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**Research Paper**

# Artificial Intelligence as an Aid for Social Relationships for Individuals With ADHD

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## ABSTRACT

ADHD poses substantial challenges for both children and adults. It becomes more difficult for those with ADHD in today's society, where maintaining interpersonal relationships is difficult. It must be noted that the field of mental health has seen an immense impact of AI. The objective of this review was to understand the effectiveness of artificial intelligence as a tool for improving interpersonal relationships for individuals with ADHD. Method: Several electronic literature databases, including PubMed, APA PsychInfo, Science Direct, EMBASE Psych, Google Scholar, Web of Science, and Science Gate, were searched for this systematic review. A specified set of keywords was used to search various databases; these keywords were then changed to reflect the results, confirming their relevance to the research.

***Keywords:*** *ADHD, Attention Deficit, Hyperactive, Social Skills, Social Relations, AI, Chatbots, Machin Learning, Relationship, Adult ADHD*

One of the most prevalent neurodevelopmental diseases in children is ADHD. It frequently persists into adulthood and is typically first diagnosed in childhood. Children with ADHD may struggle to focus, manage impulsive behaviours (doing without considering the consequences), or be highly active.

Moreover, adults with ADHD sometimes go undiagnosed. The symptoms may make it difficult to function at work, at home, or in relationships. In older ages, symptoms may take on diverse appearances; for instance, hyperactivity may manifest as severe restlessness. When the duties of adulthood increase, symptoms may get worse. People with ADHD frequently struggle to establish and sustain relationships, which can have detrimental effects like loneliness, sadness, and low self-esteem. The development of Artificial Intelligence (AI) technology has created new opportunities for tackling the social difficulties people with ADHD experience. AI-based therapies have the potential to boost social engagement, enhance social skills, and lessen the detrimental effects of ADHD on interpersonal relationships.

We are defined and fulfilled by our interpersonal relationships. Nevertheless, for those who have ADHD, the symptoms can have a negative effect on their spouses and friends, co-workers. Although we are aware of how ADHD can affect individual's capacity for

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concentration, memory, and productivity, it is hardly ever discuss how it may affect their capacity for forming and sustaining connections with others, including friends, family, co-workers, and our children (Broadbent, 2020).

MRIs help enable train brain activity and map connections within and between brain networks, which can be beneficial in a variety of situations where one with ADHD can be assisted. Images are generated by the detection of changes in blood flow. AI-based therapies have the ability to offer individualised and flexible support to people with ADHD. Monitoring social interactions, offering feedback and suggestions for development, and providing tailored treatments based on individual requirements are all possible with the help of AI technology. For instance, AI-based social skill development courses can be created to offer specialised instruction in subjects like nonverbal communication, social problem-solving, and emotion control. These programmes can be tailored to each person's specific needs and can offer continuous assistance as they strive to develop their social skills.

Although AI-based therapy has a lot to offer to those with ADHD, there are also hazards and difficulties that need to be considered. The possibility for an over-reliance on technology and a decline in face-to-face social contacts is one of the key worries. Despite the fact that AI-based interventions can offer helpful support and training, they cannot take the place of face-to-face interactions as a crucial component in developing strong relationships. AI-based interventions must therefore be employed in addition to more established interventions like social skills training and counselling.

The requirement to guarantee that AI-based solutions are created to fit the particular needs of people with ADHD is another potential challenge. Interventions must be customised to each individual's needs because individuals with ADHD have a variety of experiences and difficulties. Furthermore, it is crucial to guarantee that everyone with ADHD can access AI-based interventions, regardless of their socioeconomic situation or geography.

Thus, for individuals with ADHD, artificial intelligence may be a beneficial tool for enhancing their social interactions. AI-based therapies can assist individuals with ADHD in overcoming their social challenges and improving their communication and interpersonal skills by offering personalised feedback and support. However, it's crucial to make sure that these interventions are planned and carried out with care for privacy and ethical issues. The effectiveness of AI-based therapies in enhancing social ties among ADHD patients also need further investigation. Overall, the application of AI to aid individuals with ADHD can create new avenues for raising the quality of life and give them the tools, they need to thrive in social situations.

## METHODOLOGY

Several electronic literature databases, including PubMed, APA PsychInfo, Science Direct, EMBASE Psych, Google Scholar, Web of Science, and Science Gate, were searched for this systematic review. A specified set of keywords was used to search various databases; these keywords were then changed to reflect the results, confirming their relevance to the research. The method for selecting a study was mostly based on the research article's abstract; if it mentioned a study on the connection between ADHD and artificial intelligence or ADHD and interpersonal relationships, it was chosen, and the complete research paper was examined.

## DISCUSSION

An extensive analysis shows the author's perspective on how each of the variables are related to each other and how they can be used to further develop as an aid for individuals with adhd. Thus, the effect of AI generated aid for individuals with adhd, along with social relationship issues faced by individuals with adhd and their correlation has been discussed and analysed.

### *AI as an aid for social relationship*

Artificial intelligence (AI) is being used extensively to facilitate social interactions. Chatbots are one example of how AI is being used to analyse social interactions and provide people feedback on their social skills. AI is also being utilised to build virtual reality simulations of social events, which can aid those with social anxiety by allowing them to practise social interactions in a secure setting. While AI technologies have the ability to improve social relationships, they also run the risk of escalating already-present communication disparities. People with strong social and communication skills may gain more from encounters with AI systems than people with weaker social and communication abilities (Mou & Xu, 2017). Although most participants gave the AI chatbot interactions a positive review, those with better communication and social skills gave the human-human connection a higher rating. Additionally, these AI might benefit people with higher social skill levels while undermining societal hierarchies. As a result, it is suggested that future studies examine how AI technology might be used to solve these disparities and encourage more fair social interactions.

However, the integration of a chatbot into a serious game designed to encourage children to learn social skills and teamwork activities has the potential to improve learning results by involving students in interactive, immersive experiences that support the development of particular skills. The game proved successful in encouraging the development of social skills and teamwork, and the chatbot (Mansilla et al., 2017). More research is required to fully explore the potential of this technology in educational contexts, but the integration of chatbots in serious games can offer students personalised and interactive learning experiences.

Additionally, chatbot technology have been utilised to create a secure and supervised setting in which individuals are able to improve their social skills. With the help of a chatbot system, security officers were able to practise social skills in a variety of contexts by having text- and voice-based discussions with the chatbot. A virtual reality component of the system offers a realistic and engaging training experience. the security guards' social skills and level of comfort in social situations were both improved by the chatbot system (De Bever et al., 2019). The study emphasises how chatbot technology has the ability to offer individuals a secure and regulated environment where they may practise social interactions and develop their social skills. The study's conclusions have implications for the development and use of chatbot systems intended to assist people with social challenges, particularly those who have ADHD.

People who might not have access to conventional forms of therapy or counselling may benefit from emotional support from chatbots like XiaoIce. Techniques from cognitive psychology, machine learning, and natural language processing were combined to create XiaoIce (Zhou et al., 2020). Individuals with social issues, such as those with ADHD, may benefit from using chatbots like XiaoIce. For people who might have trouble interacting socially in traditional ways, chatbots like XiaoIce have the ability to offer emotional support

and chances for social connection. Additionally, chatbots can be developed to offer focused social skill development and support, which may be especially helpful for those with ADHD.

Online experiments incorporating chatbots Artificial intelligence (AI) communication has an effect on language and social interactions in a broad population, according to online trials utilising chatbots. Individual perceptions about social relationships and language use can be altered by AI-generated language. Participants felt more resemblance and rapport with a chatbot that conversed more like a human than one that sounded primarily like a machine. Furthermore, when compared to a chatbot that utilised human-like language, participants distanced themselves from the machine-like chatbot and were less inclined to provide personal information to it. AI may change grammar, syntax, and lexicon, among other aspects of language use (Hohenstein et al., 2021). Indicating that the usage of AI may have an impact on social interactions both positively and negatively. Similarly, the Internet of Things (IoT) can supply a plethora of data on people's social behaviours, which can then be analysed and used to create AI-powered tools that provide tailored assistance for social relationships (Dhelim et al., 2021). In order to improve people's social abilities and interpersonal connections, a framework was developed that uses IoT devices to gather data on people's social behaviours, analyses that data using AI algorithms to spot patterns and trends, and then offers personalised help based on the analysis. Such tools may be especially beneficial for people who have social challenges, such as people with ADHD.

In longitudinal research on interactions between people and chatbots, researchers looked at how users' opinions of the technology and their interactions with chatbots changed over time. Over time, users' opinions of the chatbots and interactions with them changed. User perception of the chatbots was initially lower and less human-like than it was later in the course of the study (Skjuve et al., 2022). Users' impressions of chatbots can alter as they become more accustomed to them, and chatbots are capable of forming meaningful connections with users over time. For people with social issues, including those with ADHD, chatbots that can adjust to users' needs and preferences and offer emotional support and companionship may be especially helpful. Moreover, it has been noted that the use of artificial intelligence (AI) in education has a positive impact on adolescents' social adaptation through the promotion of social learning. AI-powered technologies can be used to tailor learning experiences and offer feedback that encourages the development of social skills (Xie et al., 2022). By promoting social learning and offering personalised feedback, AI in education can have a significant impact on adolescents' social adaptation. The study underlines the potential of AI-powered tools that enhance social learning and promote social adaptability in educational settings, even while it does not specifically address the use of AI as a tool to assist people with ADHD in managing their social relationships. Future studies could examine how well these tools work for people with ADHD and other neurodevelopmental conditions which influence social interaction. Overall, AI has the power to completely change how we think about social learning and encourage social adaptation in adolescents.

***AI as a lifestyle support for individuals with ADHD***

AI has the ability to help individuals with ADHD leading to more fulfilling lives. The creation of digital assistants or chatbots that may offer reminders, work prioritisation, and other organisational support is one potential use of AI in this area. AI may also be used to create tools that will aid those with ADHD in navigating social settings and enhancing their social skills. This can entail applying AI to social interaction analysis and giving advice on

nonverbal indicators or communication techniques. The usefulness of readily accessible mobile applications (apps) for parents of kids and teenagers with ADHD, with a focus on education, self-help, and symptom treatment. Though none of the apps had undergone any clinical trials, only a small number of them offered information on evidence-based treatments for ADHD (Powell et al., 2017). The key problems with the unsuitable apps were poor usability, a lack of content supported by evidence, and an inappropriate target population. The study's overall findings underscore the need for additional user-friendly and evidence-based apps to assist parents of kids and teenagers with ADHD. To make sure the apps are evidence-based, relevant, and helpful for their intended audience, the app developers should work in collaboration with users and healthcare professionals.

Based on the multimodal serotonergic data, a machine learning algorithm classified ADHD and health controls (HC) subjects with excellent accuracy. The ADHD group had decreased availability of serotonin transporters in various brain regions, according to the researchers' observations of changes in serotonergic characteristics between the two groups. These results imply that multimodal serotonergic data can be utilised to accurately diagnose people with ADHD and HC and to shed light on the pathophysiology of ADHD (Kautzky et al., 2020).

AI based chatbot used to provide psychoeducation and cognitive behavioural therapy for adults with ADHD has shown to be perceived as feasible, easy to use and was reported to have high satisfaction in the app usage. Highlighting the possibility of employing chatbots as a tool to offer mental health help to people with attention deficit, particularly in the form of CBT and psychoeducation (Jang et al., 2021). However, further study is required to determine whether the app can improve mental health outcomes over the long run because the study had a small sample size and was only conducted for a brief period of time. Additionally, a mixed-methods approach, including surveys, usability testing, and interviews, to gather information from users of an app revealed that the participants liked the app-based chatbot and that it was convenient to operate (Jang et al., 2021). Children with Attention Deficit Hyperactivity Disorder (ADHD) who received a digital artificial intelligence-driven treatment showed significant improvements in their cognitive abilities, working memory, and response inhibition. Researchers also discovered changes in electrophysiological brain activity, which suggests that the treatment had an effect on the neural mechanisms underlying cognitive abilities (García-Sastre et al., 2021).

The efficacy of many digital health interventions and their potential advantages, such as better engagement, increased accessibility, and decreased stigma, have been researched. The authors also go over some of the possible drawbacks of using digital health interventions, such as worries about security, privacy, and the accuracy of the data (Pandian et al., 2021). The paper emphasises the potential advantages and difficulties of using digital health interventions to treat children with ADHD and offers insights into the present status of research in this area. Clinicians, researchers, and anybody else interested in the subject of digital health interventions for ADHD may find it to be a useful resource.

Based on the early improvement in ADHD symptoms, machine learning algorithms can accurately predict the efficacy of viloxazine extended-release medication in adults with ADHD. helps medical professionals make better-informed choices regarding available treatments and improve patient outcomes (Faraone et al., 2022). This demonstrates how machine learning can be used to enhance treatment outcomes for people with ADHD and underlines its promise in the field of psychiatry. Additionally, it emphasises the value of

ongoing studies in this field to comprehend the possible advantages and restrictions of applying machine learning in therapeutic settings. Additionally, based on genetic information and clinical traits, machine learning algorithms were able to reliably predict the severity of ADHD. The investigation also found a strong correlation between particular genetic variations and the severity of ADHD. Personalised treatment programmes for people with ADHD could be created using machine learning algorithms based on their genetic profiles and clinical traits (Cervantes-Henríquez et al., 2022). However, more study is required to confirm these results and examine the potential clinical uses of machine learning in ADHD diagnosis and therapy.

Mobile app for parents of children with ADHD has been created, and its usability is highlighted through study developing a prototype input from parents and clinician. It seeks to determine whether the software can help parents manage their child's ADHD symptoms and whether it is practical and helpful to do so. The software is largely well-liked by parents and has the potential to be an effective tool for helping them control their child's ADHD. However, the authors also stress that the software needs to be improved in order to increase its effectiveness and usefulness (Pereira et al., 2023).

***Social Relations and ADHD***

Social interactions are frequently challenging for people with ADHD, which can lower their quality of life. The development of social skills can be hampered by symptoms including impulsivity, inattention, and hyperactivity, which can result in social exclusion, rejection, and low self-esteem. Friendship quality was found to be inversely correlated with both internalising and externalising symptoms of ADHD in children, suggesting that these symptoms were less common in kids with better friendship quality (Normand et al., 2020). The study sheds light on the significance of social interactions in the lives of kids with ADHD and emphasises the need to improve social skills and the nature of friendships while treating ADHD. Adults with ADHD may experience negative effects in their education, career, interpersonal interactions, and financial situation. Adults with ADHD are more likely to experience scholastic challenges, lower vocational attainment, problems dating and getting married, and money issues (Barkley, 2015). Thus, giving important insights into the limitations that adults with ADHD may encounter and highlighting the significance of identifying and resolving these difficulties to enhance the quality of life for people with ADHD.

The significance of treating both social and academic functioning in the treatment of ADHD, and emphasise the need for social skills interventions to be a part of a comprehensive treatment plan that also includes other interventions like medication and parent education. Additionally, recommended that future studies concentrate on determining the most successful elements of social skills therapies, evaluating the long-term consequences of these interventions, and assessing the efficacy of these interventions for particular subgroups of ADHD sufferers (Wilkes-Gillan, Bundy, Cordier, Lincoln, et al., 2016). Moreover, the intervention programme administered by parents had a positive impact on the social play abilities of children with ADHD and their playmates. The results imply that an intervention programme offered by parents might be a successful strategy for enhancing the social play abilities of children with ADHD and their playmates (Wilkes-Gillan et al., 2016)

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Additionally, it was recommended that future studies concentrate on determining the most successful elements of social skills therapies, evaluating the long-term consequences of these interventions, and assessing the efficacy of these interventions for particular subgroups of ADHD sufferers (Mikami et al., 2017).

Children with ADHD are taught how to establish and sustain social interactions with their classmates using the Friend to Friend (F2F) intervention, a manualized social skills programme. Compared to the control group, children who received the F2F intervention significantly improved their social skills and social competence (Mikami et al., 2020). Significance of the study's findings for treating ADHD in children and emphasises the need for more research to examine the long-term outcomes of social skills therapies for children with ADHD.

The effects of Parental Friendship Coaching (PFC) on the parental emotion socialisation of children with ADHD were investigated. In comparison to the control group, the PFC intervention had a significantly favourable impact on the parental emotion socialisation of children with ADHD, according to the study. increasing parental capacity to understand and accept their child's emotional displays, to support and encourage emotion control, and to provide a positive emotional environment for the child (Smit et al., 2021). This shows the need and issues faced by individuals with ADHD in social relations. Couple therapy, psychoeducation, and cognitive-behavioural therapy are just a few examples of evidence-based interventions that can help people with ADHD improve their relationship skills. It's also important to encourage self-awareness and self-regulation skills in people with ADHD because these abilities can improve communication and emotional stability (Wymbs et al., 2021). Future studies should focus on gaining a deeper understanding of the intricate interactions between ADHD symptoms and relationship functioning in order to create better treatments for ADHD-affected couples.

## CONCLUSION

In conclusion, it can be noted that artificial intelligence has the potential to help individuals who have ADHD become more socially adept. With the development of technology, AI-based therapies can help people with ADHD overcome their social impairments. Examples include virtual coaches and social skills training programmes. AI can also assist people with ADHD in tracking their own social behaviours and providing feedback on their development. Although AI has the potential to improve social functioning in people with ADHD, it cannot replace human interaction and assistance. The effectiveness and viability of AI-based therapy for ADHD patients must be further investigated, as well as the most efficient ways to incorporate these interventions into current therapies. In general, the potential advantages of AI as a support system for social interactions for people with ADHD make it an intriguing field for further study and development.

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***Conflict of Interest***

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