Review

Coexistence of Autism Spectrum Disorder (ASD) and Attention Deficit Hyperactivity Disorder (ADHD)

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ABSTRACT

PURPOSE: This study aims to provide readers with a deeper understanding of autism spectrum disorder (ASD) and attention deficit hyperactivity disorder (ADHD), while promoting an inclusive environment by challenging and reducing biases toward neurodivergent individuals.

MATERIAL-METHODS: The study presents an overview of each disorder, including definitions, historical background, diagnostic methods, prevalence, and the coexistence of ASD and ADHD within the same individual.

DISCUSSION: Both ADHD and autism fall within the broader concept of "neurodiversity," a framework that challenges the binary classification of intelligence as "normal" or "abnormal." Neurodiversity recognizes neurological differences as natural, healthy, and valuable dimensions of human diversity. Individuals with these conditions often approach tasks, problem-solving, and design in ways that differ from neurotypical patterns.

CONCLUSIONS: Promoting awareness and acceptance of neurodiversity in communities, schools, and workplaces enhances inclusion for all individuals. Creating supportive environments that recognize the unique strengths and needs of neurodivergent people is essential for fostering their potential and well-being.

KEY WORDS: autism, ADHD, neurodiversity, coexistence, neurodevelopmental disorder

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Introduction

According to the DSM-V manual of the American Psychiatric Association, and as noted by Sally Ozonoff and Meghan Miller (2024), Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder characterized primarily by difficulties in social interaction and communication, restricted interests, and the presence of repetitive behaviors (2,3). Attention Deficit Hyperactivity Disorder (ADHD) is the most prevalent neurodevelopmental disorder in childhood, impacting the individual's functional capacity and often persisting into adulthood. Its core symptoms include inattention, hyperactivity, and impulsivity. Throughout the 20th century, various terms were used to describe this condition, including 'Minimal Brain Damage', 'Minimal Brain Dysfunction', 'Minimal Brain Disorder', and 'Hyperactive Syndrome' (4).

Historical Retrospective

By 1943, the term "child schizophrenia" was used to describe the phenomenon that would later be recognized as autism. In the same year, Austrian psychiatrist Leo Kanner made the first documented reference to infantile autism. Similar observations were independently reported by Austrian pediatrician Hans Asperger in 1944 (5).

During the 1970s, empirical evidence supporting the validity of the autism diagnosis began to emerge. In 1978, psychiatrist Michael Rutter (born in Lebanon and active in England) proposed a definition of autism based on four criteria: social retardation and impairment not attributable to intellectual disability, communication difficulties not explained by relative cognitive deficits, unusual behaviors such as stereotyped movements, and onset before 30 months of age (6).

Autism was first included in the DSM-III in 1980 under the category of Pervasive Developmental Disorders (PDDs). Since 2013, the term "autism" has appeared in the DSM-V, reflecting the current diagnostic criteria (6).

Regarding ADHD, the first well-documented description of attention deficits was published in 1775 by German physician Melchior Adam Weikard. In 1798, Scottish physician Alexander Crichton described the disorder as "the inability to attend with a necessary degree of stability to any object." In 1902, British pediatrician George Frederic Still characterized the symptoms as "an abnormal defect of moral control in children." The theory of "brain damage," later referred to as "minimal brain dysfunction," emerged in 1947. Finally, in 1994, the disorder was officially recognized in diagnostic manuals as "Attention Deficit Disorder with Hyperactivity," now commonly known as ADHD (7).

Diagnosis

According to the American Psychological Association, although autism can be diagnosed as early as 15 to 18 months of age, the average age of diagnosis is approximately 4.5 years, and some individuals are not diagnosed until adulthood. This delay is unfortunate, as early diagnosis is crucial for timely intervention (8).

Due to the complexity of autism diagnosis, which involves behavioral variability, diverse clinical presentations, comorbidities, and early childhood onset, assessment requires a thorough and systematic evaluation by trained specialists. Psychiatrists, pediatricians, and developmental pediatricians are qualified to make the diagnosis, with pediatricians playing a key role in early detection through observation (9).

The diagnostic process primarily relies on structured questionnaires, behavioral observations, cognitive and language assessments, medical examinations to exclude other conditions, and interviews with parents, teachers, or other caregivers who can provide information on the individual's social, emotional, and behavioral development. Standardized assessment tools requiring specific training are also used, such as the Rapid Interactive Screening Test for Autism in Toddlers (RITA-T), the Screening Tool for Autism in Toddlers and Young Children (STAT), and the Autism Diagnostic Observation Schedule, Second Edition (ADOS-2) (9).

The American Academy of Pediatrics recommends general developmental screening at 9, 18, and 30 months, with additional use of validated tools for autism-specific screening at 18 and 24 months. Diagnosis typically involves gathering information from parents, teachers, and the child's environment, followed by a clinical interview conducted by experts to obtain medical and social history (10).

Similarly, ADHD diagnosis involves collecting information from parents, teachers, and the child's environment. A clinical interview is conducted by specialists, and neurological-psychiatric assessment is performed. Diagnostic criteria are based on DSM-IV-TR and ICD-10. Additional assessment tools include BASC, CBCL, ADHDSC4, Comprehensive Rating Scale, CCT, and the Greek Evaluation Scale of AD/Y-IV (11,12).

Frequency of Appearance & Prevalence

Based on estimates from the Autism and Developmental Disabilities Monitoring Network of the Centers for Disease Control and Prevention, approximately 1 in 44 children is diagnosed with Autism Spectrum Disorder (ASD), while globally, the prevalence is about 1 in 160 children (World Health Organization, 2013), as confirmed by Yue Yu, Sally Ozonoff, and Meghan Miller (2024). Autism is four times more prevalent among boys

than girls (13).

According to the Global Autism Prevalence Map, the average number of autism diagnoses per 10,000 individuals is 89.88 worldwide, with regional variations: 105.03 in Africa, 56.56 in Asia, 67.59 in Europe, 146.73 in North America, 46.57 in South America, 209.12 in Australia, and 115 in Greece (14,15). In Greece, children born in 2008 and 2009 were assessed for special educational support through the Educational and Counseling Support Centers until 2019, with a coverage of 87.1% of centers and 88.1% of students born in those years (16). Nationwide research on ASD in Greek children aged 10–11 years reported a total prevalence of 2.27% (1.83% boys, 0.44% girls, ratio 4.14:1), with regional variations ranging from 0.59% to 1.50%. Only 3.8% of diagnoses occurred before the fourth year of life, and 42.7% before the sixth year, with an average age at diagnosis of six years and one month, approximately three months earlier for girls than boys (16).

ADHD manifests across all ethnic, racial, and social groups, most commonly during school age, and can persist into adulthood in approximately 65% of cases. Individuals with ADHD are also at higher risk of developing anxiety disorders and depression (17).

Sex differences are evident: boys are three times more likely to be diagnosed with ADHD than girls, exhibit more aggressive behaviors, and externalize negative emotions, while girls tend to internalize emotions and have an increased lifetime risk of depression, anxiety, and eating disorders, as well as intense emotional reactions (17).

A systematic review by Nader S. et al. included 13 reviews and post-analytical studies comprising 588 primary studies with a total of 3,277,590 participants from countries including Africa, China, Spain, India, Iran, and the USA. Findings indicated that ADHD prevalence in children and adolescents is higher when diagnosed using DSM-V criteria compared to alternative diagnostic tools (17).

Meta-analytic results showed that 40% of children with ADHD experience symptom remission in adulthood, 40% continue to exhibit impairments in emotional regulation, social functioning, and occupational performance, and 20% persist in developing ADHD traits. These findings underscore the high prevalence of ADHD and the importance of management and policy interventions for children and adolescents (17).

Internationally, ADHD prevalence in children and adolescents is approximately 8%, with boys (10%) affected twice as often as girls (5%). Inattentive type is the most common (3%), followed by hyperactive (2.95%) and combined types (2.44%) (16). Incidence rates are 7.6% in children aged 3–12 years and 5.6% in adolescents aged 12–18 years. In Africa, a 2020 study reported ADHD prevalence of 7.47% among children and adolescents, with higher rates in boys. In Spain, ADHD prevalence among children under 18 was 6.6%, and 7% in children under 12 years. In China, prevalence was 5.74% in children and 6.72% in children and adolescents (18).

In Greece, data on ADHD prevalence in children and adolescents are limited. Only a few studies conducted in 1983, 1990, and 2001 exist, with non-representative samples (19). A 2021 study by Kara et al. examined 55 children with ADHD aged 6–11 years, reporting that during the COVID-19 pandemic, children with ADHD spent 5.8% more time on electronic games and video games compared to 5% in children without ADHD, had 7% higher social interactions compared to 6.2% in controls, and 5.5% higher household participation (19).

Coexistence

Autism can be associated with well-known genetic syndromes, as it has been found to overlap with other genetic disorders such as Angelman syndrome, Adenylosuccinate Lyase Deficiency, Tourette's Syndrome, Fragile X Syndrome, Neurofibromatosis Type 1, Down Syndrome, Smith-Lemli-Opitz Syndrome, Cohen Syndrome, Cornelia de Lange Syndrome, Prader-Willi Syndrome, and Phenylketonuria (20).

The co-occurrence of two or more disorders within the same individual is frequently observed in autism. Specifically, ASD may coexist with anxiety disorders, depression, Attention Deficit Hyperactivity Disorder (ADHD), epilepsy, gastrointestinal disturbances, sleep disorders, learning difficulties, Obsessive-Compulsive Disorder (OCD), intellectual disability, sensory processing problems, immune dysfunction, aggressive and self-injurious behaviors, gender dysphoria, and bipolar disorder (21).

Similarly, ADHD can co-occur with other psychiatric or developmental disorders, including Tic disorders, Obsessive-Compulsive Disorder, mood disorders, anxiety disorders, specific learning and developmental disorders, and substance use disorders (22).

AuDHD

Until 2013, international diagnostic manuals such as DSM-IV did not allow for a concurrent diagnosis of autism and ADHD, treating them as distinct conditions. The DSM-5, released in 2013, recognized the possibility of coexistence, permitting both diagnoses in the same individual. Approximately 13% of children with ADHD are eventually diagnosed with ASD (22).

The term "AuDHD" is not officially recognized in diagnostic manuals as a separate condition; it is a convenient abbreviation used to describe individuals who meet diagnostic criteria for both autism and ADHD. Both disorders influence how a person thinks, feels, and perceives the world. Autism is characterized by

differences in communication, thinking styles, and social
interaction, often accompanied by focused interests and consistent behavioral patterns that provide structure and enjoyment (24).

ADHD is characterized by difficulties in attention regulation, impulsivity, and hyperactivity. Individuals with AuDHD vary in the type and severity of these challenges depending on stress levels and the support they receive (25). Consequently, these individuals face difficulties in planning, prioritizing, initiating daily tasks, organizing time and activities, and regulating social interactions. Estimates suggest that 40–70% of children with ADHD may also meet criteria for ASD, a figure partly explained by the prior DSM-IV restriction against dual diagnosis (26).

Both autism and ADHD affect several overlapping domains. Executive functions are impacted, including self-regulation, behavioral organization, planning and execution of ideas, goal attainment, and cognitive flexibility. Social skills (appropriate response to social situations), emotional regulation, attention focus, mental health (anxiety, depression, peer-related challenges), learning difficulties, sensory processing, and genetic factors are also commonly affected (27).

Neurobiological research has demonstrated altered development and function of cortical systems involved in visual attention and ocular control in both ADHD and autism, suggesting shared neural mechanisms (28).

The concept of "masking" describes how individuals with ADHD and autism attempt to hide symptoms in social contexts to avoid negative judgment. This may include mimicking others' social behaviors, suppressing stimulation, or forcing social engagement even when uncomfortable (28,29).

Conceptual models of ADHD and autism increasingly view these disorders as existing along continua. For example, the Simple Spectrum and Far End models describe phenotypic features along network continua, while the Emergent Far End model considers phenotypes as emergent properties of genetic or continuous neural mechanisms (27).

A modern area of research involves interoception, the awareness of internal bodily states, which is negatively associated with symptoms of both ADHD

and autism. Children with ADHD, with or without co-occurring ASD, generally exhibit lower interoception compared to typically developing peers. Similarly, children with higher autistic traits show reduced interoceptive awareness compared to those with lower traits. Difficulties in perceiving and understanding internal bodily signals may contribute to symptom manifestation in both ADHD and autism (30,31).

Conclusions

Autism and ADHD are two neurodevelopmental disorders that affect a substantial number of children and adolescents. The etiological factors for both conditions are primarily genetic, neurobiological, and environmental. Importantly, these disorders can co-occur in the same individual, which complicates diagnosis, as individuals with coexisting conditions often exhibit more severe symptoms than those with a single disorder. In cases of co-occurring ADHD and autism, the diagnosis of ADHD typically precedes that of autism. This pattern is likely because ADHD symptoms often result in earlier observable functional impairments compared to the symptoms of autism. Therefore, early and accurate assessment is critical to ensure timely intervention and support for affected individuals (34).

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