ARTIFICIAL INTELLIGENCE AND MOBILE APPS FOR MENTAL HEALTHCARE: A SOCIAL INFORMATICS PERSPECTIVE

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ABSTRACT

For decades, Artificial Intelligence (AI) has been utilized within the field of mental healthcare as part of clinical and consumer-focused applications. AI, specifically as offered through mobile applications for mental healthcare (MHapps), has potential to make a positive impact on society. However, to do so, AI must be examined through a socially conscious lens in each state of its development and implementation. For example, AI MHapps called chatbots use therapeutic techniques to assist people with anxiety and depression, but such promise is tempered by concerns about the chatbots' efficacy and privacy. To help address these issues, this short paper tracks the development of mental health chatbots, reviews their current, and explores future potential for, and concerns surrounding, these e-health tools.

KEYWORDS

Artificial Intelligence, e-Health, Internet and Disability, Mobile Technologies, Social Informatics, Social Integration

1. INTRODUCTION

For decades, Artificial Intelligence (AI) has been utilized within the field of mental healthcare. Some of these applications have been clinical, while others were intended solely for consumers. AI, specifically as offered through mobile applications for mental healthcare (MHapps), has potential to make a positive impact on society. However, to do so, AI must be examined through a socially conscious lens in each state of its development, from conception and design to deployment and regulation (Crawford & Calo 2016, p. 313). For example, AI MHapps called chatbots use therapeutic techniques to assist people coping with mental illnesses, including anxiety and depression, but their promise is tempered by concerns about efficacy and privacy. To help address these issues, this paper will briefly track the development of mental health chatbots and other MHapps, review current uses of mental health chatbots, and explore the future potential for, and concerns surrounding, these tools. The paper concludes with recommendations for applications of AI in mobile mental healthcare and makes suggestions for future research regarding chatbots in e-health.

2. CHATBOTS

Chatbots are an AI application that has either a text or voice-based communication interface. Depending on the interface, the chatbot can read written language, including emojis, or translate speech into text, which the bot then analyzes and uses to craft a response (Kretzschmar et al. 2019; Stiefel 2018). This process of a chatbot receiving input from a user and replying with a response is referred to as a conversation. The complexity of a chatbot conversation ranges from simple response tools to more involved communications techniques. The level of sophistication is dependent on the AI technology that is used to build the chatbot's responses: better developed systems will generate more involved conversations (D'Alfonso et al. 2017). In general, the technology for the AI system is selected based on the intended social application of the chatbot.

The incorporation of AI in e-health marks both a technical and a cultural shift within the mental healthcare landscape (Crawford & Calo 2016, p. 313). In mental healthcare, a human clinician's ability to connect with their patient is important in establishing a therapeutic environment. Similarly, a chatbot's ability

to present itself as a trusted tool can encourage users to have conversations with it about personal issues. Constructing a believable level of complexity in a chatbot's conversational style can help build trust in the tool. However, AI chatbots exist in a relatively unregulated place where such trust can easily be exploited. Therefore, there is a need for accountability, transparency, oversight, and enforcement of chatbots in order to maintain an ethically sound environment for their continued operation in mental healthcare (Whittaker et al., 2018, p. 9). Examinations of previous e-healthcare tools' development can be helpful in creating informed paths forward for utilizing AI chatbots in ways that better protect consumers and their data.

2.1 Development and Use of AI Chatbots in MHapps

The origins of chatbots have roots in psychology and computer science. Their formal development traces back to approximately 1966, when a natural language processing computer program named ELIZA was created by Joseph Weizenbaum. ELIZA was modeled on an empathetic communication style, intended to imitate that of a clinical psychotherapist (Luxton 2014, p. 333; Stiefel 2018). ELIZA was followed in 1972 by PARRY, created by psychiatrist Kenneth Colby. PARRY imitated a paranoid schizophrenic and received considerable attention; it was the first program to pass the Turig Test and, via ARPANET, had a conversation with ELIZA (Cerf, 1973). Twenty years later, a chatbot called SBAISTO, for Sound Blasting Acting Intelligent Text to Speech Operator, launched with its responses modeled on those of a therapist. SBAISTO was followed in 2001 by the Artificial Linguistic Internet Computer Entity, or ALICE, whose Artificial Intelligence Markup Language (AIML) can be used to create other bots (D'Alfonso et al., 2017; Stiefel, 2018). Today, chatbots are employed in different ways within and outside of e-health, and several tools are marketed directly to clinicians.

Other Internet-based mental health care interventions, such as e-therapy, and online interventions, such as websites devoted to therapeutic tools, have been utilized for many years to use the Internet as a therapeutic tool for treating mental illness (Barak et al. 2008, p. 110). For example, since 1973, virtual humans have been utilized in e-health to assist with mitigating suicide risk (Lucas et al. 2014). Within electronic interventions, interpersonal elements can closely resemble in-person therapy. Thus, MHapps can help people maintain wellness between in-person visits to their mental health providers, which can alleviate burden on clinicians. For instance, some MHapps provide mental health information, potentially increasing mental health literacy. Mental health literacy develops through engagement with information about mental health. This can promote seeking of additional therapeutic help and decrease stigmatization of mental illness (Bakker et al. 2016, p. 11). Therapeutic techniques such as CBT and DBT, as well as mental health information, can be provided through chatbots.

2.2 Current Concerns with Chatbots and other MHapps

While MHapps, including chatbots, have potential to assist mental healthcare, it is necessary to treat these technologies as part of a larger culture. The application of new technologies to old problems does not necessarily solve the issues (Meyer et al. 2019, p. 309). It is still necessary to work to ameliorate infrastructure and cultural aspects that currently impede mental health treatment. At present, concern exists for several elements of AI chatbots that echo issues found with other MHapps. Additionally, problems facing AI within other sectors are also found in chatbots. These interrelated issues include user-focused design, safety, efficacy, and privacy.

Users should be central to any system design, and this is true in the development of a chatbot. An important consideration in the evaluation of MHapps, including those using AI, is their applicability for different groups. Examinations of a technology must include determining its intended audience (Noble 2018, p. 18). While electronic therapies have sometimes been tested within marginalized populations, they are generally designed for a broader audience. This design may deem them unsuitable for specific groups that have unique concerns, such as LGBTQ+ individuals. Without paying attention to the unique needs of a particular group, a MHapp can potentially cause harm to the populations it is attempting to help, or further distance them by not providing an informed approach to their needs. MHapps may also exacerbate mental health concerns related to Internet use. For example, excessive use of online media has been linked to depression (Terry & Gunter 2018, p. 136). An app that balances off-technology activities with in-app features

may have a better chance of avoiding these problems (Bakker et al. 2016, p. 12). Such apps encourage users to go offline and participate in activities that do not involve electronics.

Another issue facing the use of MHapps is the lack of clinical standards set for them. Three standards that are currently lacking, but could easily guide chatbots in particular, are safety, efficacy, and privacy (Kretzschmar et al. 2019). Safety resources are especially necessary to address suicidality, and would need to be appropriate for the user, such as offering geographically relevant call centers or providing direct connection to trusted individuals and emergency services. Regarding efficacy, like other therapeutic techniques, a MHapp must pass rigorous testing before it can be deemed a clinically effective tool (Bakker et al. 2016, p. 2). However, few chatbots have been clinically tested in randomized control trials, and many MHapps remain completely untested (Kretzschmar et al. 2019; Terry & Gunter 2018, p. 139). Protecting the privacy of user data is also of utmost importance in MHapps, especially since AI has unique potential to cause harm in regard to personal healthcare data (Whittaker et al. 2018). Chatbots gather healthcare data about their users, most of it intimate and collected within the app with the user's expectation of privacy, but this information is often not governed by regulations, such as HIPAA in the U.S., that would normally protect consumer health information (Stiefel 2018; Terry & Gunter 2017). Privacy is of particular importance in MHapps because of its link with stigmatization of mental illness (Koffi et al. 2018, p. 4). People seeking help for their mental health must trust that their privacy will be protected both online and in person to minimize their fears of stigmatization. In part due to stigma, people may be more likely to disclose issues with an AI tool (Lucas et al. 2014, p. 95). Thus, a perceived or real lack of privacy can impact the efficacy of treatment with a chatbot.

3. CONCLUSION AND FUTURE RESEARCH

Rising needs for mental healthcare, combined with expanding technological developments, indicate continued growth of MHapps and chatbots. Many individuals coping with mental illness will need in-person treatment from a variety of clinicians throughout their lives. While an AI chatbot may provide a person with a place to access tools and a forum to discuss issues, as well as a way to track moods and increase mental health literacy, AI is not a replacement for a therapist or other mental health clinician. Unlike psychiatrists, AI cannot prescribe lifesaving medications. AI is a tool in addressing mental illness, not a panacea. As such, it must be treated as one element of a sociotechnical system, not as the whole. Ultimately, if AI chatbots and other MHapps are to have a positive impact, they must be regulated, and society must avoid techno-fundamentalism in relation to AI for mental health.

Future research on this topic will include implementing studies of information behaviors of individuals coping with mental illness who utilize chatbots and MHapps. An understanding of how people locate and utilize the information contained in these tools can help inform the development of standards to govern the applications' future iterations, as well as and societal implications for their implementations.

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