Can Chatbots Help Support a Person's Mental Health? Perceptions and Views from Mental Healthcare Professionals and Experts

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The objective of this study was to understand the attitudes of professionals who work in mental health regarding the use of conversational user interfaces, or chatbots, to support people's mental health and wellbeing. This study involves an online

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survey to measure the awareness and attitudes of mental healthcare professionals and experts. The findings from this survey show that over half of the participants in the survey agreed that there are benefits associated with mental healthcare chatbots (65%, p<0.01). The perceived importance of chatbots was also relatively high (74%, p<0.01) with more than three quarters (79%, p<0.01) of respondents agreeing that mental healthcare chatbots could help their clients to better manage their own health, yet chatbots are overwhelmingly perceived as not adequately understanding or displaying human emotion (86%, p<0.01). Even though the level of personal experience with chatbots among professionals and experts in mental health has been quite low, this study shows that, where they have been used, the experience has been mostly satisfactory. This study has found that, as years of experience increased, there was a corresponding increase in the belief that healthcare chatbots could help clients better manage their own mental health.

CCS Concepts: • **Human-centered computing** → **User centered design**; • **Applied computing** → *Health care information systems*.

Additional Key Words and Phrases: mental health professionals, chatbot, conversational user interfaces, mental health, mental health survey, wellbeing, conversational cognitive ergonomics

1 INTRODUCTION

Chatbots, also known as conversational user interfaces, are tools that use machine learning and artificial intelligence to simulate human communication, either through voice or text communication.

Voice-based chatbots are called upon within mobile devices, computers, and smart speakers such as Amazon Alexa, and Google Home. Text-based chatbots can be accessed through many channels, such as Messenger, Kik, Slack and Telegram, or in a web or mobile application [5]. The user can converse with the chatbot using text or 'quick replies' (buttons). Voice-based chatbots, used at home for support of mental health and wellbeing, require translation from speech to text (and vice versa) with success rate dependent on accent and surrounding sound (e.g. machine operating, TV on, other people talking). Additionally, elements of conversation such as secure authentication, selection over a large number of options, transcription of special terms such as names and emails can more easily be managed with text-based rather than voice-based conversation.

They support interactive communications between persons and a computer program [9]. The earliest chatbot dating back to the 1960s was ELIZA and it was developed to try to mimic the responses of a psychotherapist in a therapy session [30]. It made use of pattern matching and pronoun substitution to give an illusion of understanding even though it had no built-in knowledge [16]. Computing technology has advanced since then, with the advances in artificial intelligence and machine learning, and in particular deep neural networks, which have led to further development of chatbots. Also, the increased adoption of mobile Internet and messaging platforms has driven the adoption of digital interventions, such as chatbots [11].

Chatbots operate using natural language, and they have gained a lot of traction recently because they have the potential to provide a multitude of services through one point of contact. Chatbots have been used in education [32], customer service innovations [27], and healthcare [8]. Within the area of mental health, there has been a recent drive towards creating digital interventions that can either supplement or replace face-to-face mental health services [15]. As access to mental health services remains an issue worldwide, with the mental health workforce insufficient to meet the growing demand for mental health services [29], automated procedures hold a great promise for both mental healthcare providers and for those in need of mental health services [13].

Many chatbots are available for use in mental care provision. One of the better-known mental health chatbots is Woebot[10], which is a chatbot therapist. It works using Cognitive Behavioural Therapy (CBT) and applies techniques to help clients improve their mental health. The results of a randomised controlled trial among students found that Woebot significantly reduced symptoms of depression within 2 weeks [10].

This conversational agent was launched via Facebook Messenger, but there were some criticisms with this, as Facebook, and not Woebot or the individual, owned the conversation data [23]. This is more relevant recently, where Facebook has been under fire for the company's handling of personal data [28]. There were also criticisms that the Woebot app failed to respond appropriately to reports of child sexual abuse resulting in the Children's Commissioner for England deeming the app not fit for purpose [18]. To address some of these issues, and in particular, in relation to the privacy issues with this application, users can now ask the Woebot app to delete their user history, as well as remove all conversations, once the conversation has ended [28].

iHelpr is another mental health chatbot developed to provide self-assessment and guidelines for: stress, anxiety, depression, sleep, and self-esteem [5]. A study was conducted regarding its use, via questionnaire, and it was found that the respondents found the chatbot to be enjoyable and easy to use and stated there is a consistent personality throughout the conversation which they liked [5]. Tess is another chatbot designed to provide support for treating anxiety and depression, and it was shown that it is a feasible option for offering support for depression [12]. Bibliotherapy is another method of mental health support. This is a form of talking-therapy which uses short stories to support people with mental health issues, using concepts of CBT to assist in the recovery of the client and recent research has been investigating its adoption by bibliotherapy facilitators [19].

Various studies have been carried out to determine the feasibility and efficacy of chatbot use. An early study in 2017 [4] used an online questionnaire to determine why chatbot users in the US were using chatbots. The results showed that the greatest motivational factor was productivity, in that chatbots helped users obtain timely assistance or information [4]. A recent survey conducted by Palanica et al. 2019 set out to determine the opinions of medical practitioners on the use of this technology in healthcare. Their study showed that chatbots may have a beneficial role to play in healthcare support [24].

Current literature demonstrates that there are widespread benefits to using chatbots. One is that it is preferable for some people to use chatbots to complete certain tasks normally performed on a web page or mobile application [11]. Chatbots are also seen to relieve certain barriers in mental health provision, such as stigma around accessing psychological health services and geographical isolation that can hinder attendance at face-to-face counselling [20]. People working unconventional shifts may also have problems gaining access to mental health services. Chatbots could be used as a potential solution to these problems, as mobile mental health interventions are non-intrusive and easily accessible for anyone with a mobile phone. There has also been some evidence to suggest that chatbots can be effective in dealing with individuals with major depressive disorder [29]. Mental health counselling can be improved through the use of chatbots, where chatbots can provide a user with instant information [6], they have 24/7 availability and will provide cost savings for the users in the form of travel expenses and telephone charges [14]. Also, users enjoy the anonymity offered by chatbots, as some patients were shown to disclose sensitive information to a chatbot where they would not have done so to a human therapist, as demonstrated by Lucas et al. [17]. In the UK, Samaritans, the helpline service, recorded that users under 25 years were the highest user age group of their text messaging service, and were more likely to communicate through text than to phone the organisation [26]. These young people can also feel uncomfortable disclosing their feelings to a human being [29]. As a recent study shows, in some circumstances, patients are more likely to disclose personal details to AI-powered conversational assistants rather than to an actual clinician [21]. Many young people also feel that their problems are too personal, or they fear that this sensitive data could be shared with others [31].

Chatbots also have their limitations. They may not be able to understand the nuances of human language. Artificial intelligence has to understand the complexities at play, to prevent the provision of an unsuitable answer

or by providing unclear or nonsensical responses, in order to be able to communicate what is at the core of mental health problem. Chatbots could offer reminders every now and again that they are in fact an 'artificial intelligence', to counter any confusion. As the Woebot application warns its users: *'As smart as I may seem, I'm not capable of really understanding what you need'* [15]. Many are dismayed and horrified at the concept of chatbots for mental health and in particular for the area of suicide prevention, arguing that such a complex problem cannot conceivably be reduced to a computer algorithm [2]. Chatbots also fall short in the provision of mental health support for sensitive topics, for example, for suicide risks and where abuse is being reported [28]. Indeed, there is not enough evidence-based data to support chatbots use in suicide prevention [25].

Privacy is also a major concern for users of these applications and developers need to ensure that data sharing will not expose users to privacy risks. Poor adherence seems to be another problem with digital mental health interventions [7], and for those people that do go on to maintain a relationship with these digital resources, the fear is that some vulnerable people may begin to over rely on them which may lead to anxiety when these applications are not available. Overall, there is a need for a wider discussion about how all mental health services can and should encourage the safe and ethical use of chatbots [29].

In the recent study by Palanica et al., challenges were perceived due to chatbots not being able to understand or display human emotion. The majority of physicians (70%) in this survey expressed their concern about risks associated with healthcare chatbots for patients[24], and these concerns relate to chatbots not being able to understand the complex use of language associated with a mental health crisis, in such a way to recognise symptoms and respond appropriately [18]. Hence, rather than developing something that is state of the art, the developers may need to ensure that the technology is centered on understanding the needs of someone in crisis [3].

Chatbots represent a shift in how people manage their mental health. While there has been an increase in the development and use of such applications, it is not fully understood why professionals and experts in mental health would use chatbots and encourage their use by their clients. The study by Palanica et al. [24] investigated how the use of healthcare chatbots are regarded by physicians. Their survey concluded that chatbots can have a beneficial role to play in healthcare support but that chatbots currently do not have the expert medical knowledge needed to replace the role of the traditional physician. The effectiveness of chatbot use in the area of mental health has not been fully researched [22], and this survey extends the work of Palanica et al. to look at the professionals and experts that work in the area of mental health, to determine if chatbots designed for mental health are beneficial and to determine the efficacy of such tools.

Mental healthcare professionals are crucial in advising clients on how best to protect their wellbeing, but little is known about how they perceive chatbots in terms of benefits, challenges and risks to patients [24]. In the survey by Palanica et al., clinicians from the United States suggest that chatbots may be important in the self-management of health (for example, for appointment scheduling or medication monitoring). But these clinicians were concerned that chatbots do not understand human emotions and cannot provide diagnosis as they do not have expert knowledge and do not know the overall person and also may encourage self-diagnosis within clients [24]. It was felt that chatbots may play a role in supporting, motivating and coaching patients, but even in this they are limited by the fact that they cannot display or understand human emotion [24]. The survey showed that clinicians thought chatbots could not replace healthcare professionals, but they could support them, and more education about the evidence-based research surrounding chatbots is necessary [24]. Anderson [1] made similar findings where this type of technology was found to have poor adoption rates by physicians and poor adherence by patients.

2 OBJECTIVES

Palanica et al. research involved physicians in the United States only [24], where the opinions were primarily about physical health. Further research is needed to consider different mental healthcare professionals in different environments and how they perceive chatbots for use with their clients. Therefore, the main objective of this survey is to assess awareness, attitudes and practices of mental healthcare professionals regarding the use of digital health tools and particularly chatbots to augment and improve mental health service provision. The survey investigates: the use of healthcare chatbots; perceived benefits of healthcare chatbots to clients; perceived challenges of healthcare chatbot usage; perceived risks of healthcare chatbots, and the perceptions of healthcare chatbots in the role of a mental healthcare professional. An additional objective is to determine if there is an association between a mental healthcare professional's experience and their likelihood to recommend or prescribe the use of mental healthcare chatbots to their clients.

3 METHODS

The study involved an online survey of awareness, attitudes and practices relating to digital technology among mental healthcare professionals. Ethical approval for this study was obtained from the School of Psychology Filter (Ethics) Committee and the University Ethics Review Board at Ulster University. Respondents gave informed consent at the entry point to the online survey.

The survey was part of a larger project known as ChatPal, a project funded by the Northern Periphery and Arctic programme (2014-2020) to co-create a chatbot to support the mental wellbeing of people living in sparsely populated areas.

The ChatPal consortium is made up of partners from Northern Ireland, Ireland, Scotland, Sweden and Finland. Initial recruitment for the survey took place in Northern Ireland, via local mental health services organisation and ChatPal partner Action Mental Health (AMH). AMH shared the survey with their staff via email, emphasising the voluntary nature of participating. Recruitment also took place via email by academic institutions and health care services across the Consortium's partnership networks. Snowball sampling was used to recruit additional mental health professionals across each of these regions in Europe.

Only mental health care professionals were eligible to participate in the survey. This included individuals employed to either support the mental well-being of the population in general or support those with mental ill health on a practical or an academic basis.

The survey is subdivided into 5 main sections, including (1) usage of mental healthcare chatbots, (2) perceived benefits of healthcare chatbots to clients, (3) perceived challenges of mental healthcare chatbot usage, (4) perceived risks of healthcare chatbots, and (5) perceptions of mental healthcare chatbots by mental healthcare professionals. The survey categories remain similar to the survey designed by Palanica et al., but the emphasis on physical health and the associated symptomatology has been changed to mental health for this current study. Also, references to professionals and technology have been made more relevant to mental health rather than physical health.

Data were analysed using descriptive analyses to examine the characteristics of participant responses to survey items on mental healthcare chatbots. Data analysis was carried out using the Python programming language and Python Jupyter Notebook. Spearman's Rank Correlation Coefficients were used for association analysis between variables. Significance testing was computed for correlations, where $p<.05$ was considered statistically significant. Bar charts displaying the survey results contain error bars with an error amount of 5% percent for each data point, as a percentage of the value of that data point.

4 RESULTS

4.1 Use of Mental Health Chatbots

When asked about the perceived importance of chatbots (Figure 1), 77% of professionals and experts in mental health thought that chatbots are either somewhat important (66%) or very important (11%). In contrast, 23% believed that chatbots are somewhat unimportant (20%) or very unimportant (3%).
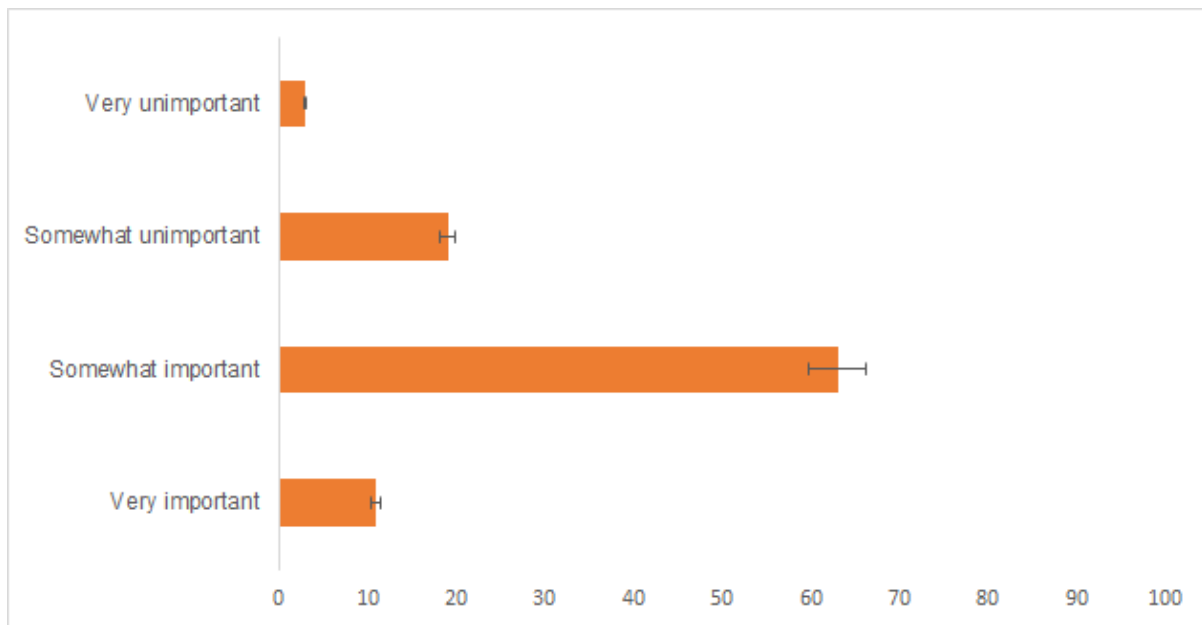

Fig. 1. Perceived importance of chatbots in mental healthcare

The surveyed professionals and experts in mental healthcare were also provided with a list of some of the chatbots currently available for use in mental healthcare and asked about their levels of awareness of these chatbots. From their replies, it is noticeable that the vast majority of the respondents have neither heard of nor used any of these applications. Of the 16 respondents who had used these chatbots, 24% of the respondents believed that their clients use mental healthcare chatbots (with 35% not using them) with the majority (38%) being unsure or did not know if their clients used mental healthcare chatbots.
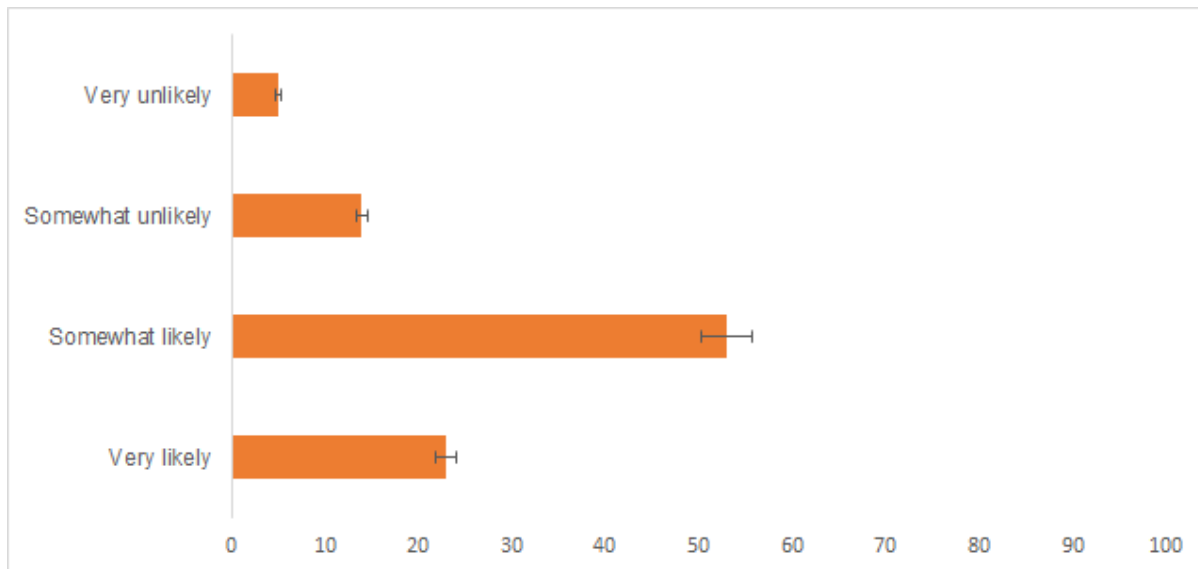
Fig. 2. Perceived likelihood to prescribe the use of mental healthcare chatbots to their clients within the next 5 years

The respondents were also asked if they would be likely to prescribe the use of mental health chatbots to their clients within the next five years. A total of 80% of respondents replied that they would be very likely (24%) or somewhat likely (56%) to prescribe these tools (Figure 2). Although there is a disparity in gender distribution in the respondents (16% male and 62% female), there was no significant difference between the percentage of males versus females and their likelihood to prescribe the use of mental health chatbots to their clients.

4.2 Perceived potential benefits of using mental healthcare chatbots for clients

The perceived benefit to clients is an important indicator of the efficacy of this new technology. The professionals and experts in mental health were asked about any apparent benefits that existed with the use of chatbots in the area of mental health. Figure 3 shows an average of 65% (SD = 13.24) agreed to some extent that there are benefits associated with mental healthcare chatbots, nevertheless an average of 17% (SD = 6.12) disagreed to some extent that there were any potential benefits. More than three quarters of respondents agreed that mental healthcare chatbots could help their clients to better manage their own health (79%). Chatbots were also perceived to improve access and timeliness to care (71%) and reduce travel time to their mental healthcare providers (81%). 60% of respondents believed that mental healthcare chatbots could prevent unnecessary visits to mental healthcare providers and that clients may disclose more information to chatbots compared to mental healthcare providers (48%).
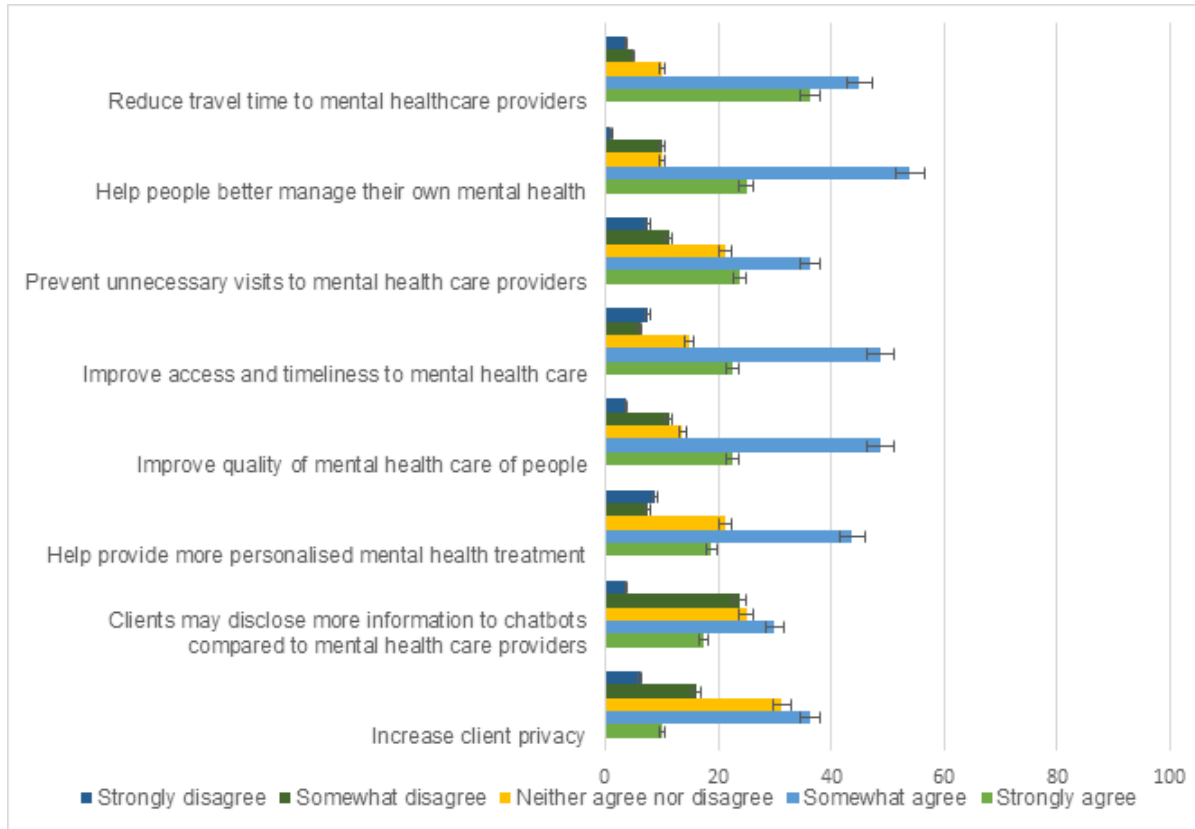
Fig. 3. Perceived benefits of mental healthcare chatbots for clients (ordered in descending order by percentage that strongly agree)

There will also be mental health-related benefits of chatbot use for clients, with an average of 53% of respondents believing in some type of physical, psychological, or behavioural health benefit to clients, with more than half of respondents believing that mental healthcare chatbots could increase activity or exercise (59%), improve nutrition or diet (63%), reduce stress (66%) or improve medication or treatment adherence (66%).

The respondents were asked how much they believe that healthcare chatbots would help or impede their work in their daily occupational role on a scale from 0 = 'impede my work' to 5 = 'help me'. The responses showed an observed range 0-5; mean 2.95; median 3; and a standard deviation of 1.15. The professionals and experts in mental health were also asked how likely it would be in the future, for healthcare chatbots to play a more significant role in clients' health than their healthcare provider, well over half (58%) of respondents thought that it would most likely happen, with 27% expressing that it would be very likely.

In relation to certain barriers to mental health provision, the majority (88%) of professionals and experts in mental health regarded the use of chatbots as strongly beneficial or somewhat beneficial. In particular, respondents found chatbots would be most beneficial for reminders for medication/treatment compliance (70%), renewing medication prescriptions (58%) and answering medication Frequently Asked Questions (54%).

There are also perceived logistical benefits of using mental healthcare chatbots, with the majority of respondents (88%) believing that advantages for organisation, planning, and management of administrative characteristics

associated with mental healthcare, are either strongly or somewhat beneficial (Figure 4). Respondents perceived that chatbots would be beneficial for scheduling doctor appointments (91%), locating mental health clinics and services in a specific area (91%), setting reminders for medication/treatment compliance (91%), or answering medication-related 'Frequently Asked Questions' (86%).
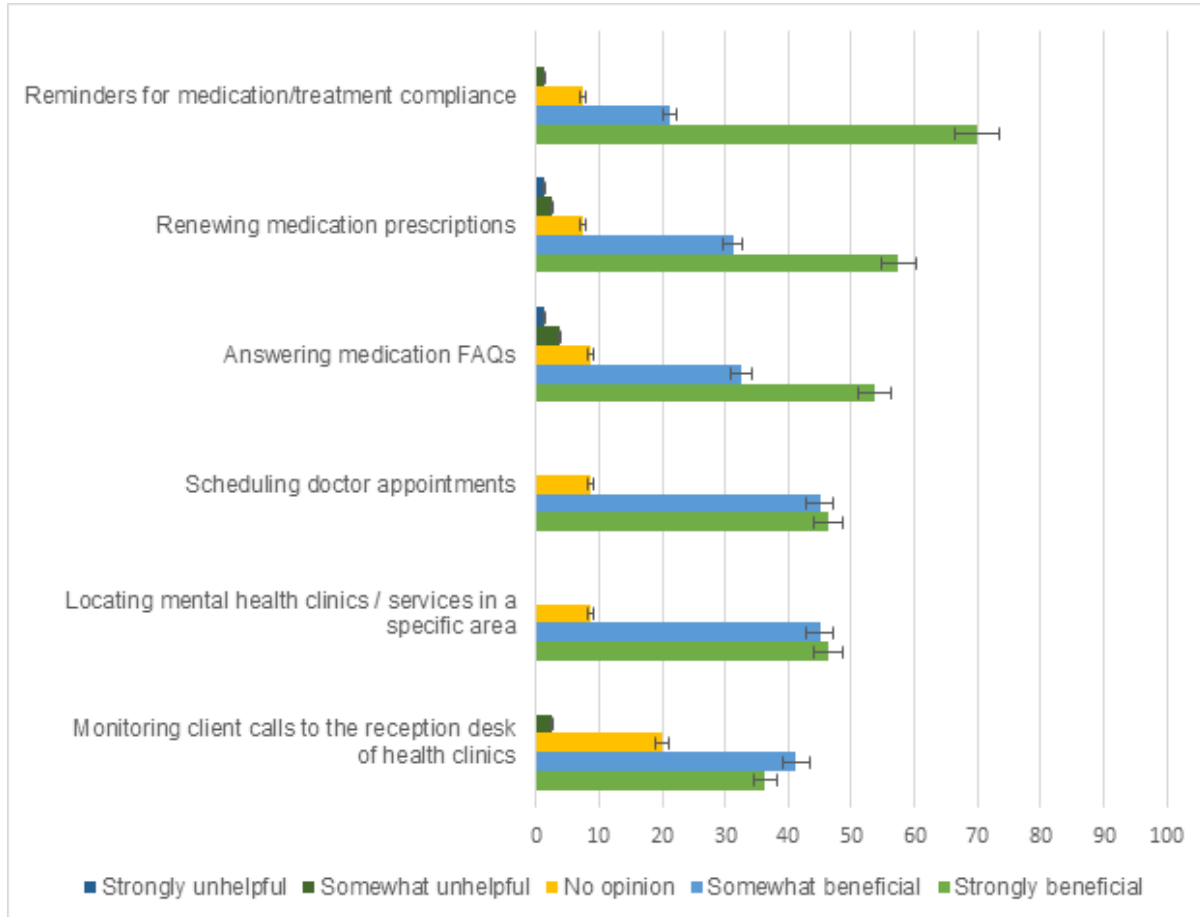

Fig. 4. Perceived logistical benefits of using chatbots for clients (ordered in descending order by percentage that find the perceptions strongly beneficial)

Along with the logistical benefits of using these applications for their clients, chatbots also have significant potential for use in self management (39%), followed by education (36%) and training (35%) (Figure 5).
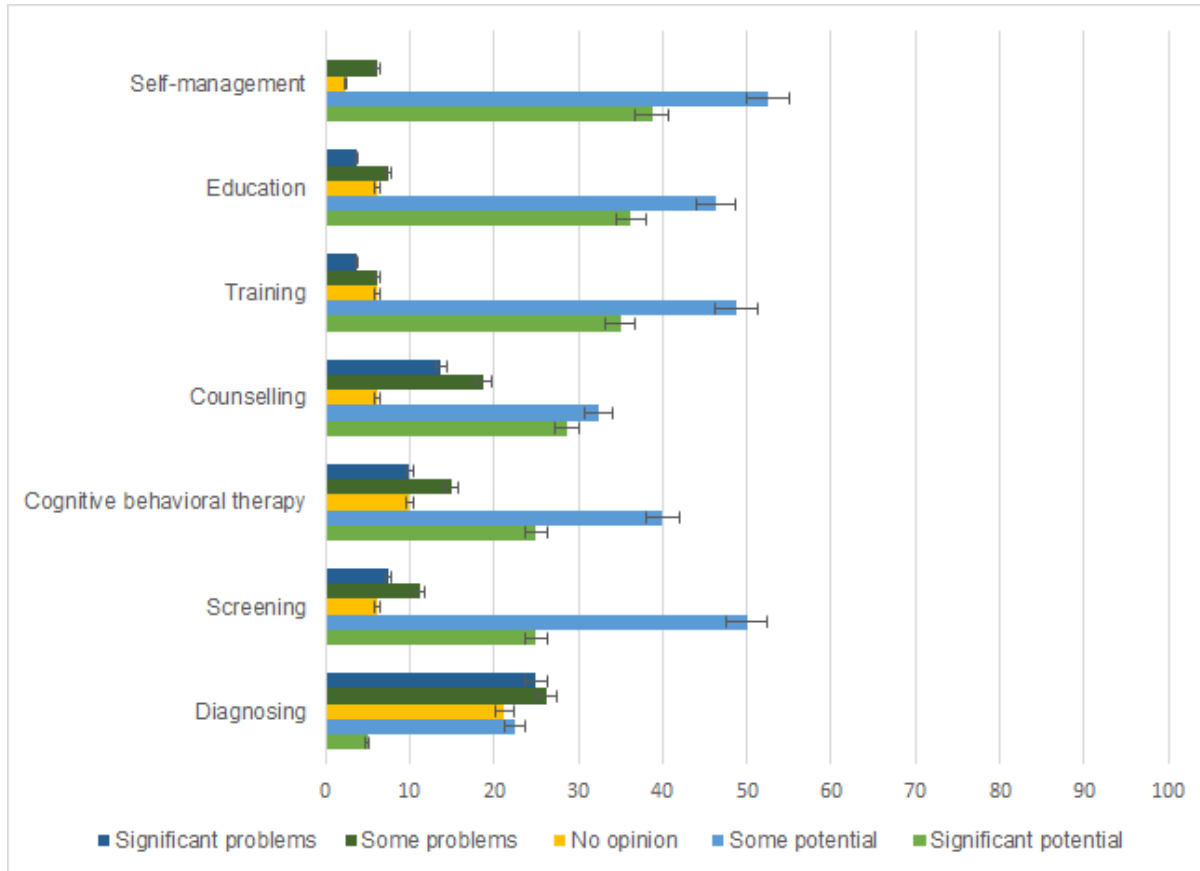
Fig. 5. Perceived potential uses for chatbots (ordered in descending order by percentage with Significant potential)

Chatbot use, as an aid to cognitive behaviour therapy, is also perceived as having strong potential (25%), as these convenient, intelligent tools can conceivably offer assistance at any time with little commitment from the client. The respondents also believed that chatbots could have potential to be used for particular disorders including: stress (82%); anxiety (80%); depression (74%) and phobia (67.5%). And, when asked if chatbots have the potential to improve specific health-related outcomes for clients, over 60% of respondents replied that medication or treatment adherence; stress reduction or management; psychological well-being increase and nutrition or diet improvement are all areas that could improve outcomes.

4.3 Perceived challenges and risks associated with mental healthcare chatbots

Along with the benefits of using mental healthcare chatbots, there are also challenges. Over half of the respondents (54%) agree that there are various challenges associated with the use of mental healthcare chatbots for clients. The main challenge identified with the use of mental healthcare chatbots was that chatbots cannot adequately understand or display human emotion (86%). Other challenges highlighted are that: chatbots cannot effectively care to the full extent of the clients' needs (77%); they lack the intelligence or knowledge to accurately assess clients (73%); and respondents perceived client data privacy and confidentiality as a challenge (59%).

This study shows overall rates of perceived risks (79%) to be a concern to the professionals and experts in mental health, in relation to the use of chatbots in care provision (Figure 6), whereas only 6% did not agree about any perceived potential risks.
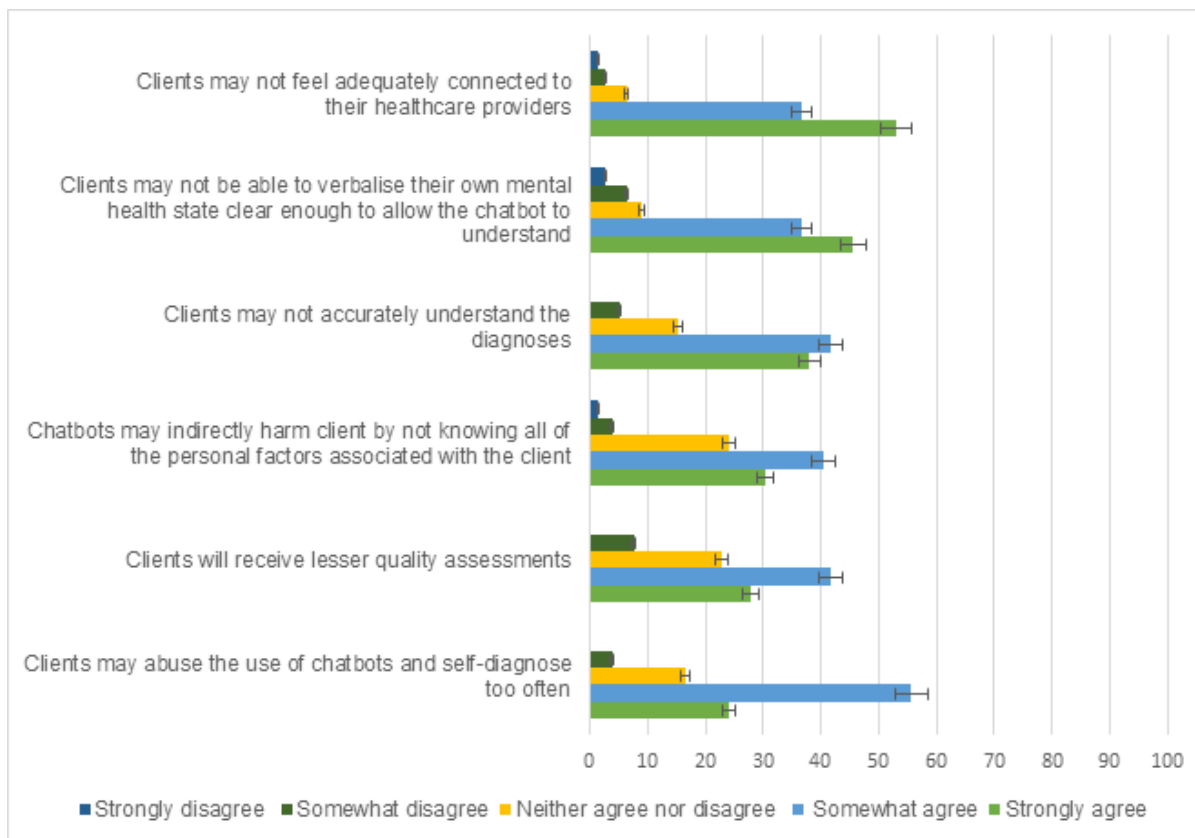

Fig. 6. Perceived risks associated with using mental healthcare chatbots for client (ordered in descending order by percentage that strongly agree)

Over 75% (78%) of respondents agreed about the listed perceived risks, with 90% claiming that the clients may not feel adequately connected to their healthcare providers as a major risk. Other major perceived risks include: clients may not be able to verbalise their own mental health state clearly enough to allow the chatbot to understand (82%); clients may not accurately understand the recommendations (80%); and clients may abuse the use of chatbots and self-assess too often (80%).

Over 57% of survey respondents indicated that healthcare chatbots would be more likely in the future to play a more significant role in the health of clients than the healthcare provider. This perhaps indicates that national health services should consider procuring mental health apps from specialised app development providers. Countries such as the United Kingdom and Sweden, where healthcare provision is free of charge at the point of care, are beginning to put in place mental health service apps libraries within their systems of universal health coverage.

From the survey results, it is evident that the majority of respondents agree that there are benefits associated with mental healthcare chatbots and that the perceived importance of chatbots is also relatively high.

Spearman's Rank correlation coefficient was used to correlate the years of experience of the respondents, as mental healthcare professionals, to various perceptions they may have about the use of chatbots. As years of experience increased, there was a corresponding increase in the belief that mental healthcare chatbots could benefit people in specific areas of mental health management: to help clients better manage their own mental health ($r = 0.543$, $p<0.01$); to improve quality of mental healthcare of people ($r = 0.536$, $p<0.01$); improve access and timeliness to mental healthcare ($r = 0.557$, $p<0.01$) and assist mental healthcare workers in their daily occupational role ($r = 0.547$, $p<0.01$). There were also significant statistical correlations between increased experience and a likelihood to recommend the prescription of mental healthcare chatbots to healthcare provider colleagues ($r = 0.224$, $p<0.03$), and a likelihood to prescribe the use of mental healthcare chatbots to clients within the next 5 years ($r = 0.219$, $p<0.03$). All these correlations are statistically significant (p-value less than 0.05), and the results indicate that, as people's experience increase, so does their belief that the use of chatbots can improve the quality of care, client self-management, access to care and assist mental healthcare workers in their roles. Similarly, there is an increase in likelihood to both recommend and prescribe the use of chatbots, with increasing years of experience of the mental healthcare professional.

5 DISCUSSION

5.1 Principal Findings

The primary aim of this study is to assess the feasibility and efficacy of chatbot use in the area of mental health, to assess the awareness, attitudes and practices of mental healthcare professionals regarding the use of chatbots in improving mental health service provision, while also determining if there is any association between a person's experience and their belief that the use of chatbots can improve the quality of care, client self-management, access to care and assist mental healthcare workers in their roles. An additional objective is to determine if there is any association between a person's experience and their likelihood to recommend or prescribe the use of mental healthcare chatbots to their clients. A total of 100 respondents from Northern Ireland, Ireland, Scotland, Sweden and Finland took part in this online survey and all the respondents were either professionals or experts in the area of mental health.

In relation to physical, psychological, or behavioural health benefits to clients, the respondents believe that mental healthcare chatbots could increase activity or exercise, improve nutrition or diet, reduce stress, improve medication or treatment adherence. Respondents also found chatbots would be beneficial for reminders for treatment compliance, renewing medication prescriptions and answering medication 'Frequently Asked Questions'. Perceived logistical benefits of using mental healthcare chatbots show a strong percentage believing there are advantages for organisation, planning, and management of administrative characteristics associated with mental healthcare.

The work by [24] indicated that chatbots may play a beneficial role in health care. However, this work has developed significantly on that research with the primary finding from this study indicating that, with greater experience, mental healthcare professionals have greater belief in the use of chatbots to better manage their clients' own mental health. This was a significant statistical correlation between increased experience and a likelihood to recommend the prescription of mental healthcare chatbots to healthcare provider colleagues, and a likelihood to prescribe the use of mental healthcare chatbots to clients within the next 5 years. This could be seen as an unexpected result where the expectation would be that younger respondents (with less experience) would be more embracing of new technologies, but counter-intuitively, people with more experience (who are generally older) are shown to have belief that these tools have a place in the mental healthcare process and they would be more likely than healthcare workers with less experience, to recommend or prescribe the use of

mental healthcare chatbots to their clients. Even though there are significant statistical correlations between both increased experience and age with a likelihood to prescribe the use of mental healthcare chatbots to clients within the next 5 years, this is not a clear picture across all age groups. Further analysis has shown that 50% of respondents under 30 years of age have responded that they would be very likely to prescribe the use of mental health care chatbots to their clients within the next 5 years, compared to 24% for 30-39 year olds, 42% for 40-49 year olds, 18% for 50-59 year olds, and 33% for those over 60. If 'very likely' and 'somewhat likely' responses are combined, then 75% of respondents under 30 years of age have responded that they would be very likely or somewhat likely to prescribe the use of mental health care chatbots to their clients within the next 5 years, compared to 80% for 30-39 year olds, 79% for 40-49 year olds, 77% for 50-59 year olds, and 83% for those over 60.

Similar to the findings of a previous cross-sectional web-based survey, which examined the physicians' perceptions of chatbot use in general healthcare, the mental health professional's adoption of available chatbots is less extensive than anticipated. Even so, more than half of the respondents to the survey agreed to some extent that there are benefits associated with mental healthcare chatbots, yet the perceived adoption among clients is still quite low. This reflects some of the results from a recent trial by Fitzpatrick et al. where they found that, despite the effectiveness of these applications, the adoption and adherence to these tools is relatively poor [10]. The perceived importance of chatbots was also relatively high with more than three quarters of respondents agreeing that mental healthcare chatbots could help their clients to better manage their own health. Chatbots were also perceived to improve access and timeliness to care, reduce travel time to their mental healthcare providers and prevent unnecessary visits to mental healthcare providers. The mental healthcare workers also believed that clients may disclose more information to chatbots compared to mental healthcare providers.

As well as perceived benefits, challenges and risks also exist. The main challenge identified with the use of mental healthcare chatbots was in relation to chatbots not adequately understanding or displaying human emotion. When trying to replicate the duties of a (human) expert, it was perceived that chatbots lack the intelligence or knowledge to assess clients accurately and it is believed that chatbots cannot effectively care to the full extent of the clients' needs. Another area that needs to be addressed in terms of chatbot adoption, relates to data privacy, as the respondents perceived client data privacy and confidentiality a challenge. An overwhelming majority of the respondents (90%) claimed that their clients may not feel adequately connected to their healthcare providers when using chatbots, and these challenges and concerns would need to be addressed before the technology can be fully endorsed by the mental healthcare workers and adopted.

5.2 Implications for policy and practice

There are many implications for the development and deployment of chatbot services in the area of mental healthcare. Development could focus more on the self-management, education and training elements of the application to reflect the findings of this survey, to direct policy and practice. The developers of these applications should consider what the mental healthcare workers find most beneficial about these applications or what could have the greatest potential. The perception of the use of some methods seems to increase with increased years of experience, which is an important finding. As such, the integration of these tools could involve training people together with people with more years' experience, who are not as digitally adept, but have the belief in the role of technology. Chatbots have been perceived to relieve certain barriers in mental health provision, which includes stigma around accessing psychological health services and geographical isolation. Findings from this study show that respondents agree that mental healthcare chatbots could help clients better manage their own health, improve access and timeliness to care, reduce travel time to mental healthcare providers and prevent unnecessary visits to mental healthcare providers. Either more pilot projects would be needed to demonstrate the technological soundness of some of these applications, or a national review board would be needed to review and rate mental healthcare apps. One solution to this is the Organisation for the Review of Care and Health

Applications (ORCHA) which is providing health app evaluation, where over 65% rating is a precondition for adoption by the UK's National Health Service (NHS), for example. ORCHA outline that there are 3 main challenges to digital health solutions, which include: lack of awareness of the part that these applications can play in the management of health and care related conditions; difficulty in accessing appropriate apps for specific needs; and the lack of trust which is inhibiting the utilisation of digital health solutions.

There are also some uncertainties and concerns about the impact of chatbots in mental healthcare provision. While there was a general perception that chatbots could potentially be used to help clients to better manage their own health, over 25% (27.5%) did not believe that clients would be inclined to disclose more information to chatbots compared to mental healthcare providers. Similarly, the respondents saw problems in the areas of diagnosing (51%), counselling (32.5%) and cognitive behavioural therapy (25%), possibly because these could be perceived as replacements for vital roles within mental healthcare management. Only when these tools can be developed to meet the requirements of the people who will use them, and are practised in real-life settings, will their impact be fully realised. Developers should take these findings into consideration when developing mental healthcare chatbots, i.e. to focus on integrating reminders into the software, for example, relating to the client's goals, medication and exercise and use the chatbots to help alleviate stress and educate people. As the mental healthcare workers also believed that clients would disclose more information to chatbots compared to mental healthcare providers, the developer needs to be able to assure client users about privacy and confidentiality. The development of these mental healthcare chatbots could also focus on increasing activity or exercise or work towards reducing stress or improving medication or treatment adherence. Finally, chatbots may offer an opportunity to redesign the mental healthcare system in such a way that promotes genuine collaboration between mental healthcare professionals and technologists. In order to integrate these new technologies into the area of mental health provision successfully, mental healthcare professionals and policy makers need to appraise the reliability and validity of such tools. If scientific evidence shows the benefits of these tools, policymakers will then need to investigate the ethical and legal concerns associated with the use of artificial intelligence to support mental health counseling treatment programs, so that these new methods can be successfully implemented.

5.3 Limitations

One of the limitations of this research is that the sample number is relatively small (n=100). All of the chatbots mentioned as examples in the survey were in English language and thus not necessarily familiar to professionals in Finland and Sweden, which is a limitation. The survey also did not capture the age group of the clients with whom the mental health professionals worked, which is a limitation and an area for future research. A further limitation is the sampling method used. The snowball survey sampling method, also known as convenience sampling, will not guarantee a random sample is selected, as the people are recruited based on whom they know and their links to the ChatPal project, and therefore not representative of the entire population. In addition to the majority of respondents being linked to a single project, there could also be a bias towards specific countries, that may have a different attitude toward digital technology for mental healthcare compared with other countries.

6 CONCLUSIONS

This study shows that, where they have been used, the experience has been mostly satisfactory, even though the level of personal experience with chatbots among professionals and experts in mental health has been quite low. The results of this survey show that the majority of respondents agree that there are benefits associated with mental healthcare chatbots and the perceived importance of chatbots is also relatively high. The perception is that clients may disclose more information to chatbots compared to mental healthcare providers and in relation to physical/psychological/behavioural health benefits to clients, the respondents believe that mental healthcare

chatbots could increase activity or exercise, improve nutrition or diet, reduce stress and improve medication or treatment adherence.

Preliminary evidence for use of chatbots in the area of mental healthcare provision is favourable. This study has found that, as years of experience increased, there was a corresponding increase in the belief that healthcare chatbots could help clients better manage their own mental health; improve quality of mental healthcare of people; improve access and timeliness to mental healthcare and assist mental healthcare workers in their daily occupational role.

REFERENCES

[1]   Gerhard Andersson. "Internet-delivered psychological treatments". In: *Annual Review of Clinical Psychology* 12 (2016), pp. 157–179.
[2]   R R Bond et al. "Chatbots for mental health and suicide prevention: Is this even ethical?" In: *European Conference on Mental Health*. 2019.
[3]   DanaKai Bradford and David Ireland. "Virtually there: Chatbots for Mental Health support?" In: (). URL: https://pdfs.semanticscholar. org/9dfe/eb34503a318d5c25fbd037258826e31dcd9f.pdf.
[4]   Petter Bae Brandtzaeg and Asbjørn Følstad. "Why people use chatbots". In: *International Conference on Internet Science*. Springer. 2017, pp. 377–392.
[5]   Gillian Cameron et al. "Assessing the Usability of a Chatbot for Mental Health Care". In: *International Conference on Internet Science*. Springer. 2018, pp. 121–132.
[6]   McTear M Cameron G, Cameron D, Megaw G, Bond R, Mulvenna M, O'Neill S, Armour C. "Towards a chatbot for digital counselling". In: *Proceedings of the 31st British Computer Society Human Computer Interaction Conference*. BCS Learning & Development Ltd, 2017, p. 24.
[7]   Helen Christensen, Kathleen M Griffiths, and Louise Farrer. "Adherence in internet interventions for anxiety and depression: systematic review". In: *Journal of medical Internet research* 11.2 (2009), e13.
[8]   Kyungyong Chung and Roy C Park. "Chatbot-based heathcare service with a knowledge base for cloud computing". In: *Cluster Computing* 22.1 (2019), pp. 1925–1937.
[9]   Kevin Cullen. *eMental Health State-of-the-art & Opportunities for Ireland*. Tech. rep. Work Research Centre, 2018, p. 55. URL: https://www.mentalhealthreform.ie/wp-content/uploads/2018/10/eMental-Health-State-of-the-art-Opportunities-for-Ireland-Full-Report.pdf.
[10]   Kathleen Kara Fitzpatrick, Alison Darcy, and Molly Vierhile. "Delivering cognitive behavior therapy to young adults with symptoms of depression and anxiety using a fully automated conversational agent (Woebot): a randomized controlled trial". In: *JMIR mental health* 4.2 (2017), e19.
[11]   Asbjørn Følstad and Petter Bae Brandtzæg. "Chatbots and the new world of HCI". In: *interactions* 24.4 (2017), pp. 38–42.
[12]   Russell Fulmer et al. "Using psychological artificial intelligence (Tess) to relieve symptoms of depression and anxiety: randomized controlled trial". In: *JMIR mental health* 5.4 (2018), e64.
[13]   Adam C Jaroszewski, Robert R Morris, and Matthew K Nock. "Randomized controlled trial of an online machine learning-driven risk assessment and intervention platform for increasing the use of crisis services." In: *Journal of consulting and clinical psychology* 87.4 (2019), p. 370.
[14]   Tobias Kowatsch et al. "Design and evaluation of a mobile chat app for the open source behavioral health intervention platform MobileCoach". In: *International Conference on Design Science Research in Information System and Technology*. Springer. 2017, pp. 485–489.
[15]   Kira Kretzschmar et al. "Can your phone be your therapist? Young people's ethical perspectives on the use of fully automated conversational agents (chatbots) in mental health support". In: *Biomedical informatics insights* 11 (2019), p. 1178222619829083.
[16]   Henry W.W. Potts Lisa A Chalaguine, Fiona L Hamilton, Anthony Hunter. "Argument harvesting using chatbots". In: *Computational Models of Argument: Proceedings of COMMA 2018* 305 (2018), p. 149.

[17] Gale M Lucas et al. "Reporting mental health symptoms: breaking down barriers to care with virtual human interviewers". In: *Frontiers in Robotics and AI* 4 (2017), p. 51.

[18] Claudia Martinez and Imogen Farhan. "Making the right choices". In: (2019). URL: https://www.bl.uk/britishlibrary/{~}/media/bl/global/social-welfare/pdfs/non-secure/m/a/k/making-right-choices-using-data-driventechnology-19.pdf.

[19] Patrick McAllister et al. "Towards Chatbots to Support Bibliotherapy Preparation and Delivery". In: *Chatbot Research and Design*. Ed. by Asbjørn Følstad et al. Cham: Springer International Publishing, 2020, pp. 127–142. ISBN: 978-3-030-39540-7.

[20] Adam Miner et al. "Conversational agents and mental health: Theory-informed assessment of language and affect". In: *Proceedings of the fourth international conference on human agent interaction*. 2016, pp. 123–130.

[21] Adam S Miner, Arnold Milstein, and Jefferey T Hancock. "Talking to machines about personal mental health problems". In: *Jama* 318.13 (2017), pp. 1217–1218.

[22] David C Mohr et al. "Behavioral intervention technologies: evidence review and recommendations for future research in mental health". In: *General hospital psychiatry* 35.4 (2013), pp. 332–338.

[23] Megan Molteni. "The Chatbot Therapist will see you now". In: *Science—Wired Magazine. Retrieved from https://www. wired. com/2017/06/facebook-messenger-woebot-chatbot-therapist* (2017).

[24] Adam Palanica et al. "Physicians' perceptions of chatbots in health care: cross-sectional web-based survey". In: *Journal of medical Internet research* 21.4 (2019), e12887.

[25] Sami Pirkola et al. *Suicide prevention and suicide attempt. Current care recommendation*. Tech. rep. Helsinki: Finnish General Medical Association, 2020. URL: https://www.kaypahoito.fi/en/ccs00130.

[26] Kristian Pollock et al. "An evaluation of Samaritans telephone and email emotional support service". In: *Nottingham, UK: University of Nottingham* (2010).

[27] Nicole M Radziwill and Morgan C Benton. "Evaluating quality of chatbots and intelligent conversational agents". In: *arXiv preprint arXiv:1704.04579* (2017).

[28] Marita Skjuve and Petter Bae Brandtzæg. "Chatbots as a new user interface for providing health information to young people". In: *Youth and news in a digital media environment–Nordic-Baltic perspectives* (2018).

[29] Aditya Nrusimha Vaidyam et al. "Chatbots and conversational agents in mental health: a review of the psychiatric landscape". In: *The Canadian Journal of Psychiatry* 64.7 (2019), pp. 456–464.

[30] J. Weizenbaum. "Eliza - a computer program for the study of natural language communication between man and machine". In: *Communication of the Association for Computing Machinery* 9.36 (1965), p. 45.

[31] Julia Shuppert West et al. "Student perceptions that inhibit the initiation of counseling". In: *The School Counselor* 39.2 (1991), pp. 77–83.

[32] Rainer Winkler and Matthias Söllner. "Unleashing the potential of chatbots in education: A state-of-the-art analysis". In: (2018). URL: https://www.alexandria.unisg.ch/254848/1/JML{_}699.pdf.