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Artificial Intelligence in Education for ADHD Students: A Survey

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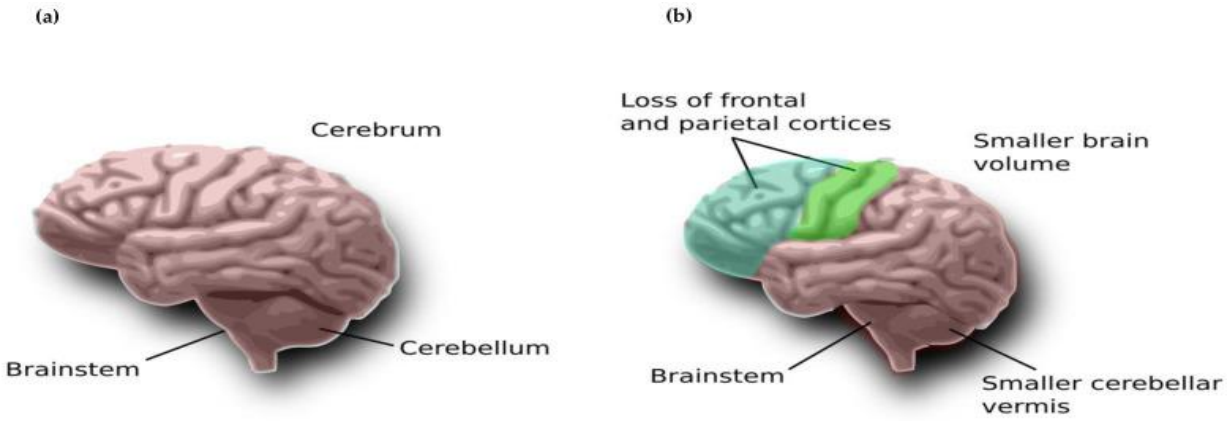
Abstract: *This paper deals the transformative potential of Artificial intelligence in education with a complete focus on students with ADHD. The aim of this study is to evaluate the effect of Artificial Intelligence (AI) on education for ADHD students. The study discovered that AI has extensively been used in education, especially by educational institutions, in various structures. In the past few years, enormous technological advancements have improvised and eased access to educational materials, positively impacted overall learning experiences for students with ADHD despite the transition to remote learning. Students are more likely to retain higher volume of information outside of class, if they get a core understanding of the subject topics during class. A model combined with an engaging front-end user interface can enhance the standard of education for students with ADHD and help them achieve the same level of understanding they would have during an in-person lesson. Findings of this research suggests that an AI model could help an instructor learn and manage symptoms of ADHD – such as distractions, impulsivity, hyperactivity and boredom, less focus – by modifying their curriculum to further engage the student. This study has the potential to fill the notable gap between technology and personalized education, using technology to provide targeted and individually tailored education for students with ADHD.*

Keywords: *ADHD, AI, Personalized Education, Issues.*

I.INTRODUCTION

Attention Deficit Hyperactivity Disorder (ADHD) is a neurobiological disorder that affects approximately 5-7% of school-aged children world-wide. It is one of the most common developmental disorders, generally appearing in toddler stage and continues into one's adulthood. It affects students' attention, executive functioning, and impulse control. Students with ADHD experience immense impulsivity, decreased concentration of attention and severe physical activity. It causes people to act without thinking about the consequences. One of the key features of children with ADHD in their lack of ability to focus on a single task for an extended period of time.

Preliminary research points to differences in brain volumes in children diagnosed with ADHD compared to neurotypical children, particularly affecting the frontal and parietal cortices.



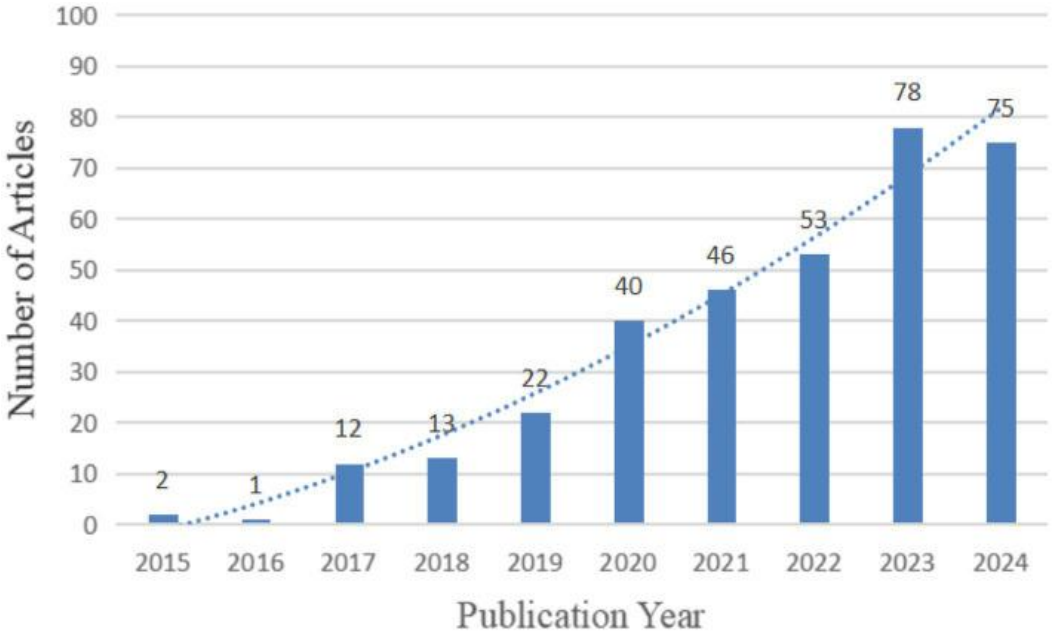
(a) *Normal brain and (**b**) ADHD brain with smaller volume.*
SOURCE: NIC-National Library of Medicine

1.1Signs and symptoms of ADHD:

- Constant fidgeting
- Low emotional control

- Poor social skills
- Violent and delinquent behaviour-aggression
- Frequently moving from one activity to another
- Auditory and Visual memory impairment
- Difficulty in Orientation
- Dyslexia
- Delay in speech development.

After conducting a deep search and manual screening, a total of 342 relevant articles were identified. The dataset revealed a significant upward trend in articles since 2017, the years 2023 and 2024 marked the peak, with 78 articles in 2023 and 75 articles in 2024, respectively. This upward trend highlights the growing interest and research in the application of AI in ADHD, as depicted in this figure, which showcases the annual number of articles over the last decade.



SOURCE: NIC-National Library of Medicine

Students with ADHD often face challenges in maintaining attention, organizing tasks, regulating behaviour which can hinder academic performance in conventional classroom settings.

II.PROBLEMS FACED BY ADHD STUDENTS

Difficulty in Focusing and Concentration: During class time, they are easily distracted by external stimuli such as noise, movement of other persons or even their own thoughts. As a result, students miss important topics and information and fail to learn with the teacher's pace.

Struggles in managing Time and Organizing Things: ADHD students do struggle to predict how long a task would take time to be completed. Hence, they end up either with carelessness in time management by procrastinate things or doing things in a complete haste. Also, these students always tend to miss their belongings such as school materials, textbook, stationaries frequently due to lack of awareness.

Anxiety due to academic failures: In a competitive environment, where rigorous tasks are involved, students with ADHD would be overwhelmed by the challenges with active listening, completing homework and assignments and assessment performance and results. All these increases the chances of academic setbacks. Facing academic failure and criticisms from the teachers, peers, family make them less motivated and helplessness.

Limited Traditional teaching methods: Traditional education often lacks personalization to address these challenges. Most traditional methods concentrate only the average and above average students and do not analyse the individual cognitive requirements. Lengthy explanations, Less interactive sessions, monotonous written and listening and the expectation to sit in a place for hours create additional difficulties for these students.

III.LITERATURE REVIEW

Applications of AI in children with ADHD

Existing literature has explored various AI applications in education including:

Intelligent Tutoring Systems-provide real-time feedback and adaptive content pacing. Tools like Auto Tutor can be personalized for ADHD learners.

Learning management systems with adaptive features and recommender systems use machine learning to adjust difficulty, pacing and content type.

Example: Ai-enhanced Khan Academy adapt to attention span and response patterns.
AI-powered virtual assistants to provide real-time feedback, guidance, and self-monitoring tools.
Gamification and Reinforcement learning -integrate game elements into learning helps sustain engagement.
Speech and Language processing tools like AI-powered speech-to-text app assists students with poor writing or note-taking skills
Edu Sense: AI classroom sensing system that identifies engagement levels.
Empathic Tutoring Systems: Combine cognitive models and emotion detection to support ADHD behaviours.
Virtual Reality (VR) + AI: Immersive learning combined with AI tracking for attention and interaction metrics.

The use of AI has a favourable effect on students both in gaining new knowledge and retaining already acquired knowledge. This offers continuous upgrading and improvement to the educational process, kindles students' interest and motivate them. It can update curriculum, educational strategies and scheduling all of which contributes to educational process.

Table 1.
Individualised educational practices in schools for children with ADHD.

Learning Area	Intervention
Reading comprehension	Establish a sustained silent reading time daily. Allow the child to read a book silently while listening to the teacher reading the story to the whole class. Getting the child to make a storyboard, retell a story during story sessions, role-play characters in a favourite story. Allowing the child to play board games/computer games to enhance reading comprehension skills. Maintaining a word-bank book for words that are hard to read. Providing students with another set of books to be read at home .
Phonics	Teaching children simple reminders on how to learn tougher phonics. Teaching children how to recognise word families for phonetic concepts. Allowing students to play board games, such as Bingo or computer games, to enhance phonics. Using picture–letter charts for children who can identify sounds but not letters .
Writing	Using storyboards to teach students to recognise parts of a story for writing. Creating a post-office in the classroom for students to write and receive letters from their teachers and peers. Using tape recorders to dictate as an alternative to writing or having teacher/peer to write for students who would tell the story .
	Aligning spelling words to frequently used words by children every day. Partnering the child with another peer to encourage each other to quiz on spelling words. Using colour-coded letters to help students spell difficult words. Combining movement activities with spelling lessons .
	r or teaching how to use a finger spacing to space out each word when writing. through structured programmes [36]
Mathematics computation	Using mnemonics to describe fundamental steps easily for Maths computation. Colour-coding arithmetic symbols to provide visual cues, allowing students to use calculators for basic computation, using computer/board games for practicing computations [36]

IV.CHALLENGES IN AI FOR ADHD EDUCATION

Despite its advantages, using AI to develop such tools also displays some limitations, as discussed below.

Previous work has emphasized the potential of gamification and multimodal learning for ADHD but lacked scalable, data-driven personalization.

Data Privacy: One major concern is its appropriate and ethical use and the bias of the algorithm. Researches show that Artificial Intelligence, due to inherent characteristics, incorporates discriminations and prejudices of society. Sensitive data on behaviour, attention, and emotions require robust safeguards against various social threats.

Bias and Generalization: ADHD is heterogeneous; models may not generalize well across all students.

Accessibility and Cost: AI tools may be expensive or inaccessible in underfunded educational settings.

Lack of Clinical Validation: Many tools lack peer-reviewed studies validating efficacy for ADHD populations.

Reduced Human emotional intelligence: Due to AI trained models assistance, students have less exposure to human, emotional, and more personal touch of a teacher-student relationship.

Future Directions

The impact that AI is having on both educators and students with special needs in the classroom is undeniable. Below are some potential future directions that may affect how AI is used in special education. The employment of AI-powered tools in the classroom allows educators to better meet the needs of their students. An AI might potentially determine a student's optimal course load based on how they learn best. Using AI methods, early intervention can be provided to students who could benefit from special education programs. Students may benefit from teachers' abilities to intervene and support them earlier if they do better in school. Communication Enhancement: The usage of artificial intelligence-powered communication tools can be extremely helpful for students with special needs. Artificial intelligence-powered devices can translate a student's spoken words into text or sign language, for example, improving the surrounding community's ability to understand them. Decisions Artificial intelligence can help educators decide which methods and interventions will have the most impact for each kid, based on data. This has the potential to yield better outcomes for disabled children. Children with special needs can benefit greatly from assistive technology, which is created to make it easier for them to carry out tasks that might otherwise be challenging for them. For pupils with visual impairments, AI-powered software may highlight material for easier reading, and for those with motor restrictions, it can provide quick feedback. The application of artificial intelligence (AI) in education technology can help teachers get administrative work done more quickly. The use of artificial intelligence in special education could be beneficial for everyone involved and educators by creating more inclusive school environments and raising students' achievement levels. Personalized AI Agents to be developed for Long-term interaction with learners to refine personalization.

V.CONCLUSION

AI holds significant promise in supporting ADHD students in education by enabling personalization, engagement, and real-time adaptation. However, ethical, technical, and pedagogical considerations must be addressed through collaborative research and development. The present literature study sought to shed light on the aspects of the use of AI in the educational process of students with Attention Deficit Hyperactivity Disorder and the risks that may be involved in its application. The literature highlights the multiple benefits that AI can bring to education by creating visual aids, such as slides or worksheets that clearly describe the learning objectives and success criteria for a subject. Also, the interactive tools offered through it can encourage the participation of students with different levels of knowledge and skills in the educational process, as well as stimulate problem-solving and critical thinking skills, which are vital for 21st century education. In this way, the learner is now put at the center and is no longer a mere listener, but an active actor, exploring information and data using tools promoted by the teacher and not requiring his/her involvement. By responsibly addressing challenges and balancing innovation with ethical considerations, we can pave the way for a transformative educational landscape that empowers students, supports educators, and fosters a lifelong love of learning.

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