International Journal of Environmental Sciences
ISSN: 2229-7359
Vol. 11 No. 19s, 2025
https://theaspd.com/index.php

Exploration Of Artificial Intelligence Integrated For Attention Deficit Hyperactivity Disorder Children

S.Soundariya[1]
[1]Assistant Professor , Department of Clinical Nutrition and Dietetics, Sri Devaraj Urs Academy of Higher Education and Research,Kolar, Karnataka, India- 563101, soundariya2314@gmail.com

Abstract
ADHD is a childhood psychiatric disorder with a strong genetic, neurobiological, and neurochemical basis. Artificial Intelligence might offer increased intervention efficacy by ensuring full personalization based on the user's performance and individual traits. An AI-powered system collects data on users performance and utilizes them to calibrate actions such as adjusting training difficulty levels. With this in mind, the current study was carried out to examine the impact of AI on ADHD children. The data collection was based on qualitative research that was conducted using focused interviews with caregivers and children with ADHD. On a trial basis, 25 children with ADHD symptoms were selected from Chennai district. Test results revealed that AI has both positive and negative impacts on children with ADHD. It can be identified that with proper usage and management of AI one can boost the life of ADHD children. Considering gender, there is a strong association between the positive and negative impact of AI on ADHD children. It also tried to propose the framework for an inclusive future of Special needs education based on focused interviews.
Keywords: *AI, ADHD, Children, symptoms, impact*

INTRODUCTION

ADHD is a well-known childhood psychiatric disorder with a strong genetic, neurobiological, and neurochemical basis (Biederman et al. 1995 and NICE 2009). ADHD is distinguished by symptoms of inattention, impulsivity, and hyperactivity, which can have a significant impact on behaviour and performance, both at school and at home (Faraone et.al. 2003). According to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-V), ADHD is defined by pervasive and impairing symptoms of inattention, hyperactivity, and impulsivity (APA 1994 and 2000 and Epstein 2013). The World Health Organization (WHO) refers to hyperkinetic disorder (HD) under a different name but lists similar operational criteria for the disorder (Kessler and Utsun 2004). ADHD is one of the most widely researched disorders in medicine. As per the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-V), diagnostic criteria for ADHD were developed based on reviews from previous research and field trials in which alternative diagnostic criteria were tested (Ghanizadeh 2013 and Singh et.al. 2015)

The rapid adoption of new technologies has sparked the creation of eHealth platforms and software for cognitive and behavioural disorders allowing the transformation of mental health therapies into various situations (Hollis et al. 2017). Computer-based training employs software development to assist children in developing cognitive and executive functioning (Powell et.al. 2018). Additionally, cognitive function training includes an element of the game that motivates children and empowers their learning process (Lumsden et.al. 2016). Apps for mobile devices could provide adaptable eHealth platforms for the management of children's behaviour and for forming a network of caregivers benefiting intervention planning and scheduling. Furthermore, the software can record accurate, direct, and dependable data that may be used to track training progress and the acquisition of new abilities.

Artificial intelligence sparked interest in recent decades due to its capacity to transform data into useful knowledge. We can communicate with our technological devices because AI algorithms better understand and process natural language to fulfil our demands. Nowadays, many applications use AI for various objectives in order to outperform their AI-free equivalents. Indeed, the potential influence of AI in ADHD eHealth applications could be significant. AI, in fact, might offer increased intervention efficacy by ensuring full personalization based on the user's performance and individual traits. An AI-powered system can be used to collect data on user performance and apply it to calibrate different levels of training (Ponticorvo et.al. 2016 and 2019, Miglino 2016). This paper also designs a questionnaire to identify children having ADHD symptoms on the basis of social background among the respondents designs a

database based onthe results of the questionnaire is used to find out the cause of ADHD in the selected children and to assess the characteristics of children with ADHD symptoms and finally optimizes the artificial intelligence-based impact of Attention Deficit Hyperactivity Disorder symptomatology among the children based on the data. The innovation of this paper lies in the organic integration of artificial intelligence technology and in understanding the positive and negative impact of children with ADHD symptoms through caregivers.

MATERIALS AND METHODS

The study is exploratory in nature, and data was gathered using qualitative research techniques. Focused interviews had been used throughout the research. A neutral interaction was held before the interview began, and all of the caretakers gave their verbal and written consent after being informed of its purpose. Children with ADHD symptoms and their caregivers both provided feedback. Twenty-five children (4–12 years) from Chennai City who were diagnosed with ADHD symptoms were chosen as the sample to conduct focused interviews.

The inclusion criteria included being the person who cares most for the child and being in charge of all of his or her responsibilities; having the necessary mental and physical ability to provide support for the child; being enthusiastic about participating in the study; caring for only one patient with a disorder like ADHD symptoms in children; and not being addicted to or abusing any psychoactive substances. Additionally, a child must have undergone at least once hospitalisation for symptoms of ADHD between the ages of 4 and 12 years without having any other disabilities, such as autism, either mental or physical impairment.

The inclusion criteria were being the main caregiver for the child and having all of his/her responsibilities, having the necessary physical and mental ability to take care of the child, willingness to participate in the study, taking care of only one patient with a disorder such as ADHD in the child, and not having any addictions and not using any psychological drugs. Also the child must have been 4 to 12 years old (school age) and hospitalized due to ADHD symptoms at least once with no other disabling disorder (physical or mental disability, autism). The exclusion criterion was the caregiver's unwillingness to continue the study. The mean duration of the interviews was 30 min, so it would not disturb their daily activities. All of the interviews were conducted by the researcher. The sample was selected to understand the support provided by institutions or caregivers andstrategies taken up by caregivers to promote inclusive child behaviour.

The responses from the target groups were collected through focused interviews. The interview was primarilyconducted in the domains are caregivers and child behaviour priorities, caregiver's perceptions of their technology use, caregivers perceptions of their technology use in the presence of their child, the impact of AI-based tools to help manage the ADHD symptoms to help the parenting and child behaviour, and sociodemographic factors.

All the ethical issues including taking written informed consent, the anonymity of the participants, the confidentiality of the information, the right to withdraw during the study, and other ethical issues were regarded in the present study. This study is part of a research that was approved by the Institutional Ethical Committee and Ethical Clearance with the certification number AUW/IHEC/FSN-20-21/XPD-27. After the interview was taken for analysis, this data was inserted into Sigmaplot 14.5 statistical software and analysis work was carried out the descriptive statistics were used to address the demographic factors and found the causes of children with ADHD symptoms using the method of garret ranking the scores. To give the scores of characteristics of children with ADHD symptoms and T-test was conducted to further investigate the association between the positive and negative impact of AI on Children with ADHD symptoms in the Gender-based acceptance.

RESULTS AND DISCUSSION

Demographic Profile of the respondents

First the social background was examined by the researcher as the social background provides all needed data on the selected children's life like their age, the standard they are enrolled in school, medium of education, school of education and their gender.

Table – 1 Demographic Profile of the respondents

S.No	Particulars	Frequency	Percentage
1	**Gender** Male Female	 19 6	 76.0 24.0
2	**Age** 5 yrs – 7 yrs 7 yrs – 10 yrs 10 yrs – 13 yrs 10 yrs and above	 6 4 7 8	 24.0 16.0 28.0 32.0
3	**Type of Family** Joint Nuclear	 9 16	 36.0 64.0
4	**Class** 1st – 3rdStd 4th – 5thStd 6thStd and above	 6 12 7	 24.0 48.0 28.0
5	**Medium of Education** Tamil English	 13 12	 52.0 48.0
6	**School of Education** Government Private	 13 12	 52.0 48.0

The gender wise distribution of the selected children showed 76 percent were male and 24 percent were female whereas their age wise classification showed that 32 percent were above age of 10 years followed by 28 percent students between the age of 10 to 13 years of age, 24 percent were between the age of 5 to 7 years and 16 percent were between the age of 7 to 10 years. The family type of the respondents showed 64 percent were living in a nuclear family system whereas 36 percent were living in joint family type. The class in which the students are enrolled showed that 48 percent were either in 4th or 5th standard whereas 28 percent were in class above 6th standard and 24 percent were in class 1st to 3rd standard. The medium of education in which the students are enrolled showed that 52 percent were from Tamil medium and government schools and 48 percent were belonging to Private schools with English medium of education. The social background of the respondents showed that the majority were male students with the age of above 10 years living in a nuclear family system studying either in 4th or 5th standard with Tamil medium of education from government school. It had clearly stated that children would affect the family type and their environment and would decrease parents' mental health and consequently increase the gender-wise of ADHD symptoms.

2. Cause of ADHD among the respondents

Even today causes of ADHD are not well defined, although studies conducted in the area of ADHD children suggest that there are various causes that play a large role in the development of the disorder. Seven causes of ADHD among the selected respondents were identified by the investigator. Details on the causes can be seen in the table (2). Using garret ranking the scores were received and converted to rank using the formula,

Percent position = $\frac{100\ (R_j - 0.5)}{N}$

Where R_j is the rank of the i^{th} item and N refers to the number of items ranked.

Table - 2

Cause of ADHD

S.No	Variables	Rank
1	Blood relatives affected with the same condition	4
2	Exposure to environmental toxins	6

3	Exposure of mothers to alcohol, smoking and other drugs	7
4	Premature birth	1
5	Brain injury	2
6	Harmful or overdose medication during childhood	3
7	Low birth weight	5

Rank 1 was assigned to the cause of "Premature birth". Many children who are born as preterm babies are found to be affected with ADHD among the selected population. Rank 2 was given to the cause of "Brain injury" where the children get exposed to some kind of injury in their brain that results in ADHD problems. Rank 3 has been assigned to the cause of "Harmful or overdose medication during childhood" where the children are exposed to some kind of harmful drugs or medications during their childhood causing ADHD problems. The other ranks are assigned to causes such as "Blood relatives affected with the same condition", "Low birth weight", "Exposure to environmental toxins" and "Exposure of mothers to alcohol, smoking and other drugs".

Among the selected respondents the major cause of ADHD was premature birth, brain injury and Harmful or overdose medication during childhood. It shows that damage to the parents and their pregnancy and parenting style is one of the important risk factors in the developmental outcomes of children with ADHD symptoms; this damage would affect the child's development cycle and help the disorder's chronic process.

3. Characteristics of children with ADHD

The children's characteristics in case of their academic performance was investigated by the researcher.

Table – 3 Characteristics of children with ADHD

S.No	Particulars	Very Good	Good	Average	Bad	Very Bad
1	Reading	3	8	12	2	-
2	Writing	2	7	13	3	-
3	Listening	4	9	11	1	-
4	Drawing	4	6	10	3	2
5	Relationship with peers	5	7	11	2	-
6	Completing home works	2	6	8	6	3
7	Play time	2	13	8	2	-
8	Maintaining neatness	1	2	13	6	3
9	Organization skills	3	6	13	1	2

The result showed that out of 25 students only 3 respondents' reading style was very good. For writing only 2 respondents were able to write properly. In the case of listening, only 4 respondents had very good listening ability. In response to drawing only 4 respondents were able to draw very well. Followed by relationships with peers, only 5 respondents were able to maintain very good relationships with their peers. In accordance with completing home works, only 2 respondents were completing their home work properly. For play time only 2 respondents were in the very good category. In the case of maintaining neatness, only 1 respondent was in a very good category and only 3 respondents organization skill was very good. In the case of characteristics of the respondents most of them were performing only average level, very few fall under other categories like very good, good, bad and very bad showing that among the selected ADHD respondents, their academic characteristics is average. All of these results have revealed the necessity of paying attention to the knowledge and attitude of children with ADHD more than ever. Appropriate and correct use of any of the resulted concepts and approaches in the present study might be helpful in organizing systemic and need-oriented educational programs through desirable and therapeutic relations with the caregivers of children with advanced ADHD symptoms.

Impact of AI on ADHD Children

Artificial intelligence was found to be having both positive and negative impact on children affected with ADHD among the identification made by the investigator. The result can be seen in table 4.

Table – 4Positive and Negative Impact of AI on ADHD Children

S.No	Positive	Frequency		S.No	Negative	Frequency	
		Yes	No			Yes	No
1	Enhance Learning	21	4	1	Hyperactivity	19	6
2	Improves Memory Power	20	5	2	Reduce Sleep Quality	21	4
3	Fosters Problem-Solving Skills	17	8	3	Stimulated Health Issues	23	2
4	Hyper focus	16	9	4	Inattention	20	5
5	Express Feeling	19	6	5	Diminishes Relationship and Social Skills	18	7

In case of positive impact it can be found from the table that 21 respondents felt that AI has enhanced their learning, 20 respondents felt that AI has improved their memory power, 17 stated that AI has fostered problem-solving skills, 16 respondents said that it made them hyper focus and 19 respondents felt that AI heels in expressing their feeling to other. Whereas in case of negative impact of AI on children, 19 students reported that AI has made them hyperactive, 21 respondents stated that it has reduced their sleep quality, 23 respondents felt that it has stimulated their health issues, 20 respondents felt that AI has made them inattention and 18 respondents felt that AI diminishes relationship and social skills.

Though AI has both positive and negative impact on the selected children it can be identified that with proper usage and management, AI can boost the life of ADHD children. AI technologies such as virtual and augmented reality improve the performance even of normal-behaviour modification for children with ADHD symptoms. Children with ADHD symptoms take a while to mingle with same-aged children, but it is not impossible. Such children require a different set of pampering and treatment so that they feel included in the effect of positive and negative AI technologies. Although there aremanual techniques to diagnose ADHD symptoms and neurobehavioural functions, they can be tackled by machine learning algorithms as expert systems that can be fed to Monitor and diagnose such signs and symptoms.

Association between positive and negative impact of AI on ADHD Children with Gender

Investigator further investigated the association between positive and negative impact of AI on ADHD children with their gender. The result can be seen in Table 5.

Table – 5 Association between positive and negative impact of AI on ADHD Children with Gender

Variable		Mean	SD	SE	T-Value	.Sig
Gender	Male	2.01	1.00	0.78	7.256	.004*
	Female	1.02	0.97	0.62		

Through the T-test result the association between positive and negative impact of AI on ADHD children with their gender showed both male and female respondents are statistically significant at 1 percent level indicating that there is a strong association between positive and negative impact of AI on ADHD children with their gender. Thus, there appears to be a link between ADHD symptoms and the effect of AI technologies on Gender impact, although at this stage it is not possible to predict the direction of causation or the positive acceptance. Moreover, it is important to differentiate the ADHD symptoms resulting from Gender using AI impact on ADHD symptoms as a neurodevelopmental disorder for children.

CONCLUSION:

ADHD is a condition which is almost always associated with poor academic performance. AI-based tools may be acceptable to use as coaching aids to help a wide sociodemographic range of caregivers improve their attentiveness while caring for their children, especially in the face of AI technologies from their own use of mobile devices. Designers and developmental specialists should work together to develop and test AI-based tools to reduce parenting issues and monitor the symptoms of attention deficit hyperactivity disorder with an initial focus on younger parents. Future investigations should validate whether it is

sufficient to focus on AI-based parenting supports touching every individual's life and making life easier for children with ADHD symptoms. It also suggests developing artificial technologies that promote creativityand will help in creating a safe environment for children where they are free to exchange ideas, and conversations with caregivers and respect the differences in each individual. To negatively impact assistive technologies on caregivers general overuse of digital technology rather than their specific problems with AI technology and to identify other factors that influence the acceptability and utility of these supports.

Conflict Of Interest

There is no potential conflict of interest.

Author Contributions

Both authors have contributed to this paper

Acknowledgement

The authors gratefully acknowledge support for this research from the Key Research Bases of National Fellowship for Scheduled Caste (No. F. 40-2/2019) for providing the University Grants Commission fellowship for this study.

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