

Review Article

Modernizing Mental Healthcare through Artificial Intelligence

Hassan. Osman^{1*}, Bahga Hamed²

^{1,2} Department of Psychiatry – Napata College, Khartoum North, Khartoum, Sudan

***Correspondent author:** Hassan Osman. Department of Psychiatry – Napata College, Khartoum North, Khartoum, Sudan. **Email:** hassannismail603@gmail.com.

Received: 28 June. 2024

Accepted: 8 July.2024

Abstract:

In this review article, we explore the implementation of Artificial Intelligence (AI) in mental healthcare. Data was collected via searching for relevant data through the use of the search engines of Google Scholar and PubMed. In our search, we found that despite the unprecedented advancements manifested, AI is, as of this writing, still far from replacing human mental health practitioners, but can be of great aid to them. As it seems from the data collected, depression and anxiety are most likely to become the first psychiatric disorders that could be detected independently with AI.

Keywords: Artificial Intelligence; AI; Napata Scientific Journal; NSJ; Mental Healthcare; Psychology; Psychiatry

Introduction:

Around 20% of adults in the United States live with a mental illness, with a substantial percentage of those not receiving treatment (1–3). Internationally, it is estimated that approximately 70% of individuals suffering from mental illness do not receive official, medical treatment (4). A plethora of causes of such reports exist; however, the issue of accessibility to mental healthcare is one which continues to play a major role (5).

The pace of technological advancement that took place starting from the industrial revolution on was, until then, hitherto undreamt of. Access to smartphones and the internet continues to increase (6). This unprecedented pace manifested in all aspects of life including, but not limited to, healthcare. Recent advancements, such as that of Artificial Intelligence (AI) have resulted in changes we have yet to fully comprehend and that only time will truly reveal. Mental healthcare has formerly established digital mental health services and is now working towards establishment of AI-driven mental healthcare improvements and interventions (7,8).

Research Methodology:

An extensive review of the literature was conducted by the researchers using the aforementioned keywords. These were run through Google Scholar and PubMed search engines. The articles were excluded based on their accessibility (some were inaccessible to the authors) and relevance to the topic at hand. The search terms used were:

- 1) Artificial Intelligence
- 2) AI
- 3) Advancements in Mental Healthcare
- 4) Advancements in Psychology
- 5) Advancements in Psychiatry

Following this, duplicates, articles which were found to discuss AI but in different applications, articles published in ‘predatory journals’, and irrelevant articles were excluded.

How did AI come to be?

The term is rather broad, covering a plethora of techniques employed with the intention of evolving computational systems that perform formerly characteristically ‘human’ cognitive abilities (9).

Uses of AI in mental health:

Mental Health, in practice, is highly dependent on the element of language. This

is how we express ourselves as humans. We base this on our idea of language (what is appropriate, what isn't, etc.). Artificial intelligence uses processes such as digital phenotyping and personal sensing (10,11) to collect information on the normal behaviors of human beings and, ergo, be able to detect any deviation from the perceived normal. This is done via the utilization of technologies such as the Internet of Things, smartphones, and wearables (12–15). Algorithms based on artificial intelligence possess the superhuman capacity to accurately analyze data input by users and, ergo, adapt their responses to the individual being assessed. This could possibly result in more positive interactions (16).

Of the mental health conditions thoroughly researched in regards to the utilization of digital phenotyping have been depression and anxiety; with most of that research focusing on the conditions and their association with physical activity (9,17–19)

In addition to being associated with assessment, recent data indicates usage of smartphone typing patterns as data (typing, swiping, tapping, etc.) for assessment of depression (9,20)

Furthermore, in addition to usage in assessment and monitoring of depression and

anxiety, smartphones, as well as other personal digital devices, have been employed in the study of schizophrenia/psychosis (9,21–28). Additionally, this technology is being studied as means to deliver personalized therapy based on the data collected (29).

Published data indicates that, in the future, healthcare chatbots would play a significant role, possibly exceeding that possessed by providers (30).

A drawback regarding the use of AI in general is the lack of human empathy (31,32). In fact, over 80% of psychiatrists do not believe AI could ever match a human practitioner in terms of empathic care (33).

Ethical Considerations:

As is, mental healthcare places its practitioners in a peculiar ethical position that requires trust for a therapeutic relationship to manifest (1,34). The addition of ethical considerations associated with AI will only further complicate the situation.

Conclusion:

In conclusion, despite the advances in AI resulting in access to more and more individuals to mental healthcare and being

rather promising, AI is still far from replacing human practitioners in the field. However, AI could be of immense use to said practitioners. However, the presence of research into the topic sheds a light and sees to it that data is made available to practitioners so as to allow for them to optimize services provided.

References:

1. Boucher EM, Harake NR, Ward HE, Stoeckl SE, Vargas J, Minkel J, et al. Artificially intelligent chatbots in digital mental health interventions: a review. *Expert Rev Med Devices* [Internet]. 2021;18(sup1):37–49. Available from: <https://doi.org/10.1080/17434440.2021.2013200>
2. Merikangas K, He J, Burstein M, Al. E. Lifetime prevalence of mental disorders in U.S. adolescents: results from the National Comorbidity Survey Replication–Adolescent Supplement (NCS-A). *J Am Acad Child Adolesc Psychiatry*. 2010;49(10):980–989.
3. MD B. NIMH. [cited 2024 Jun 5]. NIMH-mental illness. Available from: www.nimh.nih.gov/health/statistics/mental-illness#part_2555
4. Wang P, Aguilar-Gaxiola S, Alonso J, Al. E. Use of mental health services for anxiety, mood, and substance disorders in 17 countries in the WHO world mental health surveys. *Lancet*. 2007;370(9590):841–850.
5. Thomas K, Ellis A, Konrad T, Al. E. County-level estimates of mental health professional shortage in the United States. *Psychiatr Serv*. 2009;60(10):1323–1328.
6. Washington D.C.: Pew Research Center [Internet]. 2021 [cited 2024 May 28]. Perrin A. Mobile technology and home broadband 2021. Available from: www.pewresearch.org/internet/2021/06/03/mobile-technology-and-home-broadband-2021/
7. Graham S, Depp C, Lee E, Nebeker C, Tu X, Kim HC, et al. Artificial intelligence for mental health and mental illnesses: an overview. *Curr Psychiatry Rep*. 2019;21.
8. Anthes E. Mental health: there's an app for that. *Nature*. 2016;532(7597):20–2.
9. D'Alfonso S. AI in mental health. *Curr Opin Psychol* [Internet]. 2020;36:112–

7. Available from: <https://doi.org/10.1016/j.copsyc.2020.04.005>
10. Onnela JP, SL R. Harnessing smartphone-based digital phenotyping to enhance behavioral and mental health. *Neuropsychopharmacology*. 2016;41:1691–6.
11. Mohr D, Zhang M, Schueller S. Personal sensing: understanding mental health using ubiquitous sensors and machine learning. *Annu Rev Clin Psychol*. 2017;13:23–47.
12. Difrancesco S, Lamers F, Riese H, Merikangas K, Beekman A, van Hemert A, et al. Sleep, circadian rhythm, and physical activity patterns in depressive and anxiety disorders: A 2-week ambulatory assessment study. *Depress Anxiety*. 2019;36:975–86.
13. Scott J, Grierson A, Gehue L, Kallestad H, MacMillan I, Hickie I. Can consumer grade activity devices replace research grade actiwatches in youth mental health settings? *Sleep Biol Rhythms*. 2019;17:223–32.
14. de la Torre Diez I, Alonso S, Hamrioui S, Cruz E, Nozaleda L, Franco M. IoT-based services and applications for mental health in the literature. *J Med Syst*. 2019;43.
15. Montag C, Sindermann C, Baumeister H. Digital phenotyping in psychological and medical sciences: a reflection about necessary prerequisites to reduce harm and increase benefits. *Curr Opin Psychol*. 2020;
16. Shumanov M, Johnson L. Making conversations with chatbots more personalized. *Comput Hum Behav*. 2021;117:106627.
17. Masud M, Mamun M, Thapa K, Lee D, Griffiths M, Yang S. Unobtrusive monitoring of behavior and movement patterns to detect clinical depression severity level via smartphone. *J Biomed Inform*. 2020;103.
18. Ware S, Yue C, Morillo R, Lu J, Shang C, Bi J, et al. Predicting depressive symptoms using smartphone data. *Smart Health*. 2020;15.
19. Saeb S, Lattie E, Schueller S, Kording K, Mohr D. The relationship between mobile phone location sensor data and depressive symptom severity. *Peer J*. 2016;4.

20. Mastoras RE, Iakovakis D, Hadjidimitriou S, Charisis V, Kassie S, Alsaadi T, et al. Touchscreen typing pattern analysis for remote detection of the depressive tendency. *Scientific Reports* Sci Rep. 2019;9.
21. Barnett I, Torous J, Staples P, Sandoval L, Keshavan M, Onnela JP. Relapse prediction in schizophrenia through digital phenotyping: a pilot study. *Neuropsychopharmacology*. 2018;43:1660–6.
22. Buck B, Scherer E, Brian R, Wang R, Wang W, Campbell A, et al. Relationships between smartphone social behavior and relapse in schizophrenia: A preliminary report. *Schizophr Res*. 2019;208:167–72.
23. Bell I, Lim M, Rossell S, Thomas N. Ecological momentary assessment and intervention in the treatment of psychotic disorders: a systematic review. *Psychiatr Serv*. 2017;68:1172–81.
24. Robinaugh D, Brown M, Losiewicz O, Jones P, Marques L, Baker A. Towards a precision psychiatry approach to anxiety disorders with ecological momentary assessment: the example of panic disorder. *Gen Psychiatr*. 2020;33:16.
25. Triantafyllou S, Saeb S, Lattie E, Mohr D, Kording K. Relationship between sleep quality and mood: ecological momentary assessment study. *JMIR Ment Health*. 2019;6.
26. Myin-Germeys I, Klippel A, Steinhart H, Reininghaus U. Ecological momentary interventions in psychiatry. *Curr Opin Psychiatry*. 2016;29:258–63.
27. Schueller S, Aguilera A, Mohr D. Ecological momentary interventions for depression and anxiety. *Depress Anxiety*. 2017;34.
28. Hanssen E, Balvert S, Oorschot M, Borkelmans K, van Os J, Delespaul P, et al. An ecological momentary intervention incorporating personalised feedback to improve symptoms and social functioning in schizophrenia spectrum disorders. *Psychiatry Res*. 2020;284.
29. D'Alfonso S, Carpenter N, Alvarez-Jimenez M. Making the MOST out of smartphone opportunities for mental health. In: 30th Australian Conference

- on Computer- Human Interaction; Melbourne; 2018.
30. Sweeney C, Potts C, Ennis E, Al. E. Can chatbots help support a person's mental health?: perceptions and views from mental healthcare professionals and experts. *ACM HEALTH*. 2021;2(3):1–16.
 31. Montemayor C, Halpern J, Fairweather A. AI Soc. 2021. p. 1–7 In principle obstacles for empathic AI: why we can't replace human empathy in healthcare.
 32. Lisetti C, Amini R, Yasavur U, Al. E. You change! an empathic virtual agent delivers behavior change health interventions. *ACM Trans Inf Syst*. 2013;4(19):1–28.
 33. Doraiswamy P, Blease C, Bodner K. Artificial intelligence and the future of psychiatry: insights from a global physician survey. *Artif Intell Med*. 2020;102(101753).
 34. Birkhäuer J, Gaab J, Kossowsky J, Al. E. Trust in the health care professional and health outcome: a meta-analysis. *PLoS One*. 2017;12(2):e0170988.