

# Gene Transfer Therapy in Treatment of Neuro-Developmental Disorders

Sagar Lonial\*

## Introduction

Neurodevelopmental diseases are a set of conditions that impair the nervous system's development, resulting in aberrant brain function that affects emotion, learning ability, self-control, and memory. Neurodevelopmental diseases have a long-term impact on a person's life. Mutations in neuronal genes that are important for brain development can cause neurodevelopmental disorders. The symptoms of these illnesses are severe and include intellectual disability, social and cognitive difficulties.

## Types of Neurodevelopmental Disorders

### Attention Deficit Hyperactivity Disorder (ADHD)

ADHD is a disruptive behavior disorder defined by symptoms of inattention and/or hyperactivity-impulsivity that occur more frequently and severely than is expected for other people at the same developmental stage. ADHD may wreak havoc on family and peer relationships, as well as academic performance and occupational success. Roughly half of children with ADHD have a learning disability, and about one in four have a conduct disorder, according to their parents.

### Developmental language disorder (DLD) and Specific learning disorders

A learning impairment (or learning disease) is a neurological condition that affects a child's brain's ability to receive, process, retain, and respond to information. Although learning impairments differ from kid to kid, a child with a learning disability may have difficulty learning and applying specific skills, such as reading, writing, listening, speaking, reasoning, and completing math. Children with learning impairments typically have normal or above-average intelligence, but their brains absorb information differently.

### Autism Spectrum Disorder (ASD)

ASDs are a category of developmental problems characterized by substantial social, communicative, and behavioural deficits. The phrase "spectrum disorders" refers to the fact that, while persons with ASDs share certain common symptoms, they affect people differently, with some having very minor symptoms and others having severe symptoms. Children with ASDs may show little interest in others, have difficulty expressing or talking about their feelings, and avoid or resist physical touch.

### Intellectual disabilities (IDs) or intellectual development disorder (IDD)

In the disability sector, "intellectual disability" is the preferred word for this condition, but the term "mental retardation" is still used in legal and policy contexts when determining eligibility for state and federal services. Before the age of 18, intellectual disability is described as a low IQ and impairments in life skills such as communication, self-care, home living, and social or interpersonal abilities. On the basis of IQ scores, different severity groups, ranging from mild to severe retardation, are defined. High levels of lead and mercury in the environment have been linked to intellectual impairment.

Neuro-genetic disorders, such as Fragile X syndrome, Down syndrome, Rett syndrome, hypo-gonadotropic hypo-gonadal syndromes

Traumatic brain injury (cerebral palsy)

### Signs and Symptoms

The signs and symptoms mostly appear when the child is young (pre-school years) in many neurodevelopmental disorders. In some cases like schizophrenia, symptoms begin to appear around young adulthood. The signs and symptoms vary depending on the specific neurodevelopmental disorder. Patients with schizophrenia show symptoms of being withdrawn from friends and family, often lost in disoriented thoughts, have delusions and hallucinations. Patients suffering with ADHD have symptoms of inattention, distractibility, impulsivity and hyperactivity. Inability in making eye contact, difficulty in communication, resistant to touch and self-harming are the signs frequently observed in patients with Autism.

### Causes of Neurodevelopmental Disorders

The nervous system's development is strictly controlled and timed, and it is impacted by both hereditary and environmental factors. Early in life, any considerable divergence from the normal developmental path might lead to missing or aberrant neural architecture and connectivity. Social deprivation, genetic and metabolic diseases, immunological disorders, viral diseases, dietary factors, physical trauma, and toxic and environmental factors are all potential causes of neurodevelopmental disorders that affect distinct parts of the neurological system.

### Diagnosis

The existence of specific symptoms or behaviors in a kid is used to identify neurodevelopmental disorders. Genetic testing can also confirm neurodevelopmental problems. Traditionally, karyotype analysis, which detects clinically significant genetic abnormalities, has been used to discover disease-related genetic and genomic variables.

\*Corresponding author: Sagar Lonial, Department of Genetics, Emory University, Atlanta, Georgia, E-mail: slonial01@emory.edu

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### Author Affiliations

[Top](#)

Department of Genetics, University of California-Davis Davis, USA,  
E-mail: greningerAL@uw.edu

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