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## REVIEW ARTICLE

# "A Comprehensive Review of Etiology, Diagnosis, and Treatment Options for Autism Spectrum Disorders"

Somasundaram Ramachandran<sup>1\*</sup>, Nalli Leena<sup>2</sup>

Department of Pharmacology, GIET School of Pharmacy, NH-16, Chaitanya Knowledge city, Rajahmundry, Andhra Pradesh-533296, INDIA.

### Correspondence:

\*Dr.Somasundaram Ramachandran

Professor & Head

Pharmacology Department

GIET School of Pharmacy

[Email-ramsnetin@yahoo.com](mailto:Email-ramsnetin@yahoo.com)

ORCID ID- <https://orcid.org/my-orcid?orcid=0000-0001-9119-9112>

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## ABSTRACT

Autism spectrum disorder (ASD) represents a neuro development condition marked by challenges in social communication alongside repetitive behaviors restricted interests. Recently attention drawn towards rising prevalence, prompting this article to delve into potential influencers on these rates, notably changes in diagnostic criteria. Over time, there's been a noticeable raise in number of cases in children on the autism spectrum since the early 1990s, influenced by various factors. Increased awareness among families and schools, coupled with improved access to specialized education services, likely contribute to this rise. Evolving definitions and diagnostic approaches for ASD also play a role. Within this article, the authors thoroughly explore the causes, diagnosis, and treatment options for ASD. They detail the process of clinical diagnosis in both children and adults, highlighting the complexities of diagnosing adults and offering screening guidance for associated conditions.

**Keywords:** Autism spectrum disorder (ASD), Aspergers condition, prevalence, etiology, evaluation, medical comorbidity.

## **INTRODUCTION**

An intricate of neuro developmental condition characterized by a spectrum of developmental impairments known as “autism spectrum disorder (ASD)”, has garnered significant interest in the field of clinical psychology and neuroscience results from differences in the brain. Definable learning patterns, delayed or interrupted verbal and nonverbal communication, repetitive behavior, and poor social interaction are its hallmarks. Every autistic individual has his own set of abilities, signs, manifestations, and difficulties associated with the condition.

Autism and its symptoms are described in different Manuals, which is used by doctors and psychiatrists [1]. Genetics, environmental circumstances, and birth disorders are all potential causes of autism. Co-occurring disorders and problematic behaviors are frequent among the people with autism. While some people with autism may live independently, others need care and support for the rest of their lives. ASD is a condition with several underlying reasons that can persist throughout life, while its symptoms occasionally get better.

While in some kids the symptoms begin to exhibit in the first year of life, others might not until much later. The fact that people were not familiarized with autism till late 1940 to 1945; there are historical and modern people whose autism has been speculated built on their behaviors and characteristics.

Albert Einstein, Charles Darwin, Isaac Newton, Mozart, and Michelangelo are a few examples of famous people. Leo Kanner, a psychiatrist, first utilized the phrase "early-onset infantile autism" to narrate kids who exhibited attraction in other people in a 1943 report describing 11 patients who showed strong attention on objects and reluctance to change [2].

The following year, pediatrician Hans Asperger published a study on four autistic children in which he found a hereditary link by contrasting the traits of the parents. Asperger also discovered Asperger's syndrome, a more advanced type of autism [3]. Males are prone to experience autism more than females, by a ratio of about 4:1[4].

April second was of international significance that calls on United Nations member nations [5] to encourage understanding and acknowledgement of people with autism. One hundred children globally are thought to be afflicted by autism, according to estimates [6].

## **BEHAVIORS AND SYMPTOMS:**

Numerous signs, such as decreased eye contact, a lack of responsiveness to their name, and the absence of a smile in his primarily life, can be found autistic people. Some kids could first progress normally before turning hostile and losing their verbal abilities. The symptoms of autism spectrum disease largely impact social interaction, communication (verbal and nonverbal), and behavior, and each kid exhibits a distinctive pattern of behavior. Among the symptoms seen were some of the following

- Absence of emotional connection with others; resistance to physical affection; preference for solitary play; inconstant response to name;

- Occasional hearing difficulty; difficulties in talking and interacting with others; delayed or absent speech; regression in language abilities; inability to start or maintain conversations; abnormal speech patterns.
- Lack of shared enjoyment with others, the absence of facial expressions or smiles
- Limited engagement in imaginative play and tendency to repeat gestures or sounds
- Over-sensitivity to sound and indifference to temperature
- Differences in body language, repetition of words without understanding
- Limited eye contact with others and difficulty understanding simple instructions or questions
- Despite challenges, individuals with ASD often possess strength such as attention to detail and strong memory retention.
- Challenges with body posture and emotional expression, discomfort with touch
- ASD sufferers may also have trouble sleeping and becoming irritable.
- Symptoms like repetitive movements and self-harming activities, such as biting and head-banging, are common
- Difficulty in making friends is often experienced
- Specific routines or rituals are developed, and even the slightest change can cause disturbance.
- Inappropriate laughing or crying may occur.
- Coordination with other can be difficult and odd posture movements like walking on toes or overemphasized body language.

### **Causes:**

The underlying causes of ASD may be unknown to some experts, however, studies typically show that a confluence of genetic and environmental variables can affect development and create ASD. Having someone with an ASD in the family, due to genetic disorders like down syndrome or X syndrome, and having significantly low weight in the time of birth have all been related to an increased risk of developing ASD.

Several factors increase the likelihood of developing ASD, including:

- Sibling with autism patients
- Older parents
- Down syndrome or Fragile X syndrome
- Low birth weight babies or premature baby

### **TYPES OF AUTISM SPECTRUM DISORDERS:**

Autism spectrum disorders manifest in various forms, such as:

- Autistic disorder
- Asperger's syndrome
- Pervasive Developmental Disorder-Not Otherwise Specified
- Childhood Disintegrative Disorder (CDD)

**ASPERGER'S CONDITION**

Patients who experience Asperger's condition have average intellect like everyone else, but they may have trouble interacting with others, comprehending emotions, body language, and sarcasm. Suffer from symptoms of high functioning that are less severe than those of other forms of autism spectrum disorder, have a chronic illness that affects more men than women.

Common difficulties brought on by Asperger's syndrome: rigidity in beliefs and actions switching between tasks with difficulty Executive functioning issue difficulties engaging with others due to difficulty expressing emotions via speech

Treatment options for Asperger's syndrome:

- By providing Social skills training
- By motivational therapy
- Consequent behavioral therapy
- Person's parenting skills

**PERVASIVE DEVELOPMENTAL DISORDER - UNSPECIFIED (PDD-U):**

PDD-U sufferers from difficulties understand and using language, making connections with people, events, or things, displaying repetitive physical motions and behavioral patterns, and having limited social skills. Each youngster may behave and speak differently. Some people may have trouble speaking, while others might not be able to talk at all.

**AUTISTIC DISORDER:**

A severe and common form of autism is Kanner's syndrome, often known as autistic disease. A variety of symptoms, including intellectual disabilities, language delays, communication difficulties, and unique behaviors and hobbies, are used to describe it. Additionally, those who have this condition may be very sensitive to touch, sound, light, and scent. Early diagnosis is crucial to significantly improve the life for people affected by this condition.

**CHILDHOOD DISINTEGRATIVE SYNDROME (CDS):**

An uncommon disorder that affects children is called "Disintegrative psychosis or CCD", Also known as Heller's syndrome. With prevalence close to 1.7 per 100,000 kids, CDD is regarded as being incredibly uncommon. There has been a lot of study, but the etiology of this condition is still a mystery [7]. Autism and CDD are related in various ways, and CDD is occasionally the beginning of CDD, which is thought to be a low functioning variety, is abrupt and can happen within days or weeks, with some instances displaying over development [8, 9] identifying or interacting with children who are affected by this condition may not be of any issues to children's who grow properly up to the age of two. Speech, occupational, and behavioral treatment can assist the child's condition if CDD is identified early on. It's crucial to understand that while there are similarities between CDD and autism, they are distinct disorders with different diagnostic criteria and treatment approaches.

**DIAGNOSIS:**

Since there is no diagnostic medical testing for autism spectrum condition, it might be difficult to make a diagnosis. However, behavioral abnormalities can be seen in the first 18 months of birth, and a professional prognosis made by the age of two can be trusted [10]. Some children might not be diagnosed until becoming adults. It is crucial to keep an eye out for signs of autism disorder in child's behavior and seek medical treatment from a neurologist or psychologist who specializes in treating this condition [11]. There are numerous indications and symptoms linked to this set of illnesses should be identifiable by doctors. Until the age of 11 or even later [12], families of children with Asperger's condition can't notice the appropriate anomalies in their children.

It's important to acquire data on kids from a variety of sources, especially when it comes to identifying widespread developmental abnormalities [12, 13]. When compared to children who are usually developing, doctors and instructors are more likely to notice irregularities and deficits in children's behavior. Numerous tools, including the Screening tools such as the Childhood Autism Rating Scale (CARS), the Checklist for Autism in Toddlers (CHAT), the Modified Checklist for Autism in Toddlers (M-CHAT), and the Social Responsive Scale for Parents and Teachers (SRS) are commonly employed to identify autism spectrum disorder in high-risk children [14, 17].

Every time it is important to assess a child's social skills, communication behavior and abilities, speaking, hearing, languages development, eye contact, smiling, and mental behavior. The American Psychiatric Association's diagnostic and Statistical Manual of Mental Disorders (DSM-5) has established standardized criteria for diagnosing ASD. It is also advised to undergo genetic testing and fragile-X syndrome tests.

## **DIAGNOSIS IN ADULTS**

Diagnosis of ASD in adults is more complicated than the diagnosis in children. Mostly in adults, ASD symptoms can be misinterpreted with other mental disorders symptoms, Example: anxiety disorder or attention-deficit/hyperactivity disorder (ADHD).

Adults with signs of ASD should consult with expert and must focus on symptoms that confirm it by extensive ASD evaluation. It is always advisable to consult and evaluate ASD in adults with a neuropsychologist who has extensive knowledge and experience in diagnosing ASD. During diagnosis the neuro expert will focus mainly on social interaction and communication challenges, Repetitive behaviors, Sensory issues etc.

Understanding the patient's early symptom developmental history with friends and family members will be much useful for the experts to confirm the status of disease in a patient. Receiving right diagnosis of ASD for an adult will help a person understand past challenges, will help to judge the challenges involved for improving the functioning and community integration of autistic transition-age youth and adults.

**Table-1. Some Studies conducted on autism spectrum disorder (ASD):** <sup>[18-26]</sup>

Study	Objective	Methodology	Key Findings
Charman et al (2019)	Assessing the effectiveness of early experimental studies for the ASD in group setting	Randomized controlled trial	Pediatric patients who underwent early experimental studies exhibited greater progress in social activities and adaptive behavior compared to those receiving standard care.
Hazlett et al. (2020)	To Analyze and assess the brain development in infants with high risk for Autism Spectrum Disorder	Longitudinal study	Infants who later developed ASD displayed differences in brain development as early as 6 months old, with increased brain volume in specific areas.
Bolte et al. (2021)	Identifying sub groups of individuals with ASD based on behavioral characteristics	Cluster analysis	Four distinct subgroups with unique behavioral characteristics were identified, offering insights for tailored interventions in ASD individuals.

### **COMMON STATISTICAL ANALYSIS EMPLOYED FOR RESEARCHES ON AUTISM DISORDER (ASD):**

Some of the typical statistical analysis utilized in research on autistic disorder (ASD) is summarized in the table given. These analyses assist researchers in gathering and describing data, drawing conclusions about populations, examining relationships between variables, locating underlying causes, categorizing people based on shared or distinct traits, and examining intricate relationships between numerous variables. It's crucial to comprehend these statistical analyses in order to appreciate study results in the area of ASD.

### **IMPORTANT INFORMATION AND IMPLICATIONS FOR DIAGNOSIS AND TREATMENT FROM STATISTICAL ANALYSIS OF AUTISM DISORDER (ASD):**

Important statistics concerning Autism Spectrum Disorder (ASD), such as prevalence rates, age at diagnosis, IQ scores, co-morbidities, and gender distribution, are compiled in the table No-2. This knowledge can help with diagnosis and treatment planning because it sheds light on the nature of ASD and how it affects different people. Researchers, clinicians, and educators who work with people who have ASD can utilize the table No-2 & 3.

**Table No-2 Statistics concerning Autism Spectrum Disorder**

Statistic	Description
Prevalence	The proportion of individuals with ASD in a given population
Age of diagnosis	The age at which an individual with ASD is first diagnosed
IQ scores	Measures of intellectual ability, often used to assess cognitive functioning in individuals with ASD
Comorbidities	The presence of additional medical or psychiatric conditions alongside ASD
Gender distribution	The proportion of males and females diagnosed with ASD

**Table No-3 Statistics concerning Autism Spectrum Disorder**

Statistical Information	Value	Implications
Prevalence rates	1 in 54 children (CDC, 2020)	ASD is a natively common neuro developmental disorder that affects a significant portion of the population
Age of diagnosis	Average age of diagnosis is around 4 years old (CDC, 2020)	Early diagnosis and intervention can lead to better outcomes
IQ scores	Wide range of IQ scores, with approximately 30% of individuals with ASD having intellectual disability (CDC, 2020)	Identifying cognitive strengths and weaknesses can inform Educational and intervention strategies
Comorbidities	High rates of Comorbidities, including ADHD, anxiety, and depression (CDC, 2020)	Comprehensive assessment and treatment of comorbidities is important for overall well-being and quality of life
Gender distribution	4:1 male-to-female ratio (CDC, 2020)	Gender differences in symptom presentation and risk factors should be considered in diagnosis and intervention planning

The statistical study of patients with ASD sheds light on the condition's characteristics and prevalence. Recent surveys have revealed a rise in the prevalence of ASD, with current estimates indicating that 1 in 54 child in the US currently has an ASD diagnosis. A number of variables, including more knowledge and modified diagnostic criteria, have been linked to this rise in prevalence.

Research has also focused on the age at which ASD diagnoses are made, with earlier diagnoses being linked to better outcomes. However, many people with ASD are still not identified until much later in life despite efforts to promote early detection.

Research shows that IQ levels in persons with ASD vary greatly. IQ scores have been widely utilized to evaluate cognitive functioning in people with ASD. While some people with ASD are intellectually disabled, others are intelligently above normal.

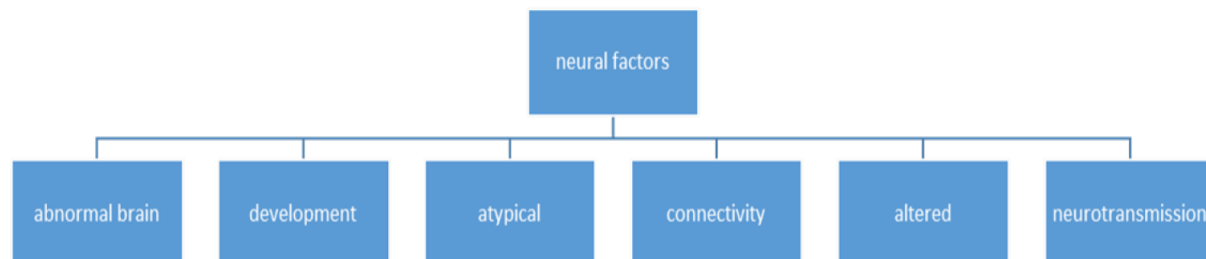
Comorbid conditions, such as depression, anxiety, or ADHD, are also prevalent in people with ASD. According to study, up to 70 percent of cases with ASD have at least one of the comorbid disorders.

ASD statistical analysis should take gender distribution into consideration, since research shows that men are more prone than women to get an ASD diagnosis. Recent studies have also emphasized the importance of identifying and diagnosing ASD in girls, who may exhibit different symptoms than males

The diagnosis process for ASD is shown in this flowchart. Finding out whether a person exhibits ASD symptoms is the first step. These symptoms might include issues with social communication, repetitive habits, and sensory processing. The individual's symptoms are then assessed using a variety of techniques, such as observation, caregiver interviews, and diagnostic tools such as ADOS or ADI-R. The doctor next evaluates if the patient's symptoms are consistent with an ASD diagnosis and defines the severity level depending on the patient's limitations [27].

### **THE DEVELOPMENT AND MAINTENANCE OF ASD:**

The below map will show the different variables that effect the development and maintenance of ASD along with support for the factors listed:<sup>[28-32]</sup> The statistical study of ASD sufferers as a whole emphasizes the complexity of the condition and the demand for a tailored approach to diagnosis and therapy. Even though prevalence rates are rising, initiatives to boost early identification and intervention might help people with ASD have better outcomes. Additionally,



identifying and treating comorbidities in addition to ASD may enhance general health and wellbeing. Finally, gender differences in ASD diagnosis and presentation should continue to be explored to ensure that all individuals with ASD receive appropriate support and treatment.

### **TREATMENT:**

Although there is no recognized treatment for autism spectrum disorder, various methods that aid to lessen the symptoms and improve abilities. Depending on the person, a different therapy or intervention may be applied. Structured and focused treatments are typically the most helpful



for people with ASD. During the preschool years, early intervention can help children develop critical social, communicative, functional, and behavioral skills. ASD symptoms can coincide with those of other afflictions like ADHD [33]. Therefore, it is essential to take the patient's unique needs into account while choosing a course of therapy.

### **THE FOLLOWING ARE SOME COMMON TYPES OF TREATMENT FOR AUTISM SPECTRUM DISORDER:**

- To analyze Behavioral changes
- Speech Therapy / Motivational therapy
- By providing occupational Therapy
- To treat by giving social Skills Training
- Consequent Behavioral Therapy (CBT)
- Drugs used (such as antidepressants, antipsychotics, or stimulants)
- Dietary Changes and Supplements (such as gluten-free or casein-free diets)
- Various Therapies (such as music, art, or animal-assisted therapies)
- Parent-Mediated Therapy like Early Start Denver Model uses a child's natural motivations (Toys, games and certain activities that a child needs and cares about )
- Sensory Integration Therapy
- Assistive Technology (such as communication devices or visual supports)

It's significant to remember that each treatment's efficacy may change based on the person receiving it and their unique demands. A thorough treatment strategy often combines a variety of treatments and therapies that are catered to the needs of the patient. Different approaches of treating autism spectrum disease.

Behavior modifications the therapy of ASD must include behavioral treatments. ABA therapy, which employs the use of positive support to teach new abilities and decrease problematic act, is one extensively utilized technique.

Research has shown that ABA is beneficial in enhancing behavior, social engagement, and communication in people with ASD. Other behavioral therapies can include parent training programs, which try to enhance parent-child connections and lessen parental stress, and social skills training, which concentrate on enhancing social functioning [34]. Medication ASD's primary symptoms cannot be precisely treated with medication. However, co-occurring disorders like ADHD, anxiety, or depression may be treated with medication. To treat the symptoms of ADHD, stimulant drugs like methylphenidate and amphetamines are frequently utilized. These drugs operate by raising brain dopamine and norepinephrine levels, which can enhance focus and lessen impulsivity and hyperactivity [35].

However, they can also cause adverse reactions including appetite loss, difficulty sleeping, and mood swings. As an alternative to stimulants, non-stimulant drugs like the medication known as Guanfacine hydrochloride and atomoxetine may be used; however, they come with side effects such as; dizziness, dry mouth, and constipation.

### **CONCLUSION**

To sum up, ASD is a complicated neuro developmental that has varying effects on people. It is a range of diseases marked by problems with social interaction, repetitive actions, and narrow interests. While the precise origin of ASD is still unknown, research indicates that genetic and environmental variables may interact to help to the development of the disorder.

The intensity of an individual's ASD symptoms as well as the symptoms themselves might vary widely. While some may experience less severe symptoms, others may experience severe symptoms that have a significant impact on everyday life. There are many forms of ASD, such as; Asperger's, Childhood Disintegrative Disorder, and Pervasive Developmental Disorder, are now considered to be a component of the ASD spectrum rather than distinct diagnoses.

For those with ASD, early identification and intervention are essential. Treatment options range from behavioral therapy to prescription drugs and other therapies. Applied behavioral analysis ABA, one of the behavioral treatments, can promote adaptive behaviors, decrease repetitive behaviors, and enhance social communication skills. Some of the ASD symptoms, including anxiety, sadness, and hyperactivity, can be treated with medication. Alternative treatments have also been utilized to help manage the symptoms of ASD, including dietary modifications, music therapy, and animal-assisted therapy.

There is still much to learn about this complicated illness, and research into the causes and treatments of ASD is currently underway. However, scientific advancement have increased our understanding of ASD, through various improvements in diagnostic and therapeutic choices, Early intervention and support are crucial for assisting those with ASD in realizing their full potential.

In conclusion ASD is a complicated illness that has a significant influence on the lives of both affected persons and their family. It is crucial to spread knowledge about this condition and offer assistance and resources to people who have ASD. We can enhance the lives of patient affected by ASD and move towards a greater understanding with continuous research and treatment improvements.

### **AUTHOR CONTRIBUTIONS**

**Somasundaram Ramachandran:** Investigation, analysis, preparation of original draft and editing.

**Nalli Leena:** Methodology, analysis, Literature review and editing.

### **CONFLICT OF INTEREST STATEMENT:**

All authors declare no conflict of interest

### **REFERENCES**

1. American Medical Association. Mental disorder diagnostic and statistical manual. 5th ed. American Psychiatric Publishing, 2013, Arlington.
2. Silberman, S. (2015). Neurotribes: The legacy of autism and the future of neurodiversity. New York, US: Penguin Books

3. Fombonne, E. (2009) "Epidemiology of pervasive developmental disorders," *Pediatric Research*, 65(6), 591–598.
4. Hans Asperger, (2018). National Socialism, and “race hygiene” in Nazi-era Vienna. *Mol Autism*, 9:29.
5. Zeidan, J., Fombonne, E., Scolah, J., Ibrahim, A., Durkin, M.S., Saxena, S., Yusuf, A., Shih, A., Elsabbagh, M. (2022). Global prevalence of autism: A systematic review update. *Autism Research*, 15(5), 778-790.
6. Fombonne, E. (2003) Update on epidemiological studies of autism and other pervasive developmental disorders. *J Autism Dev Disord*, 33(4): 365-382.
7. Mc Partland, J., Volkmar, F.R. (2012). "Autism and related disorder", mental condition neurobiology. *Handbook of Clinical Neurology*, 106: 407–418.
8. Venkat, A., Jauch, E., Russell, W.S, Crist, C.R, and Farrell. (2012). "General practitioner treatment of the autistic patient. *Postgrad Medical Journal*, 88(1042), 472-481.
9. Johnson, C.P., Myers, S.M. (2007) Identification and evaluation of autistic spectrum disorder. *Pediatrics*, 120:1183-1215.
10. Susan, L., Hyman, M.D., Susan, E., Levy, M.D., Scott, M., Myers, M.D. (2020). Identification, Evaluation, and Management of Children with Autism Spectrum Disorder, *Pediatrics*. 145 (1): e20193447.
11. Lord, C., Risi, S., Dilavore, P., Shulman, C., Thurm, A., Pickles, A. (2006) Autism from 2 to 9 of age. *Arch Gen Psychiatry*, 63(6): 694-701.
12. Mattila, M.L., Kielinen, M., Jussila, K., Linna, S.L., Bloigu, R., Ebeling, H.M., oilanen, I. (2007). An epidemiological and diagnostic study of Asperger syndrome according to four sets of diagnostic criteria. *J Am Acad Child Adolesc Psychiatry*, 46: 636-646.
13. Risi, S., Lord, K., Gotham, C., Corsello, C., Chrysler, P., Szatmari. (2006). Combined information from several sources. *J Am Acad Child Adolesc Psychiatry*, 45: 1094–1103.
14. Swettenham, J., Wheelwright, S., Cox, A., Baird, G., Charman, T., and Baron-Cohen, S. (2000). Using the Check list for Autism in Toddlers (CHAT) to detect autism early. *J R Soc Med*, 93: 521–525.
15. Wong, V., Hui L.H.S., Lee, W.C., Leung, L.S.J., Ho, P.K., Lau, W.L.C., Cheuk, Fung, W., Chung, B.A. (2004). Modified screening tool for autism (Checklist for Autism in Toddlers [CHAT-23]) for Chinese children, *Pediatrics*. 114(2): 166-176.
16. Wagner, M.B., Pereira. A., and Riesgo, R.S. (2008). The childhood autism rating scale has been translated and validated for use in Brazil. *J Pediatr (Rio J)*, 84:487–494.
17. Charman, T., Baird, G., Simonoff, E., Loucas, T., Chandler, and Meldrum, D. (2007). Efficacy of three screening instruments in the identification of autistic-spectrum disorders. *Br J Psychiatry*, 191:554-559.
18. Baron-Cohen, S., Leslie, A.M., and Frith, U. (1985). Does the child with autism possess a "theory of mind"? 37–46. *Cognition*, 21(1).
19. Kanner, L. (1943), Affective contact disturbances in autism. *Child with anxiety*, 2, 217–250.

20. Lovaas, O.I. (1987). In early autistic children, behavioral therapy and typical academic and intellectual performance. *Journal of Consulting and Clinical Psychology*, 55(1), 3-9.
21. Dawson, G., Meltzoff, J., Osterling, J., Rinaldi & Brown, E. (1998). Autism affects a child's ability to orient to everyday social cues. *Journal of Autism and Developmental Disorders*, 28(6), 479–485.
22. Bauman, M.L., & Kemper, T.L. (1985). What is the evidence for structural brain abnormalities in autism? *Research Reviews on Developmental Disabilities*, 1(3), 149–160.
23. Lord, C., Rutter, M., Di, Lavore, P.C., & Risi, S. (1989). Autism diagnostic observation schedule (ADOS). *Journal of autism and developmental disorders*, 19(2), 185-212.
24. Dawson, G., Rogers, S., Munson, J., Smith, M., Winter, J., Greenson, J., & Varley, J. (2010). Randomized, controlled trial of an intervention for toddlers with autism: the Early Start Denver Model. *Pediatrics*, 125(1), 17-23.
25. Courchesne, E., Carper, R., & Akshoomoff, N. (2003). Evidence of brain overgrowth in the first year of life in autism. *Jama*, 290(3), 337-344.
26. Constantino, J.N., & Todd, R.D. (2003). Autistic traits in the general population: a twin study. *Archives of general psychiatry*, 60(5), 524-530.
27. Lord, C., Rutter, M., & Le Couteur, A. (1994). Autism Diagnostic Interview-Revised: A revised version of a diagnostic interview for caregivers of individuals with possible pervasive developmental disorders. *Journal of Autism and Developmental Disorders*, 24(5), 659-685.
28. Abrahams, B.S., & Geschwind, D.H. (2008). Advances in autism genetics: On the threshold of a new neurobiology. *Nature Reviews Genetics*, 9(5), 341–355.
29. Hall mayer, J., Cleveland, S., Torres, A., Phillips, J., Cohen, B., Torigoe, T., & Risch, N. (2011). Genetic heritability and shared environmental factors among twin pairs with autism. *Archives of General Psychiatry*, 68(11), 1095-1102.
30. Lyall, K., Croen, LA., Sjodin, A., Yoshida, C. K., Zerbo, O., Kharrazi, M., & News chaffer, C. J. (2017). Polychlorinated biphenyl and organo chlorine pesticide concentrations in maternal mid pregnancy serum samples: Association with autism spectrum disorder and intellectual disability. *Environmental Health Perspectives*, 125(3), 474–480.
31. Geschwind, D.H., & Levitt, P. (2007). Autism spectrum disorders: Developmental disconnection syndromes. *Current Opinion in Neurobiology*, 17(1), 103–111.
32. Amaral, D.G., Schumann, C.M., & Nordahl, C.W. (2008). Neuroanatomy of autism. *Trends in Neurosciences*, 31(3), 137–145.
33. Kotte, A., Joshi, G., Fried, R., Uchida, M., Spencer, A., Woodworth , K. Y., et al. (2013). Autistic traits in children with and without ADHD. *Pediatrics*, 132(3), 612-622.
34. Bearss, K., Johnson, C., Smith, T., Lecavalier, L., Swiezy, N., Aman, M., & Scahill, L. (2015). Effect of parent training vs parent education on behavioral problems in children with autism spectrum disorder: a randomized clinical trial. *JAMA*, 313(15), 1524-1533.
35. Greenhill, LL., & Pliszka, S. (2018). Psychopharmacological treatment of ADHD in children and adolescents. *Child and Adolescent Psychiatric Clinics*, 27(2), 377-392.

