Norwegian adults who participated in a three-month behaviour change intervention at a healthy life centre showed decreased physical activity 12 months after the intervention [17]. Evidently, in unsupervised settings like at home, adherence to physical activity interventions is often poor [6, 18, 19].

Digital technologies have the potential to support engaging in and adhering to regular physical activity. The vast body of evidence on digital physical activity interventions shows that they can increase physical activity in adults [20–25]. In recent times, chatbots have emerged as digital intervention tools for promoting healthy lifestyles and encouraging behavioural change, including increasing physical activity [26–33]. A chatbot is a computer program designed to simulate human conversations. Chatbots have been developed to help individuals prevent or manage obesity, specifically weight loss [34–36]. Several studies have shown the potential or effectiveness of chatbots in increasing physical activity among their users [26, 27, 32, 33]. However, a convincing human-like connection seems to pose one of the main challenges to developing, implementing, and adopting chatbots [35].

The features and functionalities of chatbots could significantly influence their adoption as digital interventions. Chatbots mimic human interactions and could, therefore, portray a human-to-human interaction. Chew [35] identified the human appearance of chatbots as a factor that improves user engagement. Furthermore, studies that enabled chatbot conversations across devices and multiple platforms, including social media, increased user engagement [35]. Chatbot-user interactions have been described as more interactive, with features like emojis that mimic human emotions, stickers, and graphics interchange format (GIFs) [35, 36].

Although research on chatbots is increasing, there is little knowledge on including more advanced elements like social media, sensors and AI in chatbots to increase physical activity among individuals living with obesity. Innovative ways of encouraging adults, including those living with obesity, are needed to increase physical activity globally. A more advanced chatbot can leverage existing and familiar technologies such as smartphones, sensors, social media platforms, and the internet for physical activity. Furthermore, new advances in chatbot technology like ChatGPT can be applied to enhance user experience with such an intervention. The current study is part of a project to develop and test a chatbot for increasing physical activity in the above-mentioned population group. To maximize the development of the physical activity chatbot and future adoption, acceptance and sustained engagement with it, we have already involved and plan to involve more individuals living with obesity in the design and development of the intervention. Involving future users in the development of digital health interventions has been shown to generate interest and increase user engagement [29].

This study aimed to explore individuals living with obesity's preferences for the features and functionalities of a physical activity chatbot.

Methods

Study setting

The study was conducted at Evjeklinikken, an inpatient rehabilitation clinic in Norway specialised in treating morbidly obese individuals who are suffering from or at risk of comorbidity. Evjeklinikken is a part of the specialist healthcare services that attends mainly to patients from the South-Eastern Norway Regional Health Authority but is available to patients from all over Norway. Patients are first referred to a regional obesity outpatient clinic by their general practitioners. Then, they can be referred further to Evjeklinikken if they are motivated to make a lifestyle change but have not achieved the treatment goals with support from the primary health services. The treatment at Evjeklinikken focuses on providing individuals with knowledge, empowering them to foster new habits and create lasting change to improve their health.

Stays at the clinic

As of 2022, Evjeklinikken's standardised program includes four stays in the first twelve months; the first stay lasts 27 days, and the rest lasts 20 days. Patients stay home for a period of four weeks in between these stays to gain more knowledge and personal experience. After the fourth stay, patients stay home between 9 and 15 months before a 20-day stay at the clinic for the fifth time. The final stay at Evjeklinikken is a 13-day stay to be completed approximately five years after start-up but can be offered in year three or four based on the patient's preference. At the clinic, patients are grouped based on their current stay status, and they have lessons and perform activities in these groups during their stay. The clinic offers follow-up via telephone or Flowzone – an interactive online solution – between each stay [37].

Study design

Based on a qualitative design, we conducted both individual interviews and focus groups to explore the preferences of individuals with obesity for a physical activity chatbot. The interviews aimed to provide deeper insights into the participants' individual preferences and experiences with physical activity and chatbots. On the other hand, the focus groups aimed to stimulate discussions and reflections on the potential features and functionalities of the chatbot for increasing physical activity that participants consider beneficial on a group level.

Recruitment of participants

All adult patients staying at Evjeklinikken in March 2023 were invited to participate voluntarily in either a semi-structured individual interview, a focus group or both. Posters and brochures with information about the project and contact person were displayed on notice boards and left at strategic locations at the clinic. Two male patients signed up to participate via SMS (short message service). Furthermore, each group of patients was invited to participate in the interviews and focus groups after a presentation of the project at the clinic. Eighteen participants then signed up to participate in the individual interviews and focus groups.

All participants signed written informed consent before they attended the study.

Study participants

Nine patients from different patient groups staying at the clinic participated in the study. Among those staying at the clinic for the first time, one male and two females participated in the study, whereas two males and three females participated among those staying for the second time. Only one person staying at Evjeklinikken for the third time participated in the study. The participants were aged between 32 and 69 years.

Individual interviews were conducted with five patients. Eight patients attended the two focus groups (three in Focus Group 1 and five in Focus Group 2), four of whom participated in the individual interviews. The participants in the individual interviews and focus groups are presented in Table 1.

Data collection

A semi-structured interview guide was developed in this study for each of the two methods: one for the individual interviews (see Supplementary File 1) and one for the focus groups (see Supplementary File 2). The interview guide for the individual interviews was pilot-tested on a 62-year-old female patient at Evjeklinikken [38], and the interview guide for the focus groups was tested on a native Norwegian speaker to ensure the questions were easy to understand. The main topics in the two interview guides were physical activity, social media and chatbots. Additionally, the interview guide for the individual

Table 1 Characteristics of the participants

	Age (years)	Gender	Current clinic stay
Individual Interviews ($n=5$)	33–63	Male ($n=2$) Female ($n=3$)	1st – 3rd
Focus Group 1 ($n=3$)	33–50	Male ($n=1$) Female ($n=2$)	1st
Focus Group 2 ($n=5$)	42–68	Male ($n=2$) Female ($n=3$)	2nd

n number

interviews delved into issues related to participants' everyday activities, while the guide for the focus group was tailored to stimulate group discussions about experiences with technology for health management.

All the interviews and focus groups were done face-to-face in Norwegian at the clinic in March 2023 by DL, who speaks Norwegian as a second language.

Three focus groups were planned for three different groups of patients staying at Evjeklinikken – first, second and third stay – to obtain different experiences with physical activity. However, only two focus groups were carried out with the first- and second-stay patients because only one person showed up for the third focus group.

Focus Group 1 was conducted with three of the six patients staying at the clinic for the first time who signed up and lasted 68 min. Five of the six patients staying at the clinic for the second time who signed up for Focus Group 2 showed up, and the discussions lasted approximately 50 min. After each discussion, one participant in each focus group won a 500 NOK gift card for a beauty or sports shop in a draw.

For the individual interviews, five first-stay, three second-stay, and four third-stay patients signed up to participate. Consequently, five individual interviews were done: one first-stay and three second-stay patients who were also part of Focus Groups 1 and 2, respectively, and one third-stay patient. The individual interviews lasted between 19 and 32 min. One participant among the individual interviewees also won a 500 NOK gift card in a draw. All participants received souvenir bags containing antibacterial wipes, reflective bands, and an ice scraper. All interviews were audio recorded, transcribed verbatim, translated into English, and anonymized prior to analysis.

Analysis

Two authors analysed the transcripts from the individual interviews and the focus groups following an inductive thematic analysis approach [39, 40]. The first author (DL) used NVivo 12 to code the English transcripts, and the second author (RW) analysed the Norwegian transcripts using Microsoft Word.

These two authors first read all the transcripts carefully and thoroughly. Then, they identified and labelled sentences or paragraphs that described participants' preferences for a physical activity chatbot. Afterwards, similar and significant labels or codes from the individual interviews and focus groups were grouped to form subcategories. Although the data on chatbot features and functionalities were analysed together and interpreted as part of the same data material to explore the preferences for the chatbot to be developed, emphasis was placed on the discussions and dynamics in the focus groups that resulted in identifying chatbot features and functionalities acceptable to most participants. In the next phase, these subcategories were merged to develop themes that were discussed with all co-authors.

Ethics

The participants' names are replaced with the initials FI, which stands for focus group informant. For individual interviews, the letter I, which stands for informant and a number are used to represent participants. The data material was depersonalised and securely handled according to the recommendations of the Data Protection Officer at the University Hospital of North Norway.

Results

Study participants reported having limited or no familiarity with chatbots. The chatbots encountered by participants were associated with banking, postal services, the tax office, insurance, and television or internet subscriptions. The majority described their experience as negative, attributing dissatisfaction to the chatbot's perceived robotic demeanour or failure to address their queries adequately. Those who reported positive or neutral experiences were typically referred to a human customer service agent by the chatbot or posed uncomplicated requests.

Based on the analysis of the participants' preferences for a physical activity chatbot, four main themes emerged: 1) Motivation 2) Connectivity 3) User-friendliness and 4) Personalisation. Figure 1 provides an overview of the themes and their sub-themes, which are presented and discussed in detail below.

Motivation

All participants in the study said they would like some kind of social support facilitated through the chatbot, such as connecting with peers physically or digitally. For example, participants in Focus Group 1 highlighted the possibility of doing activities together physically after getting in touch with each other via the chatbot:

> *FI_3: Yes, like, for example, if I travel and I am nearby, I could say, "Hey, FI_2! Do you know about any nice hiking areas?" "Yes, like this and that," Right and then …*
> *FI_1: But I will come with you so we can have some small talk.*

Discussions among Focus Group 2 participants about chatbots ended with one pointing out the chatbot's potential to provide a digital connection in between their clinic stays:

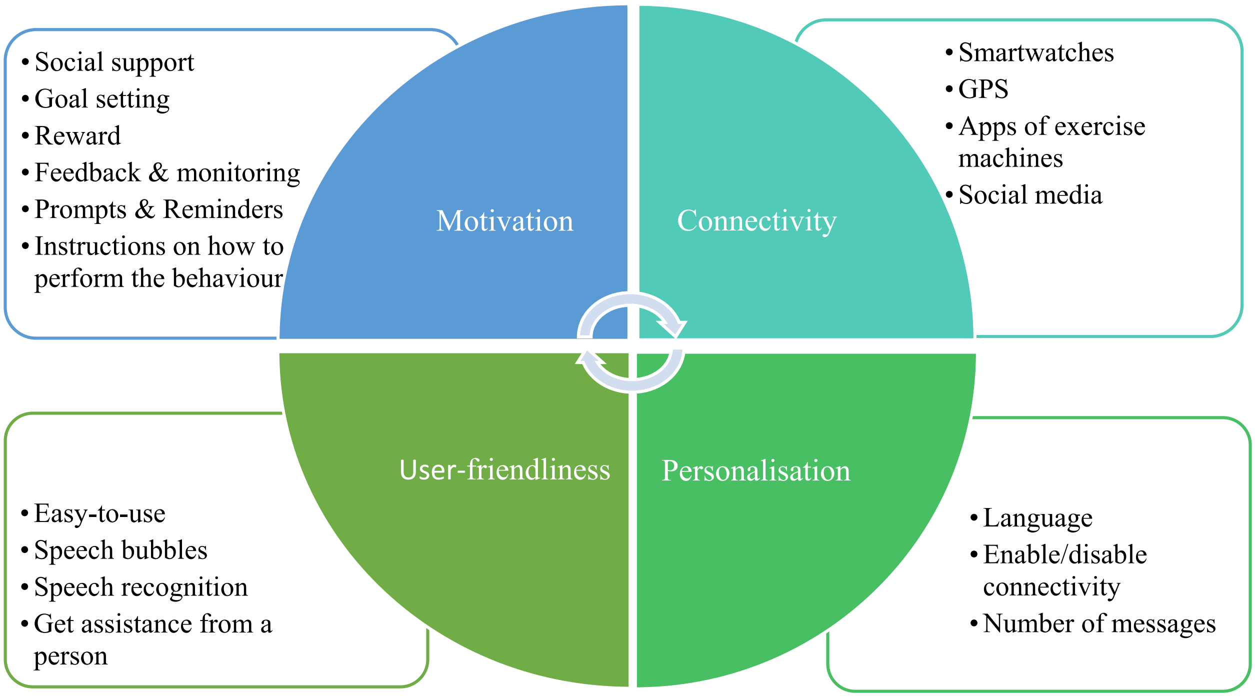

Fig. 1 Identified themes and sub-themes of preferences for a physical activity chatbot

FI_2: But it is like I say, when we will be away from here for seven months before the next stay … the more of us who are connected to the same Facebook group is smart because then we can motivate each other. Just asking how it is going allows us to think, "Oh, darn, maybe I should focus a bit more now! Now, we are going to turn this around. I have not done anything this month," Yes, well, it is a bit like that …

Participants in both individual interviews and focus groups would like the chatbot itself to provide social support in the form of a warm welcome and a human friend. One individual participant said:

I_4: … When one opens it, you meet in a way a chatbot that is … that one feels welcome. And then "Hello! Today …" ehh, maybe not like it starts to dance Jenka (Finnish folk dance), but like "Welcome! What do you want today? Should we exercise!?" and then in a way that doesn't make you feel like you are dragged into the exercising …

During discussions about the appearance of the chatbot, all participants in Focus Group 1 agreed when one person suggested a chatbot with avatar features that evolve as they progress in their weight loss journey:

FI_2: … I want to be able to make my own avatar … Yes. Like for example, make my own body, in my age, like a man … But, if I could have made myself too, I see, for example, when I register data, that the avatar might get smaller or … Like "See what you have managed to do in this time!" "You have gone from this to that".
FI_3: … I really like his idea that you can maybe make your own Avatar in there, for example.
FI_1: Yes, at least that you have the option to do it.

The chatbot's ability to help set goals and plan activities for a specific period was emphasised by all study participants in different forms. For example, one individual interview participant said:

I_4: Yes, like goal. Goal message. Or suggestions for what you can do today, for example … and then also once a week … which goals you can suggest within one week …

Most study participants wanted to receive rewards or points for achieving their goals, as exemplified in this statement by one Focus Group 2 member when summarising her preferences:

FI_3: … And motivation and boost when you have achieved a goal that you have set, that you get one of those because then you can set another one and yes. Like a reward system, maybe.

Feedback and monitoring of one's own behaviour or outcomes also emerged as motivational features that should be included in the chatbot. One of the individual interview participants said:

> *I_2: … So, it could be that ... if you know that there is someone watching you a little, in a way, right? That maybe it could be better. Because in that sense, I also feel that I am motivated up here.*

Another motivational feature mentioned was using prompts and reminders for physical activity. One of the individual interview participant's suggestion was as follows:

> *I_5: … If one has been kind of inactive, that it will say, "Hi, are you alive? Are you there?"*

Several study participants mentioned that it is important that the chatbot suggests texts, illustrations, or videos of how to perform some physical activities. Individual interview participant 3 referred to such motivational features in this way:

> *I_3: Well, yes. Maybe that one adds and shows some exercises, and shows how things can be done, an active every day.*

Identified preferences related to motivation include the chatbot providing social support by connecting users with peers physically or digitally; a human-like friend giving a warm welcome; goal setting and activity planning; rewards for goals achieved; feedback and monitoring of behaviour; and prompts and reminders for physical activity.

Connectivity

All the participants expressed interest in connecting and synchronising the chatbot with other technologies and gadgets. Several participants thought smartwatches were fun and preferred them to be connected with the chatbot. In addition, some participants suggested connecting the chatbot with motion-tracking technologies, such as step counters, Global Positioning System (GPS) receivers, etc. After discussing the features and functionalities of the chatbot, these statements summarise what participants in Focus Group 2 said on the topic:

> *FI_2: … And then I want to have it as a smartwatch with synchronization to an app …*
> *FI_5: And then there are the usual things that I have on my phone, step counter, GPS, distance measurement and …*

Connection and synchronisation with training equipment apps to access data on participants' performed activities was suggested. One individual interviewee said:

> *I_1: … Now it's maybe a bit limited how many, there are a lot of devices on the market. But, like, we have a rowing machine in the gym; it has its own app. But it might have been a bit nice if it could have connected this type of app to it (the chatbot) so that you have a place to log everything. Or that one could have logged it manually as well, for that matter. But an app that collects everything.*

Participants in the study suggested several social media platforms to integrate the physical activity chatbot. Almost all participants were either actively using Facebook or the Messenger app, had them installed, had an active account or, in the case of a 60-year-old participant, thought it would be easier to use.

However, one Focus Group 1 participant expressed scepticism about the chatbot being on social media and suggested an app because, according to her:

> *FI_3: … Yes, but well, Facebook has to have all the information. The same with TikTok, which should have all the information. And who is going to use them? Is Mark Sukkermann (Zuckerberg) going to sit and gnaw on my personal data?*

The issue of privacy and security hardly came up in most of the interviews and focus groups. However, when discussions in Focus Group 1 briefly touched on the topic, participants disagreed on their willingness to share personal and health-related information with apps and other technology:

> *FI_3: Yes, so I am a little careful when it comes to those types of things, but I love using apps to see my progress and those types of things, but I don't want to share ... Once they ask about weight and height and everything like this that is personal, I don't enter that ...*
> *FI_1: Yes, I am not like that because I have a Fitbit. I enter weight, and … I am not that strict about it. I think, "So what if the neighbour down the street knows how much I weigh?" You can see that!*

When explicitly asked about privacy and security-related concerns or preferences for the chatbot, the participant in one of the individual interviews said:

> *I_5: It is not that important to me. I am thinking a little like common sense, but then I also think that … ehh, it is no big deal for me, because if I chose to enter, for example, just my first name, age … I will not write my address and everything like that. I think that it is not a big deal.*

In addition to the chatbot being on social media, some participants thought the chatbot could be a suitable arena to connect and meet as a group. During discussions in Focus Group 1, one participant suggested:

> *FI_1: Yes, yes. But the option to connect together and such, like in Snapchat friends. Right, because then you have a common arena again.*

Connectivity-related preferences include connecting and synchronizing the chatbot with other technologies and gadgets, such as smartwatches, motion-tracking technologies, social media, and apps for training equipment. Security and privacy were also issues discussed among the participants, but their opinions varied.

User-friendliness

A common and emphasized theme was the need for the chatbot to be easy to use to make it accessible to people of all ages. As an example, the following statement was made during one focus group:

> *FI_5: Yes, but it has to be simple to use. *several agree* It has to be very, very simple.*

The participants had different views about how to make the chatbot user-friendly. While in Focus Group 1, the use of speech bubbles was proposed:

> *FI_1: ... I want speech bubbles; I think that is kind of cosy.*

In Focus Group 2, after one participant said writing text messages is a challenge because of his age, the use of speech recognition was recommended:

> *FI_2: Actually, it should have been connected to a microphone function so that you don't need to write yourself, maybe, even though the answer is written. So, if you can speak in and get written answers back. It might ...*

The possibility of getting assistance from a person when the chatbot is unable to be of service to the user was mentioned during the discussions in Focus Group 1:

> *FI_3: Yes, well, we have defects everywhere, so really, both a doctor and an IT person should be hired in there.*

Participants in the study suggested making the chatbot easy to use, enabling speech recognition and providing human assistance to enhance the chatbot's user-friendliness.

Personalisation

Several participants in the study highlighted the importance of being able to personalise some features. They would like the option to choose among languages, for example:

> *I_4: ... the world has become very multilingual. So, English and Norwegian would have been fine. To have both, and then one can choose whether one perhaps can connect to a ... it depends on how far one should take it, but like a translator, for example, Google translator. But yes, connect to something if one is unsure about the use of words. Most people are good at speaking English and Norwegian, but not everyone has necessarily grown up with Norwegian ...*

The possibility to enable and disable connectivity features was also suggested as a personalisation feature for the chatbot:

> *FI_1: Yes, I want the option to have it (location function) on or not. That's what I think. That there is an option to choose.*

In addition to multiple suggestions of the number of messages the chatbot should send, participants in Focus Group 1 suggested choosing among several options:

> *FI_3: ... Also, optional number of messages, everything from 2 to 10. Well, that you get numbers, and you can tick off, for example.*
> *FI_1: Yes. The opportunity to change, yes.*

Suggestions for personalising the chatbot included the ability to choose the language, the number of messages received and the ability to enable and disable connectivity features.

Discussion

Summary of findings

In this qualitative study, we have explored the preferences of individuals living with obesity undergoing treatment at an inpatient rehabilitation clinic regarding the features and functionalities of a physical activity chatbot. The findings showed that four main topics were important to the participants: motivation, connectivity, user-friendliness and personalisation. The participants prefer motivational features such as social support from peers and a friendly human-like chatbot, planning and setting short- and long-term physical activity goals, providing a means to visualise and monitor physical activity behaviour and outcomes, and feedback, prompts and reminders.

Preferred features and functionalities also include connection and synchronisation with smartwatches, training device apps and integration with social media platforms. In addition, participants would prefer a chatbot with features and functionalities that make it easy to use and receive human assistance when needed. Personalisation features such as language choice, number of messages, and turning features on and off were suggested. The study participants also discussed privacy and security issues but had differing opinions on providing their personal and health-related information.

The themes and subthemes identified in this study are interrelated, with the preferred features and functionalities influencing and supporting each other. For example, personalisation features and functionalities could make the chatbot easier to use, as users of all ages can tailor it to their specific needs and preferences.

Motivation, user-friendliness and personalisation

The findings of the current study are consistent with our previous study [41–43], where we found that participants testing the usability of a social media physical activity chatbot prototype preferred the physical activity challenge and goal-setting features of the chatbot [41, 42]. Likewise, in a study of Norwegian adults' design preferences for a social media chatbot, participants preferred the step goal feature [43]. Several studies have documented the effectiveness of goal setting to improve behaviour, including physical activity [3, 20, 23, 34, 35, 44–47]. A chatbot that helps users set a goal and then continuously reminds and encourages them to perform and achieve that goal could be helpful. Especially if users find it difficult to plan, perform and complete physical activities without support.

Social support was a preferred motivational factor of the chatbot for physical activity. Support from friends and other individuals who share a common goal could be a motivating factor for improving one's behaviour. In a study conducted by Simoski et al. [48], most participants expressed a preference for receiving support from a combined approach involving a virtual and real-life fitness coach. Likewise, in our study, despite the participants' existing motivation to adopt lifestyle changes, including physical activity, they expressed a desire for support from the chatbot and their peers.

When peers are not available to provide the necessary support, or security and privacy regulations hinder such interaction, the chatbot could take on this role and motivate users to achieve their goals. This provides the needed social support for users to avoid sedentary behaviour [49]. A study by Figueroa et al. [50], in which participants provided their opinions and knowledge about chatbots before and after testing a prototype, found that participants believed the chatbot was capable of providing support in the absence of support from family and friends. In the Weight Mentor chatbot study by Holmes et al. [51], social support, which they described as social contact with friends, had both a positive and negative impact.

Our findings show that these participants living with obesity prefer a chatbot that is warm, friendly, and human-like. Their suggested human-like characteristics of the chatbot could improve the user experience and facilitate compliance with its physical activity advice and tasks. Moreover, chatbots that display human-like qualities have been shown to increase the likelihood that users will comply with the chatbot's recommendations [52, 53]. A study by Roy and Naidoo [53] showed that human qualities like warmth and competence in a chatbot contribute significantly to a positive user experience with it. The more the chatbot resembles a human, the less relevant it is for the users that they are interacting with technology for their physical activity needs.

Given the continuous technological advances and the current developments in chatbot technology, particularly the use of artificial intelligence and natural language models [3, 20, 23, 32, 35, 51, 52], there may be numerous possibilities and opportunities for personalising the features and functionalities of a physical activity chatbot. The limited number of suggestions for personalisation features made by the study participants could be due to their little or no experience with chatbots or their lack of awareness of the personalisation possibilities of a physical activity chatbot. On the other hand, a less complex chatbot seems more feasible, and participants did not want to make complicated suggestions. Interventions aiming to change behaviour, like a physical activity chatbot, should include personalisation features because they are a critical component of users' adherence [23] and are highly effective in engaging users [45].

Connectivity, data privacy and security

Pharmaceutical innovations are currently changing the terrain in the field of obesity treatment [54]. The impact of these changes on other obesity treatments like combined dietary changes, physical activity and behaviour therapy remains unclear. However, obesity is a major concern to public health worldwide, and there will likely remain a need for a range of treatment approaches to obesity [55]. Perhaps, with emphasis on novel treatments that encourage the development of healthy behaviours. Interventions connected to social media or with a social media component promise to be effective in increasing physical activity and improving the well-being of adults [56]. Most of the participants in this study welcomed the idea of a social media chatbot for physical activity and discussed its potential for increasing their physical activity.

Many apps and gadgets are available for individuals who want to lose weight and increase their physical activity. The inability of a single app or gadget to provide all the features and functionalities needed to achieve weight loss or physical activity goals in the long term has resulted in a situation where most people have multiple apps for the same purpose. Participants in our study preferred that the chatbot be developed to connect and synchronise with other physical activity apps and devices. Receiving aggregated feedback from multiple physical activity technologies in one system could enhance and advance users' motivation and use of a physical activity chatbot. Laranjo et al. [45] showed that automating the feedback from apps, activity trackers, and connected devices could improve the effectiveness of such interventions.

Data privacy is currently an important topic regarding social media and mobile apps in Europe. For instance, Meta – the owner of Facebook and Instagram, has been fined 390 million Euros by the Irish Data Protection Commission for what it claims to be a breach of the GDPR (General Data Protection Regulation) [57]. In our study, data privacy and security issues were discussed, with some participants willing to share personal and health information. This is interesting as the potential users of the chatbot to be developed would likely divulge pertinent details about their health and lifestyle to the chatbot. This information could potentially be very sensitive and of a nature that many people would want to safeguard.

The disagreement among the participants who did raise the issue may indicate that it is a matter of personal preference. In a previous chatbot study [50], participants were concerned about sharing their location and personal information, which some participants in this study echoed. Conversely, in our study, some participants suggested the chatbot gain access to the GPS on their phones, with the option to turn it on and off. This implies study participants may have a limited understanding of the features and functionalities that pose privacy and security risks. It should be noted that questions about privacy and security were not included in the interview guide, and most participants did not express concern about the issue. It is possible that since the current study did not provide examples of users sharing sensitive information with a chatbot, the participants did not feel this issue was relevant at this stage.

However, the Norwegian society is characterised by a high level of trust [58]. This may be related to the fact that Norway is a small country with one of the lowest crime rates in the world [59]. Another possible explanation for participants' lack of privacy and security concerns could be that the project is being conducted by researchers associated with well-known Norwegian academic, health, and research institutions. This suggests that the institution or actor responsible for developing a digital health intervention may strongly influence users' concerns about privacy and security and, thus, their willingness to use the intervention. Hence, the responsibility falls on these institutions to ensure the secure design and development of digital health interventions that give precedence to user safety and privacy, coupled with educating users on their safe usage.

Strengths and limitations

We included individuals living with obesity attending a rehabilitation clinic and therefore motivated to increase their physical activity. The preferences for a physical activity chatbot's features and functionalities may differ for less motivated individuals living with obesity. Thus, the results of this cross-sectional study may not be generalisable. Furthermore, the patients who volunteered to participate in the study could be more interested in technology than the average person living with obesity. However, although the volunteers were diversified, their preferred features and functionalities for the physical activity chatbot were similar.

Due to language limitations, the first author/interviewer could have missed cues to ask some follow-up questions. However, the study participants responded to and discussed the questions asked thoroughly and, in some cases, provided follow-up answers to clarify their responses further to enrich the interviews and discussions.

Although many patients signed up for the study, only a few participated in the interviews and focus groups. However, this did not affect the quality and richness of the data obtained. Most study participants were on their first or second clinic stay; nonetheless, a chatbot can provide valuable support to individuals in the program for longer periods too, throughout the rehabilitation process, including periods at home and post-program physical activity maintenance. Additionally, the chatbot can be a helpful resource for individuals on the clinic's waiting list.

In hindsight, the interview guides could have included questions about privacy and security. Nevertheless, some participants raised this issue during the discussions.

Conclusions

This study presents the needs and preferences for a physical activity chatbot among Norwegian adults undergoing obesity rehabilitation at a specialised clinic. Our findings about this population's perspectives and opinions both augment and enrich the existing literature in this field. Despite previous negative experiences with chatbots, individuals living with obesity in Norway are likely to engage with a chatbot designed to increase their physical activity, particularly when it incorporates features and functionalities that foster motivation, connectivity, personalisation, and usability.

Consequently, co-designing such chatbots with potential users is essential to understanding their specific needs and preferences. Adopting a participatory development strategy, which includes regular feedback on initial chatbot prototypes, is critical to effectively addressing user requirements. This approach facilitates user adherence and increases engagement with the digital health intervention facilitated by the chatbot. The insights into needs and preferences gathered in this study will be instrumental in the development of our physical activity chatbot, tailored for individuals living with obesity. A paramount aspect of this development will be the strict protection of users' privacy and the security of their personal and health data.

Abbreviations

FI Focus Group Informant
I Informant

Supplementary Information

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Supplementary material 1.

Supplementary material 2.

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Authors' contributions

D.L, R.W, M.V.T, E.Å, P.Z, K.D, and E.G conceptualised and planned the study. D.L. developed the interview guides with guidance and feedback from R.W, M.V.T, E.Å, P.Z, K.D, and E.G. D.L. conducted the individual interviews and focus groups. D.L. and R.W. performed the data analysis with feedback from M.V.T, E.Å, P.Z, K.D, and E.G. D.L. and E.G. started the manuscript. D.L, R.W, M.V.T, E.Å, P.Z, K.D, and E.G contributed to writing and reviewing the manuscript. All authors read and approved the final manuscript.

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Availability of data and materials

The anonymised data used and/or analysed during the current study are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

The study was declared exempt by the Norwegian Regional Ethics Committee (Ref: 351357).
The University Hospital of North Norway's Data Protection Officer approved the study (Ref: 2022/6610).
All participants signed written informed consent forms prior to participating in the study.
All methods were carried out in accordance with the relevant guidelines and regulations.

Consent for publication

Not Applicable. Participants signed a consent form that informed them about the intention to publish the data from the study. In addition, no identifying or personal details are presented in this study.

Competing interests

The authors declare no competing interests.

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