An Exploration on Utilizing Artificial Intelligence to Address Cognitive Functioning in Autistic Adults

Michael Higgins III

Department of Learning Technologies, University of North Texas

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Dr. Tandra Tyler-Wood, PhD

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Cognitive Differences in Autistic Individuals

Until recently, cognitive processing in autistic individuals tended to confirm deficits in executive functioning and working memory. Several studies on cognitive deficits in the adult neurodivergent population, particularly older adults, have found significant impairments in item and relational memory, executive functioning, Theory of Mind, and attention (Tse et al., 2022) when compared to neurotypical control samples. Autistic individuals also indicated deficits in cognitive flexibility, or the ability to perform the same task under changing environments or rules (Lague et al., 2024).

Strengths

Simultaneously, neurodivergence has positive aspects that are overlooked, even by autistic people themselves. Despite longer reaction times, older autistic adults performed better in experiments with greater cognitive load when compared to neurotypical individuals (Tse et al., 2022). They also have enhanced visual-processing capabilities and higher attention, characterized by the Monotropic cognitive theory (intense but narrow form of attention in autistic people) (Lage et al., 2024). Literature also indicates that people with autism experience less susceptibility to cognitive bias and process information more rationally compared to neurotypical individuals (Rozenkrantz et al., 2021).

Cognitive Flexibility

Cognitive flexibility is a core domain in Executive Functioning. Hollocks et al. (2023) defines it as the ability to switch between cognitive processes to produce a context appropriate

behavioral response. The study focused on the following skills: attentional and set shifting, generativity (how well individuals create spontaneously appropriate novel responses), and reward sensitivity.

Research into how autism affects cognitive flexibility remains hindered by lack of adequate measurements of the domain. Furthermore, the authors find that Autism Spectrum Disorder's effects on other cognitive domains cloud researchers' ability to discern between direct cognitive flexibility deficits and more broad executive functioning issues (Hollocks et al., 2023). Despite this, in a separate more recent study, the authors confirm that executive functioning remains a challenge for people with autism (Hollocks et al., 2025).

Attention

Attention is defined by Castra et al. (2023) as a combination of selecting, modulating, and focusing on stimuli relevant to behavior. The study utilized a combination of tests to determine attention performance. In the Test of Everyday Attention (TEA), participants are evaluated on several attention domains found in everyday tasks, including selective attention, attentional switching, auditory-verbal working memory, and sustained attention. Autistic adults scored significantly lower on these TEA tests compared to the neurotypical group.

Memory

According to Desaunay et al. (2020), Memory is broken into two separate categories: short-term memory (STM), or working memory (WM) more recently, and long-term memory (LTM), divided into the subsystems explicit and implicit memory. The findings indicate differences between autistic and neurotypical individuals across memory domains. In particular, studies have shown that autism negatively affects short-term memory, including visual, verbal,

and visuospatial domains. However, fewer difficulties present themselves in long-term memory compared to short-term memory. Nevertheless, some deficits compared to neurotypical control groups still presented themselves. Desaunay et al. (2020) found a small effect size for verbal material, medium effect size for visual material, and no effect size for visuospatial material.

Executive Functioning

Jertberg et al. (2025) authored a study designed to understand the differences in executive functioning in over 900 autistic adults aged 18-77. They utilized multiple tasks to test inhibition, cognitive flexibility, working memory, and attentional orienting. Participants had an average or above average IQ. The authors wanted to correct several shortcomings of prior studies, particularly sample size and accounting for comorbid conditions like ADHD.

In all four tasks, individuals with autism showed longer reaction times compared to non-autistic individuals (Jertberg et al., 2025), aside from cognitive flexibility. Additionally, autistic individuals displayed greater efficiency in visual processing. They also exhibit meta-cognitive differences when compared to neurotypical individuals. This could cause neurodivergent people to prioritize accuracy over speed. Jertberg et al. (2025) also found the neurodivergent sample had a latency in coordination and motor tasks.

Despite these findings, the authors conclude that other than reaction time latency in the performed tasks, there were no explicit differences in any of the participants pertaining to direct executive function. They point out several reasons for previous studies' conflicting findings. Mostly, they state that small sample sizes and self-reporting questionnaires that influenced previous research. Particularly, autistic individuals statistically suffer from depression disorders more often than the general population, which could cause them to underestimate their cognitive

abilities (Jertberg et. al., 2025). Another important note found was the fact that a broader application of the term “Autism Spectrum Disorder” diversified the neurodivergent population overall when compared to previous studies. Finally, the authors concluded that creating conducive educational and professional environments, (structure, explicit instructions, and accommodations for slower processing and response speeds) for neurodivergent people can help.

History of AI Application in Education: Autism Focus

Artificial Intelligence (AI) has a long and rich history in education dating back to the 1950’s and 1960’s (Doroudi, 2022). The current principles of AI were founded by cognitive scientists who desired to build new models of human knowledge during the cognitive revolution. Alan Newell and James Moore worked to develop one of the first AI tutoring systems called Merlin in the 1970’s (Doroudi, 2022). Unfortunately, the system never materialized, and Merlin was considered a failure by its creators, mostly due to its lack of usability and no impact on the rest of the field.

However, this didn’t mark the end of educational applications of AI. A competitive and moderately successful tutoring system surfaced in 1970 by Jaime R. Corbonell. After decades of work and collaboration, researchers at Carnegie Mellon founded Carnegie Learning Inc., specializing in the development of cognitive tutors for algebra and other fields. This is one example of broad academic progress in education, as several other examples of AI and tutoring systems have appeared throughout the decades.

In the modern context, previous research has led to the creation of two parallel strands: One, called AIED (AI in Education) with a focus on information-processing theories and the other, called ICLS (Internataional Conference of Artificial Intelligence in Education) with a

focus on constructivist and situativist theories (Doroudi, 2022). Although they experience some moderate cooperation, their approaches remain largely separate. In addition to academic research, the field of AI in education continues to rapidly expand. Most countries in the world have incorporated artificial intelligence in their education systems (Zhang, 2025). Practical applications include personalized learning paths and intelligent marking systems for homework. To accomplish this, AI systems interfere with cognitive processes by adapting the presentation of material and cognitive load intensity. They also monitor cognitive trajectories in real-time and reveal logical breaks of argumentative structures in writing (Zhang, 2025).

Current Issues

Problems Surrounding Autism's Diagnosis, Research, and Ethical Concerns

Lack of research focus persists as a major problem facing current research into AI applications for autistic cognitive deficits. The majority of existing research only focuses on social skill improvements in the autistic population, not cognition. Even in domains studied and focused on by researchers, such as robots used to improve social communication, have produced mixed outcomes (Adako et al., 2025). Furthermore, research into AI interventions for autistic adults is almost nonexistent.

More broadly, conflicting data remains problematic for understanding the cognitive strengths and deficits of neurodivergence separate from implementation of artificial intelligence. For example, where one study finds no link between autism and executive functioning, other studies show a significant difference (Jertberg et al, 2025). Sample size calls some studies into question as well. Multiple studies concerning cognitive deficits have less than 50 participants

(Jertberg et al., 2025). Autism research also has historically focused on difficulties autistic individuals' experience instead of discussing their strengths (Lampinen et al., 2025).

Research in Autism Spectrum Disorder has long-standing ethical issues (N'eman et al., 2023). First, current research in autism focuses on reducing autistic traits and enhancing masking capabilities of autistic individuals. Masking is defined as the process in which individuals with autism conceal their autistic traits in social situations to conform to neurotypical social standards (Venkatesan & Tolani, 2024). Some researchers go so far as to state that the most optimal outcome for autistic individuals is a complete elimination of symptoms, despite concerns raised by autistic advocacy groups. Academic literature concerning intervention strategies, such as those supporting ABA (Applied Behavioral Analysis) and measurement instruments like the Social Reciprocity Scale-2 explore intervention of autistic traits that are, in fact, harmless (N'eman et al., 2023).

The issues expand beyond targeted intervention research. In one study, Macari et al. wanted to understand differences in emotional reactivity between neurotypical and autistic toddlers by exposing them to frightening masks, objects, and strangers (N'eman et al., 2023). Despite the outcry by autism advocates, the authors went through with the study (Macari et al., 2021).

Research in autism also has issues with underrepresented groups, such as people of color and individuals from lower socioeconomic classes (Maye et al., 2021). National autism databases overrepresent white individuals from middle- to high- income brackets. This bias has significant effects beyond academia. Diagnosis and the prevalence of autism differ across race and ethnicity, even if the study accounts for socioeconomic status differences among population samples. It also cascades into public health, with poorer outcomes for physical and mental health regardless

of an individual's stage of life (Maye et al., 2021). Research often requires reliable transportation and taking time off work, as well as high quality internet, which many families may not have. Non-English speakers are also frequently excluded from research studies. Female populations are consistently underrepresented as well (D'Mello, 2022).

Finally, autism research faces a severe challenge purely deriving from how broad ASD as a diagnosis is (Waterhouse, 2021). As the diagnostic criteria of ASD has expanded, so has the heterogeneity of individuals across various domains, including language, intelligence, comorbid diagnoses, and severity (Rabot et al, 2023). Meta-analyses indicate that effect sizes decreased by up to 80% in studies comparing neurodivergent and neurotypical individuals. This could be due to the widening of diagnostic criteria for ASD (Rabot et al., 2023). Additionally, symptoms of autism, such as communication problems, depression, and even repetitive behaviors, overlap with other psychiatric and neurological conditions (Bertelli et al., 2024).

AI Research for Autistic Interventions

With respect to autism, current research remains sparse and implications of artificial intelligence specifically concerning the autistic population is even less common (Kotsi et al., 2025). Finding data on postsecondary applications proves difficult, as most research on autism focuses on children instead of adults (Johnson et al., 2024). However, challenges with cognitive processes occur throughout the lifespan, therefore some of the initial literature on AI interventions can apply to autistic individuals regardless of age. Utilizing AI to assist autistic students, in an analysis of 13 empirical studies, targeted social skills, emotional recognition, and social communication. Only three of the studies targeted cognitive challenges (Kotsi et al., 2025). In fact, Kotsi et al. (2025) highlight that research on improving cognition in autism students lags, and most existing research they analyzed concerned only social skills and

emotional domains. This represents a significant gap in the application of AI technology in autistic cognition.

Challenges of Using Artificial Intelligence in Autistic Educational Interventions

As discussed previously, studies on AI applications in students with autism are not plentiful, especially in the adult population. However, some studies do exist but pertain mostly to children. Most interventions that use AI focus on social interaction and eye contact (Yang et al., 2024). General studies performed using special education students have been published. Large Language Models (LLMs) and AI show significant promise in offering personalized learning and support (Voultsiou & Moussiades, 2025). AI can also detect patterns in behavior to customize interventions. Immersive technologies, LLMs, and AI integration provide a true positive impact on the learning environment for special education students (Voultsiou & Moussiades, 2025).

Despite these benefits, several core issues with AI in education in general (and therefore extrapolated to educational interventions for autism students specifically) persist. AI has the potential to over-optimize and in doing so can diminish learners' internal motivation to explore material. Additionally, AI tools can optimize the learning process too efficiently, which may lead the tool to start optimizing for the sake of data instead of knowledge transfer for the student (Zhang, 2025). AI also struggles with intercultural adaptation, in that most AI programs suffer from Western centrism, which may compete with non-Western educational traditions. Students who over-rely on AI tools for writing also show a more diminished capacity for rigor and identifying counterexamples (Zhang, 2025).

Specifically for autistic students, Kotsi et al. (2025) list several challenges, including privacy concerns, data security, informed consent, unequal access based on socioeconomic

factors, and others. Training data for AI also has inherent biases (Dhabliya et al., 2025), and these can affect educational AI tools.

Conclusion

Summary

People who have Autism Spectrum Disorder have an array of cognitive deficits in addition to social challenges. In large meta-analyses, persistent evidence concludes that these challenges appear in cognitive flexibility, memory, attention, and executive function. However, this only tells part of the story, and findings are mixed at best in relation to understanding the entirety of the disorder. Autistic individuals also display some advantages regarding cognitive bias and rational information processing. Furthermore, attention deficits could be attributed to narrower yet more focused attention when compared to neurotypical population samples.

Autistic individuals also suffer more from comorbid psychiatric diagnoses which impact daily functioning when compared to the general population. Many studies on autistic cognition do not account for symptoms that might possibly relate to other disorders and not autism itself. Additionally, some studies state that people with autism perform better on tasks with greater cognitive load and enhanced visual-processing capabilities. Because most studies on autism focus on deficits or pathology instead of direct cognition, strengths of neurodivergent individuals is largely understated or unexplored altogether.

In research, several systemic and critical problems plague advancements in understanding neurodivergence. Ethical issues stem from both current research practices and academic studies' objectives more broadly. Current exploration into mitigating targeted behaviors for social congruence instead of cognition remains a consistent problem, and many of these targeted

behaviors (such as eye contact or hand flapping) are harmless. Research also suffers from smaller sample sizes, inconsistent assessment instruments, bias against individuals from lower socioeconomic classes and racially marginalized groups, and lack of participation of the female population. Additionally, resources primarily focus on autistic individuals that do not have intellectual disabilities even though this group comprises 38% of the total autistic population (Bertelli et al., 2024).

In a broader context, the changes in the DSM-V potentially blur the lines of proper diagnosis (Rabot et al., 2023). This has rippling effects throughout research and intervention practices. Concurrent diagnoses also remain a persistent problem, and their interactions with the disorder remain understudied. Misdiagnosis also could occur more frequently as certain phenotypic autistic traits can also signify other psychiatric conditions.

Personal Point of View

In an effort to communicate effectively, I will intentionally shift from third to first person for this section, since it requests my direct perspective. I was diagnosed with ASD Level 1 earlier this year, but throughout my 31 years on this planet, I always knew I differed substantially from my peers. I also have PTSD due to childhood trauma, but this only explained half of the story. I took the opportunity to use this project to understand my condition, my cognitive differences, and the intersection between neurodivergence and artificial intelligence, which remains a passion I have for myself and other autistic individuals.

Starting this project, I thought it would be easy to find data that matched what I wanted. I explored the UNT library eagerly searching for answers to my academic and personal questions. What I found told a completely different story. I instead uncovered an array of morbid truths concerning the state of the field: limited sample sizes, intentional exclusion of the intellectually

disabled, discrimination, and ethical concerns that made me temporarily walk away from the research. In my entire academic career, I never experienced the level of disillusionment I have experienced with this project. I finally see the dark underbellies of academic research I knew existed but had never experienced face-to-face.

The problems of diagnosis cannot be ignored, either. Researchers struggle to get empirical data because we have lumped together a huge, diverse population into a spectrum. Academics and professionals can debate the empiricism of this decision, but it affects research in the field regardless of its validity. Subsequently, this directly affects autistic people as it rolls downhill from academia to practice.

Specific data on interventions using artificial intelligence also lack focus on bridging the understood cognitive deficits in memory, executive function, and other areas autistic people struggle with. Researchers, parents, and educators seem to have an explicit and painstakingly misapplied focus on social integration and social skills. While social skills and training are important for people with autism, a much better use of our time, resources, and effort would be helping neurodivergent people achieve better methods of cognition.

The fields of psychology, education, and artificial intelligence have incredible potential to help autistic people in many ways, but the lack of data and focus stunts this potential. We know that LLMs, AI, and virtual reality (VR) have wide applications for autistic people and individuals with special needs more broadly (Voultsiou & Moussiades, 2025), but our misapplied concentration on how to "make autistic people fit in more" degrades our ability to move forward.

In conclusion, while the potential for AI to assist individuals with autism could have amazing positive consequences for them, our discrimination, failures of research practices, and misapplied focus hinders progress in bettering neurodivergent people's lives. We need a holistic

interdisciplinary approach that addresses ethical, diagnostic, and research issues to increase the effectiveness of interventions. I hope that by moving forward with a PhD program, I will be able to contribute to the field by bringing both lived and academic experience. This project didn't make me want to stop but instead invigorated me to continue my journey. For that, I am grateful.

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