

## Autism and Pharmacology

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Autism is a neurodevelopmental disorder characterized by impaired social interaction and communication, repetitive and stereotypical patterns of behavior, and uneven intellectual development, often with mental retardation. Symptoms begin in early childhood. The cause is unknown in many children, although in some evidence they support a genetic component; autism can be the result of a health disorder. Diagnosis is based on developmental history and observation. Treatment consists of behavioral procedures and sometimes medication. Autism usually manifests itself in the first year of life. The disorder is characterized by atypical interactions, insistence on immutability, speech difficulties, and unequal intellectual abilities.

Treatment is usually multidisciplinary, and recent research has shown measurable benefits from intense, behavioral approaches that encourage interaction and meaningful communication. Psychologists and teachers typically focus on behavioral analysis and then adapt behavioral treatment strategies to the specific difficulty of the patient, at home and at school. Treatment should be started early and with the help of a range of aids, such as singing, changing pictures and talking. Physiotherapists and occupational therapists plan and implement strategies to help sick children compensate for specific deficiencies in motor function and motor planning. Antipsychotics and mood stabilizers such as valproic acid can help control behavior.

**ASD**

Drugs used in autism target neuromodulation at different neuronal sites [1]. Those utilizing anticonvulsant, neuroleptic, antidepressant, stimulant, cholinesterase inhibitors, anxiolytics, mood stabilizers and other pharmacological interventions in autism do so for a variety of purposes. Each of these classes of drugs will be examined relative to their proposed neuromodulatory actions as they relate to the Autism Spectrum Disorder (ASD) population.

Children with ASD demonstrate deficits in 1) social interaction, 2) verbal and nonverbal communication, and 3) repetitive behaviors or interests. Many have unusual sensory responses. Symptoms range from mild to severe and present with individual uniqueness and complexity. Some aspects of learning may seem exceptional while others may lag. These children reflect a mix of communication, social, and behavioral patterns that are individual but fit into the overall diagnosis of ASD. Aggression, irritability and/or self-injury in children with autistic spectrum disorders often meet the threshold indicating pharmacological intervention.

Autism Spectrum Disorders have been shown to be related to complex combinations of environmental, neurological, immunological, and genetic factors. In addition to strong genetic links, environmental factors such as infection and drug exposure during pregnancy, perinatal hypoxia, postnatal infections and metabolic disorders have each been implicated in autistic populations.

**Disorders**

Classification of childhood-originated neuropsychiatric disorders has shifted dramatically over the course of the twentieth century and beyond [2]. Noticing unusual behaviors in childhood, and related neurological symptoms, is probably as old as mankind. However, with the advent of effective antibiotics, it has become possible to treat disorders which are chronic, not obviously infective and persistent from childhood throughout the rest of life.

The central notion of autism is that certain children appear early in development to live lives unto themselves, with a large degree of apparent disregard for parents and other people. Their physical health is usually robust. They have varying degrees of language development. Their motor development often appears largely, if not entirely, normal. However, beyond these spectra, they appear

to respond largely to internal stimuli. It may be difficult to engage their attention, even for very short periods of times (seconds). Their usual self-care milestones may be restricted, or reached only with exceptional degrees of behavioral reinforcement.

Asperger's syndrome was originally viewed as an entirely different, discrete entity, unrelated to autism. The defining characteristic, or symptomatology, was thought to be a quite skewed misreading of social cues. This is a child who is into herself/himself and, yet, does appear to relate to the world. Unlike the autistic child, the one with Asperger's syndrome supposedly relates, but in ways that appear to be peculiar or fanciful to both peers and adults. Such children might well mature and find places in the adult world. However, they would likely be isolated, in professions or jobs which required minimal interaction with others. As with autism, conventional measures of intelligence could display a broad range from dull to normal to bright.

### Diagnosis

Although not always diagnosed in childhood, chronic problems with attention deficits are associated with neurocognitive disorders that originate in childhood [3]. Attention deficit hyperactivity disorder (ADHD) and autism spectrum disorder (ASD) are chronic neurocognitive disorders originating in childhood. More than 30% of children with ASD also meet the criteria for ADHD. Furthermore, another 20% of children with ASD demonstrate subthreshold levels of ADHD symptoms. This comorbidity is pertinent because the presence of ADHD symptoms impacts cognition, additional autistic traits, and adaptive behavior. Although both disorders initially present in a similar social and biological manner, they are different disorders with very different functional impairment. The Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-5) organized the diagnostic criteria in perhaps one of the more significant changes in how the diagnosis is derived. The escalation of the diagnosis of both ADHD and ASD over the past decade has in some regard been a public health concern. Nonetheless, it is important not to overlook either diagnosis. The overdiagnosis and the underdiagnosis can have lifelong negative effects on the development of an individual's ability to reach his or her personal autonomy and social potential. Only by understanding both disorders can the highest level of functioning be reached for the child as well as his or her family.

Autism spectrum disorder (ASD) has been the recipient of much debate in the organization of diagnostic criteria and where it "fits" in the disordered attention treatment. When the DSM-5 was

released in 2013, there were concerns (some of which still remain) that the criteria would impact pending research and disability determination, and potentially dilute pervasive developmental disorder (PDD) and Asperger's disorder, both of which are components of the autistic spectrum. Previously, DSM-IV diagnoses were individual diagnoses: autistic disorder, Asperger's, PDD not otherwise specified (PDD-NOS), and two disorders that are closely associated: Rett's disorder (Rett's syndrome) and childhood disintegrative disorder (CDD). CDD is a neurodevelopment disorder that is characterized by distinct and pervasive impairment in multiple developmental areas, primarily in the realm of social skills, communication, and behavior. DSM-5 included PDD and Asperger's into one diagnosis, that of autistic spectrum. Pursuant to Rett's syndrome and CDD, they are subgroups within the diagnosis and are associated with a known medical or genetic disorder.

The common characteristics of these diagnoses include a variety of symptoms that are differentiated diagnostically and encompass a wide range of outcomes and impairments. Subsequently, the inclusion of the symptoms within a chapter on attention disorders is purposeful as there is often either a comorbid attention deficit diagnosis or inherent attention delays that respond to medications for ADHD, or the primary presenting symptom may be consistent with attentional problems that ultimately lead to the diagnosis of Asperger's.

The development of the clarity of the diagnosis has evolved and continues to be refined. The term autism spectrum is a synonym that is widely accepted by parents and experts. In both the DSM II and I, the symptoms that are now consistent with autism spectrum were considered within the diagnosis of schizophrenia. Previously, ASD was primarily considered a developmental disorder; however, more recently it has been associated with a higher incidence of medical disorders including seizures, sleep disturbances, gastrointestinal (GI) symptoms, metabolic issues, hormonal imbalances, infection, and allergies. Of the multiple medical comorbidities, epilepsy shares several mechanisms with ASD, which impacts the overall functional impairment.

### Interventions

Current pharmacological interventions in autism spectrum disorders are essentially directed at reducing cognitive and behavioral impairments [1]. Treatment studies have demonstrated little observable benefit to core deficits of ASD, however, the argument is made that, in addition to the practical benefits of reducing behavioral and cognitive impairments, symptom

reduction is a reflection of more efficient neural processing and development.

Effective impairment reduction often allows children to remain in a family home, function in a school setting, optimize responsiveness to behavioral and educational methods and, generally, function more normally than would otherwise be possible. Those of us who treat children who will otherwise be excluded from normal environments appreciate the importance and complexity of these interventions. The greater promise of pharmacological interventions is their potential, through early intervention, to inhibit or reduce the development of pathological and pathogenic endophenotypes.

### Management

There has been controversy surrounding the treatment for ASD [3]. From dietary treatment to nonapproved medications and a variety of therapeutic interventions, parents and caregivers have been bombarded with ideas that have not always been associated with improvement or good outcomes. This speaks to the heightened awareness and passion about the long-term effects of the disorder on autonomy, family, and society. This is not to say that the modalities of treatment, both conventional and nonconventional, are not intended for the betterment of the individuals who are affected.

While there is no one medication or treatment that is recommended for ASD, the management is focused on symptoms and developmental growth. A significant amount of information is available on several evidence-based or informed websites such as NIMH (National Institute of Mental Health), Autism Speaks, and Autism Society. Careful preparation of children's stages of growth into adolescents and adults will require ongoing support and education. These are areas for development of support service projects that will serve to address the unique needs of these individuals as they enter adulthood. All ASD patients should be monitored for comorbid psychiatric diagnosis and medical disorders. Despite a growing body of evidence and diagnostic-refined techniques, there is little known regarding the treatment of the aging adult with ASD. This is a gap in the research, and as the generation of newly diagnosed ASD children or young adults enters the older adult phase there needs to be further inquiry on the supports or treatment into older adulthood.

The assessment of the individual who presents with symptoms consistent with disordered attention requires a careful review that is initiated by some form of recognition of a social, academic, or professionally functional impairment. The complexities of the potential diagnosis (if any) are aided by the collaboration with supportive parties who are able to provide external information so that the clinician can perform a detailed comprehensive assessment. The diagnostic intricacies of individuals whose lives are impacted by attention difficulty require skill and knowledge and are key to the initiation of treatment recommendations.

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