

Generative AI: A Promising, but Cautious, Ally in Children's Mental Health

Muhammad Mahbubur Rahman*


Assistant professor, Center for Translational Research at Children's National Hospital, USA

Assistant professor, Pediatrics & of Biostatistics and Bioinformatics at George Washington University, USA

ISSN: 2832-4463



***Corresponding author:** Muhammad Mahbubur Rahman, Assistant professor, Center for Translational Research at Children's National Hospital and Pediatrics & of Biostatistics and Bioinformatics at George Washington University, USA

Submission:  July 26, 2024

Published:  August 12, 2024

Volume 4- Issue 1

How to cite this article: Muhammad Mahbubur Rahman*. Generative AI: A Promising, but Cautious, Ally in Children's Mental Health. COJ Rob Artificial Intel. 4(1). COJRA. 000577. 2024.
DOI: [10.31031/COJRA.2024.04.000577](https://doi.org/10.31031/COJRA.2024.04.000577)

Copyright@ Muhammad Mahbubur Rahman, This article is distributed under the terms of the Creative Commons Attribution 4.0 International License, which permits unrestricted use and redistribution provided that the original author and source are credited.

Abstract

Generative Artificial Intelligence (AI), a powerful subfield of AI, is rapidly gaining momentum in both private and public sectors, demonstrating its applicability across diverse domains. The healthcare system is no exception, with researchers enthusiastically embracing its potential to provide valuable support across various healthcare domains. This article explores the transformative potential of Generative AI in addressing children's mental health, considering its promises, challenges, and ethical implications. By highlighting the applications of Generative AI models in detection and support, the article emphasizes the need for cautious implementation due to risks such as bias, hallucination, and privacy concerns. Emphasizing a collaborative approach involving clinicians and robust governance, the article concludes by advocating for responsible integration, acknowledging Generative AI as an augmentation, not a replacement, for human expertise in the realm of children's mental health.

Keywords: Generative AI; Mental health; Large language model; Children's mental health

Introduction

According to the World Health Organization (WHO), mental health is characterized as the mental well-being of an individual, enabling them to understand their capabilities, handle normal life stresses, and contribute to their community. This complicated aspect of life encompasses an individual's mind, body, social surroundings, and the environment. Children's mental health is more complex due to associated factors like developmental elements (cognitive and emotional factors), the impact of early life experiences (such as bullying, inadequate family support, and academic stress), and limited communication skills.

Despite these complexities, mental health is considered a fundamental human right essential for individuals to lead fulfilling and productive lives. Hence, recognizing and addressing potential factors contributing to children's mental health issues is essential. While stakeholders like parents, teachers, clinicians, mental health professionals and academic researchers play an important role in fostering good mental health in children, the identification, treatment, and management of mental health issues pose significant challenges. These challenges stem from various sources, including the diverse developmental trajectories of children, varied early life experiences, misconceptions and stigma around mental health, limited access to resources, a spectrum of complex disorders, and even the mental health conditions of parents and caregivers.

Artificial Intelligence (AI), particularly Generative AI (GenAI) technology, has the potential to contribute significantly to the development of children's mental health. GenAI, a subset of AI, can generate new content such as text, images, speech, videos, and complex patterns by learning from vast datasets sourced from public and private channels. This technology mimics human behavior and could offer innovative avenues for supporting children's mental health. However, like any technological advancement, GenAI has both positive and negative aspects, contingent on its ethical application. This paper explores the promises of GenAI and describes

potential challenges it may pose in the context of children's mental health development.

Promises

AI technologies, including deep learning, machine learning, and natural language processing, have been widely applied in addressing children's mental health. Deep learning methods, such as deep belief networks, have been used in classifying autism spectrum disorders based on brain imaging data in young children [1]. Similarly, Convolutional Neural Networks (CNNs) have been employed for detecting autism spectrum disorder using brain imaging datasets [2]. Multiple studies have harnessed deep learning approaches for detecting Attention-Deficit/Hyperactivity Disorder (ADHD) in children [3,4]. Machine learning algorithms have successfully identified depression in children [5]. Furthermore, machine learning techniques have played an important role in predicting anxiety and depression risk factors in school-age children [6]. Moreover, machine learning has been applied to predicting depression and anxiety in mid-adolescence using multi-wave longitudinal data [7]. NLP techniques have been used in mental health identification for children and adolescents, including the identification of suicidal adolescents from mental health records [8] and the recognition of suicidal behavior among psychiatrically hospitalized adolescents through the analysis of electronic health records [9]. These approaches have found widespread applications in the field of adult's mental health as well.

To our knowledge, there has been no research specifically conducted on children's mental health utilizing GenAI methods. However, a limited number of studies have explored the application of GenAI in general mental health [10,11]. Most of these studies primarily focus on ChatGPT as a use case. An editorial discusses the potential integration and few associated challenges of GenAI technologies into general mental health care [12]. We believe that there is significant potential for the adaptation of GenAI in the context of children's mental health.

A chatbot leveraging a Large Language Model (LLM), a type of GenAI, has significant potential in advancing mental health support for children. For instance, an LLM-powered chatbot could be designed as an interactive storytelling tool for children, assisting in managing anxiety and depression by diverting them from negative thoughts. Through immersive narratives, it can deliver hopeful messages and educate coping skills in the form of a story. Additionally, the chatbot could function as a supportive question-and-answer system for parents dealing with children's mental health issues, offering 24x7 non-emergency assistance. By analyzing their previous interactions, the LLM-based chatbot can provide valuable information to parents. This is similar to the functionality of Woebot Health, a non-GenAI-based chatbot supporting mental health in adults [13].

Leveraging LLM enables the extraction of mental health concepts from various sources, including social media, Electronic Health Records (EHR), and research publications. This facilitates easy access to such information for parents, teachers, and clinicians. It can efficiently summarize clinical notes, thereby saving valuable

time for clinicians when reviewing patient charts. As a mood monitoring tool, LLM can analyze children's day-to-day activities such as social media interactions, forum participation, written assignments and essays to identify children's emotions, mental strengths, weaknesses and assist in managing their mental health conditions.

Furthermore, LLM has the capability to analyze both structured and unstructured content in children's EHR, understanding symptoms and the entire trajectory of mental health-related issues. This capacity could allow developing personalized treatment plans for mental illness. It could also allow the early detection of any potential mental illness. Additionally, LLM can contribute to the creation of mental health education content tailored for children. This content helps children better understand symptoms, potential risks, and effective management strategies for their mental well-being.

In addition to LLM, GenAI demonstrates the capability to understand images and videos, generating new and previously unseen realistic visuals [14]. This implies that GenAI can play a crucial role in creating supportive tools for clinicians, not only interpreting text-based health records but also images and videos, including fMRI scans, X-rays, EEG data and video recordings of Cognitive-Behavioral Therapy (CBT) sessions. Such a support tool has the potential to assist clinicians, allowing them to be more deeply engaged in supporting children and providing personalized care.

Children facing challenges with Social-Emotional Learning (SEL) may be at a heightened risk of developing behavioral issues and psychiatric disorders [15]. GenAI has the potential to assist these children in cultivating self-awareness, coping mechanisms and interpersonal skills. This can be achieved through the creation of personalized interactive games, educational videos and activities tailored to their specific needs and developmental requirements. GenAI can also streamline various automated tasks including appointment scheduling, note-taking, billing, insurance processing and information validation. This efficiency allows mental health professionals or clinicians to dedicate more time to decision-making and providing focused patient care.

Challenges

While GenAI has a great promise for addressing mental health concerns in children, it is not without its limitations. Various GenAI models, including Gemini, ChatGPT, DALL-E and Sora, are trained on extensive datasets comprising terabytes of information, including hundreds of millions of image-caption pairs and video-captions sourced from the web. However, this data may contain disinformation, misleading content, violence, hateful content, discriminatory narratives and negative stereotyping. Consequently, there is a risk that trained GenAI models may produce inaccurate mental health information, generate violent content and provide biased suggestions for mental health treatment plans. Such outcomes pose a considerable risk to the well-being of children, potentially exacerbating their mental states. Therefore, the implementation of effective regulations and the integration of

clinician monitoring within the GenAI model are essential to ensure responsible and safe use in the context of mental health support for children.

GenAI models may produce incorrect, absurd, or irrelevant content, a phenomenon commonly referred to as hallucination. Hallucination can occur due to various factors, including biases and incorrect data, limited training data and incomplete prompt engineering. In the context of children mental health, such errors could have serious consequences. To mitigate the risk of hallucination in GenAI models, careful attention should be given to data curation and prompt engineering during the training process. Combining multiple strategies, including fact-checking by taking clinicians-in-the-loop, fine-tuning the models using high-quality data and providing clear prompts, can help minimize the occurrence of hallucinatory outputs. This cautious approach is essential to ensure the reliability and safety of the generated content in children's mental health.

Ensuring the privacy and confidentiality of patients, especially children, is of utmost importance. Patients have the right to control their Personal Health Information (PHI). Healthcare providers are obligated to maintain the confidentiality of children's PHI and transparent to the legal guardians on the data use policy. The use of GenAI models trained on extensive patient data raises concerns about potential PHI inclusion or leaks, constituting a violation of HIPAA regulations. When curating data for model training with children's data, strict adherence to HIPAA compliance is crucial. Establishing robust data governance is essential to minimize patient data exposure during both training and use. Obtaining proper consent from legal guardians is essential. Rather than training GenAI models with all-encompassing children's data, a recommended approach involves fine-tuning large models exclusively with appropriately de-identified and anonymized children's data. This ensures minimal exposure of children's PHI to the models, promoting both privacy and regulatory compliance. Additionally, a synthetic data generation approach tailored to children's mental health data can be used. This method generates realistic data with appropriate statistical representation while maintaining anonymization, thereby strengthening security, privacy and mitigating data bias, while facilitating effective GenAI models training.

Another challenge with GenAI models lies in their inherent technological complexity. The team engaged in training and developing applications using GenAI models must possess a thorough understanding of the approach and appropriate usage. Inadequate understanding and the development of inaccurate or poorly designed mental health applications have the potential to exacerbate health conditions, particularly considering the rapid pace of children's mental, emotional and social development. Last but certainly not least, a fundamental challenge with GenAI lies in its substantial computing demands for training on vast datasets, often reaching hundreds of terabytes. This requires accelerated computing, sizable storage and large GPU memories, commonly facilitated through cloud computing platforms such

as AWS, Google Cloud and Microsoft Azure. Ensuring secure data storage on public clouds requires careful security configuration by institutions. Transparent communication with legal guardians regarding the storage of their children's data in the cloud is necessary. The institutional data governance body should play a key role in upholding the security and transparency of children's data throughout this process.

Conclusion

In conclusion, the potential impact of GenAI on the development of children's mental health is significant, comparable to the transformative influence of electricity in its domain. However, the adoption of this technology presents challenges related to trust and privacy. While government bodies and agencies, such as the FDA and NIST, work on regulations to address bias and enhance trust in GenAI, it is essential to establish robust institutional governance for both data and technology to minimize potential harm and foster trustworthiness. It is important to note that GenAI is not intended to replace psychiatrists and therapists but to assist them in providing enhanced care for children. Involving clinicians in the loop and incorporating their feedback into model training processes can significantly enhance trust, reduce bias and result in a more accurate and secure model.

Conflict of Interest

The authors have declared that they have no competing or potential conflicts of interest.

References

1. Akhavan Aghdam M, Sharifi A, Pedram MM (2018) Combination of rs-fMRI and sMRI data to discriminate autism spectrum disorders in young children using deep belief network. *J Digit Imaging* (6): 895-903.
2. Sherkatghanad Z, Akhondzadeh M, Salari S, Abdar M, Rajendra AU, et al. (2020) Automated detection of autism spectrum disorder using a convolutional neural network. *Front Neurosci* (13): 1325.
3. Chen H, Song Y, Li X (2019) A deep learning framework for identifying children with ADHD using an EEG-based brain network. *Neurocomputing* (356): 83-96.
4. Vahid A, Bluschke A, Roessner V, Stober S, Beste C (2019) Deep learning based on event-related EEG differentiates children with ADHD from healthy controls. *J Clin Med* 8(7): 1055.
5. Haque UM, Kabir E, Khanam R (2021) Detection of child depression using machine learning methods. *PLoS One* 16(12): e0261131.
6. Qasrawi R, Stephanny PVP, Al-Halawa DA, Hallaq S, Abdeen Z, et al. (2022) Assessment and prediction of depression and anxiety risk factors in schoolchildren: machine learning techniques performance analysis. *JMIR Form Res* 6(8): e32736.
7. Hawes MT, Schwartz HA, Son Y, Klein DN (2023) Predicting adolescent depression and anxiety from multi-wave longitudinal data using machine learning. *Psychol Med* 53(13): 6205-6211.
8. Sumithra Velupillai, Sophie Epstein, André Bittar, Thomas Stephenson, Rina Dutta, et al. (2019) Identifying suicidal adolescents from mental health records using natural language processing. *Stud Health Technol Inform* 264: 413-417.
9. Carson NJ, Mullin B, Sanchez MJ, Frederick L, Yang k, et al. (2019) Identification of suicidal behavior among psychiatrically hospitalized adolescents using natural language processing and machine learning of electronic health records. *PLoS One* 14(2): e0211116.

10. Takefuji Y (2023) Impact of COVID-19 on mental health in the US with generative AI. *Asian J Psychiatry* (88): 103736.
11. Souza BC, Andrade Neto AS, Roazzi A (2024) The generative AI revolution, cognitive mediation networks theory and the emergence of a new mode of mental functioning: Introducing the Sophotechnic Mediation scale. *Computers in Human Behavior: Artificial Humans* 2(1): 100042.
12. Torous J, Blease C (2024) Generative artificial intelligence in mental health care: Potential benefits and current challenges. *World Psychiatry* 23(1): 1-2.
13. Fitzpatrick KK, Darcy A, Vierhile M (2017) Delivering cognitive behavior therapy to young adults with symptoms of depression and anxiety using a fully automated conversational agent (Woebot): A randomized controlled trial. *JMIR Ment Health* 4(2): e19.
14. (2024) OpenAI. Sora: OpenAI Video generation models as world simulators.
15. Briggs-Gowan MJ, Carter AS (2008) Social-emotional screening status in early childhood predicts elementary school outcomes. *Pediatrics* 121(5): 957-962.