

# Autism Spectrum Disorders and the EEG

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## Introduction

As those with Autism Spectrum Disorders commonly need EEGs, an overview of the disorders, helpful EEG tips, and expected EEG findings are discussed here.

There are 3 syndromes in the category of ASDs. Autism disorder is characterized by abnormalities in social interaction, communication, behaviours, and a cognitive delay in severe cases. Asperger syndrome is similar to autism disorder, but does not involve verbal communication deficits or cognitive delays. Pervasive developmental disorder not otherwise specified (PDD-NOS) is generally characterized by abnormalities in either behaviours or social interaction, or a milder degree of both compared to autism disorder.

## Background

ASDs are the fastest growing developmental disability. An estimated 1 in every 88 children born will have an ASD. Boys are affected four times more often than girls. The rates of ASD have increased ten fold since half a century ago; which is partially related to the expansion of the disorders included under the umbrella term 'ASD'.

Although the cause of ASDs is not yet understood, various factors have been linked, such as genetics, unidentified environmental factors that affect phenotype expression post gestation, various environmental factors during gestation (ex. alcohol, thalidomide, and valproic acid), having aged parents, and having an encephalopathy as a newborn.

## Signs and Symptoms

The primary features of ASDs are impaired social function and abnormal behaviours, sometimes involving communication difficulties and cognitive delay. Specifically, these are observed as:

- Lack of eye contact
- Unresponsiveness, including to one's own name
- Attentive to an inanimate object for excessive periods of time
- Normal development regresses
- Fails to understand tone of voice or facial expressions
- Repetitive behaviours, and routine driven interests and activities
- Self-abusive often, and sometimes violence towards others
- Slow language development
- Difficulty feeling empathy
- Sleep problems (in estimated 86%)
- Sensory integration disorders (hypersensitive to sounds, sensations, etc.)
- Anxiety and depression often occur
- Cognitive delay in more than half (estimates range from 40-69%)
- Learning disabilities are common (estimates range from 25-75%)
- Epilepsy occurs in about one fourth of ASD patients (estimates range from 11-39%).

## Tips for Technologists

Involve the caregivers (explain, reassure - child can sense anxiety)

Investigate the child's traits:

- How does she/he communicate? Start speaking at age appropriate level if unsure. Adjust the way you speak as you go.
- What approaches may be best? The parent will know best.
- Do they have behaviors that may be calming? (repetitive clapping, cutting paper, playing with a particular toy, etc.)

Ensure you are extra prepared (extra 10-20, nu-prep, etc.)

A mirror may be helpful to allow understanding of what is happening

Due to sensory hypersensitivity, keep in mind

- Speaking loudly may hurt ears
- Restraining can make frantic due to sensation of surroundings
- Often a firmer touch is less sensitive to these patients
- Keep visual surroundings simple – avoid excessive people and objects moving in room

## EEG Observations and Correlations

EEG is necessary in the diagnosis and treatment of associated epilepsies in these patients. EEG can also be used to rule out seizure disorders before a diagnosis is given. In the case of epilepsies, a range of epileptiform from focal epileptiform transients to generalized spike and wave to polyspikes to continuous sharp and slow wave complexes in deep sleep – can be expected in these patients. Epileptiform is sometimes seen in these patients when they haven't had clinical seizures. Diffuse slowing in a variety of frequencies, most commonly theta, can be expected as well. The PDR is often slow and disorganized. The EEG activity is usually asynchronous, especially in the frontal regions. The severity of the EEG parallels the severity of the neuropsychological problems.

Studies suggest that the asynchronous, slow activity in the frontal lobe represents underdeveloped connections with the rest of the cortex. Likewise, symmetrical, synchronous theta activity in the temporal lobes represents overdeveloped connections within the lobes. These abnormalities together likely cause some of the neurological difficulties seen ASDs, as this reflects an inability to process information globally across the brain.

See figure 1 and figure 2 for a sample of the above findings.

Figure 1:  
Underlying  
delta and a  
generalized  
spike and  
wave  
discharge



Figure 2:  
Generalized  
delta and  
theta with  
frequent  
epileptiform  
discharges



## Diagnosis

Diagnosing an ASD is a lengthy process involving many different specialists. It takes two years on average. Certain milestones should be met at particular ages - recognition of these not being met is the first step. A health care provider then screens the child to assess what kind of delay he/she may have. A multidisciplinary team performs adaptive, sensory, motor, cognitive, developmental, hearing, and language testing next. This may lead to an ASD diagnosis such as autism disorder, PDD-NOS, Asperger syndrome, or a non-ASD, such as childhood disintegrative disorder or Rett syndrome. An early diagnosis leads to early treatment, which may help improve the child's ability to function and lessen his/her symptoms.

## Conclusion

The rates of ASDs are rapidly expanding, leading it to be the fastest growing developmental disability. However, the causes of these disorders have not been clearly identified. Remember to use the caregivers to your advantage during the EEG set up, and to be mindful of these patients' hypersensitivities. Expect epileptiform, slowing, asynchrony, and artifacts – the severity of the EEG will parallel the neuropsychological severity of the patient. The prognosis for these patients varies greatly, ranging from being dependent on family members or social support through out their lives, to living independently, holding jobs, and having relationships.

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