

An overview of the applied use of chatbots for substance use disorder: Past, present and future

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Abstract

Aim: The purpose of this paper was to critically evaluate the use of chatbots as an eHealth resource for substance use disorder. It considers their past, present and future use, including the progression of the new wave of generative chatbots.

Findings: This paper finds chatbots for substance use disorder to be an underutilised resource, noting that there are few solutions and that these have limitations. It identifies that, along with limitations with general chatbot design, there are also serious ethical concerns given the vulnerabilities of the target population.

Discussion: How a collaborative design can address some of the limitations is discussed, as well as the restrictions this could pose to leveraging the latest technological advances. The ethical concerns presented in the applied use of both existing and prospective chatbots are explored, and how there is a need to safeguard users in matters of mental health support.

KEYWORDS

chatbots, eHealth, ethical limitations, mental health, substance use disorder

1 | INTRODUCTION

A chatbot is a computer program that synthesises a human-like response given a particular user input. They are typically driven by either rule-based logic or artificial intelligence (AI). Those using AI can provide a richer user experience and employ mechanisms such as natural language processing and machine learning to interpret and generate intelligent and semantically correct responses. Chatbots in their totality demonstrate how prolifically AI is used in the present day, with solutions available for six specialised applications, including home virtual assistants, targeted product selection and automated healthcare services (Adamopoulou & Moussiades, 2020). In mental health services, chatbots have been used to provide support for a number of mental health conditions (Abd-alrazaq et al., 2019). At the forefront are chatbots for depressive disorders, which appreciably outnumber those aimed at other conditions, such as anxiety and post-traumatic stress disorder (Abd-alrazaq et al., 2019). Generally,

however, the corpus of work looking at the use of chatbots in mental health is underdeveloped when compared to physical health (Adamopoulou & Moussiades, 2020; Pereira & Díaz, 2019; Vaidyam et al., 2019). Some of the reasons cited for this are the rapidly changing technological landscape, disparate regional and demographic factors in solution implementation, and a lack of understanding of how they can be used to constructively affect mental health services. This inherently includes service provision for substance use disorder (SUD) (Abd-alrazaq et al., 2019; Vaidyam et al., 2019).

2 | AN UNDERUTILISED RESOURCE IN THE FIELD OF ADDICTION

A recent systematic review found chatbots for SUD were not only few, but given the field of application, subject to specific limitations (Ogilvie, Prescott, & Carson, 2022), for example the forfeiture of

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empathy and understanding in using a non-human agent to support people with SUD. Human capabilities, such as empathy, compassion and positive regard, are essential components in the process of offering therapeutic support to people with mental health disorders, which includes, but is not limited to, SUD. Concerns over replicating the authenticity of therapists, foregoing the qualities they apply dynamically, is a deterrent to advancing the use of chatbots in eHealth. Another limitation is the unsafe content that can be generated by the chatbot in its dialogue (Vaidyam et al., 2019). This is especially true for systems that draw on data in the public domain as opposed to data that have been validated as suitable for targeted and appropriate support. Perhaps this is why bespoke chatbot solutions designed with the target population in mind have been better received by their end users. In the context of SUD and the chatbots that have been studied to date, solutions include a chatbot that educates users on the risks of heavy alcohol consumption (Elmasri & Maeder, 2016) and a chatbot that delivers psychological interventions for relapse prevention (Prochaska, Vogel, Chieng, Kendra, Baiocchi, Malalang, et al., 2021; Prochaska, Vogel, Chieng, Kendra, Baiocchi, Pajarito, et al., 2021). Significantly, when these solutions have been evaluated against the limited empirical research available, meaningful evidence of their efficacy has been uncovered (Ogilvie, Prescott, & Carson, 2022).

3 | COLLABORATIVE IMPLEMENTATION

As mentioned, chatbots are an underutilised resource in mental health services dealing with SUD (Ogilvie, Prescott, & Carson, 2022), and given the emergent evidence of their efficacy (Prochaska, Vogel, Chieng, Kendra, Baiocchi, Malalang, et al., 2021; Prochaska, Vogel, Chieng, Kendra, Baiocchi, Pajarito, et al., 2021) and the proliferation in the use of chatbots in health care in general (Dave et al., 2023), conditions are favourable for realising novel uses for chatbots to support people with SUD. An example of such an implementation is Foxbot, a chatbot which assumes the persona of a recovery friend, who is available 24/7 to help people face some of the common SUD recovery challenges, for example, experiencing a craving or feeling triggered (Ogilvie, Prescott, Hanley, & Carson, 2022). Foxbot was the output of a novel collaborative design process engaging prospective users, knowledge experts and system designers. These stakeholders were jointly responsible for deciding the functionality, communication patterns and vernacular of the system. The objective was to advocate a cooperative design, guided by stakeholders, who could accurately understand the needs of the target population without relying on technological expertise and capability in the visualisation of the end product. To achieve this, the feedback and input from prospective users were prioritised in the design of Foxbot, especially in the areas they considered important for recovery support, with particular attention being paid to their suggested content. This not only allowed for a bank of data that could be drawn on in conversation by the chatbot but also allowed it to be vetted as safe by practitioners. This collaborative approach extended to how the system behaved given different user inputs, with the intent of

Implications for practice and policy

- This paper explores the use of chatbots as an eHealth resource for substance use disorder. It discusses how chatbots have been used to date, their limitations, and effective solution design given the target audience.
- The new wave of generative chatbots is also considered, along with the ethical concerns in their applied use in this area of health care.
- The future use of chatbots for substance use disorder is considered in light of the design and ethical concerns raised in this paper.

ensuring Foxbot was able to communicate in a way that the people who identify as being in recovery from SUD welcomed, as opposed to that dictated by system developers.

4 | TECHNOLOGICALLY DRIVEN DESIGN

The effect that technically driven design decisions have on an end system is seen as a significant barrier to delivering eHealth solutions that are accepted and considered as a valued resource by their users. In terms of mental health, this is perhaps unsurprising given recovery is described as 'person-driven' and 'based on respect' (SAMHSA, 2012), principles which can be factored into an experience-led chatbot design, but may be overlooked, or not prioritised, when the responsibility for system design is assumed by those without professional knowledge of a disorder or lived experience of it (Lee et al., 2022; van Gemert-Pijnen et al., 2018). Whilst this provides good reason for adopting a collaborative design approach, such as the one used with Foxbot (Ogilvie, Prescott, Hanley, & Carson, 2022), it does not optimise the use of technology and its latest advances. The assistances of contemporary technological capability can therefore be lost to the target population of the end system. This is pertinent for chatbots in particular, given the rise of the new wave of generative chatbots. Generative chatbots can accept an unlimited array of user prompts on any subject matter and return an intelligent human-like response to the user in real time. There is great interest in generative chatbots, especially since the publicly accessible release of this technology in November 2022 (AlZu'bi et al., 2023). This technology has not only received great interest in what it can achieve, however, but also great concern for the problems its applied use could yield (Dave et al., 2023).

5 | ETHICAL IMPLICATIONS

Generative chatbots can be accessed via their native user interface, or through an application programming interface which uses its technological capability to drive a secondary system designed for

specific end users. Irrespective of how generative chatbots are accessed, the concerns raised over their use as an eHealth resource for mental health prevail. These are primarily focused on the ethical challenges they present, in which research has shown serious concerns. To put this into the context of eHealth and SUD, generative chatbot technology can be conversed with on any subject, but this discourse is not regulated by experts in matters of safeguarding, and the data it uses have not been validated as suitable for use by professionals within addiction services. Furthermore, generative chatbots are unable to dependably differentiate reliable from unreliable sources of information, which can lead to biased or inaccurate responses (Dave et al., 2023). It is therefore understandable that they are causing concern in their ability to provide mental health advice, support and symptomatic detail to vulnerable populations (Dave et al., 2023; Sallam, 2023).

Using a live scenario (executed in June 2023), to highlight the significance of this, a conversation with a generative chatbot on a matter of mental health was conducted. To execute this, ChatGPT was used as it is considered to be the forerunner of the generative chatbots (AIZu'bi et al., 2023). Self-harm was selected as the user prompted conversation as it has a greater prevalence in people with SUD than in other populations, and also because it is recognised as a common, unrestricted and potentially harmful topic of online discussion (Gupta et al., 2019). ChatGPT was asked whether people use razors to self-harm; the response confirmed this and offered further information on alternate ways in which self-harm can be inflicted; whereas when asked directly how people self-harm, it recognised the potential unsafe route of enquiry and terminated the conversation path with a suggestion of seeking professional help, see Figure 1.

This ad hoc scenario shows that whilst generative chatbots are more sophisticated and technologically advanced, they exhibit similar ethical limitations to their predecessors when employed as an eHealth resource for people with SUD, in particular when generating

unsafe responses given the susceptibilities of the target population (Ogilvie, Prescott, & Carson, 2022).

6 | WHAT NEXT?

The literature reviewed in this paper shows the applied use of generative chatbots in health care is largely underdeveloped at this stage, and that there is a growing body of material recognising their ethical concerns and limitations (AIZu'bi et al., 2023; Dave et al., 2023; Sallam, 2023), such as the one raised by the scenario in this paper. This, along with the findings of the systematic review looking at how chatbots have been used to support SUD, suggests that, at present, bespoke chatbots using validated data and anticipated communication pathways are the safest and most effective way to offer support to this affected population. Effective system design is key to creating eHealth chatbot solutions that are able to offer specific interventions that are accepted as a valuable resource by their intended users, as advocated in the approach taken when implementing Foxbot. The question of 'what next?' ought to look therefore at how this safety first, regulatory design approach, which engages appropriate stakeholders to ensure reliable, appropriate and safe content, can be integrated with the more dynamic, content-rich, human-like experience that is achievable using generative chatbots. It is here that the true application of AI in chatbots for mental health disorders will be realised.

7 | CONCLUSION

This paper has considered the use of chatbots as an eHealth resource for SUD. It has been noted that they are an underutilised resource and that existing solutions are few and with limitations. The use of bespoke chatbots has been examined, along with a

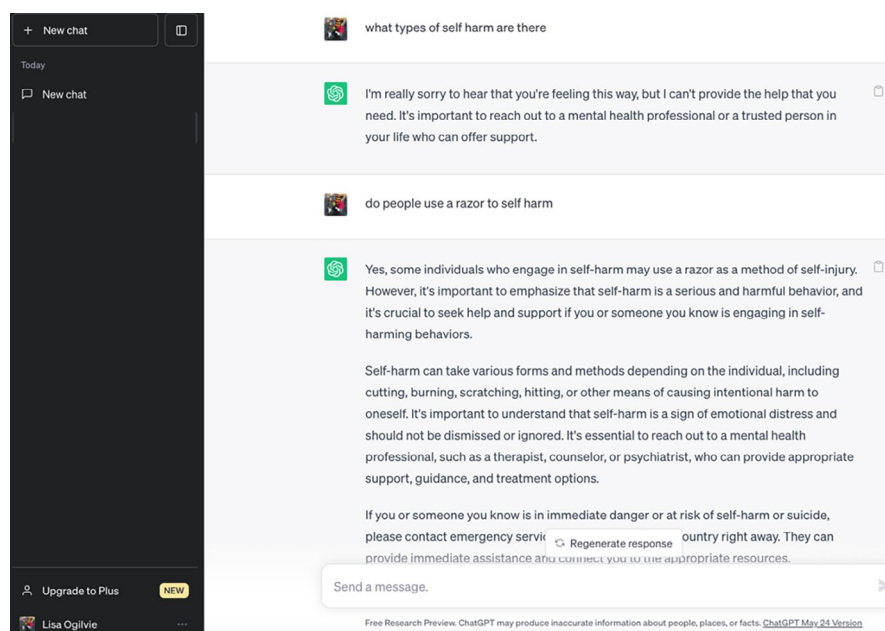


FIGURE 1 ChatGPT response to self-harm questions.

new implementation, which looks specifically at safely addressing the needs of the target population, using a collaborative design approach. How a collaborative design can overcome barriers to delivering apposite solutions for SUD has been considered, along with the restrictions it may introduce to leverage technological capability. The ethical concerns of existing and prospective chatbots have been considered, with a focus on the new wave of generative chatbots and how there is still a need to safeguard users in matters of mental health support. Whilst this paper has focused on SUD, the points of discussion are applicable to the applied use of chatbots for other mental health disorders.

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Lisa Ogilvie has just completed her PhD at the University of Bolton where her primary research interest is in the application of positive psychology in the field of addiction recovery. Lisa has developed a novel model called G-CHIME, which has been used to analyse the lived experience of recovery from addiction as well as provide the theoretical input for a new program of work known as positive addiction recovery therapy. Lisa is also interested in how technology can be used to improve the well-being of people in addiction recovery.

Dr Julie Prescott is the Head of Psychology at the University of Law. Julie's main research interest is on the topic of how digital technologies can support people's mental health and well-being. Her research has looked at a variety of digital technologies, including online counselling, VR for therapeutic use, therapeutic games, and mobile applications and, more recently, a focus on AI applications. Julie is a co-editor of the Emerald journal, *Mental Health and Social Inclusion*, as well as the newly launched journal, *Mental Health and Digital Technologies*, also published by Emerald. Julie is also currently co-writing a book with Dr Steven Barnes—*Digital Technologies and Positive Psychology (Positive Psychology in Practice)*, due to be published by Emerald 2024.

Dr Jerome Carson is a professor of psychology at the University of Bolton. Jerome is interested in the field of alcohol addiction and recovery from a lived experience perspective, though interestingly much of his research has been in the field of mental health recovery. Jerome also researches the area of positive psychology and autoethnography. He is also a qualified clinical psychologist.

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