Looking After Children with AUTISM

A Handbook

3rd Edition

A NeuroGen Publication

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Autism Child Development Centre
(ACDC)

Autism Child Development Centre (ACDC), based in NeuroGen Brain and Spine Institute, is a centre offering latest-treatments under one roof in a comfortable & child-friendly environment. Our aim is to provide multi-discipilnary rehabilitation for children with autism spectrum disorders (ASD) and other Neurodevelopmental disorders like Mental Retardation, Attention Deficit hyperactivity disorder, Cerebral Palsy, Retts syndrome, Learning disability, Global developmental delay etc.

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This book is basically a compilation of information / literature on the available on the topic, from various sources (which have been acknowledged duly). However, this is by no means an exhaustive resource, since the field is evolving at a very rapid pace. Every effort is made to ensure accuracy of material, but the publisher, printer and author will not be held responsible for any inadvertent error(s).

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This book is dedicated to all the courageous and loving parents of children with autism.






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Dr. Alok Sharma is a Neurosurgeon and Neuroscientist, who presently is the Director of NeuroGen Brain and Spine Institute, Navi Mumbai and KLS Institute of AntiAging both in Navi Mumbai, India. He was the Professor and Head of Department of Neurosurgery at the LTMG Hospital and Medical College, Mumbai from 1998 to 2023.

He has published over 172 scientific publications, authored 24 books, contributed chapters to many textbooks. He has made over 200 scientific presentations at International, National and Zonal conferences and meetings and has organized and arranged over 25 National and International conference/ Workshops in various specialized aspects of Neurosurgery. He is the President of the "Society of Regenerative Sciences (India)" and Vice President of "International Association of Neurorestoratology".

He is the pioneer of Cell therapy in Neurological disorders. His landmark accomplishments include the publication of the World's first scientific paper on the role of cellular therapy in Autism. He has also published the World's first paper on cell therapy in intellectual disability. He has revolutionized the management of neurodevelopmental disorders with his innovative combination of cellular and integrative therapies.

He has been the recipient of several international and national awards, such as the Rose of Paracelsus award from the EMA Oxford 2016, The European Award for best practices, Brussels 2018, The Bharat Gaurav Award, London 2019, The Newton Universal Legendary Award, Boston 2022, The Sino Phil Asia International Peace Award, Manila 2023, The Nelson Mandela Leadership Award, Oxford, UK, 2023.

He has set up India's first dedicated Anti-aging institute in Navi Mumbai. During the COVID-19 Pandemic, he did original research on the use of Stem cells and Ozone therapy in COVID-19 and has published 4 papers and 2 books on COVID-19.

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Dr. Nandini Gokulchandran is an M.D. in medical Microbiology, presently working in the capacity of Deputy Director & Head of Medical Services at Neurogen Brain and Spine Institute. She did 4 years of post-graduate fellowship in the field of Developmental Neurology and stem cell research at Tata Institute of Fundamental Research, Mumbai. She brings to Neurogen Brain and Spine Institute an astute amalgamation of medical/clinical background with deep faith in and understanding of stem cell research & regenerative medicine, especially in neurodevelopment disorder such as autism, cerebral palsy & mental retardation. She has to her credit 41 scientific publication in international peer review journals (1st Author publication in reputed Science magazine as well as 7 papers on autism). She has also co-authored 18 books on stem cell therapy and neurological disorders.

Dr. Hemangi Sane, *M.D. (Internal Medicine, USA) (Medical Physician)*

Dr. Hemangi Sane is the Chairperson Professional International Council for Autism. She is working as "Deputy Director, Head of Research and Development, Consultant Physician" at NeuroGen Brain and Spine Institute, Navi Mumbai, and "Founder" of Asha Ek Hope foundation for ALS/MND, India. Her unique broad and sensitive outlook comes from her experience as a clinician, researcher and as an ALS patient herself. She obtained MBBS degree from the prestigious GS Medical College KEM Hospital, Mumbai University then she post graduated with MD degree in Internal Medicine from the renowned New York Medical College, USA. She is also certified in 'Precision and Anti-Aging Medicine' from USA. She is certified in Integrative therapies such as HBOT, Ozone Therapy etc. She has more than 20 years of clinical experience in which she has more than 110 scientific peer reviewed publications in International and National medical journals. She has co-authored more than 17 medical books, along with multiple chapters in various International Medical Books. She has received numerous national and international awards. She is recipient of award "Iconic Women Creating a Better World for All". She envisions an independent and better quality of life for Neurodiverse children and Neurological patients. Her positivity, compassion and enthusiasm are an inspiration to others.

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Dr. Hema Biju Niravethu is one of the core members that came together with Dr. Alok Sharma when Neurogen was initially conceptualised.With almost 30 years of national and international work experience, she has been instrumental in implementing several early practices that have helped in laying the foundation of Neurogen as a pioneer in Research and Development in Neuro-Rehabilitation and Stem Cells.While leading the Department of OT at Neurogen, she has authored 6 books and also jointly published over 20 articles in peer reviewedjournals and presented papers at numerous forums related to neurorehabilitation. After completing her Bachelor's in India (1994) and her OTR (USA) in 1996, Dr. Hema obtained her M.O.Th (2003). A lifelong learner, Dr. Hema consistently updates her expertise through ongoing education, including Fellowships in Advanced Occupational Therapy in Neurorehabilitation (2019), Palliative Care (2021), and Mental Health (2024), alongside numerous specialized certifications in aquatherapy, hand therapy and splinting, office ergonomics, and OT in oncology, ensuring she remains at the forefront of her evolving field. She remains dedicated to her work and enjoys mentoring future occupational therapists.

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A Dedication to Dr. Temple Grandin

A Beacon of Hope for Every Autism Parent

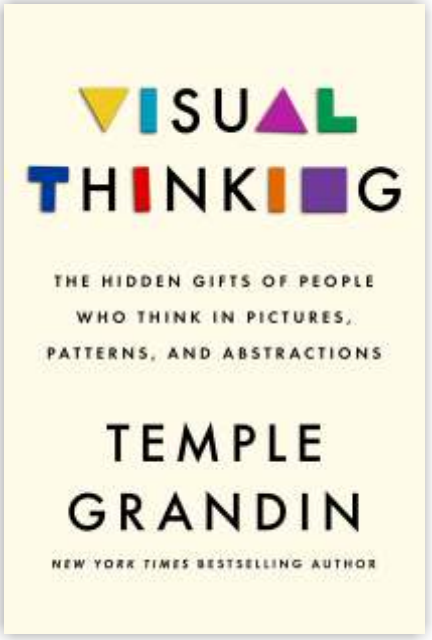
Dr. Temple Grandin is more than a name—she is a living symbol of possibility, resilience, and brilliance. Diagnosed with autism in an era when little was understood and even less accepted, Temple's journey from silence to global acclaim offers hope to every parent walking the path of autism alongside their child.

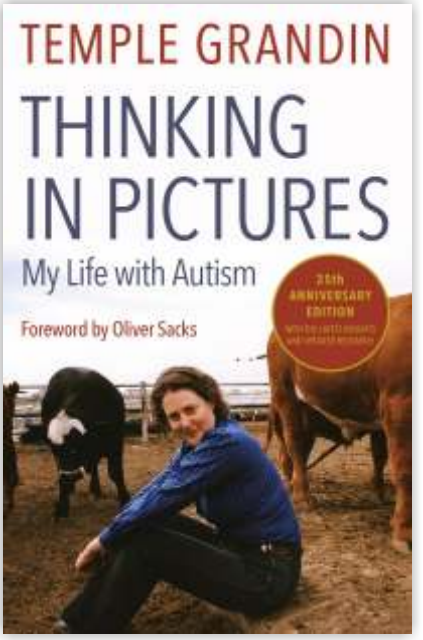
Speechless until the age of four and labeled "brain-damaged" by early professionals, Temple's future seemed uncertain. But with the unwavering belief of her mother, Eustacia Cutler, early intervention, and nurturing guidance, Temple didn't just find her voice—she amplified it for millions. From being bullied and misunderstood, she emerged as a visionary who has not only revolutionized the livestock industry with her humane designs but has also become one of the world's most powerful advocates for autism awareness and neurodiversity.

What makes her story remarkable is not just what she achieved, but how she thinks. Temple taught the world that autism is not a deficit—it's a difference. She introduced us to the idea that autistic individuals think in unique ways: visually, mathematically, or verbally. Her famous phrase, *"I think in pictures,"*

unlocked new understanding for parents, educators, and clinicians around the globe.

Through her books, talks, research, and tireless advocacy, Dr. Grandin reminds us that sensory sensitivities, social challenges, and differences in learning styles are not roadblocks—they are clues to unlocking hidden potential. She has shown us that with the right environment, encouragement, and practical exposure, children on the spectrum can flourish beyond society's expectations.





As a professor, scientist, inventor, and role model, Temple's life affirms that *being different is not less.* Her deep empathy for animals and her profound insights into the autistic mind have forever changed the way we teach, support, and understand those who see the world differently.

To every parent reading this: let Dr. Temple Grandin's story be your guiding light. Believe in your child's potential, even when the world doesn't yet understand them. Because sometimes, the very traits that make them different will one day make them exceptional.

"The world needs all kinds of minds." — Dr. Temple Grandin

1st Edition Autism Handbook being Released
By Health Minister of Maharashtra
Hon'ble Dr. Deepak Sawant
On 8th April 2017 at Navi Mumbai, Maharashtra India

For the **"Looking After Children with Autism - A Handbook"**
(Marathi Edition)

Preface

Autism is one of the most unrecognized and neglected epidemics of our time whose incidence is increasing significantly. From 1 in 10,000 cases in 1970 it is now 1 in 36 currently. Autism doesn't just affect the child but rather the whole family. Parents of children with autism (especially the mothers) have to put almost every aspect of the rest of their lives on hold as they struggle with the intensely challenging task of looking after the child with autism. Looking after these children involves hard physical strenuous work, lots of time, a very positive attitude and a spiritual acceptance of this difficult reality. Parents of children with autism can feel very alone in this world. It is almost as if there is no one who will understand what they are going through and the sacrifices that make every day just to see that their child is well. It is our belief that well informed and empowered parents would be able to make the biggest difference to the lives of children with autism. We salute the courage, perseverance and efforts that parents put in on a day to day basis and do hope that this book will provide them with the information they need to help their children.

Another major transformation that has occurred is the shift in focus from what these children cannot do to what is exceptional in them. Our own studies using advanced brain imaging technologies are showing that whilst there are parts of the brain that are working less there are also parts of the brain that are working more. Some of the greatest scientists and business people have had a history of being on what is today considered the autism spectrum.

Children with Autism are very special indeed. They live in their own world. They have a purity of thought and action that we sometimes wish the rest of the world had too. Their needs and requirements are limited. They never lie. They cannot pretend. They do not try to be who they are not. They do not know what it is like to cheat someone. There is a wonderful simplicity and genuineness to them and they can be very loving and caring. Their smiles and laughter is so real. Yes, they are very very special. Unfortunately, they cannot completely look after themselves and need to be looked after. If there was some way in which we could make them functionally independent then we would have achieved a lot.

This is where a new hope has appeared in the medical world with the most recent availability of Cell/Stem cell therapy. Recent imaging studies have shown that there are some parts of the brain of the child with autism that are not functioning properly. Cellular therapy has shown to correct and repair these damaged parts of the brain. This has opened up a completely new line of medical management for children on the Autism spectrum. What the parents had been told all these years that no medical treatment is available is no longer valid. There is a treatment available and this treatment is not in the distant future but rather it is available right now. There are several scientific publications available from across the world that show the safety and clinical benefits of cellular therapy for Autism. We do understand that since this

is a new form of therapy, it is natural that as parents you will be concerned about various aspects of the treatment particularly its safety and efficacy. In this book we have given you all the information that you may need to understand about all the newer treatments in a simple and easy to read manner. More detailed information is available in our other books which are shown on the back cover.

It is our belief that children / adults on the autism spectrum are not less than but are different. 16 years of clinical work and having treated over 6000 people from over a 100 countries on the autism spectrum has given us clinical results and insights that clearly show that by combining conventional rehabilitation with newer medical treatment options such as cell/ stem cell therapy and the various oxygen based integrative therapies can significant assist in making these children and adults lead independent productive lives. All our clinical results are published in scientific papers in peer reviewed medical journals.

We wish you all happy reading and do hope that with all the information that we have so painstakingly assimilated and put together, you will be able to make a positive difference to the lives of your very special children on the autism spectrum.

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C O N T E N T S

Section - A : Know More About Autism

Section - B : Therapeutic Interventions

Section - C : Newer Interventions

Section - D : Living With Autism

Scientific Publications in International and National Medical Journals on Cell therapy in Neurological conditions by Dr. Alok Sharma / NeuroGen

A) AUTISM:

1. Suvarna Badhe, Samson Nivins, Pooja Kulkarni , Alitta Jose , Divesh Manek , Satyendra Badhe, Hemangi Sane, Nandini Gokulchandran, Prerna Badhe, Alok Sharma. Abnormal development of the corpus callosum in Autism spectrum disorder: A MRI Study. Topics in Magnetic Resonance Imaging. 2024 Jun 4;33(3):e0312
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SECTION A

KNOW MORE ABOUT AUTISM

CHAPTER 1

WHAT IS AUTISM

Welcome to Your Autism Handbook: Navigating the Spectrum, Chapter by Chapter

As parents embarking on the unique journey of raising a child with Autism Spectrum Disorder (ASD), you are your child's most vital advocate. This handbook is designed to be your reliable companion, offering scientifically grounded guidance compiled by professionals to understand and effectively support your child at every stage. We recognize the initial feelings of being overwhelmed and the ongoing need for clarity as research evolves. To navigate this landscape with confidence, we've structured this book into chapters that delve into the core aspects of autism support:

Inside This Book:

Understanding Autism: A clear, research-based overview of Autism Spectrum Disorder, highlighting its diverse presentations and underlying neurodevelopmental traits.

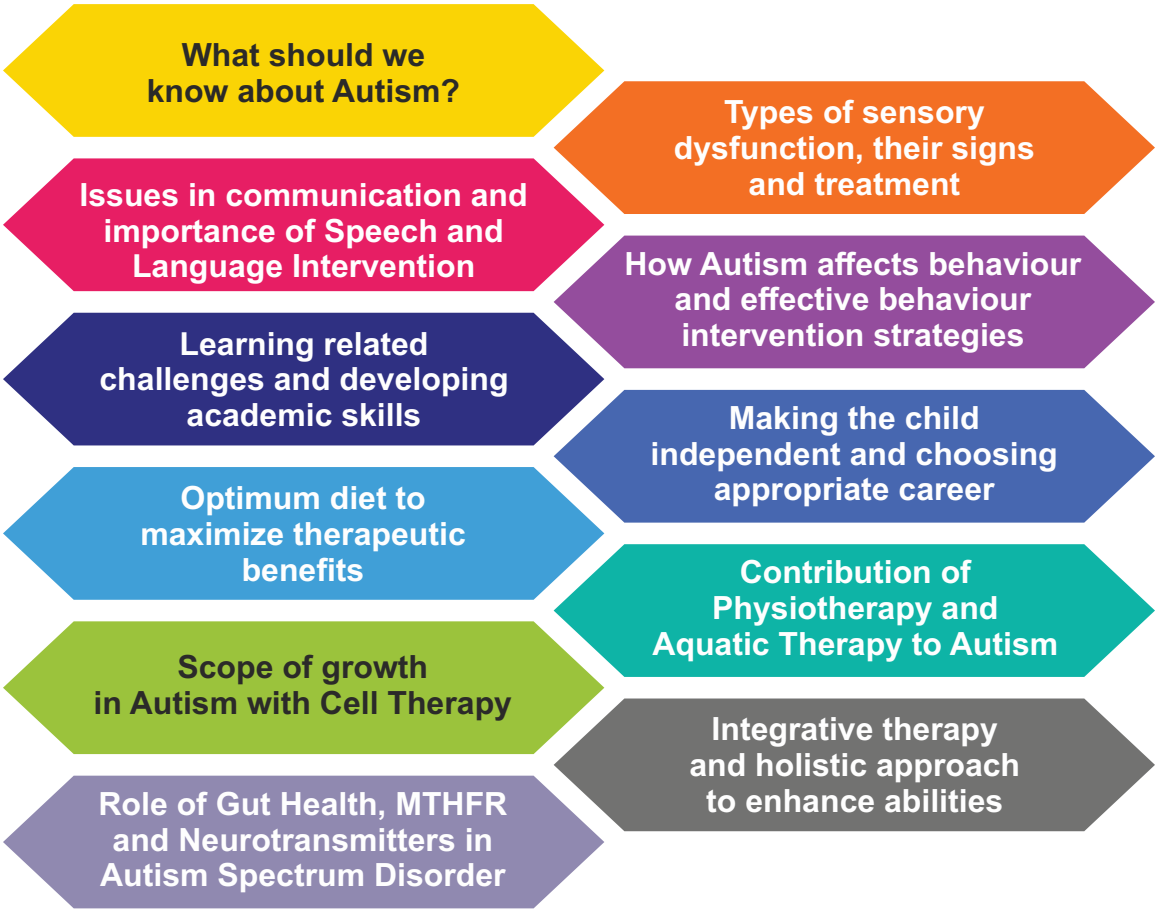
Evidence-Based Therapies: Practical insights into established interventions-rehabilitation, aquatic therapy, reflex integration, sensory work, nutrition, and medical support—grounded in current clinical research.

Integrative Approaches: An exploration of complementary therapies like Hyperbaric Oxygen and Ozone Therapy, with a balanced view of their potential roles in holistic care.

Biological Connections: Insights into the gut-brain axis, MTHFR and genetic influences, reflecting the growing understanding of autism's complex biology.

Future Directions: A glimpse into promising frontiers such as cell therapy, offering hope through ongoing research and advancement.

Our aim is to empower you with the knowledge to make informed decisions, understand the rationale behind recommended interventions, and approach autism with greater awareness, empathy, and unwavering hope. This handbook is more than just information; it's a guide to illuminating the path towards comprehensive support and a brighter future for your child. Let's begin this journey together, chapter by chapter.



What is Autism?

Autism is a pervasive developmental disorder occurring in the early developmental years of the child with signs seen as early as age 2. The formal diagnostic term is Autism Spectrum Disorder in which the word "spectrum" denotes that Autism appears in different forms with varying levels of severity. This means that each individual with Autism uniquely experiences symptoms, and has different strengths and challenges.

This complex neurodevelopmental disability is known to have the following characteristic features:

- Deficits in receptive and expressive speech which in turn affect verbal communication and the individual's ability to express themselves fully.
- Presence of repetitive body mannerisms and sensory processing difficulties reflecting sensitivity towards certain stimuli or sensory seeking behaviours.
- Issues in the way an individual relates to other people and their surrounding environment, how they interpret social cues and interact with others, hence impacting the scope of having socio-emotional bonds.
- Compromised cognitive functions due to subnormal functioning of some areas of the brain.

Autism spectrum disorder as mentioned in Diagnostic and Statistical manual of mental Disorder (DSM-5) has definitive criteria for diagnosis involving the above mentioned symptoms. Autism Spectrum Disorder can also co-occur with Intellectual Disability, Attention Deficit Hyperactivity

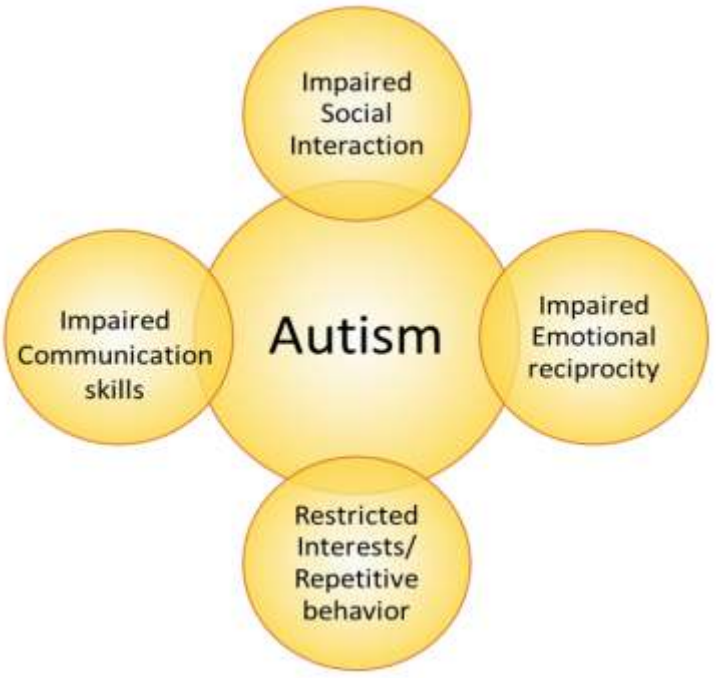


Figure 1: Behavioural changes observed in Autism

Disorder, Medical diagnosis such as epilepsy, Sleep disorder, Eating disorder, OCD, Depression and Anxiety.

Often children diagnosed with ASD may show normal development up to 2-3 years of age and later exhibit regression of these acquired skills.

DSM - 5 classifies Autism in 3 levels i.e "level 1- requiring support; level 2- Requiring substantial support; level-3 Requiring very substantial support" Thus the severity ranges from Mild to Moderate and Moderate to severe.

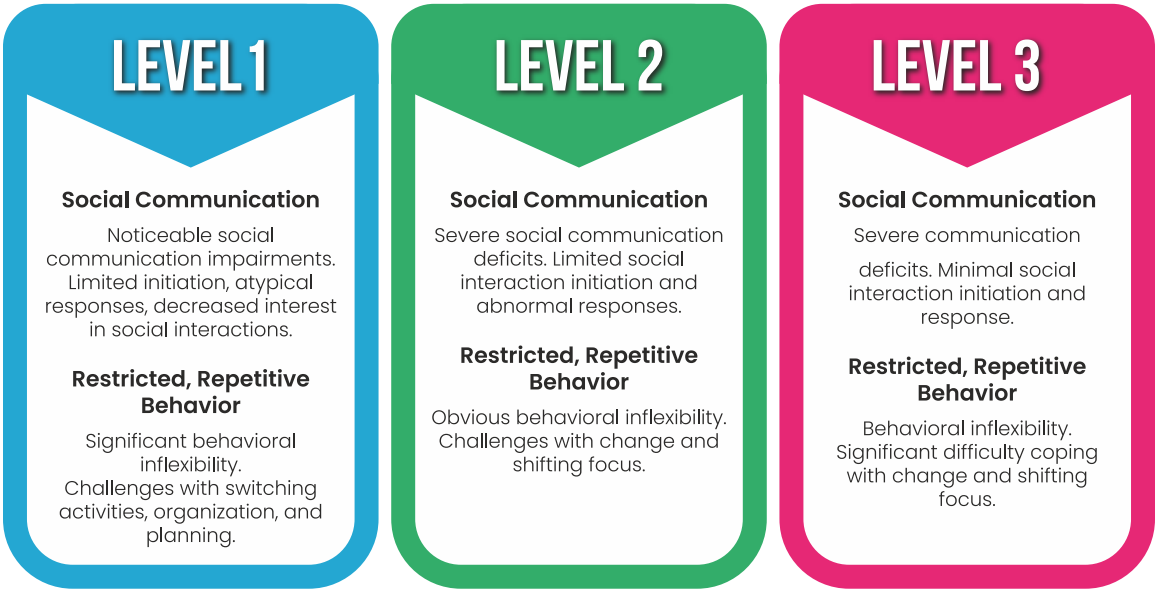


Figure 2: Classification of DSM - 5 levels of Autism

Rapid Increase in Prevalence, The prevalence of autism has surged in the USA, from 1 in 150 in 2000 to 1 in 36 in 2023 (CDC USA).

It is approximated that 1 in 100 children are diagnosed with Autism around the world. Approximately 70 million individuals worldwide are on the autism spectrum, constituting 1% of the global population

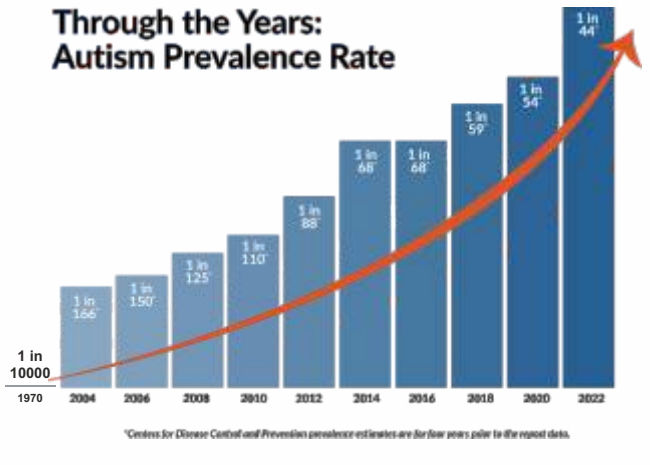


Figure 3: Increased Prevalence Rate of Autism through years

What causes Autism?

Autism Spectrum Disorder (ASD) is a brain-related condition that affects how a person interacts, communicates, and behaves. People with ASD may have trouble with social skills and often show repeated or unusual behaviors. The exact cause isn't known, but both genes and the environment seem to play a role.

Causes of Autism:

Some of these are established causes and some are still controversial

Picture of established and controversial

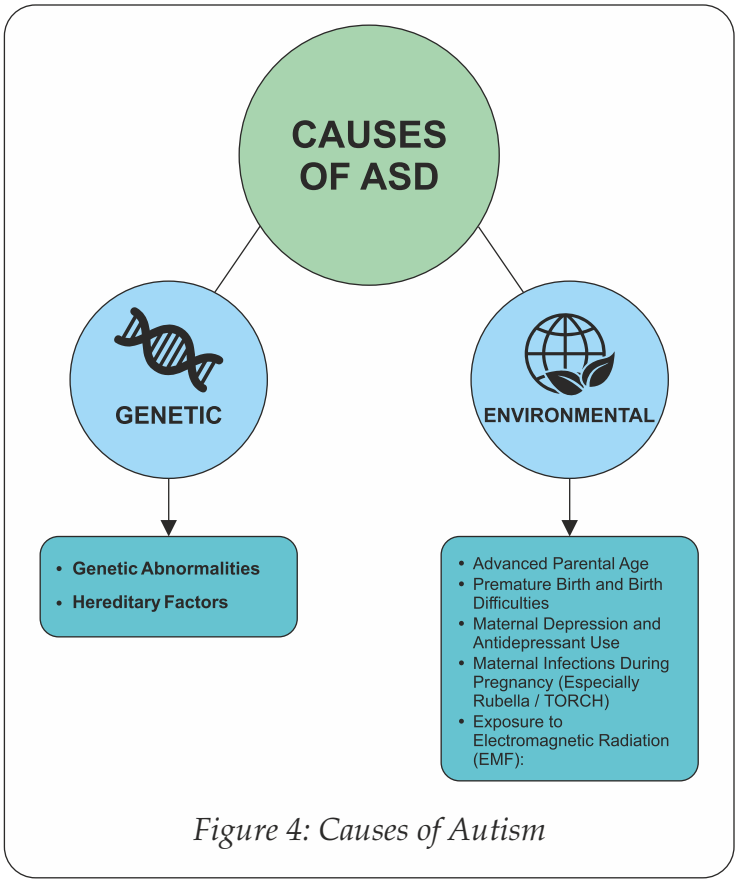


Figure 4: Causes of Autism

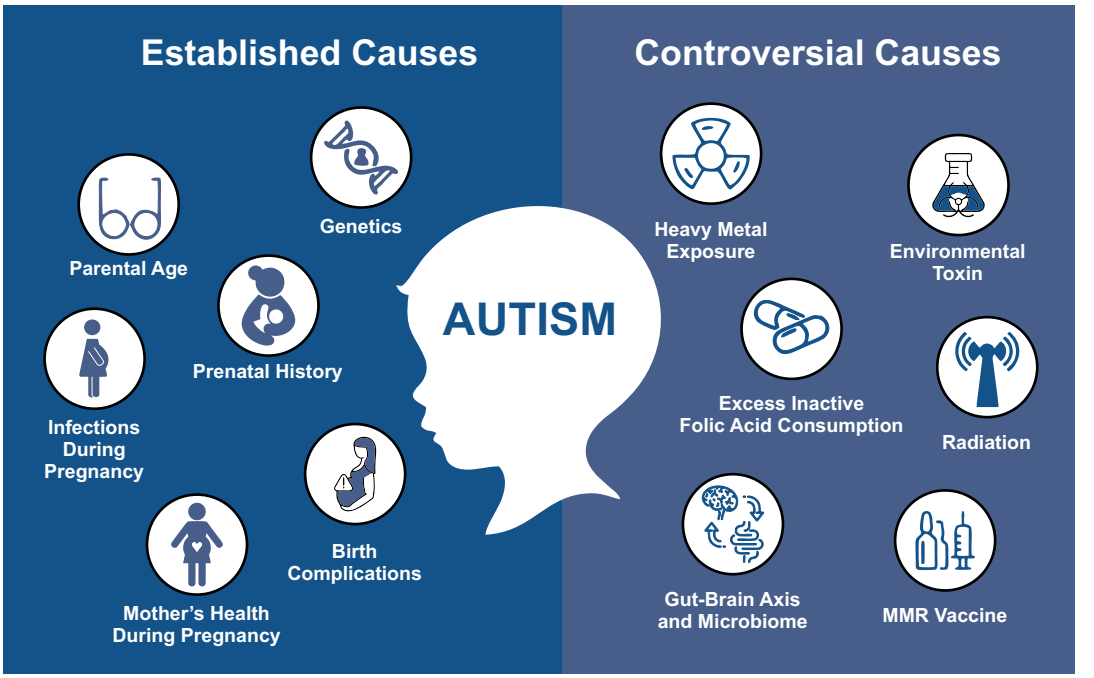


Figure 5: Picture of established and controversial

Established causes:

Genetics: Autism can run in families. Changes in certain genes may affect how the brain develops. Genetic factors are estimated to contribute 40 to 80 percent of the risk for developing Autism.

Parental Age: Older parents, especially fathers over 40, may have a higher chance of having a child with autism.

Prenatal History:

Infections During Pregnancy: Infections like rubella or CMV during pregnancy may affect the baby's brain development.

Mother's Health during Pregnancy: Conditions such as diabetes or obesity during pregnancy may raise the risk of autism.

Antidepressant Use During Pregnancy: Taking certain depression medicines (like SSRIs) while pregnant might slightly increase autism risk.

Birth Complication: Babies born too early, too small, or with low oxygen levels may face a higher risk of brain-related issues like autism.

Controversial Causes:

Heavy Metal exposure: Exposure to heavy metals like lead or mercury has been suggested as a possible cause of autism.

Environmental Toxin: Toxins in the environment, like air pollution or pesticides, might affect a baby's brain during pregnancy.

Radiation: Radiation exposure (ionizing or non-ionizing) might be a causal link to brain defect.

Excess inactive folic acid consumption: Overconsumption of inactive folic acid by mother, often from supplements, may affect how the brain develops in some babies. Some studies suggest a link to autism.

Gut-Brain Axis and Microbiome

Recent studies suggest that imbalance in gut microbiome may influence neurodevelopment and may be a causative factor for autism.

MMR (Measles, Mumps, and Rubella) Vaccine:

In 1998, a research study which was later retracted, reported of MMR vaccine to cause autism. However, the theory that autism is caused by the MMR vaccine is still controversial and has not been proven to be true.

Irrespective of the cause, early diagnosis, and intervention lead to significantly improved outcomes. Increased awareness of Autism at the grassroots level and access to services that carry out diagnostic procedures of the disorder paves the way for creating a treatment plan that would minimize the severity of autistic symptoms in the child and increase chances of independent living.

What is the fundamental problem in Autism Spectrum Disorder?

"Why did my child develop Autism?"- although the answer to "why" is still complex, what is becoming clear with ongoing research is, "What is the fundamental problem in the brains of children with Autism?". In Autism, though the brain structure looks normal, there are functional abnormalities in specific brain regions like the mesial temporal lobe (the innermost part of the brain responsible for learning, understanding, memory, social interaction, and abstract thinking), frontal

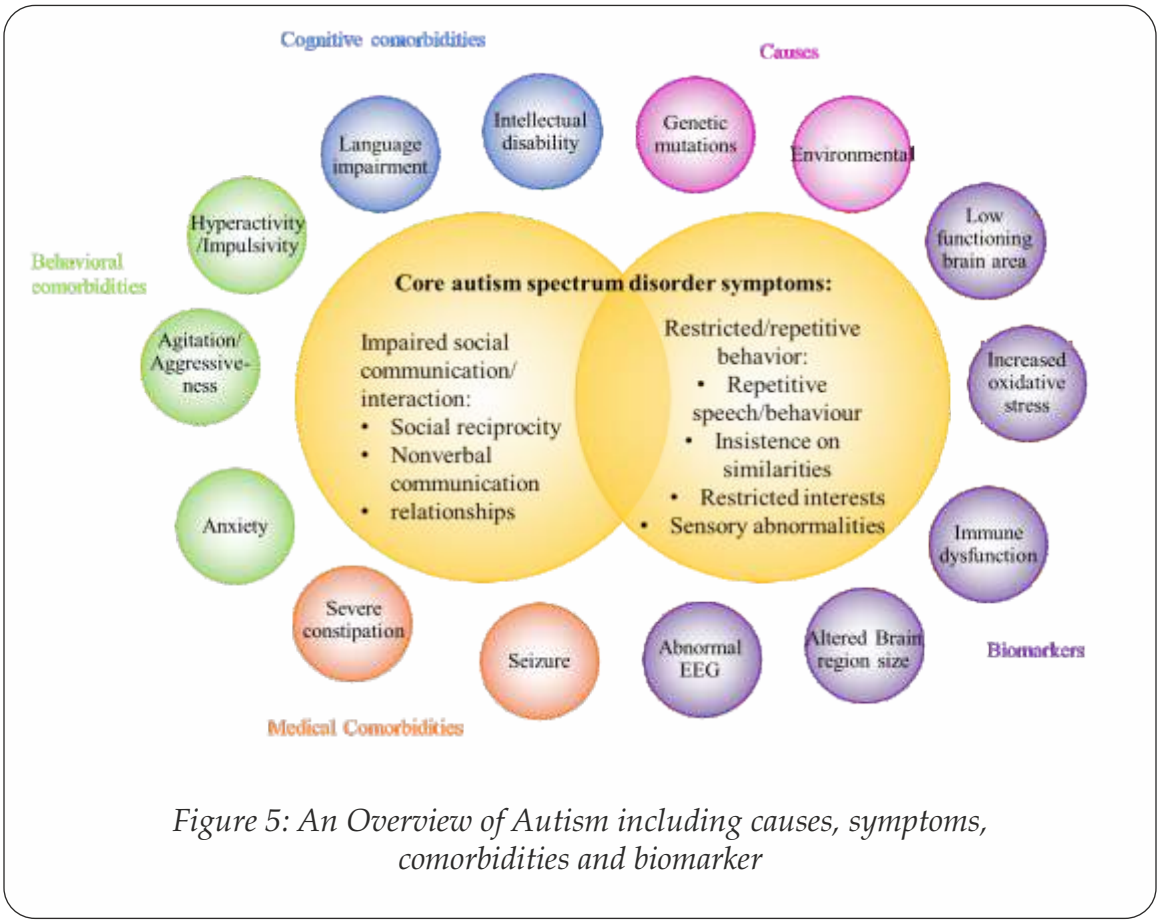


Figure 5: An Overview of Autism including causes, symptoms, comorbidities and biomarker

lobe (the front part of the brain responsible for emotions and aggression), Thalamus (responsible for sensory issues) and cerebellum (responsible for balance, coordination, muscle tone, and speech). Hence the dysfunctioning of these areas is responsible for problems seen in autism.

This information, about the functioning of brain areas, is obtained from PET-CT and functional MRI scans of the brain. These imaging studies allow us to examine activation patterns in the brain and have so far revealed that reduced blood flow to the above-mentioned areas could lead to their reduced functioning.

Autism Spectrum Disorder affects not only the child/individual diagnosed,it also affects siblings and parents. It challenges family members to modify their style of interaction with the individual diagnosed. Autism being a lifelong condition can put a lot of stress on all family members and caregivers.

Famous Neurodivergent Personalities

Elon Musk

Elon Musk, CEO of Tesla and SpaceX, revealed in 2021 he has Asperger's syndrome, a form of autism.

Bill Gates

Bill Gates, co-founder of Microsoft and one of the world's most influential minds, has revolutionized technology and global philanthropy. Known for his deep focus and analytical thinking, In his memoir- Source Code: My Beginnings, Bill Gates reflects on his childhood behaviors and acknowledges that, if he were growing up today, he would likely be diagnosed on the autism spectrum. Highlighting how neurodiversity can drive innovation and change.

Satoshi Tajiri

Creator of Pokemon has stated that he has high functioning Autism, how he liked bugs as a child which he used as his base to create Pokemon characters.

Temple Grandin
Scientist

Temple Grandin, a scientist and autism advocate, used her visual thinking to revolutionize livestock handling, proving that neuro-divergence can drive innovation in animal science.

Sir Anthony Hopkins
Oscar-Winning Actor

Sir Anthony Hopkins, diagnosed with Autism Spectrum Disorder, credits his deep focus and unique thinking for his powerful performances, making him an acclaimed, award-winning actor.

Dani Bowman - Entrepreneur

Dani Bowman, an autistic animator and entrepreneur, founded DaniMation at 14, advocating inclusion and diversity through her creative work.

Jessica - Jane Applegate

British Paralympic swimmer who was diagnosed with ASD, and is competing in olympics.

Greta Thurnberg Activist

Greta Thunberg, diagnosed with Asperger's, calls autism her "superpower," using her focus and resilience to become a leading voice in global climate activism.

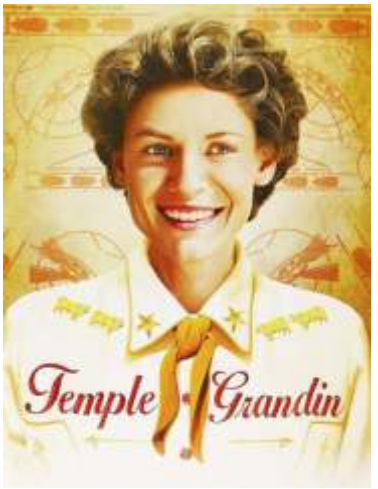
Jiya Rai Swimmer

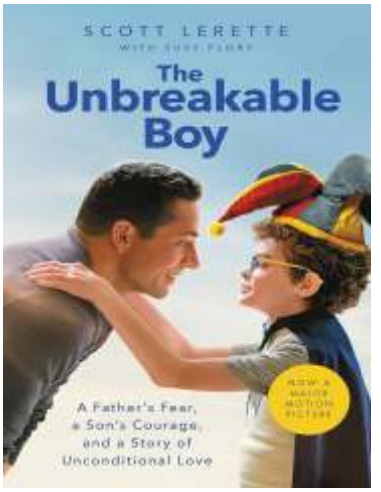
Jiya Rai, an autistic open-water swimmer, has set records, earning national and international accolades while using her achievements to promote autism awareness and inclusion.

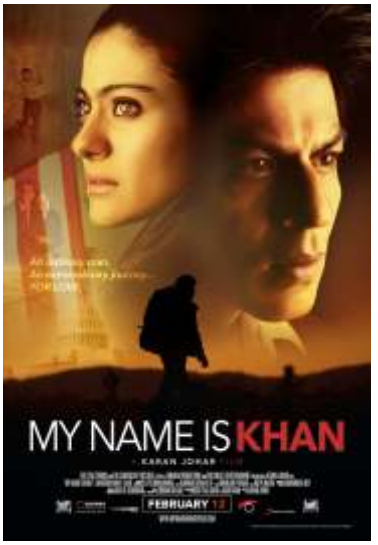
Pranav Bakhshi

Pranav is the first Indian model with Autism

Movies and Television Series Portraying Autism







CHAPTER 2

BRAIN ABNORMALITIES

- Brain abnormalities in autism
- Brain connectivity in autism
- Brain areas affected in autism

The main reason for Autism symptoms is Brain Dysfunction. There are some areas of the brain which are working less than normal and some are working more than normal. This imbalance in brain activity leads to Autism symptoms.

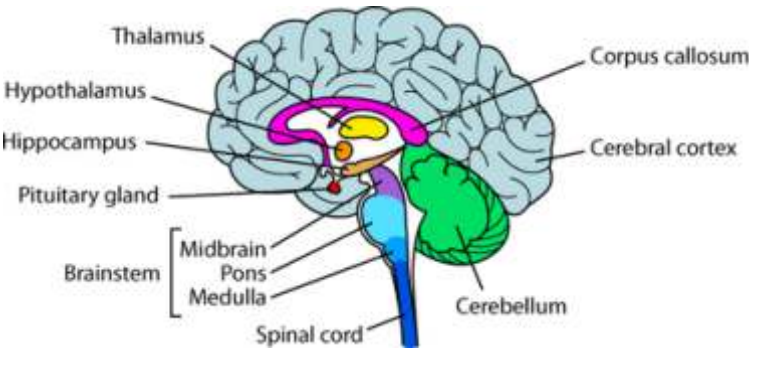


Figure 1: Different areas of the brain

What are the areas of the brain contributing to abnormality of Autism?

There are various abnormalities that are being associated with autism. Their brain shows abnormal metabolism. The brain metabolism in autism varies across different parts of the brain with the cerebellum(small brain), thalamus and temporal being affected as compared to neurotypical children. Studies have reported hypometabolism (low metabolic activity) in Amygdala, Hippocampus, Parahippocampal gyrus, Cerebellum, Caudate nucleus, Mesial temporal lobe, Thalamus and Superior and middle temporal pole whereas hypermetabolism (high metabolic activity) in Calcarine Fissure, Heschl's Gyrus and Cortical frontal areas.

Individuals with Autism are often strong visual learners, an ability that may be linked to increased metabolic activity in the visual cortex (Parieto-Occipital Area), enhancing their ability to process and retain visual information more effectively than other types of input.

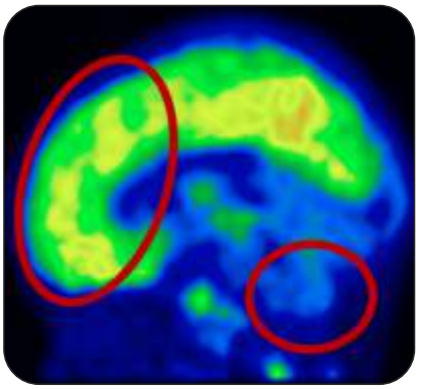


Figure 2: Hypermetabolism (high) in frontal areas and hypometabolism (low) in cerebellum on Brain PET-CT Scan of autism individual

How does abnormal brain connectivity contribute to autism?

In children with Autism Spectrum Disorder (ASD), the brain often shows an imbalance in how different areas connect and communicate. Some parts of the brain may have too little connectivity, while others may have too much.

For example, the cerebellum, which helps with coordination and thinking, often has weak long-distance connections. This can make it harder for children with autism to manage tasks and process information smoothly.

The prefrontal cortex, important for decision-making and problem-solving, also shows abnormal connections. This may affect how children with autism think and respond in social situations.

Another important part is the corpus callosum, which links the left and right sides of the brain. In autism, this connection is often weaker, which can lead to difficulties

in communication and social interaction. We published a brain MRI study which showed that the overall size of Corpus Callosum is smaller as compared to neurotypical children.

What are the structural abnormalities observed in the brains of individuals with autism?

The overall structure of the brain of autistic children might be normal that is why the MRI study usually does not show any abnormality. But there are certain specific alterations observed in white (nerve fiber) and grey (nerve cell)matter of the brain which are associated with autism. There are abnormalities observed in regions such as cerebellum, corpus callosum, amygdala, hippocampus etc. These abnormalities include excess white matter neurons, decreased numbers of neurons, early overgrowth of the frontal portion of the brain, reduced cell size, reduction in the density of neurons etc. These alterations affect the connectivity of the brain and thereby are associated with the symptoms of autism.

How does the brain metabolism change over time in individuals with ASD?

The baseline pattern of brain glucose metabolism as well as developmental age related metabolic changes in children with autism were compared with the healthy brain. And as per the data findings of PET-CT published study autistic children below 5 years showed higher than normal metabolism and older children showed

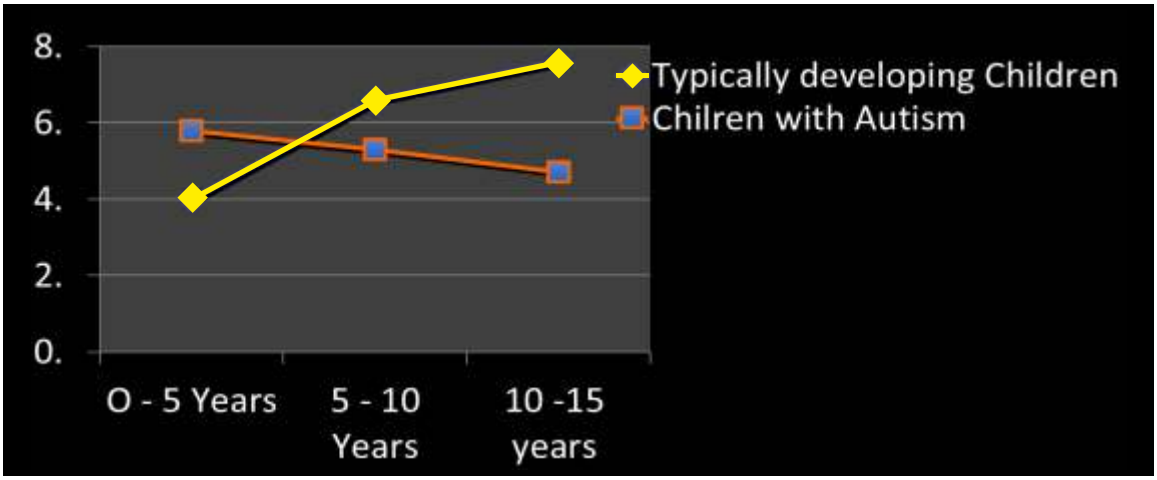


Figure 3: The graph shows relation between age and absolute mean standardized uptake values of children with and without autism. The vertical axis represents standardized uptake values while the horizontal axis represents age. There was a linear decrease in the metabolism of the brain with increase in age in autistic children while typically developing children show increase in brain metabolism as age increases.

lower than normal metabolism. That means as the age increases the metabolic activity of the brain of autistic individuals decreases whereas in normal individuals, the brain metabolism increases with age until adulthood (Figure). Hence, arresting the pathophysiological deterioration becomes crucial in order to reduce brain abnormalities in autism patients. Therefore, early interventions are required in autism patients before their brain metabolism will be reduced than normal.

Which of the brain areas are responsible for autism related symptoms?

Brain Regions	Autism Related Symptoms
Amygdala	Affected emotional response, increased aggressive behavior and hyperactivity
Hippocampus	Memory, concentration and learning is affected
Parahippocampal gyrus	Spatial memory and navigation are affected
Caudate nucleus	Social interaction along with stereotypical behaviors is affected
Cerebellum	Overall body balance, coordinated movements, command follow, speech and cognition are affected
Mesial temporal lobe	Affected sitting tolerance and hyperactivity
Thalamus	Sensory issues and affected eye contact
Temporal poles	Affected emotional and social behavior
Cingulate gyrus	Processing emotions and behavior regulation is affected
Orbitofrontal cortex	Sensory issues and difficulties in understanding rewards and punishments
Prefrontal cortex	Affected emotional regulations such as inability to show empathy, insight, response flexibility, fear modulation, body regulations and affected communication
Limbic brain	Inability to show stress responses such as fight, flight, freeze responses

CHAPTER 3

WHAT ARE THE SENSORY ISSUES IN AUTISM?

- Senses
- Sensory challenges
- Sensory Integration

Children and adults with Autism Spectrum Disorder have difficulty perceiving and responding to sensory information from their bodies and also from the surrounding environment. To understand the sensory issues of the child it is important as parents to become more educated about the sensory system and the problems associated with it.

The Primary Senses

Tactile system: This includes nerves under the skin's surface that send information about touch, pain, temperature, and pressure to the brain. The system plays an important role in perceiving environmental cues that could be life-threatening and using protective reactions for survival.

Vestibular system: This system includes structures within the inner ear (the semicircular canals) that detect movement and changes in the position of the head. For example, the vestibular system tells you when your head is upright or tilted (even with your eyes closed).

Proprioceptive system: This refers to components of muscles, joints, and tendons that provide a person with a subconscious awareness of their body position. This is the system that allows you to walk or kick without looking at your feet or touching your nose with your eyes closed.

It also allows your fine motor muscles to manipulate objects such as writing with a pencil, using a spoon to eat, and buttoning one's shirt.

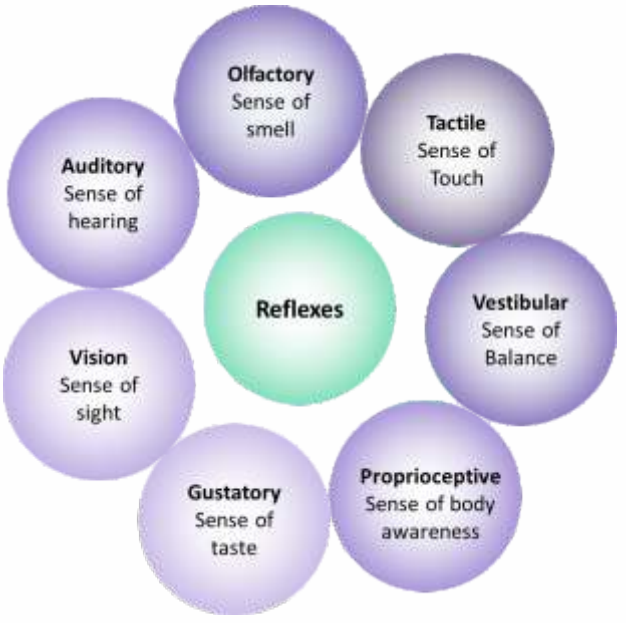


Figure 1: Primary Senses affected by Autism

• Vision

The visual system helps you process and interpret spatial information and physical features of people, events, and objects in the environment.

It also plays a role in pattern recognition and discrimination of figures against a background in a process called figure-ground perception. These abilities help you to learn and retain information better.

• Auditory

This system provides the basis for developing oral language skills. Sound imitation is the first step in developing speech and being able to hear the sounds, allows you to imitate and play with these sounds. As you grow, it allows you to establish the foundation for spelling and grammar which contributes to the development of written language as well.

• Olfaction

The olfactory system includes a bundle of nerves that serve the sense of smell allowing us to detect the flavors in the foods we eat. Olfaction is one of our most

powerful senses having a strong connection to our long-term memories. It has the potential to influence our mood and behavior. Lastly, it also alerts us about hazardous substances such as poisons, leaking gas, or smoke.

- **Gustatory**

This system includes taste buds in the oral cavities and mainly on the upper surface of the tongue. Functionally speaking, the nerves work in the detection, recognition, and discrimination of the five basic tastes – sweet, bitter, umami, sour, and salty, which can be combined to form more elaborate taste sensations.

Dysfunctions In Sensory Integration

- A child may be hypo-responsive or hyper-responsive to sensory input resulting in either unusually high or unusually low activity levels. The child may appear fatigued or in constant motion.
- In addition, some children may fluctuate between these extremes. Problems in coordinating the gross and/or fine motor muscles problems may commonly occur when the primary sensory systems are dysfunctional. This may inadvertently result in speech/language delays and academic underachievement.
- From a behavioural perspective, the child may have inattention, difficulty inhibiting their impulses, and show a general lack of executive functions such as thinking, planning, and organizing. They may feel threatened in a new environment and their inability to adjust may lead to frustration, aggression, or withdrawal.

Is Autism Spectrum Disorder and Sensory Integration Dysfunction (also called Sensory Processing Disorder) the same?

Simply put, no – Autism and Sensory Processing Disorder (SPD) are not the same things and the terms cannot be used interchangeably. In Autism, the socio-emotional pathways of the brain face disruptions in connectivity, whereas those pathways are intact in children with SPD alone. While the two are different and distinct conditions, children and people on the Autism spectrum do have a significantly higher rate of about 90% of having sensory processing delays. Although the link between Autism and SPD is elusive, recent literature suggests that both disorders are bound by a strong genetic component and increased incidence of family history for both disorders. A genetic piece may link processing delays and autism, but at this time there is no definitive evidence for that.

Signs of Sensory Dysfunction

Tactile Defensiveness Or Hypersensitivity To Touch	Tactile Seeking Or Hyposensitivity To Touch
❖ Becomes fearful, anxious, or aggressive with light or unexpected touch. ❖ Appears fearful of, or avoids standing close to other people or peers (especially in lines). ❖ Becomes frightened when touched from behind or by someone / something they cannot see (such as under a blanket). ❖ Complains about having hair brushed; may be very picky about using a particular brush ❖ Bothered by rough bed sheets (i.e., if old and "bumpy"). ❖ Avoids group situations for fear of the unexpected touch. ❖ Resists friendly or affectionate touch from anyone besides parents or siblings (and sometimes them too!). ❖ Dislikes kisses, will "wipe off' place where kissed. ❖ Avoids touching certain textures of material (blankets, rugs, stuffed animals). ❖ Refuses to wear new or stiff clothes, clothes with rough textures, turtlenecks, jeans, hats, belts, etc. ❖ Avoids using hands for play.	❖ A constant need to touch people or textures, even when it's inappropriate to do so unaware of being touched / bumped unless done with extreme force or intensity ❖ Is not bothered by injuries, like cuts and bruises, and shows no distress with shots (may even say they love getting shots!) ❖ May not be aware that their hands or face are dirty or feel his / her nose running ❖ Maybe self-abusive; pinching, biting, or banging his head ❖ Mouths objects, mouths hands, or licks parts of self excessively ❖ Frequently hurts other children or pets while playing ❖ Repeatedly touches surfaces or objects that are soothing (i.e., blanket) ❖ Craves vibrating or strong sensory input ❖ Has a preference and craving for excessively spicy, sweet, sour, or salty foods

❖ Avoids/dislikes/aversive to "messy play", i.e., sand, mud, water, glue, glitter, playdoh, slime, shaving cream/funny foam, etc. ❖ Will be distressed by dirty hands and want to wipe or wash them frequently. ❖ Distressed by seams in socks and may refuse to wear them. ❖ Distressed by clothes rubbing on the skin; may want to wear shorts and short sleeves year round, toddlers may prefer to be naked and pull diapers and clothes off constantly. ❖ May want to wear long sleeve shirts and long pants year-round to avoid having skin exposed. ❖ Distressed about having hair, toenails, or fingernails cut. ❖ Picky eater, only eating certain tastes and textures; mixed textures tend to be avoided as well as hot or cold foods; resists trying new foods. ❖ May refuse to walk barefoot on grass or sand	

a.tactile mats exploring

b.refusing to wear a certain kinds of clothes

c.refusing to walk on different sensory textures

d.difficulty with hair combing

Figure 2 : Tactile related Sensory Issues

Poor Tactile Perception And Discrimination

- Has difficulty with fine motor tasks such as buttoning, zipping, and fastening clothes
- May not be able to identify which part of their body was touched if they were not looking
- Maybe a messy dresser; looks disheveled, does not notice pants are twisted, the shirt is half untucked, shoes are untied, one pant leg is up and one is down, etc.
- Has difficulty using scissors, crayons, or silverware
- Continues to mouth objects to explore them even after age two
- Has difficulty figuring out physical characteristics of objects; shape, size, texture, temperature, weight, etc.

Figure 3: Difficulty in performing fine motor skills.

Vestibular Hypersensitivity	Vestibular Seeking Or Hyposensitivity
❖ Avoids / dislikes playground equipment; i.e., swings, ladders, slides, or merry-go-rounds ❖ Prefers sedentary tasks, moves slowly and cautiously, avoids taking risks, and may appear "wimpy" ❖ Avoids / dislikes elevators and escalators; may prefer sitting while they are on them or, actually get motion sickness from them ❖ Afraid of heights, even the height of a curb or step, also called gravitational insecurity ❖ Fearful of going up or down stairs or walking on uneven surfaces ❖ Afraid of being tipped upside down, sideways, or backward; will strongly resist getting hair washed over the sink; fearful reactions to ordinary movement activities ❖ Loses balance easily and may appear clumsy ❖ Fearful of activities that require good balance ❖ Avoids rapid or rotating movements	❖ In constant motion, can't seem to sit still. ❖ Craves fast, spinning, and/or intense movement experiences. ❖ Could spin for hours and never appear to be dizzy. ❖ Always jumping on furniture, trampolines, spinning in a swivel chair, or getting into upside down positions. ❖ Loves to swing or climb heights. ❖ Likes excessive body whirling, jumping, and/or spinning. ❖ Rocks body, shakes leg, or head while sitting.

Figure 4 : Swinging for vestibular input

Figure 5 : Afraid of climbing on heights

Proprioceptive Seeking

- ❖ Seeks out jumping, bumping, and rashing activities
- ❖ Bites or sucks on fingers and/or frequently cracks his/her knuckles
- ❖ Loves/seeks out "squishing" activities
- ❖ Excessive banging on/with toys and objects
- ❖ Frequently falls on floor intentionally
- ❖ Would jump on a trampoline for hours on end
- ❖ Grinds his/her teeth throughout the day
- ❖ Loves pushing/pulling/dragging objects
- ❖ Loves jumping off furniture or from high places
- ❖ Frequently hits, bumps, or pushes other children

More Signs Of Vestibular Dysfunction: Poor Muscle Tone And Coordination

- ❖ Has a limp, "floppy" body.
- ❖ Difficulty simultaneously lifting head, arms, and legs off the floor while lying on stomach ("superman" position).
- ❖ Often sits in a "W sit" position on the floor to stabilize the body.
- ❖ Fatigues easily.
- ❖ Compensates for "looseness" by grasping objects tightly.
- ❖ Difficulty turning door knobs, handles, opening and closing items.
- ❖ Difficulty getting dressed and performing fastening, zipping, and buttoning.

More Signs of Proprioceptive Dysfunction: Difficulty With Postural Stability, Grading Of Movement, and Motor Planning

- ❖ Misjudges how much to flex and extend muscles during tasks / activities (i.e., putting arms into sleeves or climbing).
- ❖ Difficulty regulating pressure when writing / drawing; may be too light to see or so hard the tip of the writing utensil breaks.
- ❖ Written work is messy and he / she often rips the paper when erasing.
- ❖ Always seems to be breaking objects and toys.

❖ Has poor body awareness; bumps into things, knocks things over, trips, and/or appears clumsy. ❖ Poor gross motor skills; jumping, catching a ball, jumping jacks, climbing a ladder, etc. ❖ Poor fine motor skills; difficulty using "tools", such as pencils, silverware, combs, scissors, etc. ❖ May appear ambidextrous, frequently switching hands for coloring, cutting, writing, etc.; does not have an established hand preference/ dominance by 4 or 5 years old. ❖ Difficulty learning exercise or dance steps.	❖ May not understand the idea of "heavy" or "light"; would not be able to hold two objects and tell you which weighs more difficulty manipulating small objects (buttons, snaps), eating sloppily, and resistance to new motor movement activities. ❖ Seems to do everything with too much force; i.e., walking, slamming doors, pressing things too hard, slamming objects down. ❖ Has poor body awareness; bumps into things, knocks things over, trips, and/or appears clumsy.

What is a Sensory diet? What are the signs of Sensory overload?

Hypersensitivity To Sounds Or Auditory Defensiveness	**Hyposensitivity To Sounds Or Auditory Seeking**
❖ Distracted by sounds not normally noticed by others; i.e., the humming of lights or refrigerators, fans, heaters, or clocks ticking. ❖ Extreme response to or fear of sudden, high-pitched, loud, or metallic noises like flushing toilets, clanking silverware, or other noises that seem unoffensive to others. ❖ Runs away, cries, and/or covers ears with loud or unexpected sounds. ❖ May refuse to go to movie theaters, parades, skating rinks, musical concerts/parks, etc.	❖ Often does not respond to verbal cues or to name being called. ❖ Appears to "make noise for noise's sake". ❖ Loves excessively loud music or TV. ❖ Seems to have difficulty in understanding or remembering what was said. ❖ Had little or no vocalizing or babbling as an infant.

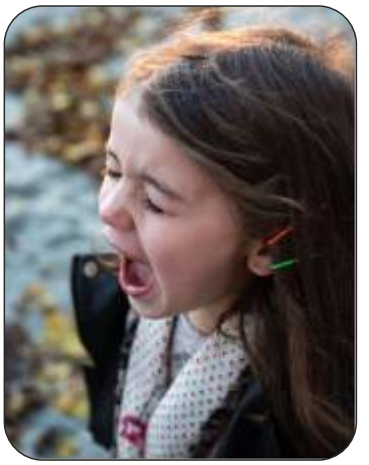


Figure 6: Startled or distressed by sudden loud noises.

Hypersensitivity To Oral Input Or Oral Defensiveness	Hyposensitivity To Oral Input Or Oral-Motor Seeking
❖ Picky eater, often with extreme food preferences; i.e., limited repertoire of foods, picky about brands. ❖ Resistive to trying new foods or restaurants, and may not eat at other people's houses). ❖ May only eat "soft" or pureed foods past 24 months of age. ❖ May gag with textured foods. ❖ Has difficulty with sucking, chewing, and swallowing; may choke or have a fear of choking. ❖ May only eat hot or cold foods. ❖ Dislikes or complains about toothpaste and mouthwash.	❖ May lick, taste, or chew on inedible objects. ❖ Prefers foods with intense flavor; i.e., excessively spicy, sweet, sour, or salty. ❖ Excessive drooling past the teething stage. ❖ Frequently chews on hair, shirt, or fingers. ❖ Constantly putting objects in mouth past the toddler years. ❖ Acts as if all foods taste the same. ❖ Loves vibrating toothbrushes and even trips to the dentist.

Figure 7: refusing to eat certain textures of food

Figure 8: mouths objects excessively

Figure 9: refuses to eat a certain food due to its smell

Figure 10: mouthing a certain texture of inedible item

Olfactory Hypersensitivity (Over-Responsive)	**Olfactory Hyposensitivity (Under-Responsive)**
❖ Reacts negatively to, or dislikes smells which do not usually bother, or get noticed, by other people. ❖ Refuses to eat certain foods because of their smell. ❖ Offended and/or nauseated by bathroom odors or personal hygiene smells. ❖ Bothered/irritated by the smell of perfume or cologne. ❖ Bothered by household or cooking smells.	❖ Has difficulty discriminating unpleasant odors. ❖ Does not notice odors that others usually complain about. ❖ Fails to notice or ignore unpleasant odors. ❖ Uses smell to interact with objects. ❖ Make excessive use of smelling when introduced to objects people or places.

Hypersensitivity To Visual Input (Over-Responsive)	Hypersensitivity To Visual Input (Under-Responsive Or Difficulty With Tracking, Discrimination, Or Perception)
❖ Sensitive to bright lights; will squint, cover eyes, cry, and/or get headaches from the light. ❖ Has difficulty keeping eyes focused on the task/activity he/she is working on for an appropriate amount of time. ❖ Easily distracted by other visual stimuli in the room; i.e., movement, decorations, toys, windows, doorways, etc. ❖ Has difficulty in bright colorful rooms or a dimly lit room. ❖ Avoids eye contact.	❖ Has difficulty telling the difference between similar printed letters or figures; i.e., p & q, b & d, + and x, or square and rectangle. ❖ Has a hard time seeing the "big picture"; i.e., focuses on the details or patterns within the picture. ❖ Has difficulty locating items among other items; i.e., papers on a desk, clothes in a drawer, items on a grocery shelf, or toys in a bin/toy box. ❖ Visual-seeking behaviours such as excessive liking towards a particular color, staring at bright lights or rotating objects like wheels or fan. ❖ Visual stimming with toys or objects. ❖ Looking from the corner of the eyes, also called eye-cornering. ❖ Often loses place when copying from a book or the chalkboard. ❖ Difficulty controlling eye movement to track and follow moving objects ❖ Has difficulty telling the difference between different colors, shapes, and sizes. ❖ often loses his/her place while reading or doing math problems.

	❖ Complains about "seeing double" ❖ Difficulty finding differences in pictures, words, symbols, or objects ❖ Difficulty with consistent spacing and size of letters during writing and/or lining up numbers in math problems. ❖ Difficulty with jigsaw puzzles, copying shapes, and/or cutting/tracing along a line. ❖ Tends to write at a slant (up or downhill) on a page. ❖ Confuses left and right ❖ Fatigues easily with schoolwork ❖ Difficulty judging spatial relationships in the environment; i .e., bumps into objects / people or missteps on curbs and stairs.

Figure 11: visual stimming with toys or objects

Other Sensory Processing Or Integration Dysfunctions:

Auditory-Language Processing Dysfunction	Social, Emotional & Play Dysfunction Social
❖ Unable to locate the source of a sound. ❖ Difficulty identifying people's voices. ❖ Difficulty discriminating between sounds/words; i.e., "dare" and "dear". ❖ Difficulty filtering out other sounds while trying to pay attention to one person talking. ❖ Difficulty attending to, understanding, and remembering what is said or read; often asks for directions to be repeated and may only be able to understand or follow two sequential directions at a time. ❖ Looks at others/for reassurance before answering. ❖ Difficulty putting ideas into words (written or verbal). ❖ Often talks out of turn or "off-topic". ❖ If not understood, has difficulty re-phrasing; may get frustrated, angry, and give up. ❖ Difficulty reading, especially out loud (may also be dyslexic). ❖ Difficulty articulating and speaking clearly. ❖ The ability to speak often improves after intense movement.	❖ Difficulty getting along with peers. ❖ Prefers playing by themself with objects or toys rather than with people. ❖ Does not interact reciprocally with peers or adults; hard to have a "meaningful" two-way conversation. ❖ Self-abusive or abusive to others. ❖ Others have a hard time interpreting a child's cues, needs, or emotions. ❖ Does not seek out connections with familiar people.

Auditory-Language Processing Dysfunction	Social, Emotional & Play Dysfunction Social
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Play

- Difficulty with imitative play (over 10 months)
- Wanders without purposeful play or exploration (over 15 months)
- Needs adult guidance to play, difficulty playing independently (over 18 months)
- Participates in repetitive play for hours; i.e., lining up toys, cars, blocks, watching one movie over and over, etc.

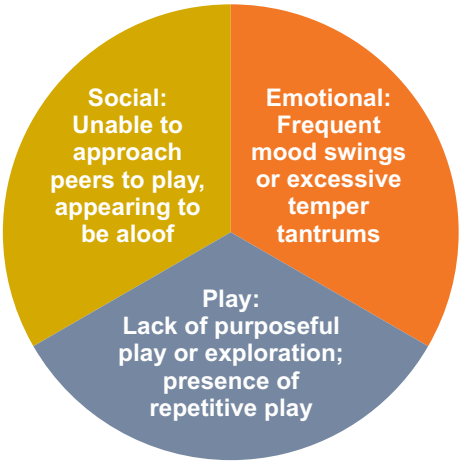


Figure 12: Social, emotional & play difficulties in children with ASD.

The aforementioned list highlights the various kinds of sensory dysfunctions experienced by children and people with Autism. Early detection of these signs may ensure timely intervention for your child and maximize treatment outcomes in the child's areas of deficit.

CHAPTER 4

BEHAVIOURAL MANIFESTATION OF AUTISM

- General Behaviour problem
- Behaviour problems seen in- Play, Social setting, Academic work & Self care
- Harmful Behaviour

Children and teenagers with Autism may have a plethora of behavioural problems owing to deficits in their ability to understand social situations and communicate. The problem is compounded by the presence of hypo-reactivity or hyper-reactivity to sensory input from their immediate environment. They often have trouble understanding what is happening around them which makes them feel anxious, frustrated or overwhelmed. Below are the domains in which children with Autism may experience behavioural difficulties. Not all children may face trouble in each of the areas listed. The severity of the problem faced may also vary depending on the individual differences shown by children. To understand and better plan the therapeutic intervention for your child, it is essential to make a note of his/her behavioural problems.

What are the behavioural problems that can be seen in Autism?

Obsessive Compulsive tendency	Spitting	Pulling hair
Fixations	Bedwetting	Head banging
Turn taking difficulties	Eating inedible objects	Biting self and others
Eloping behaviour	Vocal stimming	Masturbating
Jumping from height	Hand flapping	Shouting
Running on the road	Finger wiggling	Hitting
Difficulty sitting in a place	Hyperactivity	Rigidity with routines and positions
Repetitive play	Body rocking	Throwing objects

(A) What are the external and internal factors affecting behaviour problems?

Below-listed are external as well as internal factors that could cause the child to show behaviour problems across multiple contexts or situations:

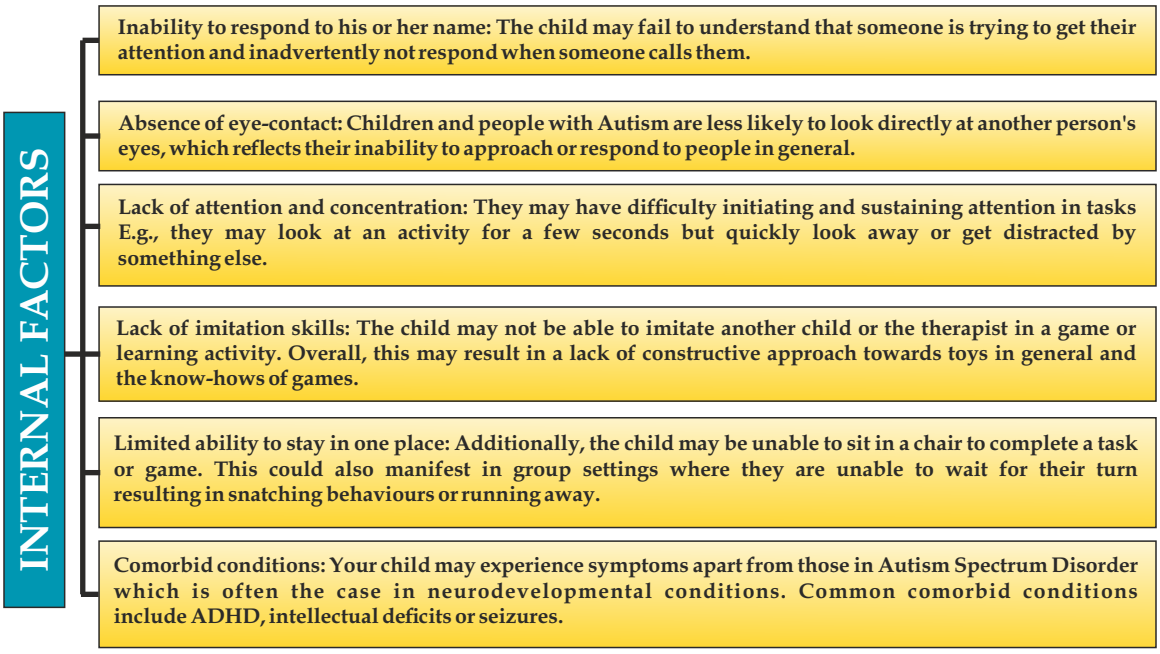


Figure 1: Internal Factors of Behaviour of Autism

EXTERNAL FACTORS

Rigidity with routines: Children on the Autism Spectrum feel more comfortable in predictable environments, and they can get very upset if the routine is suddenly changed or unfamiliar. For example, the child might get upset if you change the route you usually take home from school.

Transitions: The child may not understand it's time to move on from one activity to another or may want to stick to the same activity atlength.

Sensory sensitivities: Sensory sensitivities often startle the children - for example, they might like feeling or touching particular surfaces or objects and may get upset if they aren't allowed to touch.

Sensory overload: The child might get overwhelmed if too much is happening around them. For example, the light may be too bright, or they may fear loud noises and a sudden, unexpected loud sound may disturb them.

Discomfort, pain or illness: This could include things like the feeling of clothes against skin, a prickly label or wet pants, a bump or pain. Check with your general physician if you suspect there could be a medical condition causing your child's behaviour.

Unrealistic expectations: The children can get frustrated if they're expected to do something they don't have the skills for, like getting dressed independently.

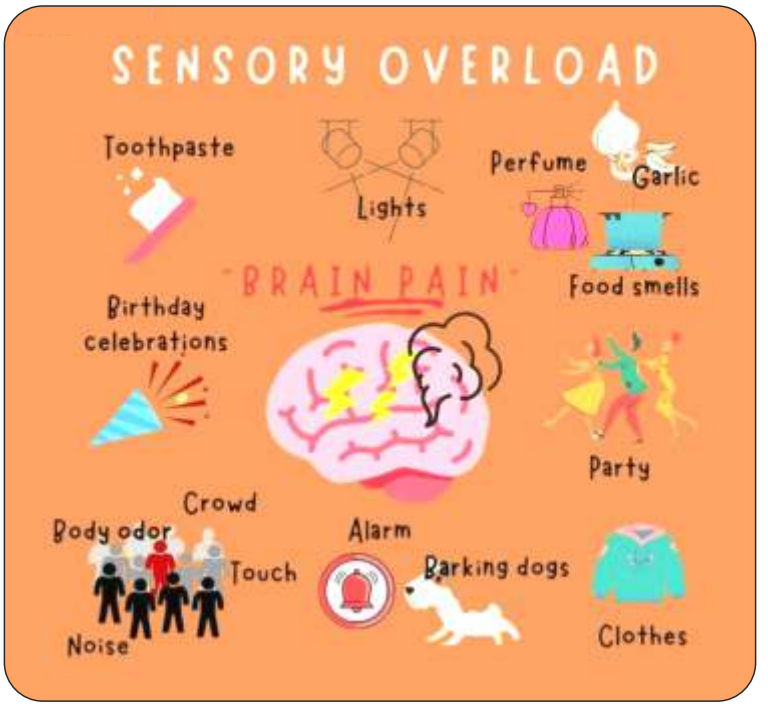


Figure 2: External Factors of Behaviour of Autism

(B) How behaviour problems affect play?

Play is what children do. Play is how children interact with others. It is through play that children learn about friendships and develop in imminent areas like physical health, cognition and social skills. But "play" can be a problem area for children with Autism. Let's understand how:

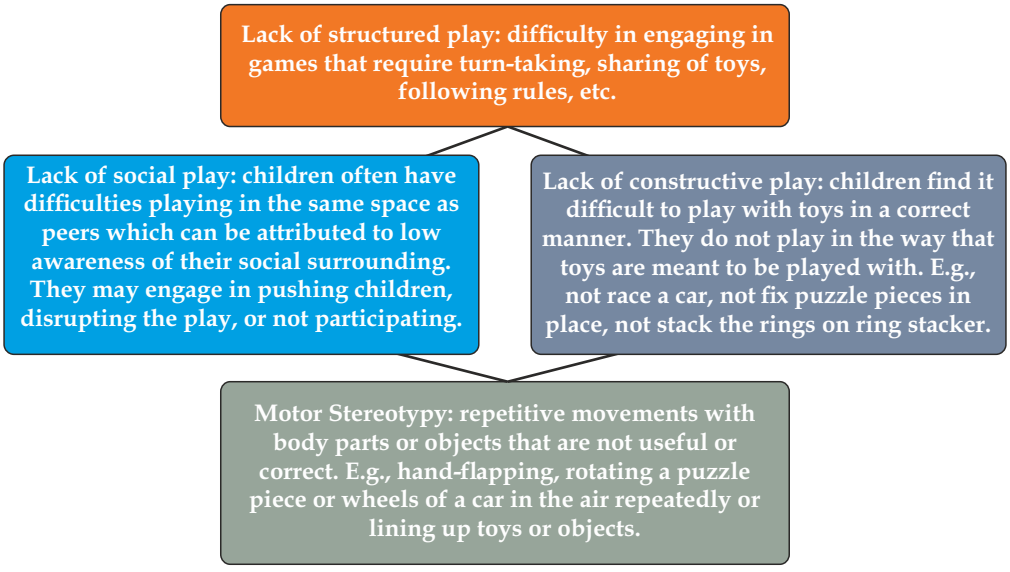


Figure 3: Behaviour Problems affecting Play in Autism

Figure 4: Behaviour Problems affecting Play and Social skills in Autism

(C) How does behaviour problem affect social skills?

Children with Autism have difficulties in comprehending and using speech. Due to this, they often fail to approach or sustain interactions with others or completely withdraw from the situation. Following are some of the ways in which they manifest the problem:

Figure 5: Behaviour Problems affecting Social skills in Autism

(D) How behaviour problems affect academic performance?

These include challenges in co-operating for and learning academic work in a classroom.

Figure 6: Behaviour problems affecting academic performance

- **Being a part of a classroom:** This often reflects in not raising hand in class or answering the teachers, not listening to what is being said in the class, participating in group work, cultural and extra-curricular activities.
- **Retaining Information:** Children with Autism may show below average academic memory wherein they quickly forget what they have learned or do not retrieve information when expected to do so.
- **Reading and writing:** Children find it difficult to read and write alphabets, numbers, or words, perform mathematical calculations, etc. This ultimately leads to poor performance in school activities.

Figure 7: Behaviour problems affecting reading and writing

(E) How Behaviour problems affects Self-Care?

Disturbances in behaviour are seen in children while engaged in activities of daily living or self-care such as bathing, eating, dressing, etc. They need additional support and training to accomplish these basic tasks successfully. Parents often

encounter a number of problems in the caretaking of their children, some of which are as follows:

a. **Can perform only a few steps but not the entire task:** e.g., cannot complete a long task such as hand washing, bathing, wearing clothes, etc. They may be independent in a few steps but not finish the entire task. E.g., they can get the water running for a bath but not apply soap to clean the body.

b. **Needs constant reminders for doing daily activities:** The children need to be reminded frequently to finish the self-care activity like brushing their teeth, wearing shoes, etc. they may need prompts ranging from physical to verbal to help them go about the task.

Figure 8: Behaviour problems affecting self care activities

(F) How do behaviour problems affect safety?

These are the behaviors (Hitting, Biting, Scratching, Pinching and throwing) that interfere with learning of appropriate behaviors. These behaviors occur mainly because the child does not know how to communicate his wants or likes. These behaviors are compensatory behaviors for appropriate behaviors. These behaviors can also be harmful to the child or others around him. Engaging in such behaviors makes it difficult for the child to be a part of a social group such as school and also engage in various activities such as academic work, play, social interactions.

Figure 9: Behaviour problems affecting safety of children

(G) How motivation affects Behaviour?

Children with Autism show very low interest in activities such as play or social communication. They appear to be aloof or comfortable in their own shell. They seem detached and disinterested in what is happening around them. Getting them to engage in any activity is extremely difficult because they lack the motivation and necessary skills.

The above-mentioned problem areas are important to be tracked in the treatment process of the child as they can alter a child's functioning and interfere with his/her growth. Knowledge of these issues will help the parents understand what their kids do, report to the concerned therapists and modify therapeutic plans accordingly.

CHAPTER 5

WHAT ARE THE COMMUNICATION CHALLENGES IN AUTISM

- Speech related challenges
- Key areas affected in Speech and Communication

Individuals with autism face challenges in both understanding and using communication, compounded by existing deficits in social skills. This limits their ability to express themselves, leading them to adopt unconventional forms of communication, such as repeating words, using single words, babbling, or guiding their parents' hands to indicate their needs.

Figure 1: Communication challenges in autism

Parents are often confused by this issue and turn to speech and language pathologists in hopes of getting their child to speak. In their eagerness to hear their child use words and sentences, they sometimes neglect to build a strong bond with them. This mental barrier can prevent them from exploring other equally important forms of communication, serving as a reminder that:

a) Whether expression comes through spoken language, picture cards, a communication device, gestures, or sign language; it is all a valid form of communication.

b) Every individual has something to communicate with us. It is our duty to listen in a way that guarantees they are both heard and understood.

Individuals with Autism Face Challenges in Key Areas of Communication, Including:

- Understanding and using non-verbal gestures, like pointing, waving, or showing objects to others.
- Following directions or commands.
- Understanding and using words or losing words.
- Initiating or maintaining conversations.
- Learning to read or write.
- Difficulty in comprehending.

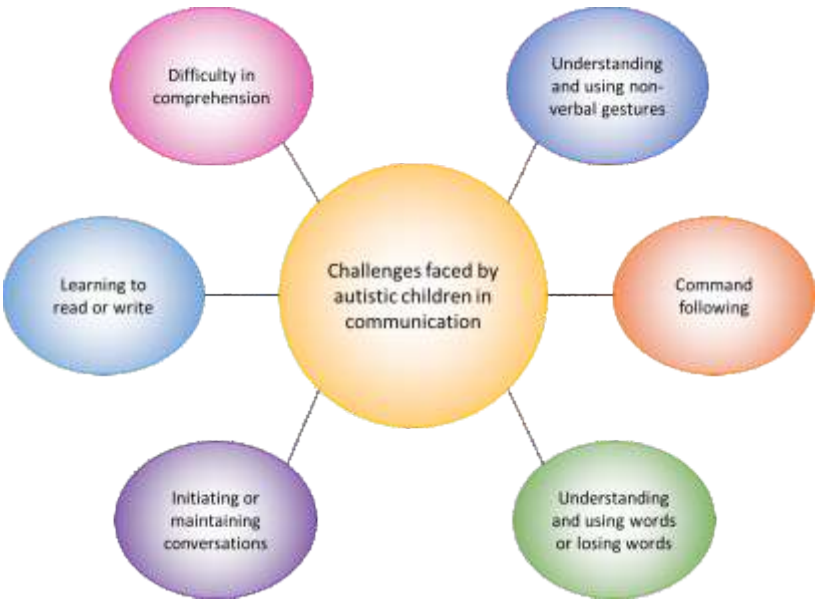


Figure 2: Challenges in Key Areas of Communication

Individuals with autism may also exhibit challenges in the following key areas of speech:

- Echolalia: It is the immediate repetition of words, phrases, or sounds, often without context or understanding.
- Delayed echolalia: It is the repetition of phrases, words, or parts of words that were previously heard, often occurring after a time delay
- Talking with a flat expression or using a sing-song voice.
- Throwing tantrums as a way to communicate needs, desires, or refusals when unable to express them verbally.
- Involving in non-verbal motor activities, such as specific postures, gait, gross and fine motor movements (either deliberate or automatic), oral motions, various mouth positions, drooling, swallowing, or chewing.
- Adopting speech motor functions- struggle and strain during speech attempts, deviations in sound and rhythm of speech.
- Hypo/hyper nasality causing abnormality in speech sounds.
- Repetitive speech and self-talk. For instance, an individual may repeatedly ask, "Are we going to the zoo? Are we going to the zoo?" countless times or until someone intervenes and redirects them. They may also repeat comforting phrases to themselves, like "It's okay, you are not hurt."
- Limited ability to start conversations or express thoughts without prompting from others.

Figure 3: Challenges in key areas of Speech

It is important to recognize that speech and language difficulties arise when the brain's signaling processes are disrupted, even though the vocal structures themselves are typically unaffected. These challenges often point to cognitive issues rather than physical impairments. Additionally, the language chosen for instruction plays a significant role in speech development. Focusing on an individual's native language, rather than a multilingual approach, can be particularly helpful in addressing speech-related difficulties. In summary, individuals with autism often have difficulty naturally picking up nonverbal cues, such as facial expressions and subtle verbal hints. They may also struggle with maintaining appropriate eye contact and using the correct tone of voice, all of which complicate the development of speech and language skills. Even when language is acquired, it is often used in unusual or atypical ways, with a marked difficulty in initiating or sustaining conversations with others.Therapeutic interventions, especially when implemented in social settings, are vital. This highlights the need for a multidisciplinary approach to treating autism, involving various professionals to address the complex nature of the condition.

CHAPTER 6

WHAT ARE THE PHYSICAL CHALLENGES ASSOCIATED WITH AUTISM?

- Physical Challenges in Autism
- Common Postural Deviations in Autism
- Muscle related factors
- Other Associated conditions

- Autism Spectrum Disorder (ASD) is primarily known for affecting communication, behavior, and social interaction, many individuals on the spectrum also experience physical challenges. These challenges can influence movement, balance and coordination

- Motor skill difficulties are common in individuals with autism and may include delays in gross motor skills (e.g., running, jumping, climbing) and fine motor tasks (e.g., writing, buttoning, utensil use). Challenges with coordination and balance are also frequently observed, contributing to clumsiness and difficulty with physical activities.

- One such challenge is toe walking, where child walks on the balls of their feet without letting their heels touch the ground. This behavior is often linked to sensory sensitivities—such as avoiding certain floor textures—or to a need for increased sensory feedback related to body awareness. In some cases, toe walking becomes a habitual motor pattern or results from tight calf muscles, which can further affect balance and posture if left unaddressed.
- Children with autism may have poor balance and coordination due to low muscle tone, weak core strength, and difficulties with motor planning. Sensory processing issues, especially with body awareness and movement, can also affect their ability to stay stable and move smoothly. These challenges often lead to delayed motor skills and clumsiness during physical activities.

How Does Autism Affect Posture and Body Alignment?

Children with autism may show postural issues like kyphosis (rounded upper back), lordosis (excessive lower back curve), and a preference for W-sitting, which can affect hip and trunk stability. These patterns are often linked to low muscle tone, poor core strength, and motor planning difficulties.

Common postural deviations in autism

a) Kyphotic posture in sitting :

- Kyphosis is an exaggerated, forward rounding of the upper back.
- This posture is a result of reduced strength, decreased biomechanical stability, or from a sensory impairment.

Figure 1: Kyphotic posture in sitting

b) Lordotic posture in standing:

- An exaggerated inward curve of the lower back, which can affect balance and posture.
- A child with lordosis has a swayback appearance.
- There is weakness in the abdominal muscles.

Figure 2: Lordotic Posture in Standing

c) W' posture in sitting:

- W-sitting, often seen in children with low muscle tone, can lead to weak core muscles and joint issues.
- Tightness in muscles like the hamstrings, hip adductors, and Achilles tendon can limit movement, affecting balance and coordination.

Figure 3: W- Sitting

Muscle related Factors

a) Posture-Related Muscle Tightness in Autism

1. **Pectoral muscles –** Often tight in children with a slouched, kyphotic posture.
2. **Hamstrings –** Commonly tight in children who sits in W-sitting.
3. **Adductor magnus –** Tightness seen in W-sitting and children with intoeing.
4. **Tendo-Achilles –** Typically tight in children who walk on their toes.

b) Posture-Related Muscle Weakness in Autism

1. **Core muscles –** Weakness can lead to poor trunk control and slouched posture.
2. **Back extensors –** Often underactive in children with kyphotic posture.
3. **Hip muscles** – Weakness may contribute to W-sitting and poor postural stability.
4. **Ankle and foot muscles –** Reduced strength can affect balance and increase toe

walking.

Other associated conditions

- Children with autism often have **low muscle tone (hypotonia), poor postural control, and delayed motor development,** which can contribute to various musculoskeletal issues.

  a) **Winging of Scapula:** Weakness in the shoulder and upper back muscles can cause the shoulder blades to stick out, especially during arm movements.

Figure 4: Winging Of Scapula

  b) **Hypermobile Joints:** Loose or overly flexible joints are common due to reduced muscle tone and connective tissue laxity.

Figure 5: Hypermobile Joints

  c) **Intoeing:**

  - Intoeing is when a child's feet or toes point inward while walking. It is most common between 6 months and 5 years, during early walking and coordination development.

- Poor motor planning and muscle imbalances, especially in the hips and legs, can lead to inward turning of the feet.

Figure 6: Intoeing of feet

d) **Flat Feet:**

Weakness in the foot arches and poor alignment can cause the arch to collapse, resulting in flat feet.The foot arch usually forms by age 5 or 6.

Figure 7: Flat Feet

e) **Pronated Feet:**

- Pronated feet occur when the middle part of the foot flattens due to a drop in key foot bones, like the navicular.
- This causes the arch to collapse, reducing foot stability and possibly affecting walking or balance.

Figure 8: Pronated feet

CHAPTER 7

ASSESSMENTS AND EVALUATION TOOLS FOR AUTISM:

- Childhood Autism Rating Scale - 2 (CARS-2)
- Vineland Social Maturity Scale (VSMS)
- Autism Treatment Evaluation Checklist (ATEC)
- Functional Independence Measure (FIM)
- Autism Spectrum Quotient (AQ) Test
- The Autism Diagnostic Observation Schedule (ADOS)
- Gilliam Autism Rating Scale - 3 (GARS-3)
- Intelligence Quotient Tests
- The Indian Scale for Assessment of Autism (ISAA)
- Receptive-Expressive Emergent Language Scale (REELS)

1. Childhood Autism Rating Scale-2 (CARS-2):

Childhood Autism Rating Scale edition 2, is a rating scale designed specifically for trained clinicians like Psychologists and other Mental Health Professionals. After direct and thorough observation of the child, the clinician rates the scale for various domains usually affected with Autism like social interaction, repetitive behaviour, verbal and non-verbal communication, adaptability to change etc.

CARS-2 is used for children below the age of 6 years or above 6 years if their estimated Intelligence Quotient is of 79 or lower or noticeable communication impairment is noticed. Scoring and interpretation of the scores may vary for different age ranges. However, a cut off of 28 is indicative that further Autism Assessment may be warranted. After meeting the cut-off range, the scores are divided in 2 broader segments indicative of Mild-Moderate Autism symptoms and Moderate-Severe Autism symptoms.

2. Gilliam Autism Rating Scale-3 (GARS-3):

Gilliam Autism Rating Scale-3 (GARS-3) is a widely used assessment tool aimed to understand the severity of the presenting Autism Symptoms. It is divided in 6 sub-scales measuring the areas most affected when it comes to Autism Spectrum Disorder. The sub-scales are; Restricted/Repetitive Behaviours, Social Interaction, Social Communication, Emotional Responses, Cognitive Style and Maladaptive Speech.

Gilliam Autism Rating Scale-3 (GARS-3) can be administered by a trained professional qualified to be working with individuals on the spectrum. GARS-3 can be administered to individuals between the age range of 3 years to 22 years. After considerable calculations, GARS-3 yields an Autism Index which provides 4 levels of probability of having Autism. Autism Index of less than 54 marks level 0 stating that it is unlikely for an individual to have Autism; Autism Index between 55-70 marks Level 1 which suggests that an individual may require Minimal Support; Autism Inex between 71-100 marks level 2 which suggests individual may require Substantial Support and lastly, Autism Index above 101 marks Level 3 which suggests that the individual may require Very Substantial Support.

3. Vineland Social Maturity Scale (VSMS):

Vineland Social Maturity Scale (VSMS) is a psychometric tool commonly used to understand an individual's social and adaptive functioning for those with intellectual and developmental difficulties. Eight areas of Social functioning are assessed with the help of the scale, namely; Self-Help General, Self-Help Eating, Self-Help Dressing, Self-Direction, Occupation, Communication, Locomotion and

Socialization.

It can be administered for individuals with intellectual or developmental difficulties between birth to 15 years of age, and is administered by a trained clinician/professional with the help of the primary care-giver/parent. VSMS yields two scores including Social Age and Social Quotient. Social Age helps us understand at what age level the individual's social and adaptive functioning is and up to what level can they independently function.

Chronological Age : the number of years since birth.

Social Age : refers to an individual's maturity level and ability to fulfill social roles and expectations, as compared to individuals of the same age.

Children with autism sometimes have a lower social age than their chronological age because they develop social and communication skills at a slower rate. Autism can have an impact on how children interact with others, interpret social cues, and participate in discussions or group activities. As a result, despite their age, their ability to handle social circumstances may be similar to that of a younger child.

4. Autism Treatment Evaluation Checklist (ATEC):

Autism Treatment Checklist is a tool developed by Autism Research Institute (ARI), to help understand the development of the individual on the spectrum over-time. It is not a diagnostic tool rather a check-list used by parents, caregivers, teachers and other professionals to understand the treatment outcome and effectiveness.

The 4 areas assessed with ATEC are Speech/Language/Communication, Sociability, Sensory/Cognitive Awareness and Health/Physical Behaviour. Atec can be used for all individuals above the age of 2 years. While ATEC is not a diagnostic tool, the score ranges can help understand the severity of Autism in an individual, with higher scores signifying higher levels of Autism symptoms.

5. Intelligence Quotient Tests:

Intelligence Quotient Tests are commonly used for individuals with Autism to understand their cognitive abilities, differentiative Autism from Intellectual Disability and for determining their learning and educational needs.

Some commonly used Intelligence Quotient tests include:

Wechsler Intelligence Scale for Children (WISC): Administered for children between the ages of 6-16 years of age which assess areas like verbal comprehension,

visual-spatial intelligence, reasoning, working memory and processing speed.

Wechsler Adult Intelligence Scale (WAIS): Administered for individuals between the age ranges of 16-90 years of age and assesses areas like verbal comprehension, perceptual reasoning, working memory and processing speed.

6. Functional Independence Measure (FIM):

The Functional Independence Measure (FIM) is an instrument that was developed as a measure of independence in Activities of Daily Living (ADL's) for a variety of populations. The FIM instrument:

- Includes measures of independence for self-care, including sphincter control, transfers, locomotion, communication and social cognition.
- Is an 18-item, seven-level, ordinal scale intended to be sensitive to changes over the course of a comprehensive inpatient medical rehabilitation program.
- The higher the scores in the FIM scale, the better the level of independence. A person can score a maximum of 126 on the scale.

Figure 1: Independence in Activities of Daily Living (ADL's)

7. The Indian Scale for Assessment of Autism (ISAA) :

The Indian Scale for Assessment of Autism (ISAA) is a 40-item, 5-point Likert scale assessment tool developed by the Government of India to measure the severity of autism and is used for certification and follow-up, but not screening.

- The ISAA consists of 40 items, rated on a 5-point scale (1-5), and is divided into six domains: social relationships and reciprocity, emotional responsiveness, speech, language, and communication, behavior patterns, sensory aspects, and cognitive component.

- Scoring: The ISAA categorizes autism into no autism (score <70), mild autism (70-106), moderate autism (107-153), and severe autism (>153).

8. Receptive-Expressive Emergent Language Scale (REELS):

The Receptive-Expressive Emergent Language Scale by Bzoch, League and Brown, 2006, is a standardized assessment tool used to evaluate the language abilities focusing on receptive (understanding) and expressive (production) language skills. It is a comprehensive test for assessing all components of language including syntax, semantics, pragmatics, etc. It is administered by a caregiver interview by a speech-language pathologist. REELS can not only be used as an assessment tool but also to formulate an individualized intervention plan.

9. Autism Spectrum Quotient (AQ) Test:

The Autism-Spectrum Quotient (AQ) Test is a self-administered questionnaire designed to determine the presence of autism-spectrum features in adults. Developed by Simon Baron-Cohen and his team at the Cambridge Autism Research Centre, the test consists of 50 items. The test allows people to evaluate their own behaviors and preferences using a series of questions designed to measure features linked with the Autism Spectrum across 5 domains- Social Skills, Attention Switching, Attention to Detail, Communication, Imagination

10. The Autism Diagnostic Observation Schedule (ADOS):

ADOS is a semi-structured assessment tool to assess various aspects related to ASD including social communication and behavioural aspects. It is a standardized scale assessed and administered by trained professionals. This scale is based on clinical judgement recorded post observation of the individual to various social interactions and activities.

ADOS-2 can be administered to children starting from 12 months of age up to Adults who may be suspected with Autism Spectrum Disorder.

The above mentioned are some of the evaluations amongst many more assessment tools.

CHAPTER 8

GUT ISSUES IN AUTISM

- Gut issues
- Relation with Autism
- Gut brain axis

Is it common for children with ASD to have gut issues?

Children with Autism Spectrum Disorder (ASD) tend to have more gut issues, including gastrointestinal (GI) symptoms such as abdominal pain, constipation, diarrhea etc. Large differences in microbiome composition between Autism Spectrum Disorder (ASD) patients and neurotypical individuals have been reported.

What are the gut issues faced by Autism Spectrum Disorder (ASD) children?

Following are some common gut issues:

- Malabsorption
- Maldigestion
- Abnormal intestinal permeability / Leaky gut
- Microbial overgrowth (fungal, bacterial and viral)

These events could cause symptoms including diarrhea, constipation, gas, belching, probing and visibly undigested foods.

What is the link between gut and Autism Spectrum Disorder (ASD)?

There is increasing evidence suggesting a link between ASD and the gastrointestinal (GI) system. Studies have shown that ASD children have chronic inflammation in their gut. There is also an association of ASD with gastrointestinal (GI) microbiome. Experimental and clinical studies have shown that patients diagnosed with ASD display alterations of the gut microbiome. These in turn, influence the immune system and brain via gut-brain axis. These issues lead to more impaired communication and aberrant behaviors in children with autism.

What is the gut-brain axis?

Studies on the gut–brain axis suggested that the gut contains millions of nerve cells, making a network called the enteric nervous system (ENS). This enteric nervous system is also considered as our second brain. The ENS and the central nervous system (CNS) are mainly connected via the vagus nerve and form the gut–brain axis. This nerve also controls messages that are sent to the heart, lungs and other organs. The gut microbiota plays a very important role by regulating physical and mental activities. The communications within the gut–brain axis occur via hormones and neurotransmitters. More than 90% of the body's serotonin is produced in the gut. Apart from these, other neurotransmitters such as glutamate, GABA, dopamine, and norepinephrine are also produced by the gut microbiota. Dopamine is one of the major neurotransmitters in reward-motivated behavior, norepinephrine helps in arousal and alertness and is also involved in behavior and cognition, like memory, learning, and attention. Hence, these neurotransmitters produced in the gut influence our emotions and behaviour by regulating the gut–brain axis. Therefore, a healthy gut is very important for a healthy brain.

What is the role of gut microbiome in ASD?

The human gut microbiome consists of trillions of bacterial cells, which are as important as human body cells. These diverse groups of bacteria perform many

beneficial activities, often involved in metabolites production and transportation and maintenance of gut homeostasis or balance. There are numerous beneficial bacteria present that generate many neurotransmitters and active metabolites in the gut by utilizing the consumed foods. These bacteria also produce many essential chemicals which regulate emotions and behavior. They also increase the production of antioxidant and neuro-protectant molecules inside the gut. But in ASD, instead of beneficial bacteria such as Lactobacillus, Bifidobacterium, etc. there is more harmful bacteria such as Clostridium, Candida, etc., in the colon, which produces neurotoxin, and due to leaky gut it passes through and causes inflammation, and this hampers neurodevelopment causing cognitive and behavioral deficits (Figure 7.1).

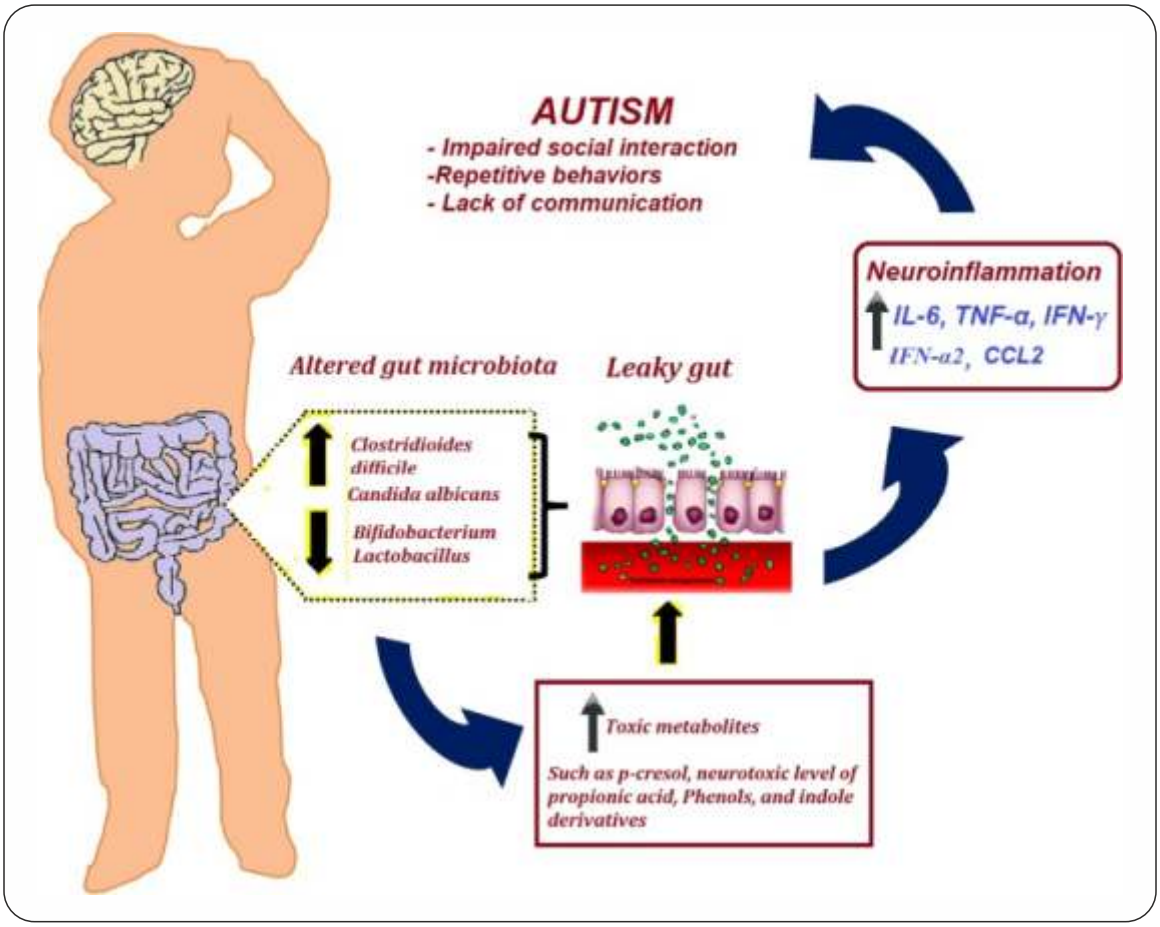


Figure 1: Gut microbiome imbalance in ASD

How does the gut microbiome cause leaky gut?

Studies have shown that children with autism tend to have high levels of inflammation causing chemicals in their intestine due to altered gut microbiome.

Elevated levels of these chemicals were associated with the occurrence of behavioral and communication disorders. People suffering from ASD frequently have increased intestinal mucosal permeability or leaky gut due to their chronic inflammation. In normal individuals, the cells of the intestine are tightly packed and intact which allows essential nutrients, water and other molecules transportation only when it is required. But, in a leaky gut, there are gaps between the cells which allows flow of larger particles such as food, proteins, bacteria and chemicals including toxins to enter the blood circulation and trigger immune reactions (Figure 2).

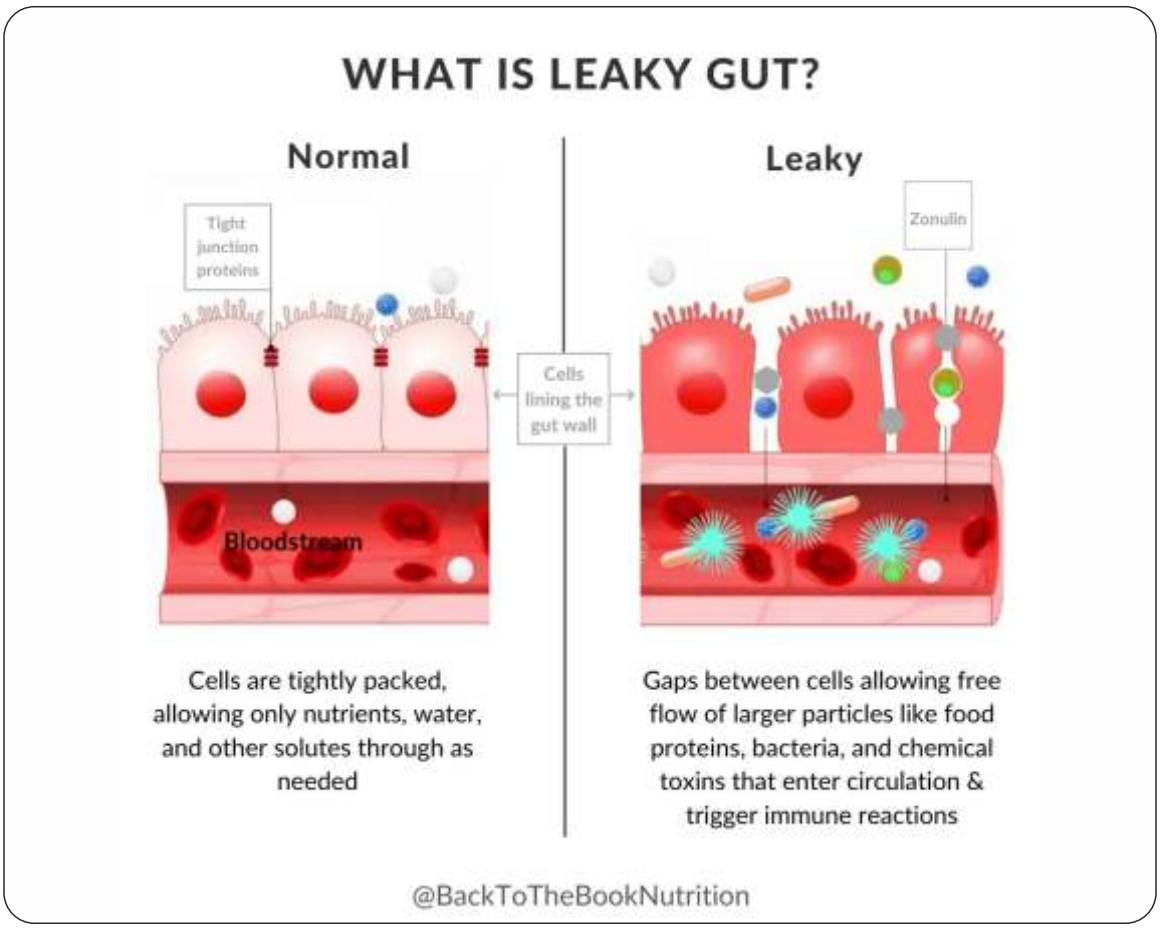


Figure 2: Normal versus Leaky gut

How does alteration in gut microbiome affect?

Studies show that alteration of gut microbiome and their metabolites are not only linked to gastrointestinal problems but also to autism. When a gut issue arises, the number of good bacteria (probiotics) is reduced and yeast overgrowth can happen. The toxins from the excess yeast enter the bloodstream, which can make autism

characteristics worse, such as sleep disturbances, sensory issues, hyperactivity, etc. Restoring the balance between yeast and probiotics removes the toxins from the body, reducing autism characteristics.

How can the gut issues be addressed?

The gut issues can be managed by diet and nutritional management, as explained in Chapter 18: Nutrition and Diet of Section-B: Therapeutic Interventions & Gut Detox Chapter

How to test gut health?

Gut testing is currently an emerging diagnostic practice. Stool, saliva, intestinal biopsies, and breath samples are among the several samples used to assess gut health and gather data on the variety of the gut microbiome. Stool analysis is the most widely and commonly utilized approach, as it is noninvasive and easily available. The stool sample is further examined to determine the presence of bacterial patterns in your gut using sequencing data and algorithms. It provides us with a complete report on the existence and level of all good and bad microbes in your sample, as well as other information such as neurotransmitter levels, short-chain fatty acid levels, vitamin levels, and disease susceptibility. Report gives information on bacteria, fungi, parasites infection in the gut. It also tells about the lack of good microbes. Gut health testing in autism patients can detect imbalances in the gut microbiota, which can impact both gastrointestinal and behavioral symptoms (ASD).

How Do Gut Pathogens Affect Individuals with ASD?

Scholarship on the bi-directional communication between the gut and brain has led researchers to believe that gut microbiota acts as a cofactor in the development of various neurodevelopmental conditions, including autism spectrum disorder. Additionally, anecdotal reports from caregivers of children on the spectrum suggest a high prevalence of gastrointestinal (GI) issues, such as constipation, abdominal pain, diarrhea, and vomiting. These GI symptoms have frequently been linked to gut dysbiosis—an imbalance in gut microbiota.

Studies have indicated a connection between gut dysbiosis and behavioural changes, gastrointestinal disturbances, and immune system alterations, all of which resemble ASD symptoms. Clinical trials comparing individuals with and without ASD revealed distinct differences in gut flora, with the neurodiverse group exhibiting higher levels of pathogens such as Clostridium, Aspergillus, and Bacteroides. Studies on Bacteroides fragilis found that its administration increased repetitive and restricted behaviours while reducing social novelty.

Gut bacteria regulate the production of short-chain fatty acids (SCFAs). SCFAs play a crucial role in reducing inflammation and synthesizing essential vitamins. Abnormalities in SCFAs can contribute to metabolic and neurological challenges associated with ASD. Evidence also suggests that SCFAs can have an effect on mood and mental health.

Pathogens also influence neurotransmitter production in individuals with ASD. Elevated levels of P-cresol, a microbial byproduct of Clostridium, have been detected in the urine of children with ASD. This metabolite disrupts dopamine levels, which are essential for regulating social behavior and overall behavioral regulation.

What are probiotics?

Probiotics are live microorganisms that provide health benefits when consumed in adequate amounts. They help maintain a balanced gut microbiota, support digestion, and boost the immune system. Common sources include fermented foods like yogurt, kefir, sauerkraut, and probiotic supplements.

How do they influence gut health in ASD?

As research into the harmful effects of pathogens advances, scientists have been eager to find solutions. Probiotics and beneficial gut microbes are essential for maintaining gut symbiosis, reducing inflammation, and potentially alleviating the symptoms of ASD. The use of probiotics as a therapeutic intervention for ASD has been investigated due to their capacity to influence the gut-brain axis.

What does research say about probiotics and ASD?

The results of a syatic meta-analysis indicate that probiotic treatment successfully alleviates gastrointestinal issues in children on the autism spectrum. Probiotics have been found to strengthen the immune system, enhance nerve function, and support digestion, thereby influencing brain function and behaviour through the gut-brain connection. Probiotics balances neurotransmitters and thereby improves brain function.

Can probiotics help control harmful bacteria in the gut?

Yes, further research in the field has shown that the mere abundance of commensals helps regulate the presence of harmful pathogens in the gut. For instance, a higher abundance of Bifidobacterium has been found to keep harmful strains of Clostridium in check.

Are there any limitations to probiotic use for ASD?

While studies show promising results, probiotic treatments for ASD are still being researched. Factors like the specific strains used, dosage, and individual differences in gut microbiota can influence their effectiveness. Consulting a healthcare provider before starting probiotic supplementation is recommended.

What are vitamins and how are they related to Gut health?

Vitamins are essential micronutrients that the body needs for various metabolic and regulatory processes, and they are crucial for gut health, supporting microbiome diversity, immune function, and gut barrier integrity.

Vitamins help maintain a healthy gut by supporting good bacteria and improving digestion. Vitamin A, B2, D, E, and beta-carotene promote beneficial gut microbes, while vitamins A, B2, B3, C, and K increase microbial diversity. Vitamin D boosts the overall number of microbes, and vitamin C helps produce gut-friendly short-chain fatty acids. Vitamins B2 and E support microbes that make these fatty acids. Vitamins A and D also strengthen the gut lining and immune defenses, indirectly improving gut health. A balanced intake of these vitamins ensures a strong, diverse, and well-functioning gut microbiome.

How does intake of Vitamins affect Autism?

Research suggests that children with ASD may have vitamin deficiencies affecting their health and development. High doses of B vitamins (B1, B2, B3, B5, B6, B12, biotin, folate), C, D, and K may be beneficial for ASD individuals.

- Vitamin B2 & B6 help to improve mitochondrial functions.
- B12 and folate are important for brain development and studies have shown supplementation improves sleep, Gut Issues, hyperactivity and speech.
- Biotin, a B vitamin, is often low in ASD children and supplementation has shown behavioral improvements.
- Vitamin D deficiency is linked to ASD severity and low immunity.

Many ASD children may have nutrient imbalances due to dietary habits and metabolism issues. Parents have reported improvements in nonverbal IQ and symptoms with essential fatty acids, vitamins, and a gluten-free, casein-free, soy-free diet.

What are neurotransmitters and what is their relationship with

GUT?

Neurotransmitters are chemicals that help brain cells communicate, affecting things like movement, emotions, and memory. Some of these chemicals can either stimulate or calm brain cells.

The types of bacteria in our gut can affect the brain by changing the chemicals they produce, like GABA, serotonin, and dopamine. These chemicals play a role in brain function and mood. Our diet influences this process, as the food we eat provides the building blocks needed to make neurotransmitters. Foods that contain proteins, fats, carbohydrates, vitamins, and minerals help create the energy and chemicals that support brain health. So, what we eat can directly affect our mental and physical well-being.

How does Gut Neurotransmitters affect Autism symptomatology?

In individuals with autism spectrum disorder (ASD), disruptions in the production and regulation of key neurotransmitters contribute to the core symptoms, such as social challenges, repetitive behaviors, and learning difficulties.

Some neurotransmitters that are particularly involved in the development and manifestation of autism-related behaviors are:

- Serotonin: Disruptions in its production and signaling can lead to repetitive behaviors and mood issues.
- Norepinephrine (Noradrenaline): Increased levels are linked to attention issues and learning difficulties.
- Dopamine: Dysfunction in dopamine pathways can result in social difficulties and stereotyped behaviors.
- Oxytocin: Affects social bonding, trust, and emotional responses, and plays a role in enhancing social interactions.
- GABA–Glutamate: Imbalances between excitatory glutamate and inhibitory GABA can lead to hyperactivity, low social communication and behavior issues.

The proper functioning of neurotransmitters is vital for healthy brain activity and behavior.

What are SCFAs?

Short-chain fatty acids (SCFAs) are a type of fatty acid created by beneficial bacteria

in our gut by breaking down fiber from the food. SCFAs, particularly butyrate, serve as a fuel source for cells , promoting digestive health. They serve to maintain the intestinal barrier, which keeps hazardous substances out of the bloodstream. Because of their anti-inflammatory properties, SCFAs can aid in the treatment of inflammatory bowel disease (IBD) and irritable bowel syndrome (IBS). Through the gut-brain axis, SCFAs interact with the brain to affect mood, stress reactions, and even cognitive performance. SCFAs help regulate appetite and energy balance.

How does Gut imbalance affect SCFA production?

Gut dysbiosis, or an imbalance in the gut microbiota, can impair the formation of short-chain fatty acids (SCFAs) by altering the populations of helpful bacteria that ferment dietary fibers. Bifidobacterium, Lactobacillus, and Faecalibacterium prausnitzii are the main beneficial gut bacteria that create SCFAs such as acetate, propionate, and butyrate. A decrease in these beneficial bacteria results in a fall in SCFA levels when dysbiosis occurs, which can be caused by illnesses, antibiotics, or poor diet. This reduction can damage the gut barrier, promote inflammation, and affect metabolic and neurological functioning. Butyrate deficit may impair gut barrier function, resulting in increased intestinal permeability, a condition known as "leaky gut", which has been seen in some people with ASD.

How do antibiotics affect the gut microbiome?

Antibiotics are medicines that kill bacteria, but they don't only kill the bad ones—they also kill the good bacteria in your gut. This can upset the natural balance in your stomach and intestines. How well your gut goes back to normal after taking antibiotics depends on things like which antibiotic you took, how much, how long you took it, and your diet or health. Sometimes, the gut doesn't fully recover, which can lead to problems like stomach infections. To help the gut heal, doctors are looking into using things like probiotics, special fibers (prebiotics), or even healthy bacteria from other people.

CHAPTER 9

MTHFR IN AUTISM

- What is MTHFR?
- Mutations in MTHFR gene
- Folate receptors and Folate receptor Autoantibodies
- FRAAT Test
- Importance of Folinic acid (Leucovorin)

What is MTHFR, and what is its function?

Folic acid is a very important B9 vitamin that plays a predominant role in brain function. But for our bodies to use folic acid, it needs to be converted into a different active form that is 5-MTHF. A gene called MTHFR (methylenetetrahydrofolate reductase) is crucial for converting inactive folic acid (vitamin B9) into active 5-MTHF (5-methyltetrahydrofolate). MTHFR is also essential for the methylation activities that are necessary for DNA repair and production. For the control of gene

expression and neurodevelopment, proper DNA methylation is essential.

What are the mutations (changes) seen in the MTHFR gene with respect to ASD?

MTHFR gene mutation is seen in almost 70 - 75% autism children. A higher risk of ASD has been linked to two frequent gene variants in the MTHFR gene: C677T and A1298C, which are found on Exon 4 and Exon 7, respectively. There are 2 types of mutations: homozygous and heterozygous. Homozygous means having two identical copies of a gene, and the other one, Heterozygous, means having two different copies. A mutation's heterozygous or homozygous status can be detected using the MTHFR test.

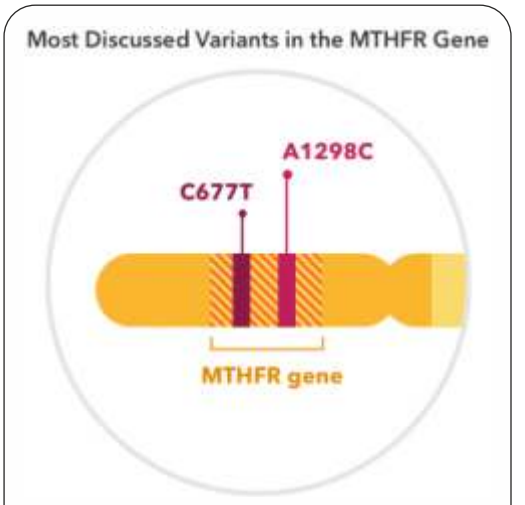


Figure 1: MTHFR Gene

What is the importance of 5-Methyltetrahydrofolate (5-MTHF)?

5-MTHF, the bioactive form of folate, is used directly by the brain. 5-MTHF is a necessary cofactor for regulating the levels of homocysteine (which can form clots) in the blood. Adequate levels of 5-MTHF are required for neurodevelopment, brain function, and DNA methylation. Low 5-MTHF levels can result from disturbances in folate metabolism brought on by MTHFR mutations.This may result in speech difficulties, mood disorders, anxiety, depression, and difficulty concentrating.

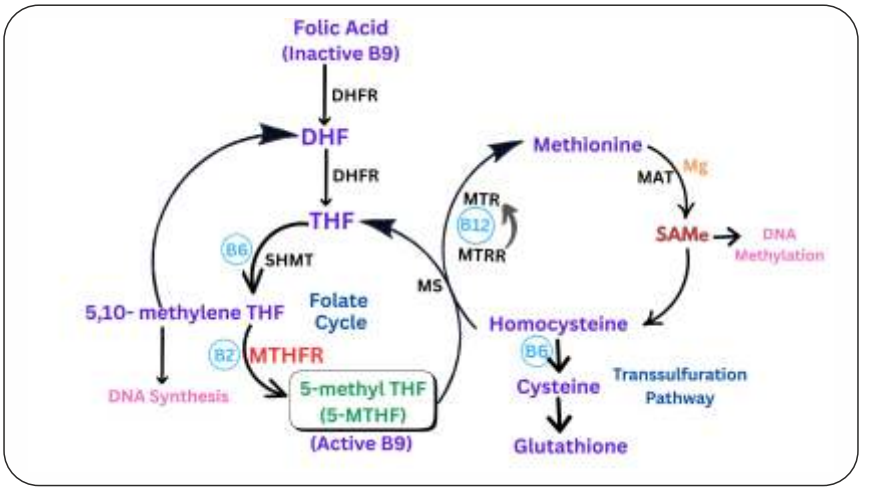


Figure 2: Folate Cycle

If there is MTHFR gene mutation, what is the treatment?

MTHFR gene mutation cannot be corrected. Therefore the treatment includes supplementation with active folate i.e. 5- MTHF or L- methyl folate. This can improve speech, anxiety, depression, attention and concentration, etc.

What is UMFA?

When the intake of inactive folic acid, especially from fortified foods or supplements, exceeds the metabolic capacity of the body, it can lead to unmetabolized folic acid (UMFA) buildup and cause negative effects. Many individuals with ASD have genetic variations in the MTHFR gene that can affect their ability to convert inactive folic acid to 5-MTHF, potentially leading to higher UMFA levels.

What are folate receptors and how does it facilitate folate uptake into cells?

Folate receptor (FRα) are proteins present on the surface of cells that help absorb methyl folate (active vitamin B9) from the blood. They play a crucial role in the uptake and transport of folate across the brain's protective layer (Blood Brain barrier). In a healthy brain, this active folate binds with this receptor and enters the brain and supports healthy growth, brain development and function.

What are folate receptor autoantibodies (FRAA), how do they impact folate receptor function and contribute to cerebral folate deficiency syndrome ?

In many children with autism spectrum disorder (ASD), there is disruption in folate receptor. The immune system produces antibodies that mistakenly target the body's own folate receptors. These antibodies are known as folate receptor autoantibodies (FRAA). Which interfere with the transport of active folate into the brain, resulting in cerebral folate deficiency (CFD) syndrome. This means that the brain doesn't receive the folate it needs, leading to limited speech development, behavioral and mood changes.About 70% of children diagnosed with ASD have autoantibodies against the folate receptor (FRα) resulting in low levels of folate within the brain despite normal levels in the blood. If a child is suspected to have symptoms of Autism, then Folate Receptor Autoantibody Test (FRAAT) is recommended.

What is the purpose of the FRAAT test and what does it measure?

FRAAT is a diagnostic blood test that screens for autoantibodies (Folate receptor autoantibodies) against folate receptors in the blood enabling early detection and intervention. A blocking assay and a binding assay are the two components of FRAAT. The FRAAT assays measure the quantity of binding and blocking antibodies that are present. FRAAT Test positive means there are antibodies to the folate receptor which are preventing active folate to enter the brain. The assays indirectly tell us whether folate (and its active form, 5-MTHF), is present in the brain. Treatment typically involves folinic acid (Leucovorin) supplementation which can correct the folate deficiency.

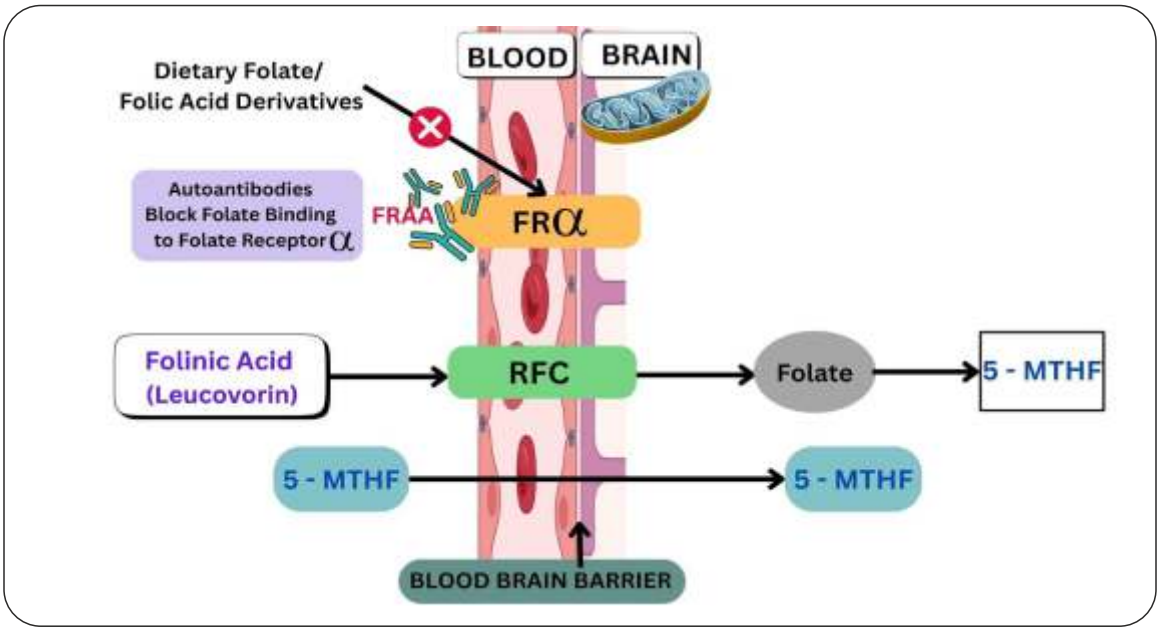


Figure 3: Cerebral Folate Transportation in Autistic Children

What is Leucovorin, and how does it help reduce symptoms of ASD?

Folinic acid (Leucovorin) is a naturally occurring vitamin derivative of folic acid. Even if the main alpha folate receptors are blocked by antibodies, folinic acid can enter the brain via a different channel using reduced folate carrier (RFC), allowing the brain to absorb the necessary folate. Leucovorin can restore folate level and neural functioning in the brain. In many studies, leucovorin has shown evidence, particularly for improving speech and communication in children with language delays, repetitive behavior, irritability and hyperactivity. During the first few weeks of treatment, the most frequently reported problem is increased hyperactivity. But this effect is usually temporary and goes away in 6 to 9 weeks. Initial hyperactivity can be lessened by starting with a lesser dose and increasing it gradually.

CHAPTER 10

NEUROTRANSMITTERS IN AUTISM

- Neurotransmitters and their functions
- Different types of neurotransmitters
- Understanding the effect of their imbalance in autism

What are neurotransmitters?

Neurotransmitters are tiny chemical messengers that help brain cells (neurons) talk to each other and to other parts of the body. They are very important for how we move, feel, think, learn, and even how we sense the world around us.

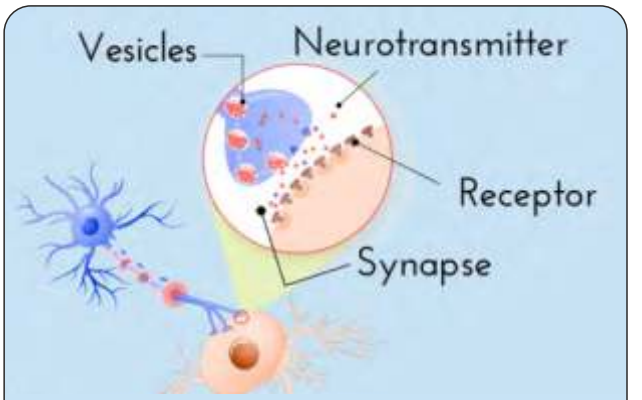


Figure 1: Neurotransmitters

Where are they found?

Most neurotransmitters are in the brain and spinal cord (called the central nervous system). They're also in other parts of the body, like the gut and immune system. Inside neurons, they're stored in small bubble-like sacs. When a neuron gets activated, it sends these chemicals to nearby cells to pass on messages.

What are their functions?

Neurotransmitters do a lot! They help with:

- Thinking and learning (like memory and solving problems)
- Emotions (like feeling happy, motivated, or stressed)
- Social interactions (like bonding and communication)
- Body functions (like heart rate, digestion, breathing, and sleep)
- Immune and gut health (which also affect brain function, especially in autism)

What are their implications in neurodevelopmental conditions like autism spectrum disorder (ASD)?

In autism, there is imbalance of certain neurotransmitters.. This can affect things like social skills, emotions, how the body processes sensory information, and repetitive behaviors.

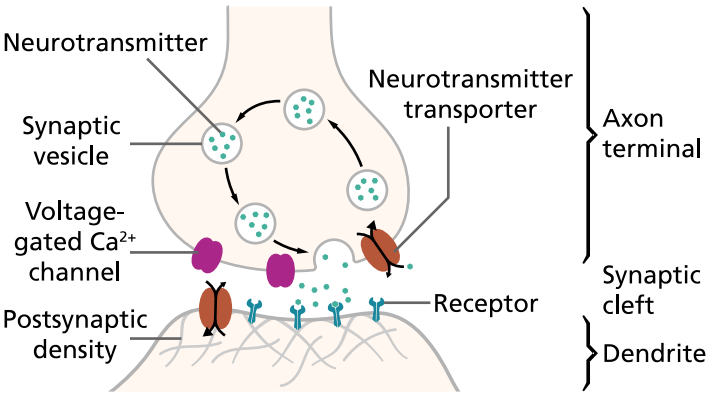


Figure 2 : Neurotransmission

Neurotransmitters and Their Functions :

Dopamine

What is dopamine?

Often called the "feel-good" chemical, dopamine helps with learning and forming habits.

Where and from what is it produced?
It's made in specific areas of the brain (substantia nigra and ventral tegmental area) and comes from the amino acid (which are proteins) tyrosine.

What is its primary function?
It makes activities feel rewarding and helps with motivation, movement, and learning.

What does dopamine imbalance in Autism lead to?
It can lead to low motivation, trouble with social interaction, attention issues, repetitive behavior, and sensory challenges.

Serotonin
What is serotonin?
Serotonin helps regulate mood, emotions, sleep, and digestion.

Where and from what is it produced?
Most of it is made in the gut (almost 90%), and some in the brain (raphe nuclei in the brain). It comes from the amino acid tryptophan.

What is its primary function?
It supports emotional well-being. Low levels can lead to anxiety or depression.

What does serotonin imbalance in Autism lead to?
It can cause sensory problems, social and communication difficulties, and rigid or repetitive behaviors.

GABA
What is GABA?
GABA calms the brain down—it slows things down when the brain is too active.

Where and from what is it produced?
It is made in the brain from another chemical called glutamate.

What is its primary function?
It helps with calmness, focus, sleep, and emotional control.

What does GABA imbalance in Autism lead to?
It may cause anxiety, sensory overload, hyperactivity, trouble with social cues, and seizures.

Norepinephrine
What is Norepinephrine?
It's a chemical that helps with alertness, stress response, and focus.

Where and from what is it produced?
Made in the brain (locus coeruleus) and adrenal glands, from dopamine

What is its primary function?
It helps us stay alert, manage stress, and control mood and heart rate.

What does norepinephrine imbalance in Autism lead to?
It can cause emotional outbursts, trouble focusing, anxiety, and sensory problems.

Epinephrine
What is Epinephrine?
Also known as adrenaline, it kicks in when we're stressed or in danger.

Where and from what is it produced?
Mostly in the adrenal glands, and a little in the brain. It's made from norepinephrine.

What is its primary function?
Prepares the body for action—raises heart rate, sharpens focus, and boosts energy.

What does epinephrine imbalance in Autism lead to?
It may cause anxiety, sleep problems, gut issues, and emotional meltdowns.

Histamine
What is Histamine?
It helps with wakefulness, digestion, and immune responses (like allergies).

Where and from what is it produced?
Made in the brain and immune cells, from the amino acid histidine.

What is its primary function?
It keeps us awake, helps digest food, and plays a role in allergic reactions.

What does histamine imbalance in Autism lead to?
It may cause sleep problems, hyperactivity, anxiety, gut issues, and picky eating.

Glutamate
What is glutamate?
It's the brain's main "go" signal—it excites brain cells to help them communicate.

Where and from what is it produced?
Made in the brain from the amino acid glutamine.

What is its primary function?
Helps with learning, memory, and processing sensory information.

What does glutamate imbalance in Autism lead to?
It may cause sensory overload, poor attention, hyperactivity, repetitive behavior, and seizures.

Acetylcholine

What is acetylcholine?
It helps with memory, learning, and controlling muscles.

Where and from what is it produced?
Made in the brain (basal forebrain and brain) and body from choline and a chemical called acetyl-CoA.

What is its primary function?
Supports thinking, focus, memory, and movement.

What does acetylcholine imbalance in Autism lead to?
It may cause a short attention span, memory problems, emotional struggles, and social difficulties.

Glycine
What is glycine?
It's both a calming neurotransmitter and an amino acid important for the brain and body.

Where and from what is it produced?
Made in the brain and liver from other amino acids, also found in food.

What is its primary function?
Helps with sleep, pain control, and motor function. Also supports learning and memory.

What does glycine imbalance in Autism lead to?
It may cause sensory issues, sleep problems, trouble with communication, and learning difficulties.

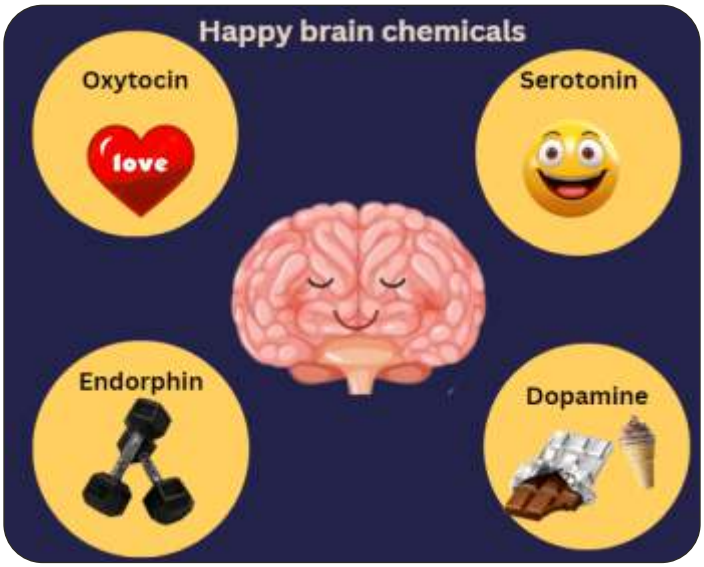


Figure 5 : Pictorial representation of factors/stimuli that increase neurotransmitters

Oxytocin

What is Oxytocin?

Called the "love hormone," it helps with bonding, empathy, and emotions.

Where and from what is it produced?

Made in the brain (hypothalamus) and released by the pituitary gland.

What is its primary function?

It supports trust, emotional connection, and social bonding.

What does oxytocin imbalance in Autism lead to?

It can cause emotional struggles, difficulty reading social cues, and repetitive behaviors.

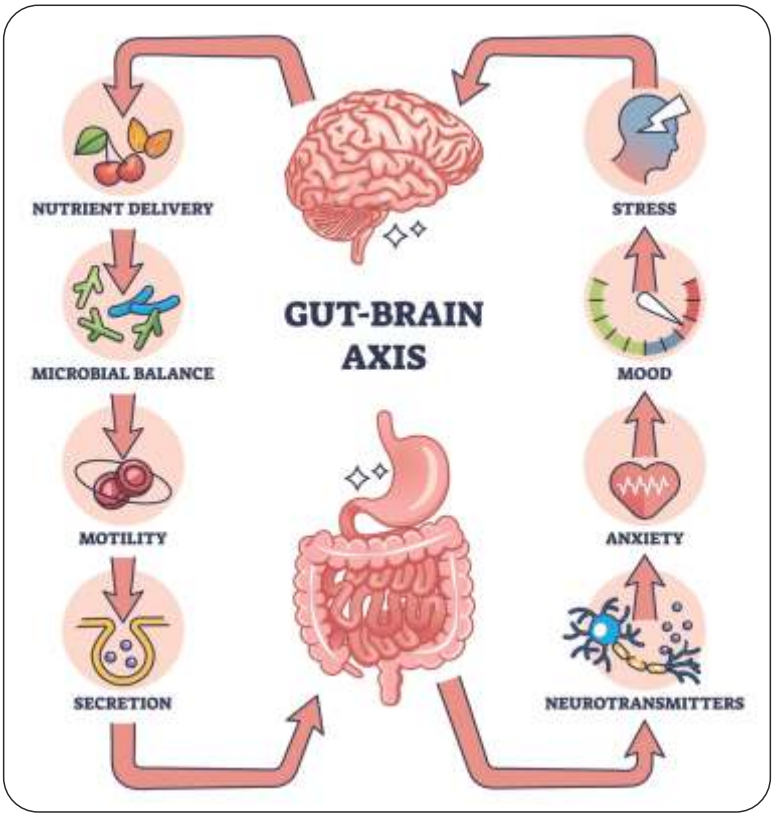


Figure 6 : Connection between brain and gut (Gut-Brain Axis)

Gut is also called second brain. All neurotransmitters are also produced in the gut by microbiomes. 90% of serotonin is made in the gut. Therefore any imbalance in the gut microbiome will lead to improper neurotransmitter production. Through the gut brain axis this will cause behavior symptoms. For more information on gut issues refer to chapter 8.

CHAPTER 11

INVESTIGATION

- Routine blood tests
- Micronutrient and vitamin Testing
- Food intolerance and Food allergy test
- Gene test

➢ Routine blood test

The routine blood investigation for children with autism spectrum disorder includes the following tests as Complete Blood Count (CBC), Serum electrolyte, Serum Creatinine, Liver Function Test (LFT), Thyroid profile, C Reactive Protein (CRP) test, and Blood sugar testing. These tests are part of your child's developmental and physiological assessment.

Routine blood tests in autism -

- Look for signs of diseases and health conditions such as diabetes, Anemia.
- Measure and monitor the liver functions and rule out jaundice.
- Check the child's kidney function.
- Check thyroid function for weight gain.

Figure 1: Routine blood tests in autism

➢ Micronutrient and vitamin Testing

- Check for Vitamin D, Vitamin B2 B6 & B12, Serum Calcium, Serum Magnesium, folic acid, Homocysteine ,Vitamin A , Zinc.
- Majority Autism children are deficient in Vitamin D, Vitamin B2 B6 & B12,Vitamin A.
- Also they have low levels of magnesium and zinc which can cause hyperactivity and low immunity.
- Folic acid levels are usually high because of MTHFR gene mutation.
- For more information on Vitamins refer chapter- Medical Management and alternate treatment

Food intolerance and Food allergies

➢ Organic acids test (OAT)

Organic Acid Test measures the nutritional and metabolic profile levels of organic substances in your child's urine that are normally formed as part of various vital biochemical pathways in the body. Failure of a particular pathway can result in either accumulation or degradation of its byproducts. It is used in children, especially newborns to check for rare inborn genetic defects of metabolism. In recent years it has been one of the most useful tests in children with autism spectrum disorder (ASD). It involves simple blood collection from the child's vein.

➢ The OAT test in autism patients,

- Shows dysbiosis, abnormal overgrowth of yeast and bacteria in the gut.
- Examine High oxalates in the GI tract which can also significantly reduce absorption of essential minerals such as calcium, magnesium, zinc, and others.
- Detecting formation of oxalate crystals in the eyes that can be a source of severe eye pain in autistic individuals who may exhibit eye-poking behaviors.
- Useful in screening of mitochondrial dysfunction, a reason for increased oxidative stress in autism
- Useful in understanding neurotransmitter levels.

➢ Heavy metal toxicity test

A heavy metal toxicity test is a group of tests that identify and quantify the amount of potentially toxic metals present in your child's blood, urine or in the hair and other body tissues or body fluids. The most often examined metals are lead, mercury, arsenic, and cadmium. Metals like copper, aluminum, zinc, and thallium are less commonly tested. According to clinical studies, there is a strong correlation between pathological illnesses and the concentrations of various elements in the hair, blood, teeth or urine, especially potentially poisonous metals like cadmium, mercury, lead, and arsenic.

Natural occurrences of heavy metals include the environment, certain foods, medications, and even water. Your child's body system can be exposed to them in several ways. They may be inhaled by you and your child, eaten, or absorbed through the skin. Heavy metal poisoning may result from an increased absorption of these metals in the child's body. Severe health problems brought on by heavy metal toxicity might include organ damage, behavioral issues, cognitive function problems, and issues related to memory.

In Autism there is chronic heavy metal toxicity and therefore blood test may not give accurate information. Hence urine challenge test needs to be done by an expert to give information about the actual cellular heavy metal toxicity.

➢ Gut microbiome test

The microorganisms that live in the body's digestive tract are referred to as the gut microbiome. The intestines, stomach, colon, and esophagus part of the Gastrointestinal (GI) system contain microbes that affect the digestion process of the body. Microbes of the gut include both healthy and unhealthy strains of

bacteria, as well as fungi, viruses, and parasites. It is important to maintain balance between good and bad microbe.In Autism there may be an imbalance which could exaggerate the symptoms. It is also crucial for maintaining the immune system's balance. The primary aim of the gut microbiome test is to examine the microbes and the potential imbalances in your child's Gastrointestinal (GI) system. The peripheral intestinal system of the body is also linked to emotional and cognitive centers of the Brain through Gut -Brain axis. Gastrointestinal issues are a common comorbidity in children with autism spectrum disorder. The manifestation of the primary symptoms of autism may be influenced by this malfunction.

The test identifies the variety of microorganisms, such as bacteria, archaea, viruses, and fungus, that are present within the gut and identifies the strain in which the child is deficient, so that beneficial bacteria can be further restored through treatment. It also provides clues for potential inflammatory conditions and dietary sensitivities in children with autism.

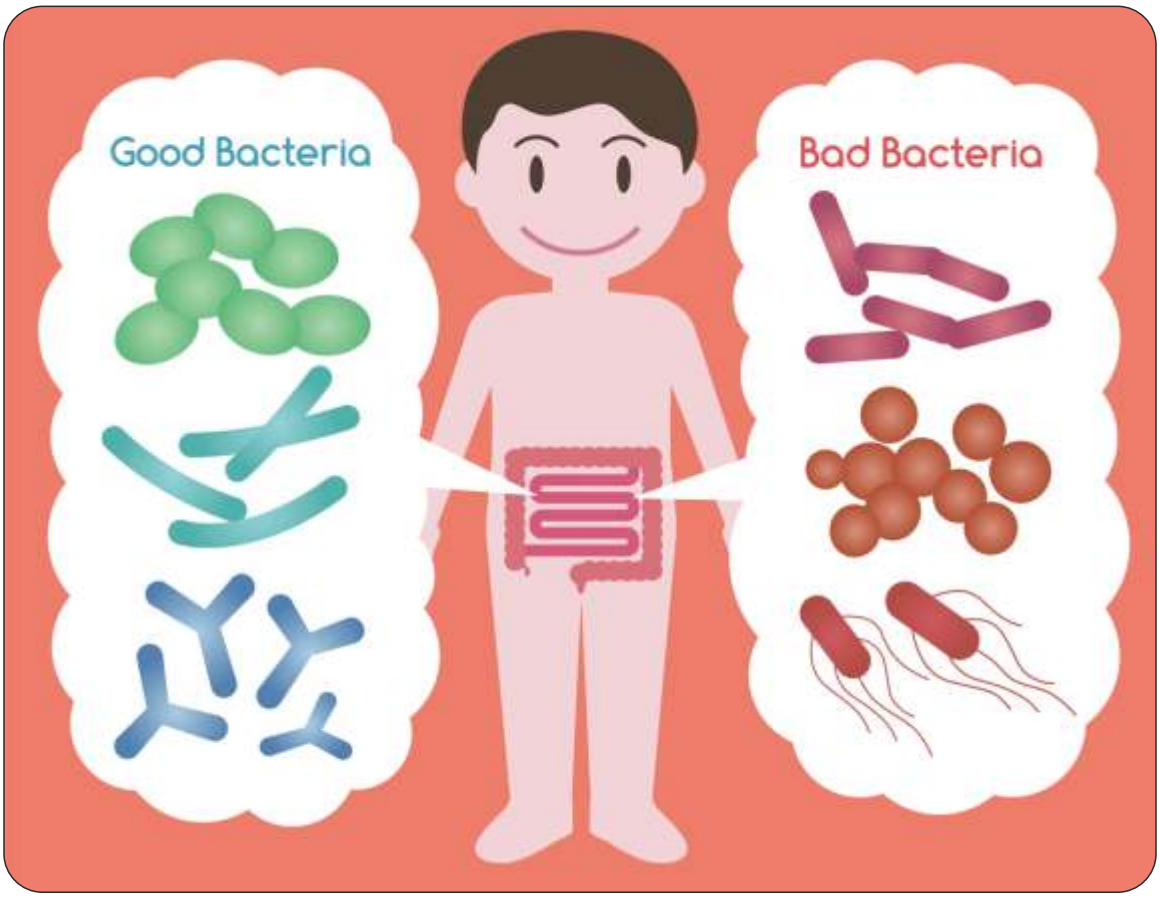


Figure 2: Gut microbiome test

The Food Intolerance Test

It is a diagnostic tool designed to help identify food sensitivities and intolerances. It employs cutting-edge Protein Microarray technology to detect food-specific IgG antibodies in the blood. This technology is a high-throughput platform that allows for the simultaneous screening of a large number of food antigens in a single sample including fruits, vegetables, grains, dairy, nuts, and meats.

This test provides a detailed profile of the body's immune response to different foods, allowing for a better understanding of potential food intolerances. Elevated levels of these antibodies suggest potential sensitivities to the tested foods, which may lead to symptoms like bloating, fatigue, headaches, digestive issues, and more.

How the Test Works:

- **IgG Antibodies:** When you eat a certain food, your immune system may produce IgG antibodies in response. These are part of the immune system and are linked to more long-term reactions, not immediate allergic responses.
- **Protein Microarray Technology:** The test uses a special tool called a microarray to look for antibodies that attach to specific foods at once.

Test Steps:

- Sample Collection: The test requires a blood sample, usually taken from a vein.

Food intolerance test will give information on which food items should be avoided and which ones can be safely consumed.

Food Allergy test :

A food allergy blood test, also called an allergen-specific IgE test, checks the amount of IgE antibodies in your blood. These antibodies are produced by your immune system when it reacts to certain foods, helping to identify possible food allergies.

Here's a simple breakdown:

- What it measures: The test looks for IgE antibodies, which your body makes when it reacts to something that causes an allergy.
- How it works: If you have a food allergy, your body produces more IgE antibodies in response to that specific food.

• Types of tests:

- Total IgE test: Measures all IgE antibodies in your blood.

- Specific IgE test: Measures IgE antibodies to a particular food.

How to interpret results: High IgE levels to a specific food could suggest an allergy. However, a positive result doesn't always mean you have an allergy, and more tests like an oral food challenge may be needed to confirm it.

Food allergies can give symptoms like rash all over the body or more severe reactions like swelling of lips ,tongue or breathing difficulties. So this test gives information on food items to be completely avoided.

• Investigations

Electroencephalograph (EEG)

EEG is a diagnostic procedure used to study electrical activity of the brain in an individual. It tracks and records electrical brain wave patterns. There is an identifiable pattern created by regular electrical activity in the brain. EEG aids medical professionals to find abnormal patterns that indicate seizures or other issues such as sleep disorders and behavioral disturbances. 50% to 80% of people with autism have aberrant brain activity, and 20% to 40% of them develop clinical seizures.

In autism, EEG helps-

- To detect any seizure activity in children
- To know location, type, and severity of seizure
- To detect typical seizures or absence seizures in children with ASD

Genetic testing and counseling

Genetic testing is a medical test that detects changes in the Deoxyribose Nucleic Acid (DNA) that may be caused due to mutations or variations of nucleotides. It assesses an individual's risk of disease, identifies possible inherited diseases and/or possibilities of genetic inheritance. Mutations in more than 100 genes are associated with ASD. A genetic test cannot diagnose or detect autism because numerous genes along with environmental factors may underlie the condition. Therefore, genetic testing in ASD can only look for causes and not be used as a diagnostic tool. Though children with ASD can be checked for genetic disorders that can cause ASD, including Fragile X syndrome and Rett syndrome.

Genetic counseling involves a counselor or a trained medical professional to guide and comprehend various ongoing medical concerns a guardian of autistic child is facing, which includes

- Explaining the genetic aspects of the disease to caregivers

- Clinical evaluation of the patient and assessment of family history
- Discussion of genetic testing options
- Interpretation of results
- Informing about medical treatments and prognosis and
- Communicate the risks of recurrence in sibling

Genetic counseling helps families of the patient with autism by allowing them to share emotional distress that, if neglected, can have a detrimental effect on quality of life.

Gene test :

Part A : Genetic Test for ASD

1. **Whole exon sequencing:** Whole-exome sequencing (WES) is an effective genetic test for detecting mutations in protein-coding regions of genes. It can detect mutations associated with autism spectrum disorder (ASD).

   KCTD13: A gene in the 16p11.2 region that has a major role in autism.

   SHANK3: Involved in social and communicative processes; associated with autism and behavioral problems.

   CNTNAP2: It controls behavior and contributes to the formation of neural connections in the brain that affect social behavior and language.

2. **Fragile X :** Fragile X syndrome (FXS) is a genetic condition and a known cause of autism spectrum disorder. An FMR1 complete mutation or other loss-of-function variant causes fragile X syndrome, which almost usually manifests in males. The disease is characterized by intellectual disability, developmental delay, and a range of behavioral problems.

3. **Rett Syndrome:** RTT is a severe neurodevelopmental condition that predominantly affects girls. It is associated with MECP2 gene mutations. RTT has a major impact on cognitive and motor abilities, making everyday tasks and communication difficult.

Part B:

1. **MTHFR gene testing:** A higher risk of ASD in almost 70 - 75 % children has been linked to two frequent gene variants in the MTHFR gene: C677T and A1298C, which are found on Exon 4 and Exon 7, respectively. An MTHFR gene test, a blood test, checks for common variations (mutations) in the MTHFR gene, which is involved in folate metabolism, and can indicate a higher risk of

certain health conditions. A mutation's heterozygous or homozygous status can be detected using the MTHFR test. An MTHFR gene test, a blood test, checks for common variations (mutations) in the MTHFR gene, which is involved in folate metabolism, and can indicate a higher risk of certain health conditions. (refer to chapter 8)

2. **Folate Receptor Autoantibody Test (FRAAT)** is a diagnostic blood test that screens for autoantibodies (Folate receptor autoantibodies) against folate receptors in the blood enabling early detection and intervention. The FRAAT assays measure the quantity of binding and blocking antibodies that are present. (refer to chapter 8)

CHAPTER 12

NEURO-IMAGING IN AUTISM

- Magnetic Resonance Imaging (MRI) in Autism
- Functional MRI (fMRI) in Autism
- Positron Emission Tomography-Computed Tomography (PET-CT) scan in Autism

Radiological Investigations

1. Magnetic Resonance Imaging (MRI)

MRI is a noninvasive scanning technique that provides the basic anatomical structural changes of the brain. Functional abnormality cannot be detected by MRI. Although most autistic children are found to have normal brain anatomy, it helps to detect any structural anomalies of the brain, presence of tumors or cysts, hypoxic ischemic encephalopathy, or infections or tuberous sclerosis. It also helps to establish the prognosis and is useful for medical management.

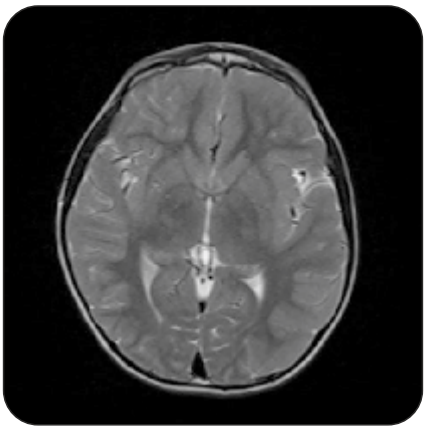


Figure 1: Magnetic Resonance Imaging (MRI) scan

2. Functional MRI (fMRI)

fMRI studies reveal brain activity through the measurement of metabolic changes in the blood flow, blood volume and blood oxygenation. fMRI shows the active part of the organ along with its anatomy. The behavioral issues associated with autism are due to neurobiological dysfunction. It is used to study the aberrant neurobiological functions of the brain, which indirectly measures the neuronal activation of cognitive, motor, sensory, or emotional tasks. Though fMRI provides valuable information, the use of this as a monitoring tool in children with autism is practically not feasible.

3. Positron Emission Tomography-Computed Tomography (PET-CT) scan

PET-CT scan is a painless nuclear medicine imaging test that demonstrates brain functioning. MRI may not be able to detect the functional abnormalities in the brain function as in autism structure of the brain may be normal. Hence, PET-CT scanning is used for functional measurement. It provides an insight into the metabolism and regional activity of the brain. It works on the principle that changes in the cellular metabolism is associated with the activity of the nervous tissue. In autism, most observed abnormalities are that some brain regions show increased uptake (Hypermetabolism) and some brain regions show decreased uptake (Hypometabolism). Areas that commonly show hypometabolism in autism are Mesial Temporal Lobe, Cerebellum, Thalamus, Orbito frontal cortex and Hippocampus (Figure).

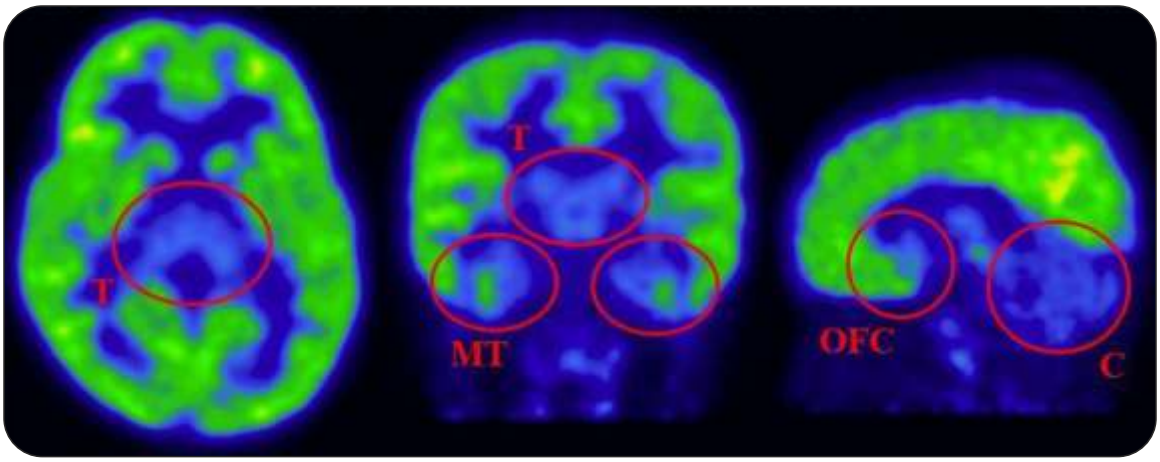


Figure 2: PET-CT Scan image of a child with Autism showing hypometabolism in Thalamus (T), Mesial Temporal Lobe (MT), Orbito Frontal Cortex (OFC) and Cerebellum (C).

Which areas of the brain are related to which symptoms of autism?

Brain Region	Associated Skills
Amygdala	Emotional response, Affection, Social skills, Behavior regulation, Non-verbal communication, Conveying needs, fear response, memory modulation
Angular Gyrus	Recognizing numbers, Comprehension, Reading, Spatial awareness
Calcarine Cortex	Visual perception, Eye contact, Identifying objects
Caudate Nucleus	Learning routines, Habit formation, Behavior
Cerebellum	Gross/fine motor, Hand-eye coordination, Bilateral coordination, Sitting tolerance, Vestibular, Gravitational security
Anterior Cingulate Cortex	Impulse control, Behavior, Emotional regulation, Command following, Decision making
Middle Cingulate Cortex	Attention, Response to name, Cognitive control, Pain processing

Posterior Cingulate Cortex	Memory, Self-awareness, Orientation of time
Cuneus	Visual attention, Reading, Object identification
Inferior Frontal Gyrus (Opercularis)	Speech, Repeating words, Vocabulary, Expressive skills, Non-verbal communication, Conveying needs
Inferior Frontal Gyrus (Orbitalis)	Social interaction, Play behavior, Adaptability
Inferior Frontal Gyrus (Triangularis)	Language understanding, Comprehension skills
Medial Orbital Part of the Frontal Lobe	Emotional regulation, Affection, Behavioral response, reward-based decision making
Middle Frontal Gyrus	Attention, Concentration, Problem solving, Adaptability, Solve puzzles
Middle Orbital Frontal Gyrus	Behavior control, Value-based decision making, Bathing, Dressing
Superior Frontal Gyrus	Higher cognitive functions, self-awareness, comprehension
Medial Superior Frontal Gyrus	Motor planning, Social behavior, Motivation, Play behavior
Superior Orbital Frontal Gyrus	Behavior, Impulse control, Hyperactivity reduction, Inhibitory control
Fusiform Gyrus	Face recognition, Object recognition, Reading
Heschl's Gyrus	Auditory processing, Respond to name, Speech perception
Hippocampus	Memory, Orientation of time, Learning new routines
Insula	Sensory issues, Gustatory response, Emotional awareness, Non-verbal communication, Interoception, conveying needs

Lingual Gyrus	Reading, Visual identification
Inferior Occipital Gyrus	Visual, Object identification
Middle Occipital Gyrus	Visual attention, Motion tracking
Superior Occipital Gyrus	Understanding positions (up/down), Visual spatial awareness
Olfactory Cortex	Smell identification (indirectly ADLs, Grooming)
Pallidum	Motor control, Movement coordination
Paracentral Lobule	Gross motor skills, Physical movement
ParaHippocampal Gyrus	Memory encoding, scene recognition, Contextual understanding
Inferior Parietal Lobule	Recognizing numbers, Language processing, Identifying body parts, Bathing, Dressing, Spatial awareness
Superior Parietal Lobule	Perceptual skills, Tactile/Vestibular, Visual spatial tasks, Gravitational security
Postcentral Gyrus	Primary somatosensory cortex, Tactile response, Sensory evaluation
Precentral Gyrus	Voluntary movement, Fine motor control, Writing, Bathing, Dressing
Precuneus	Self-reflection, Episodic memory, Imaginative play, Solve puzzles
Putamen	Motor planning, Routine actions, Bathing, Dressing
Rectus Gyrus	Social understanding, Affection
Rolandic Operculum	Somatosensory integration, Speech articulation, Imitation of sounds

Supplementary Motor Area	Motor tasks, Coordination, Bimanual tasks
SupraMarginal Gyrus	Speech development, Empathy, Social behavior
Inferior Temporal Gyrus	Identifying objects, Memory
Lateral Temporal Cortex	Speech, Auditory response
Medial Temporal Cortex	Memory, Learning
Middle Temporal Gyrus	Vocabulary, Comprehension, Gravitational insecurity, Semantic memory
Middle Temporal Pole	Social skills, Understanding gestures, Non-verbal communication, Conveying needs
Superior Temporal Pole	Emotional expression, Social awareness
Superior Temporal Gyrus	Speech, Listening skills
Thalamus	Attention, Sensory processing, Behavior filtering

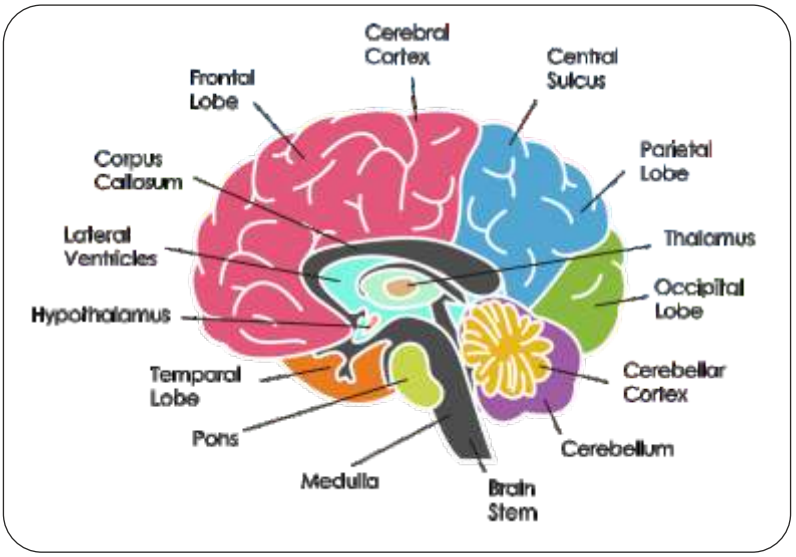


Figure 3: Parts of Brain

SECTION B

THERAPEUTIC INTERVENTIONS

CHAPTER 13

SENSORY INTEGRATION

- Sensory Diet
- Sensory Input
- Emotional Regulation

"Sensations are food for the brain"- Dr. Jean Ayres

What is Sensory Integration?
What is Sensory Integration Therapy?
What is a Sensory diet?
What are the signs of Sensory overload?

SENSORY INTEGRATION is an innate neurobiological process that refers to the interpretation of sensory stimulation from the environment by the brain. Sensory integration focuses primarily on the three basic senses--tactile, vestibular, and proprioceptive.

One such model for sensory integration was developed by Dr. A. Jean Ayres, an

American occupational therapist, and educational psychologist. The crux of the model is to produce sensations through physical tasks that lead to adaptive responses, and consequently, to even more complex responses. In the case of children, the intervention is based on play, allowing the construction of sensory experiences and the planning of actions with guided and growing challenges.

What is Sensory Integration Therapy?

Sensory integration is how the brain appropriately processes sensory information we receive from our senses throughout the day, organizing and responding to it. It helps us move and interact with our environment in a safe manner and optimize learning. Sensory integration is important for all tasks we do. Sensory integration therapy involves providing controlled and meaningful sensory experiences so that the child can spontaneously and appropriately form responses to connect with their surroundings.

An occupational therapist provides sensory integration therapy. A Sensory diet can be followed up at home. Every child varies in their sensory needs. Some may seek more sensory input, and others may need to have their sensory input reduced. Similar to an individual's nutritional needs, a sensory diet consists of specific essentials planned to meet the child's sensory integration needs.

What is a Sensory diet?

A Sensory Diet is planned to give each child the sensory input that he or she requires regularly through-out the whole day to make it easier for them to participate fully in whatever they are doing. Children need their sensory needs met all day long so a sensory diet plan has to be carefully distributed throughout the day.

A Sensory diet will help make learning more fun; helping kids pay more attention; provide the needed sensory input and act as a bridge to fill the gap whenever there is a break in therapy. Parents consult with your occupational therapist regularly to make sure the diet that you are using is age appropriate and is still fitting your child's sensory needs.

Following are samples of activities which can be included in the diet:

Vestibular input:

It is movement based input like swinging, jumping, hanging, hanging upside down, rolling, etc.

Vestibular equipment

- Calming - slow rhythmic input, e.g. rocking, swinging, Slow linear gliding.

Vestibular equipment

- Alerting - fast unpredictable movements- like arrhythmic swinging in different direction; sliding, jumping

Note:- Never force movement; if your child has vestibular or movement sensitivities, please work closely with the child to recognize and prevent signs of nervous system overload. (Mentioned at the end of the chapter)

Different types of movement chairs

Different types of swing

Different types of swing

Proprioceptive input

- It is sensations from joints, muscles and connective tissues like pushing and pulling heavy objects, deep pressure activities, squeezing. It has a calming and organizing effect. Its input can have a lasting effect for up to two hours. When in doubt, always choose proprioceptive activities.

Proprioceptive activities

Proprioceptive activities

- Playing with therapy putty
- Playing tug-of-war
- Carrying, pulling and pushing –can use a weighted cart, box, or laundry basket
- Carrying heavy items –groceries, boxes, books
- Mopping / sweeping
- brushing
- Slow stroking
- Being swaddled
- Using weighted items (vests, blankets, lap pad)
- Medicine ball games Push or pull basket with objects, toys or books in it
- Play "magic carpet"- pulling another child/adult while the person is sitting on a bedsheet
- Pillow fight
- Army crawl and animal walks

- Wheelbarrow walk

Equipment to provide Deep pressure

Tactile input:

There are different types of texture input through touch. Some examples include play with play doh, slime, gel, kinetic sand, paint, shaving cream, rice, flour.etc.

- Alerting - light touch, unexpected touch, cool or cold temperatures, and new objects.
- Calming - firm touch, warmth, familiar objects, deep touch and hugs.
- Regulating - fidget toys, fur blankets, contact with others.

Tactile activities

Tactile activities

Note:- Do not force a child to touch something they don't like. Gradual exposure and use of assistance like a paintbrush, stick, gloves, or even a toy will be instead helpful.

Auditory input:

It include hearing and listening like listening to music or songs

- Alerting - new, loud, varies in rhythm sounds or voice.
- Calming - familiar, soft, follows a rhythm sounds or voice.

Auditory activities

Visual input :

It involves making eye contact, processing what is seen with the eyes and interpreting visual input.

- **Alerting** - bright lights, contrasting colors, unexpected movement of lights;

Conflicting visual patterns.

- **Calming** - not changing, predictable, dim lights; Complementary visual patterns, Playing in an indoor tent.
- **Regulating** – visuals, less clutter, no distractions.

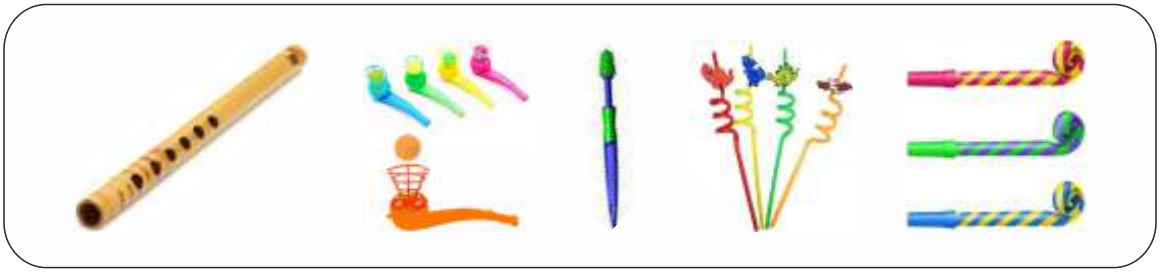
Visual activities

Gustatory input:

It is the oral input in form of edibles and non edibles

- Alerting - crunchy , cold, sour, spicy, minty foods; Blowing on whistles
- Calming - warm, smooth, sweet.
- Regulating - chewy tubes, chewing gum, sucking through a straw, blowing bubbles, deep breathing.

Variety of chewies for oral motor stimulation



Oral motor activities

Olfactory input:

It is the sense of smell and is closely connected to the taste system

- **Alerting** - citrus, peppermint smells.
- **Calming** - lavender, vanilla smells.

Sensory input may have a different impact on different individuals. Being aware of the environment and how it may be affecting your child can be a key to understanding their needs. Observe how sensory input or activities help your child feel alert, calm or help them concentrate. This will enable you to form a most appropriate sensory diet suiting all your kid's needs.

What are the signs of Sensory overload?

Sensory overload signs:-

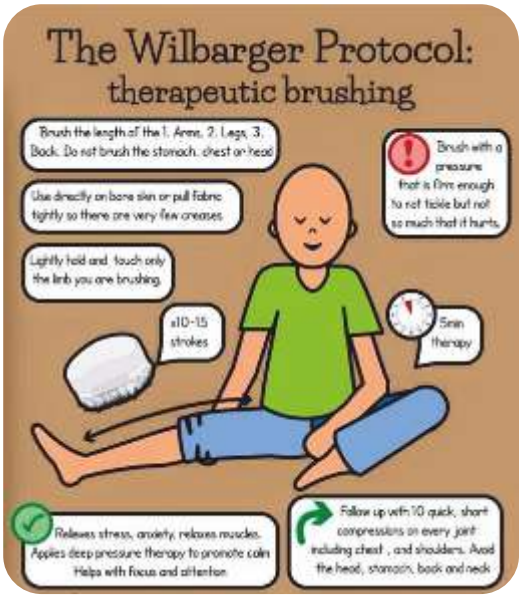
If you notice the following signs in your child post stimulatory activities/stimulation, kindly stop the given activity and instead give proprioceptive activities which are safe inputs and have a dampening effect on other systems. If the environment is over stimulating then taking your child out of the environment will help and a meltdown can be avoided.

- Appears to over excited or sensitivity more than normal during or following an activity
- Becomes increasingly distracted, disoriented, or confused

- May feel nauseous or vomits
- Sudden paleness / flushed, sweaty, or clammy skin
- Quick breathing or slower shallow breathing
- Tremors
- Yawning
- Drowsiness/fatigue
- Sleeplessness
- Irritability and/or angry outbursts
- Makes poor eye contact
- Covers eyes around bright lights
- Closes ears to avoid loud sounds or voices

A sensory diet is best planned by the family and therapist together. Both must work together to successfully implement a sensory diet, to support the child's performance in various environments.

Alternate Programs for Self-Regulation:



- **Therapressure Programme (earlier called Wilbarger Protocol)**

The Wilbarger Therapressure Program™ makes use of deep pressure touch and joint proprioception to reduce sensory defensiveness. Deep pressure touch input is applied to precise areas of the body (including the hands, arms, back, legs and feet) using a Therapressure brush. It is followed by joint proprioception or compression input to the joints in the shoulders, elbows, hands, hips, knees and ankles.

- **Alert programme**

This program facilitates a child to think about how they feel. It uses the idea of a car engine to teach children about self-regulation, i.e. sometimes it runs high (hyper, overexcited, wild, out of control, angry, afraid), low (sluggish, low, tired, sad), or

'just right' (happy and easy to learn, play, get along with others and have fun). Children can use the sensory diet activities to change the speed of their engine and maintain balance at just the right speed.

- **The Zones of Regulation**

Zones of Regulation is a program used to support the maturation of self-regulation in children. How the child feels and the states of alertness they are experiencing are categorized into four colored zones as follows:

The Zones of Regulation

Sensory diet activities are helpful to move the child in the green zone.

- **The Incredible 5-Point Scale**

This helps a child understand their emotions and behaviors. It teaches and guides children how to cope in different social situations.

CHAPTER 14

REFLEX INTEGRATION

- Primitive Reflexes
- Reflex Integration

What are Primitive Reflexes ?

Infants have a number of rudimentary responses during normal development, such as the Moro reflex, the rooting reflex, or the Babinski. As a child's brain development advances, these reflexes which aid in the infant's response to external stimuli should integrate (fade).

The process by which newborns' rudimentary reflexes / automatic movements are incorporated into increasingly sophisticated voluntary motor control is known as reflex integration.

As the brain develops normally, these reflexes progressively diminish; enabling greater deliberate control over movement.However, some of these reflexes might not integrate correctly or might stay more active in people with autism spectrum

disorder (ASD), which could have an impact on social interaction, motor control, and sensory processing.

How reflex integration relates to Autism?

As the child's nervous system develops, these reflexes, which aid the infant in responding to external stimuli, should integrate .

Motor development-

Some of these reflexes may endure in autistic children, which could hinder their ability to coordinate and perform more complex motor abilities and the development of motor skills. Lack of integration in reflexes can impair balance, coordination, and the capacity to execute more intricate actions.Things like handwriting, tying shoes, and using utensils that call for fine or gross motor skills may be difficult for kids with autism.

Sensory processing -

Sensory processing is frequently linked to primitive reflexes. These reflexes, if they continue, may be a factor in sensory sensitivities or sensory seeking behaviors that are frequently observed in autism .A child that has an unintegrated Moro reflex, for instance, may be extremely sensitive to loud noises or abrupt movements.

Social Interaction and Emotional Control:

Emotional control and social actions are associated with some of the primordial reflexes. For instance, a child with a preserved Moro reflex may experience increased stress reactions or trouble controlling their emotions, which may affect their social skills and capacity to interact with others.

What is Reflex Integration Therapy?

Reflex integration therapy focuses on assisting autistic children in integrating these reflexes. This consists of-

Neuro developmental Therapy:

These treatments could consist of activities that aid in the integration of primordial reflexes. Neuro developmental therapy seeks to enhance brain growth.

Occupational therapy:

In order to enhance motor skills and sensory processing, occupational therapists may apply reflex integration techniques to sensory-motor exercises.

Movement based interventions:

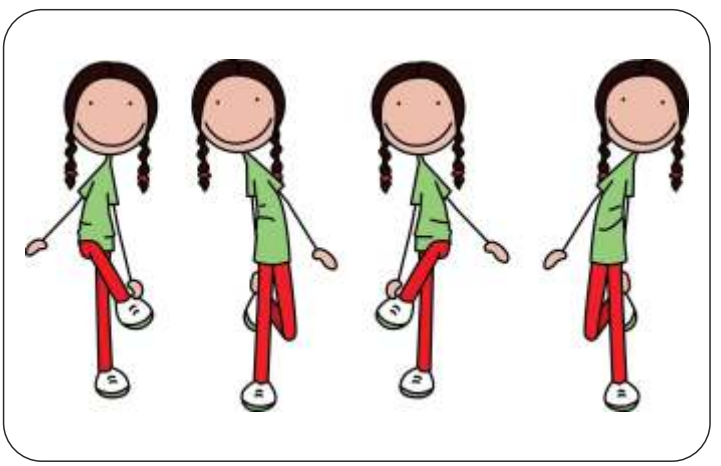
To help integrate reflexes and encourage improved coordination and body

awareness, exercises including rhythmic movement patterns, balance, and coordination are occasionally employed.

In conclusion, treating retained reflexes can be a component of a comprehensive strategy to support a kid with autism, even though reflex integration is not the main focus of treatment for this condition. It might aid in social interaction, emotional control, motor skill development, and sensory sensitivity reduction. Working with an occupational therapist or other specialist to evaluate and offer focused interventions can be helpful if you suspect reflex integration problems in a child with autism.

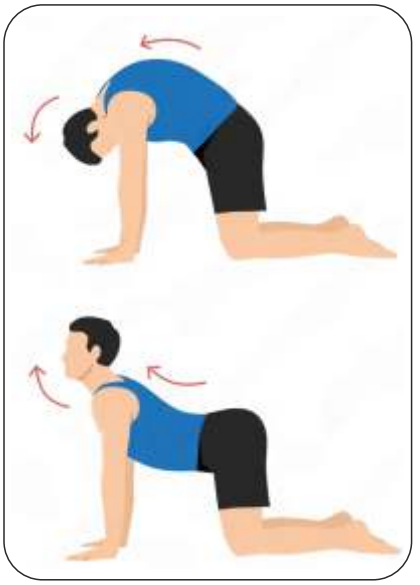
ATNR Reflex-

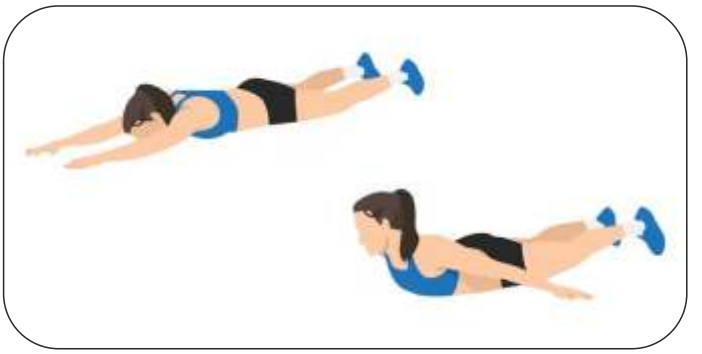
ATNR integration exercise – Cross Crawls, Marching in one place.



STNR reflex –

STNR reflex integration exercises- Cat- cow pose, Snow angels pose.





CHAPTER 15

BEHAVIOR MODIFICATION

- ABA
- ABC tracking
- Prompts
- Managing inappropriate Behaviour

What is Applied Behavioral Analysis (ABA) ?

Applied Behavior Analysis (ABA) is a scientific and evidence-based intervention designed to support individuals, particularly those on the autism spectrum. It is grounded in the principles of learning and reinforcement. Research has shown that ABA can lead to significant improvements in areas such as language development, social interaction, intellectual functioning, and daily living skills.

ABA focuses on analyzing current behaviors by collecting data and syatically teaching, modifying, or replacing behaviors to reduce problematic patterns and promote positive outcomes. It is not only effective in managing challenging behaviors but also plays a vital role in skill acquisition. Techniques such as reinforcement and punishment are commonly used within ABA to shape and encourage desired behaviors.

Figure 1: Applied Behaviour analysis

How to analyze behaviour ?

Behavior is analyzed using the three-term contingency, commonly known as the ABC model.

- **A** stands for **Antecedent**, which refers to what happens before the behavior—this includes any events, conditions, or triggers that may motivate or lead to the behavior of interest.
- **B** stands for **Behavior**, which describes the specific actions or responses demonstrated by the individual. It helps us identify and define what the behavior looks like when it occurs.
- **C** stands for **Consequence**, which refers to what happens after the behavior—this includes the outcomes or responses that may influence whether the behavior is likely to occur again in the future.

Understanding the ABC model is essential in behavior analysis, as it helps identify patterns and guides effective intervention strategies.

ABC DATA TRACKING

Student:	Date:	Duration:
A- Antecedent What happened before?	B- Behavior What inappropriate behavior happened?	C- Consequence What happened after?
❑ Asked to do something	❑ Noncompliance	❑ Verbal redirection
❑ Told No/ denied access	❑ Physical aggression	❑ Called for assistance and removed
❑ Attention given to others	❑ Screaming/ tantrum	❑ Ignored problem behavior
❑ Transition	❑ Throwing objects/ destroying property	❑ Guided compliance
❑ On going behavior interrupted	❑ Running away	❑ Time-out (duration: .....)
❑ Other:	❑ Other:	❑ Other:

Figure 2: ABC tracking

What is reinforcement ?

Reinforcement is a fundamental concept in the field of behaviorism. It refers to the process by which behaviors are learned and shaped through the consequences that follow them. For example, a child may clean his room because he received candy the last time he did it. Reinforcement is an essential tool for developing and modifying behavior, as it involves either presenting or removing a stimulus to increase the likelihood of a behavior occurring again in the future.

Reinforcement can be **positive** or **negative.**

- **Positive reinforcement** involves presenting a desirable stimulus after a desired behavior is exhibited, making that behavior more likely to occur in the future. *Example: A mother gives chocolates to her son when he puts his toys back in the cupboard.*
- Negative reinforcement involves removing an aversive stimulus after a desired behavior is exhibited, which also increases the likelihood of that behavior happening again. *Example: A child puts his toys back in the cupboard to avoid solving puzzles he dislikes.*

Figure 3: Reinforcement

What is punishment?

Punishment is another key principle in Applied Behavior Analysis (ABA), aimed at reducing or modifying challenging behaviors. It involves delivering a consequence immediately after the occurrence of a behavior, with the goal of decreasing the likelihood of that behavior occurring again in the future. *For example: A child may avoid touching any object emitting smoke after experiencing a burn from touching a boiling pot of food.*

Punishment can be **positive** or **negative:**

- **Positive punishment** involves presenting an aversive consequence following an undesirable behavior, thereby reducing the chances of the behavior reoccurring. *Example: A child who displays aggressive behavior toward peers is required to complete*

two pages of a disliked worksheet as a consequence.

- **Negative punishment** involves removing a desirable stimulus after an undesirable behavior is exhibited, which also decreases the likelihood of that behavior happening again. *Example: A child who screams after receiving a favorite toy has their playtime with that toy reduced as a consequence.*

Figure 4: Punishment

What is Discrete Trial Training (DTT)?

Discrete Trial Training (DTT) is an instructional method grounded in the principles of **Applied Behavior Analysis (ABA)**. It is a **structured teaching technique** that breaks down complex skills into smaller, manageable steps and teaches them in a syatic, step-by-step manner.

For example, if we want to teach a child to identify the color **red,** the process might look like this:

1. **Antecedent (Instruction):** The therapist gives a clear prompt, e.g., *"Touch red."*
2. **Behavior (Response):** The child touches the red card.
3. **Consequence:** The therapist provides positive reinforcement, such as saying *"Good job!"* and giving a small reward.
4. **Inter-trial Interval (Pause):** A brief pause is given before the next trial begins.

DTT involves **repetitive practice**, using **reinforcement** to strengthen correct responses and **error correction** to guide learning. For instance, if the child touches the blue card instead of red, the therapist will prompt or guide the child toward the correct response, helping them learn through correction and support.

Figure 5: Discrete Trial training

What is Early and Intensive Behavioral Intervention (EIBI)?

Early and Intensive Behavioral Intervention is an **Applied Behavior Analysis (ABA)**-based program designed specifically for **toddlers under the age of five.** The primary goal of EIBI is to address and modify **challenging behavioral patterns** that may arise during early development. Research suggests that if left unaddressed, these behaviors can lead to **psychological, social, and emotional difficulties later in life.**

EIBI is particularly effective for **children on the autism spectrum,** who often exhibit problematic or socially limiting behaviors. The intervention focuses on creating **individualized behavior plans,** which are developed based on thorough data collection and analysis of the child's behaviors.

Key features of EIBI include:

- Use of Discrete Trial Training (DTT) to teach new skills in a structured manner.
- A supportive, interactive environment between the child and therapist.
- 20 to 40 hours of therapy per week, tailored to the child's specific needs.
- Supervision and guidance by a trained ABA professional.

EIBI not only aims to reduce negative behaviors but also supports the development of communication, social, and daily living skills, setting a strong foundation for future growth.

Figure 6: EIBI

What is the Early Start Denver Model (ESDM)?

The **Early Start Denver Model (ESDM)** is an evidence-based early intervention approach designed for **young children with autism,** typically between the ages of 12 and 48 months. It is rooted in research on **typical infant development,** while also accounting for how **autism symptoms** can impact a child's behavior and learning.

ESDM integrates **Applied Behavior Analysis (ABA)** principles with **developmentally appropriate practices.** A core focus of the model is on building **warm, positive relationships,** encouraging caregivers and therapists to interact with the child with **care, sensitivity, and responsiveness.**

Key features of ESDM include:

- Teaching through play-based activities, daily routines, and naturalistic interactions.
- Emphasizing both verbal and non-verbal communication.
- Developing individualized goals based on the child's developmental milestones.
- Involving the entire family in the planning and implementation process.
- Training parents and caregivers to incorporate ESDM techniques into everyday activities such as bathing, eating, and playing.

By embedding learning opportunities into meaningful moments, ESDM fosters social, cognitive, and communication development in a natural and supportive environment.

Figure 7: Early Start Denver Model

What is Naturalistic Environment Training?

Naturalistic Environment Training (NET) is a contemporary approach within **Applied Behavior Analysis (ABA)** that takes learning beyond the structured classroom and into the child's **everyday environment.** NET is built on the idea that **children learn best in natural settings**—where they feel comfortable, engaged, and motivated.

Rather than relying solely on formal instruction, NET focuses on using **real-life situations and spontaneous moments** as teaching opportunities. This makes learning more relevant and meaningful to the child. Whether it's during playtime, mealtime, or community outings, NET integrates skill-building into **authentic daily routines.**

Key features of NET include:

- Teaching in **natural contexts** that are familiar to the child
- Using the child's **interests and motivations** to guide learning
- Promoting **generalization of skills** across various people, settings, and tasks
- A **flexible and individualized approach** that adapts to each child's needs

NET empowers children to apply what they've learned in real-world situations, making skills more functional and long-lasting.

Figure 8: NET

What is Pivotal Response Training (PRT)?

Pivotal Response Training is a **natural form of teaching** based on the principles of **Applied Behavior Analysis (ABA).** It is a **child-centered** and **empirically approved** method designed to support children on the autism spectrum. PRT focuses on teaching **four fundamental (pivotal) skills,** which help the child **master other related skills more efficiently.**

The four pivotal areas include:

- **Motivation**
- **Initiation**
- **Responding to multiple cues**
- **Self-management**

It uses the child's interests and preferences, creating a suitable and engaging environment for learning.PRT leads to secondary gains by encouraging the development of new, related skills without the need for structured teaching. The approach promotes natural learning, making it both effective and enjoyable for the child.

What is Focused and Comprehensive Applied Behaviour Analysis ?

	Focused Applied Behaviour Analysis	Comprehensive Applied Behaviour Analysis
Definitions	Targets treatment of a specific behaviour of interest	involves treatment of multiple domains of development
Time per week	10-25 hours a week	30-40 hours a week
Scope of treatment	Narrow- Targets one behaviour or skill	Broad- Targets developmental domains e.g., cognition, ADLs
Examples of Goals	- Reduce aggression - Toilet training - Teach requesting	• Improve language • Increase play and social skills • Reduce challenging behaviors

What is Prompting ?

Prompts are cues or hints that aid the learner in responding to a question or instruction. Prompts are given after the instruction has been delivered and right before the child responds. Prompts are given in order to ensure the child responds appropriately to the instruction. Prompts can be response or stimulus prompt

Response prompt	**Stimulus prompt**
Assistance given to the **learner's behavior** to help produce the correct response	A cue added or altered in the **stimulus** to help the learner respond correctly
Response prompt acts on the **behavior** (during or right after the stimulus)	Response prompt acts on **antecedent** (before the behavior)
Examples of response prompts includes physical guidance (hand-over-hand), Modeling the response, Verbal prompts, Gestural cues	Examples of stimulus prompt includes highlighting the correct option, enlarging the correct picture, placing the correct object closer

Figure 9 & 10: Prompting

What is the Token economy and Behavioural contract?

Token Economy is a behavioral modification technique that uses tokens as a medium of reinforcement to encourage positive change in the behaviour of interest. Token economy allows children to earn tokens (stickers, stars) for displaying the desired behaviour or skill and then exchanging the tokens for the final reward. For instance, on finishing each task from his morning routine Alex earns a star and after collecting 8 stars he can exchange it for 10 minutes of TV time. Token economy is used to develop discipline and teach responsibility for personal tasks.

Figure 11: Token Economy

Behavioral Contracts are used with individuals who have mastered the token economy system. Behavioral contracts are made between the individual in therapy and their therapist, parent, sibling, and teachers. The contract specifies the desired behavior, mentions the mastery criteria, acceptable level of completion, the reward and the reinforcement system (i.e., token economy). Behavioral contracts come with a record form where the frequency, intensity, and quality of task completion is noted. Behavioral contracts help with developing self management, self discipline, independence, and self-motivation.

What is Shaping ?

Shaping is an operant conditioning procedure (i.e., learning through reinforcement and punishment) used to teach complex new skills. The target behavior is broken down into small, manageable steps, and only one step is taught and reinforced at a time. Once the chosen step is mastered, the therapist moves on to teaching the next step in the sequence. For example, when teaching a child to make a sandwich, the first step—collecting the necessary materials—is taught and reinforced, while assistance is provided for the remaining steps. Once this step is mastered, the focus shifts to the next step, such as cutting the vegetables, and so on.

What is Chaining?

Chaining is an instructional method used in Applied Behavior Analysis (ABA) to help individuals learn multi-step and complicated tasks by dividing the task into smaller and manageable steps. Each step of the chain acts as a prompt for the next action and reinforcement is given to the learner as they master each step. There are three main types of chaining: forward chaining (teaching steps from the beginning), backward chaining (teaching steps from the end), and total task chaining (teaching all steps at once). Chaining is especially useful for teaching daily living skills such as brushing teeth, dressing, or making food, by building independence over time.

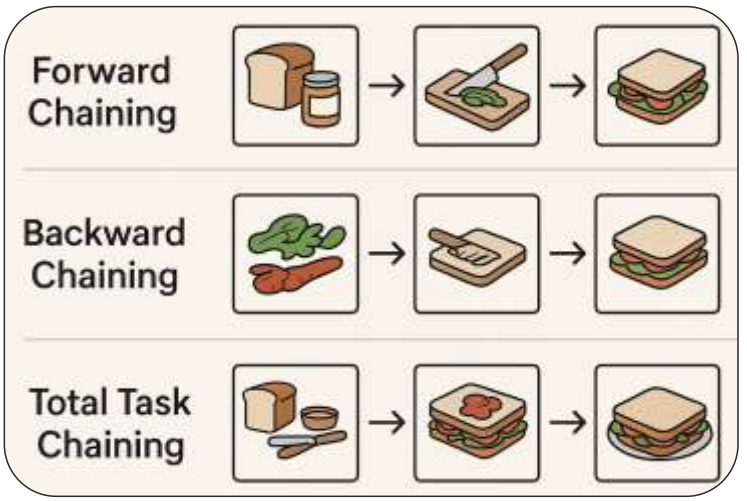


Figure 12: Chaining

What are Social stories?

Social Stories contain narratives of social events, skills, or tasks that are short, and personalized to help individuals, especially children with Autism Spectrum Disorder (ASD). Social stories help with understanding social situations, expectations, and appropriate behaviors. They use simple language and visuals to explain events, routines, or interactions from the child's perspective. Social stories aim to increase predictability, reduce anxiety, and teach positive social responses. For example, a social story might explain what happens during a haircut or how to greet someone. They are often used as part of behavioral and communication interventions.

Figure 13: Social stories

Frequently Asked Questions (FAQs)

1. How can I help my child develop behaviors or skills?

- Use "First–Then" statements to build structure and expectation. E.g., "First we finish our lunch, then we will go to the park." "First we put the toys away, then we will watch cartoons."
- Reward/reinforce desired behaviors consistently.
- Focus on what you want the child to do, rather than what you want them to stop doing.
- Be consistent and clear with instructions and expectations.

2. How can I improve my child's play skills?

- Teach appropriate play behavior through modeling and structured play.
- Make play fun, engaging, and motivating for the child.
- Use a low-distraction environment to help the child focus on play activities.
- Begin with parallel play, then encourage interactive and cooperative play.

3. How can I improve my child's social interaction and communication?

- Enroll your child in group therapy to help them learn how to be around peers.
- Teach turn-taking and sharing through play and structured activities.
- Use picture cards or PECS (Picture Exchange Communication Sy) to build communication skills.
- Practice role-playing and observational learning to teach appropriate behavior in social situations.
- Reinforce eye contact, greetings, and waiting skills during social routines.

4. How can I improve my child's academic skills?

- Create a structured learning environment with minimal distractions.
- Give step-by-step instructions, gradually increasing complexity.
- Use the child's interests to make lessons more engaging and meaningful.
- Offer visual schedules, timers, and positive reinforcement to help with attention and motivation.

5. How can I help my child develop self-help skills?

- Break down each task into simple, teachable steps.
- Use visual communication tools like picture sequences or task cards.
- Provide regular practice in natural settings (e.g., brushing teeth, dressing).
- Reinforce every successful attempt with praise or tangible rewards.

6. How can I reduce or manage stimming behaviors?

Stimming is a form of self-stimulation that may serve multiple functions:

- To relax or self-soothe
- To manage sensory input
- As a response to boredom or frustration
- To help focus or concentrate

Strategies to manage stimming:

- Identify and reduce triggers (e.g., noise, stress, overstimulation).
- Create a calming and predictable routine.
- Reinforce acceptable behaviors and teach self-regulation.
- Avoid punishing stimming, as it may worsen or be replaced with a more challenging behavior.
- Teach alternative behaviors that fulfill the same sensory need (e.g., squeezing a stress ball instead of hand-flapping).

7. How do I handle inappropriate behavior?

- Remember: All behaviors are learned and can be unlearned with the right support.
- Identify triggers: Check for medical, sensory, emotional, or environmental causes.

- Track the frequency, duration, and intensity of the behavior.
- Maintain a log book noting what happened before, during, and after the behavior.
- Keep comfort items or calming activities ready to help with regulation.
- Consult professionals to develop a clear and consistent behavior management plan.

8. How to handle self-stimulating behaviors like masturbation?

Self-stimulating behaviors, such as pressure-seeking, can develop into private self-stimulatory behaviors like masturbation, especially during puberty.

Guidelines:

- Teach body boundaries, including the concepts of "good touch" and "bad touch", using social stories and visual aids.
- Explain private vs. public behavior: Help them understand that some activities, like bathing or changing clothes, are done in private—and so is masturbation.
- Reinforce privacy rules gently and clearly.
- Address curiosity and development with age-appropriate, respectful education.
- Stay non-judgmental and supportive, while teaching appropriate behavior and self-regulation.

Strategies to Manage Inappropriate Behaviors – FAQs

Q1: What can I do if my child throws objects?

- Provide appropriate throwing activities (e.g., basketball, tossing balls into a basket).
- Involve the child in cleaning up afterward to build responsibility.

Q2: How do I manage biting or hitting (others or self)?

- Use blocking and time-out.
- Create a safe space and use visual supports.
- Offer choices and prepare for transitions.
- Redirect to alternatives like chewy toys, punching bag, or mini trampoline

Q3: What can I do if my child engages in excessive self-talking or repetitive speech?

- Keep the child actively engaged in meaningful tasks like helping with chores

(e.g., cutting vegetables).

- Use songs, rhymes, or structured interactive activities to redirect verbal repetition.

Q4: How do I manage hair-pulling or pinching behavior?

- Offer safe alternatives like a doll with hair or string toys for pulling.
- Use therabands for resistance-based pulling to meet sensory needs.

Q5: How do I help a hyperactive child with low sitting tolerance?

- Encourage regular physical activities like swimming, running, or skating to release energy.
- Consider dietary adjustments (after medical consultation), such as gluten-free, casein-free, and sugar-free diets.
- Use short, structured activities and frequent movement breaks to build tolerance over time.

Q6: What should I do during tantrums or meltdowns?

- Reduce task difficulty if needed.
- Use negative reinforcement (e.g., no reaction).
- Offer countdowns and distractions (e.g., bubbles, light toys, music).

Q7: How can I address low attention and limited compliance?

- Break tasks into smaller steps.
- Give breaks as needed.
- Use rewards for completing tasks.

Q8: What can help reduce spitting?

- Redirect with bubble blowing, chewy tubes, or blow painting.
- Use firm verbal feedback and have the child clean up.
- Try time-out to calm down.
- Encourage functional communication like saying "No" or using gestures.
- Positively reinforce appropriate alternatives.

Q9: How can I manage bedwetting?

- ● Establish a toilet routine before bed.

- Limit fluid intake a few hours prior.
- Use moisture alarms and mattress protection.
- Address underlying medical or emotional causes.

Q10: What are some calming strategies for my child?

- Create a safe sensory space with preferred lights, textures, and scents.
- Give choices to avoid frustration.
- Prepare the child in advance for any routine changes.
- Use visual cues and countdowns (e.g., "In 5 counts, bubbles are over").
- Reinforce positive behaviors and use soothing distractions like music or sensory play.

Whom to approach for professional help?

Psychologist
ABA Therapist
Behaviour Therapist
Registered Behavior Technician

CHAPTER 16

COMMUNICATION AND SPEECH

- Language Acquisition
- AAC (Augmentative and Alternative Communication)
- Prompts
- Oral Motor Exercises

What is communication and language?

Speech-language pathologists handle speech, language, communication, voice, fluency, swallowing, social and cognitive communication components in their treatment plans. Speech therapy helps individuals to express their wants, thoughts and learn to communicate effectively, which is essential for forming connections and thriving in their environment.

Speech-language pathologists (SLPs) play an essential part in treating individuals with autism, particularly in terms of early diagnosis, communication and linguistic stimulation.

According to recent studies, autism can also be identified earlier, between the ages of 10 and 12 months. However, the symptoms are not as apparent for parents to

detect. A better prognosis for speech, language, and social communication depends on early diagnosis and intervention. Speech therapy helps individuals improve their understanding of both verbal and nonverbal communication. By observing signals such as facial expressions, body language, and other nonverbal indicators, they can better interpret the meaning behind these actions. This ability to understand and respond to communication without verbal prompts is crucial. It allows individuals to express their needs and desires through gestures, pointing, or other forms of nonverbal communication, facilitating effective interaction and expression.

What is the importance of neonatal hearing screening?

Neonatal hearing screening is essential for early identification and management of hearing impairments in newborns, which can significantly impact their language and cognitive development.

Two commonly used, non-invasive screening methods are Otoacoustic Emissions (OAE) and Brain Evoked Response Audiometry (BERA)

Figure 1: Otoacoustic Emissions (OAE)

Figure 2: Brain Evoked Response Audiometry (BERA)

What Prerequisite skills are beneficial for individuals with autism prior to initiating speech therapy?

Developing prerequisite skills is vital for enhancing the effectiveness of speech therapy, particularly for individuals with autism. These skills, such as eye contact, joint attention, imitation, and sitting tolerance is crucial for maximizing the benefits of speech therapy, especially for individuals with autism. These abilities create a supportive framework for effective learning and communication development.

Figure 3: Ormotor training for imitation

Activities for Sitting Tolerance	Activities for Attention Span
Choice-Based Activities: Allow the individual to choose between activities (e.g., sit and color or play with blocks). Giving choices can make sitting more enjoyable and motivating. **Art or Crafts:** Let the individual do coloring, drawing, or simple crafts while seated.This will help them be busy and focused on a creative task. **Sensory Activities:** Activities like playing with clay or kinetic sand can address sensory needs, promoting calmness and readiness to sit. **Use Social Stories:** Social stories are personalized narratives that help individuals understand and navigate social situations by clearly outlining expected behaviors and responses. This helps to teach sitting tolerance, as they provide structured guidance on how to remain seated and engaged during various activities.	**Board games:** To teach basic rules, then progress to complex ones to enhance strategic thinking and concentration. **Craft activities:** like cutting, pasting, finger painting, and clay molding to boost fine motor skills and focus. **Matching and Sorting games:** such as placing colored beads into corresponding boxes, to improve cognitive skills and attention to detail. **Memory games:** like matching flashcards to strengthen concentration and working memory. **Utilize interactive media:** such as audiovisual books and learning apps, to provide dynamic ways to improve attention spans.

What is the importance of receptive language in autism?

"Understanding Comes Before Speaking"

Receptive language skills refer to an individual's ability to understand and process the language they hear or read. This includes comprehending vocabulary, interpreting sentence structures, and grasping the meaning conveyed in communication. For example, when a child follows a teacher's instruction to "Please sit down," they are utilizing their receptive language skills to comprehend and act upon the request.

What are all the possible ways to enhance receptive skills?

Figure 4: Prerequisite for speech

What are methods to aid cognition and understanding?

Multi-modal training:

Introduce a concept using different modalities or cues hence stimulating different centres in the brain.

- **Tactile-kinesthetic mode:**

  Using real objects or models lets the individuals touch and feel different textures.

- **Visual mode:**

  Provide attractive pictures and motion figures that the individual will enjoy

watching. Using bright colours and shiny material if the individual isn't overwhelmed by it is another option.

- **Auditory mode:**

  Providing repeated verbal or auditory stimulation also called auditory bombardment helps the individual with auditory attention and recall.

Figure 5: Multi-modal training

What are the methods of starting need-based communication?

Gestural communication: Gestural communication refers to the use of non-verbal movements (e.g., hand gestures, facial expressions, body language) to express thoughts, needs, and emotions. Gestures precede verbal language and are predictive of later language development. Model and reinforce gestures during routines (e.g., waving, clapping, pointing). Use gesture-speech combinations to support verbal development.

Figure 6: Gestural communication

How to help articulate words and form sentences well?

Individuals with autism like other typically developing they may have difficulty with the articulation of sounds and framing sentences. They also have difficulty

with nonliteral language and various concepts of language like time, abstract concepts, etc. A speech pathologist helps them to develop these concepts in context.

Strategies :

- Make sure that you are always available for the individuals .
- Establish eye contact every time you speak. Adjust yourself to make sure that you are communicating face-to-face.
- Orient the Individuals towards you by establishing eye contact, visual props, and drawing attention.
- Use meaningful gestures to improve the clarity of communication.
- Use simple meaningful sentences.

Augmentative and Alternative Communication (AAC):

Figure 7: Augmentative and Alternative Communication (AAC)

Augmentative and Alternative Communication (AAC) refers to various methods that assist individuals in expressing themselves when traditional speech is challenging. These methods can either supplement existing speech or serve as the primary mode of communication, depending on the individual's requirements. AAC encompasses unaided systems, such as gestures and sign language, and aided systems, including communication boards and electronic devices. For individuals with autism, AAC plays a vital role in enhancing communication by providing alternative ways to convey thoughts, needs, and emotions, thereby promoting greater independence and social interaction.

Figure 8: Picture Exchange Communication Sy (PECS)

The Picture Exchange Communication Sy (PECS) is a widely utilized low-tech augmentative and alternative communication (AAC) method designed to assist individuals in developing functional communication skills. Effective implementation of PECS requires comprehensive training for communication partners—including teachers, parents, and

clinicians—to ensure consistent and meaningful interactions . This collaborative approach enhances the individuals ability to express needs and engage socially

Rapid Prompting Method (RPM)

The Rapid Prompting Method (RPM) is a teaching approach that uses a letter board and sensory cues to help people with autism and other difficulties communicate by pointing, typing, or writing.

Method: The facilitator (teacher or therapist) holds a keyboard or letter board and gives tactile, visual, and auditory cues to help the person's hand or finger point to or write letters.

What are the strategies for directing social interaction?

Individuals with autism have difficulty with casual conversations and expressing their needs. Some may have specific likes, dislikes and difficulty in expressing it. Speech therapy helps Individuals with autism in developing social interaction and peer communication.

Social Stories

- Create short narratives that describe specific social situations, appropriate behaviors, and the expected outcome.
- Useful for children with ASD or social communication difficulties.

Peer-Mediated Strategies

- Teach peers how to interact and support the child during social situations.
- Encourages inclusion and natural social learning.

Role Play

- Practice different social scenarios (e.g., making a request, handling rejection).
- Builds confidence and flexibility in real-life situations.

Turn-Taking Activities

- Use games or structured play to teach waiting, sharing, and conversational turns.
- Reinforces the back-and-forth nature of interaction.

Figure 9: Turn Taking in Group Therapy

Figure 10: Fun games teaching school behaviour

How to Enhance Speech Intelligibility?

Articulation Exercises: Practicing specific sounds and words can enhance pronunciation. Utilizing tongue twisters or repeating challenging words helps in refining articulation.

Articulatory drills: Sounds sets that can be bi-syllables or tri-syllable can be used repeatedly with auditory feedback initiated by the individual itself to recognize his speech error.

Figure 11: Articulation Exercises

Lip and tongue trills: This helps the individual to maximise the ability of the lip and tongue in strength and coordination.

Mirror Practice: Speaking in front of a mirror allows individuals to observe and adjust their mouth movements, leading to better articulation

Volume Control: Speaking at an appropriate volume ensures the listener can hear and understand the speech without strain

What Are the Effective Intervention Strategies for Individuals Who Have Echolalia?

Intervention for echolalia must be individualized, as echoic utterances differ widely based on each individual's social, cognitive, linguistic, and situational profile. The goal is not necessarily to eliminate echolalia, but to shape it into more functional, meaningful communication.

Many times, echolalia is used as a self-regulatory behaviour in a demanding or unstructured environment. In such situations provide opportunities for smooth transitions.

Echolalia increases when an individual doesn't understand what is said to them. It's important to speak in a way they can understand. Let them take the lead and respond by repeating or adding to what they say.

How to tackle childhood apraxia of speech?

Prompts for Restructuring Oral Muscular Phonetic Targets (PROMPT). It is a technique commonly used for childhood apraxia of speech. With the use of touch signals applied to the patient's articulators, this tactile-kinesthetic technique guides the patient through a particular word, phrase, or sentence. This hands-on approach assists the client to plan, coordinate and produce sounds.

Later the touch cues should fade as the individual's speech production improves. By minimising unnecessary muscle movements like jaw sliding and insufficient lip rounding, this improves motor control and aids in the development of appropriate oral muscular motions.

Figure 12: Oral-motor exercises

What is an Oromotor Dysfunction?

Oromotor dysfunction refers to difficulties or abnormalities in the functioning of the muscles and structures involved in speech and swallowing, which include the

lips, tongue, jaw, soft palate, and facial muscles. This dysfunction can significantly affect a person's ability to produce clear speech and effectively manage oral functions such as eating, drinking, and breathing.

In speech therapy, oromotor dysfunction is often addressed through specific therapeutic exercises and techniques designed to strengthen and coordinate the muscles of the mouth. The goal is to improve muscle control, increase oral motor coordination, and enhance the overall ability to communicate and perform daily oral activities.

Figure 13: Oro motor exercises

What are the benefits of oral-motor exercises?

Oral-motor exercises are designed to enhance and coordinate the muscles used in speech and swallowing, ultimately improving an individual's ability to eat, drink and speak more efficiently. These exercises can also boost a patient's self-confidence and self-esteem when communicating, offering both functional and emotional benefits.

When combined with breathing and speech exercises, oral-motor activities can effectively improve speech intelligibility. Some individuals may struggle with acquiring oral-motor skills, such as a weak suck or difficulty transitioning to chewing, as well as experiencing oral defensiveness (e.g., gagging) or challenges with mealtime behaviors.

In speech and language therapy, oral-motor exercises are often incorporated in a drill-like approach to assist individuals with difficulties in speech production.The underlying principle of oral-motor therapy is that inadequate oral-motor strength or control can hinder the development of both feeding and speech. These strategies are designed to heighten the individual's awareness of their oral mechanism and its structures, reduce oral-tactile sensitivity, and enhance the differentiation of oral movements.

Individuals with Autism often experience unique feeding challenges that can significantly impact their nutritional intake, growth, and overall health.These difficulties are multifaceted, ming from sensory sensitivities or chewing difficulties,addressing these challenges requires a comprehensive approach, including targeted interventions such as oral motor exercises,sensory feeding integration techniques,positive reinforcement and structured mealtime routines.

CHAPTER 17

PAVING THE WAY FOR EDUCATION

- Educational concerns
- Newer trends
- IEP
- Concepts of teaching

How Special Education helps children with autism?

Special education helps children restructure autism spectrum disorder and learn the various streams of knowledge that they find difficult in regular classroom settings as well as one-on-one learning. Special education encourages children to be more motivated because they are taught by certified rehabilitation professionals and they have access to well-adapted classrooms, assistive technology, and special literary materials. It fosters learning readiness and forwardness. Special education can be provided in regular schools with some special arrangements, or it can be provided in special schools with a barrier-free environment inside and outside the school for each disabled student. Children with autism are assessed to determine their specific strengths and weaknesses, which is where special education comes in. This assessment determines their specific needs and aids in the design of the

intervention, which leads to the achievement of a higher level of personal self-sufficiency.

Figure 1: A snapshot of an individualized special education session

What Educational concerns do you see among children with autism?

- **Intelligence:** Although many children with autism spectrum disorder have average or above-average intelligence in educational terms, autism can still affect learning in a variety of ways.
- **Attention:** Children with autism have difficulty focusing on a task for an extended period because their reading and writing skills are impaired.
- **Motor skills:** As a result of sensory issues and poor finger coordination, children with autism frequently struggle with grip and are unable to hold a pencil properly. They may apply too much pressure to the pencil or their writing may be very light.
- **Communication:** This can be a challenge. If the education staff does not know how to help students with communication deficits in a learning environment, the student will likely struggle even more.
- **Comprehension:** Children with ASD have underlying challenges with cognitive skills which affects their understanding.
- **Generalization:** Most children with ASD have intelligence but they have difficulty applying these skills in day-to-day life.
- **Sensory issues:** Sensory issues affect learning in various ways. Learning is impacted by hypo-sensory and hyper-sensory issues.

- **Behavior issues:** Children with ASD have a variety of behavioral issues, such as hand flapping, jumping, hitting, and spinning, which interfere with their learning.

Figure 2: Method to develop writing skills

What Happens to a Child During Special Education Therapy?

Special education therapy provides individualized support to children with special needs, helping them learn in a structured and inclusive environment tailored to their unique strengths and challenges.

Instructional Strategies and Support Techniques:

- **Task Analysis:** Tasks and assignments are broken down into small, manageable steps. Each step is presented separately with appropriate feedback to ensure understanding.
- **Writing Support:** If a child has difficulty writing, they may be provided with a copy of notes or assisted by a student writer.
- **Adaptations and Materials:** Teaching materials are adapted based on the child's needs, ensuring accessibility and comprehension.
- **Consistency and Structure:** Clear, consistent structure and routines are maintained in the classroom. Rules are specific, direct, written down, and applied consistently to support predictability and understanding.
- **Clear Instructions:** Directions are given in simple, concise language. Visual or written instructions are also provided alongside oral instructions. Additional time is allowed for oral responses.
- **Self-Regulation Strategies:** Children are taught what to do while waiting for help (e.g., underlining, highlighting, or rephrasing directions; jotting down keywords or questions on sticky notes).

- **Communication Support:** If a child uses an alternative communication method (like a communication book or device), it remains accessible during recess and lunch. Peers are taught how to interact using the child's communication tools.
- **Low-Key Behavioral Cues:** Discreet cues (like touching the child's desk) are used to redirect behavior or attention without drawing peer attention.

Early Intervention and Integration:

When early intervention is provided to a child with special needs—especially one with strong cognitive skills—they can be gradually integrated into mainstream settings.

If a child:

- Shows less interest or has poor sitting tolerance,
- Is hyperactive or a rote learner,
- Has attention deficits,

...then the special educator creates a structured seating arrangement and uses various calming and engagement techniques. These may include:

- Play-based learning
- Painting or music
- Montessori methods

To teach a concept like numbers, the educator might use various methods:

- Counting with objects
- Matching games
- Oral or random number recall

If the child is easily distracted by others, seating arrangements can be adjusted to reduce distractions. Engaging methods like number songs, number painting, or asking numbers out of sequence may be used to evaluate learning in a fun and interactive way.

Individualized Education Plan (IEP):

Each child receives an IEP tailored to their age and specific disability. This plan is collaboratively created by a team that may include:

- Special educators
- Neurorehabilitation therapists

- Parents

Effective teaching methods are chosen based on the child's abilities and progress. The focus is on both meaningful learning and generalization of skills in daily life.

Alternative Teaching Approaches:

When a student struggles with concept learning, educators may use techniques like:

- Simple to complex
- Known to unknown
- Whole to part
- Concrete to abstract

What are the techniques and strategies to manage these concerns?

- Modification in seating arrangements to improve attention and concentration.
- Social awareness in the disability sector to understand the need to educate children with autism.
- Learning should be more of a play method, with non-formal evaluation.
- Learning should be more of a known-to-unknown method of understanding concepts.
- Simple to the complex will be more beneficial for young children with ASD in understanding concepts.
- Whole to part is one effective teaching method where children with ASD learn many abstract concepts
- IEPs are an effective way to provide assessment, planning, and evaluative methods to the educational journey.
- TEACCH is a special education program that provides a highly structured environment for children with ASD.

What are the new trends in special education?

- **Inclusive classroom:** special educators introduce an integrated approach to teaching and learning, employing methods for students of varying ability levels. Furthermore, most separate or "pull-out" instruction, as well as sessions with occupational, speech, or behavioural therapists, are done in shorter chunks of time.

- **Parental involvement:** Parental involvement is important for a child's overall development, including academic performance and independent life skills.
- **Early intervention:** At an early age, the brain is still developing therefore early intervention is quite essential for a child's development.
- **Technology:** Today's special education students use various technology tools for everything from text dictation, question and answer, quick evaluation, closed captioning of audio apps, and even real-time feedback on their reading and writing.

Who can provide special education therapy?

A person who has:

- Completed RCI (Rehabilitation Council India)
- Masters in Special Education
- Certificate in Special Education
- Diploma in Special Education
- Bachelor's Degree in Special Education
- Vocational rehabilitation- vocational training

FAQ's

❖ **Why is special Education Important?**

Every child has the right to the same opportunities as others, regardless of the difficulties they face. Special education is of great importance for children with learning disabilities, because it gives them the opportunity to get quality education in line with their unique needs with adaptation in the general curriculum. Special education enables every student to gain a high level of independence and reach their full potential. Special education gives them individual plans which help a child's overall development to be independent in their life. It also provides the student proper guidance of vocational as per their ability to be independent financially in their own life.

❖ **Where and when to start?**

Special education can be started as general education and early intervention plays an important role for a child to cope with other neurotypical students.

❖ **How can we start special education for children with Autism Spectrum Disorder?**

- Child needs are assessed by the special educator, the need for special education

and related services are identified.

- Eligibility is decided
- IEP Meeting
- Goal setting
- Evaluation

❖ **How early can we start special education ?**

Pre learning concepts can be introduced as early as 2.6 years.

❖ How to teach and what materials are required?

Teaching methods are selected according to the child's needs, usually learning follows the below mentioned rules.

- Simple to complex
- Know to unknown
- Whole to parts
- Concert to abstract
- Form small groups
- Child center classrooms
- Blend the basics with more specialized instruction

Material:

- **Visuals Aids:** Blackboard, Posters, Flashcards, Presentations, Printed textbooks, Graphs and Infographics.
- **Audio Aids:** Radio, Tape-recorder and CDs.
- **Audio-visual aids:** Videos, Video recordings, Films and Documentaries, Virtual Classrooms sensory learning toys , Language Laboratory.
- **Computer-Assisted Learning:** Pre-recorded DVDs, CDs, online quizzes, ebooks, podcasts and blogs.

CHAPTER 18

ART BASED THERAPY

- Music therapy
- Dance therapy
- Art therapy

Learning Through Art, Dance, and Music for Children with Special Needs

Art is a powerful form of expression that involves the application of human emotions and creativity. It commonly manifests in painting, drawing, dance, and music—mediums that are especially beneficial for children with special needs.

What are the major concerns faced by kids with Special Needs?

- Individuals on the spectrum have dysfunctional sensory systems. The senses are either hypo/ hyper reactive to stimuli.
- Individuals on the spectrum face major challenges when it comes to understanding, identifying, and managing their own emotions. We may see

emotional dysregulation in the form of laughing without reason or throwing temper tantrums.

- Keeping in mind the difficulties faced by individuals with special needs, certain strategies can be implemented including different mediums of Art, Dance and Music.

How does Music help in Autism Spectrum Disorder?

Music as a Multi-Sensory Learning Tool

Music engages the tactile, auditory, and visual systems, creating a whole-body sensory experience. This integration enhances learning and helps children connect more deeply with their environment.

- **Emotional Expression:** Music can act as a bridge for children who struggle to express emotions.

Figure 1: Use of Djembe in Art Therapy

- *Example:* A child who uses vocal stimming to regulate in overstimulating environments may calm down with relaxing music.
- *Example:* A non-verbal child may use music as a medium for emotional expression.

Music and Brain Function

Research indicates that children with ASD process music in a similar manner to neurotypical children, even if their language or social skills are impaired.

Music Enhances Learning Skills

- Singing improves speech and communication.
- Rhythm strengthens motor coordination.
- Lyrics Memorization aids in retaining academic information.

Listening to music improves attention span in classroom settings.

Figure 2: Dance Therapy

1. Physical Health and Motor Development

Dance improves:

- Strength, flexibility, and endurance
- Posture and balance
- Motor abilities such as speed, stability, and coordination

2. Teaching Emotions Through Movement

Emotions are felt in the body—for example, joy might make us jump, while anger might make us tense up. Dance helps children:

- Understand how emotions feel physically
- Improve body awareness and emotional regulation

3. Enhancing Imitation Skills

Imitation is a key part of learning. Dance routines involving mirroring movements help children:

- Practice copying behavior
- Generalize imitation to other life skills

4. Building Confidence and Independence

Dance gives children the chance to:

- Be actively involved in learning
- Experience goal-setting and achievement
- Boost self-esteem through independence and enjoyment

5. Relieving Stress

Dance, like other forms of exercise, reduces stress. Its creative and expressive nature often provides greater emotional release than other physical activities.

How Does Art Help Individuals with Special Needs?

Figure 3: Painting activity in Art Therapy

Painting and Drawing

Through these activities, children can explore:

- Colors, shapes, sizes, and spatial awareness.
- Emotional expression, especially for non-verbal children.
- Improved motor control, focus, and visual processing.

Crafting and Hands-On Art

Craft projects like clay modeling, sand art, or origami help children:

- Understand textures and tactile feedback.
- Develop problem-solving and fine motor skills.
- Promote teamwork and communication, especially among high-functioning autistic kids through activities like collage and poster-making.

Figure 4: Craft activities in Art Therapy

Drama Therapy

Drama Therapy is a therapeutic approach that supports individuals facing various challenges by enhancing their ability to communicate and interact with others. It involves the use of theatrical exercises and techniques to develop and strengthen social communication skills. Through this process, individuals can learn and practice essential social skills, build self-confidence, and improve self-esteem.

Drama Therapy also helps individuals recognize and understand their own emotions as well as the feelings of others. It encourages creative thinking and provides a safe outlet for expressing emotions more easily. As a group-based leisure activity, it promotes emotional identification and the ability to label feelings, contributing to emotional growth and interpersonal development.

Art-Based Activities

1. **Finger Painting** – Encourages sensory exploration and self-expression.
2. **Coloring Pages** – Improves focus, motor skills, and color recognition.
3. **Clay or Play-Dough Modeling** – Builds tactile awareness and fine motor coordination.
4. **Collage Making** – Develops planning, sequencing, and communication (especially in groups).
5. **Stamping or Sponge Painting** – Promotes creativity and sensory engagement.
6. **Sand Art** – Introduces texture and helps with sensory integration.
7. **Origami and Paper Folding** – Enhances concentration and hand-eye coordination.

8. **Mandala Coloring** – Supports relaxation and emotional regulation.
9. **Nature Art (leaves, twigs, stones)** – Encourages outdoor exploration and creativity.
10. **Poster Creation** – Supports teamwork and expression in high-functioning children.

Dance-Based Activities

1. **Free Movement Dance** – Allows expression of emotions and reduces stress.
2. **Follow-the-Leader Dance** – Builds imitation and social interaction skills.
3. **Emotion-Inspired Movement (happy/sad/angry dances)** – Teaches emotional awareness.
4. **Animal Movement Game** – Promotes body awareness and imagination.
5. **Mirror Dancing (Mirroring Partner's Moves)** – Enhances imitation and focus.
6. **Dance to a Story** – Combines storytelling with movement to improve comprehension and creativity.
7. **Freeze Dance** – Helps improve self-regulation, impulse control, and listening skills.
8. **Stretch and Move Sessions** – Boosts flexibility and motor planning.
9. **Props Dance (scarves, ribbons, balls)** – Adds tactile input and visual stimulation.
10. **Choreography Practice (simple routines)** – Builds memory, coordination, and confidence.

Music-Based Activities

1. **Sing-Along Sessions** – Boosts language development and emotional expression.
2. **Instrument Play (drums, shakers, xylophone)** – Develops rhythm, timing, and sensory feedback.
3. **Musical Storytime** – Combines storytelling with sound cues to enhance attention.
4. **Music and Movement (dance to music)** – Integrates auditory and motor skills.
5. **Sound Matching Games** – Sharpens listening and auditory discrimination.
6. **Call-and-Response Songs** – Promotes communication and turn-taking.

7. **Relaxing Music for Calming Down** – Helps in emotional regulation and sensory soothing.
8. **Rhythm Clapping Games** – Enhances coordination and sequencing skills.
9. **Song-Based Instructions (e.g., "Clean-Up Song")** – Reinforces routines through melody.
10. **Musical Chairs with Modified Rules** – Teaches turn-taking and social interaction.

CHAPTER 19

GROUP THERAPY

- Introduction to group therapy
- Benefits of group therapy
- Techniques of group therapy
- Newer trends

What is group therapy?

Group therapy is a distinctive type of therapy, in which a group of children engage in various activities together. It is a kind of therapy where the therapist can observe the way a child can relate, communicate and behave with other children in a group setting.

How can group therapy benefit children with autism?

- Boosts their social interaction and learns the skill of building and maintaining social relations.
- Helps in reducing the anxiety that children experience during social interactions.

- Participation in group play helps the children to understand structured play as well as cooperative play with their peers.
- Enhances the imitation skills of the children through the activities conducted.
- Encourages turn-taking and waiting for their turn in games.
- Facilitates learning social norms like greeting, waving a hi, giving hi-5, saying bye, etc.
- Aids them in deciphering verbal and non-verbal cues in communication.
- Acts as a good opportunity to make them understand the mannerisms followed in a public setting.
- It enhances a child's sense of self-worth and helps them become confident.
- Aids in improving their emotional regulation.
- Improves problem-solving abilities.
- It is a way to enlighten the children as well as the families about how others are walking the same path as them.
- Group therapy fosters social communication and interaction. It provides children an opportunity to make social relations in a fun environment.

Figure 1: Improving interaction skills in a group setting

Figure 2: Improving imitation skills

What are some effective techniques for conducting group therapy?

- It is best to gradually integrate the child with limited social skills into a small group.
- The child should enjoy the experience.

Figure 3: Understanding the concepts of winning and losing

- Begin with easy 1-step games.
- Keep things organized.
- Be there to assist the child whenever necessary.
- Play background music with a slow rhythm.
- If the child becomes agitated or hyper during group therapy, take him/her away from the group for a while, and then bring him/her back once they have calmed down.
- Be patient because it might take some time to notice long-term changes in a child's behaviour.

Which activities can be done in group therapy?

1. Musical chairs.
2. Races.
3. Passing the parcel.
4. Obstacle course relay.
5. Creative activities with shared equipment.
6. Ring Around the Roses
7. Oranges and Lemons.
8. Bowling.
9. Group rhymes and imitations.
10. Simon says games.

What are some current trends in group therapy?

1. Creative group therapy - this kind of group intervention creates a structured yet adaptable environment for impromptu explorations and responsiveness, where uncertainty challenges the need for predictability and allows the emergence of social engagement through creative play.

2. The Kimochi therapy, which incorporates Kimochis characters and curriculum, serves as an effective resource for fostering social-emotional learning (SEL) in children, even those on the autism spectrum. It aids them in recognizing, articulating, and regulating their emotions within a secure and captivating environment.

3. The Son-Rise Program – a truly child-centered approach (for children and adults diagnosed with Autism and other related disorders) that encourages you to work with your child rather than against them. This fosters a learning environment that is incredibly caring and respectful, enabling you and your child to develop a joyful connection.

4. Floortime - For children with autism spectrum disorder (ASD), floortime is a play-based therapy focusing on building connections and improving social, emotional, and cognitive abilities via interactive, child-led play and can be carried in group set-up.

5. Playdates - Playdates can be a great way for children with autism spectrum disorder (ASD) to develop their social skills and engage with others, although they must be carefully planned and prepared to ensure a positive experience.

6. The Brick-by-Brick programme - this program brings children together through a shared interest in LEGO play in group settings that children call Brick Club. At Brick Club, they work together to build specific LEGO models or design and build their own freestyle LEGO creations in small teams.

7. Autism friendly theatre - a solution to open the doors to theatre for many young children with autism who find 'theatre' a real challenge. It is called multi-sensory immersive theatre. No imposing stages, no loud clapping, no hushing sounds or frowns from other people and no big crowds. Most sensory live shows are between 45 mins and 1 hour.

Figure 6: The brick-by-brick program

CHAPTER 20

PLAY THERAPY

- Introduction of Play Therapy
- Equipments used in Play Therapy
- Categories of Play Therapy
- Benefits of Play Therapy

What is Play Therapy?

- Play therapy is a dynamic process involving the child, therapist and the environment where the child tries to understand at his or her own pace and with his or her needs, those issues, past and current, conscious and unconscious, that affect the child's life in the present. (British Association of Play Therapists, 2002).
- Children participate in play activities of their choice as part of play therapy. The play therapy environment allows children with ASD to express themselves in ways that are most comfortable for them. Unlike many other behavioral therapies, the play therapist's role is to engage the kid in a relationship through play. (Ray, Sullivan, & Carlson, 2012)
- There are two ways in which play therapy sessions can be taken - directive

(therapists' active inputs during the session) and non-directive (child leads the session in the direction he feels right without active inputs from therapist).

- Core attributes of participation are evident in play occupations: taking part, feeling included, having choice over what to engage in, and achieving meaningful goals. (Hoogesten and Woodgate, 2010.

Figure 1: Directive approach in play

What is the equipment to be used in Play Therapy?

For infants:

- Bright and moving toys
- Hanging cradle toys
- Musical Toys
- Balloons
- Rattles

4-6 months

- Soft Squeeze toys
- Toy Animals

7 to 9 months.

- Squeeze and Sound toys
- Blocks
- Plastic Rings

10 to 12 months.

- Water play
- Motion toys
- Balls
- Picture books
- Pull push toys

Toddlers

- Vehicles
- Dolls
- Ball
- Fitting toys
- Household articles
- Crayons

School children

- Craft
- Puzzles
- Paint material
- Housekeeping and carpenters toy tools

Figure 2: Use of sand in play

What are the categories of Play Therapy?

1. Active play: physical outdoor sports
2. Make believe (role plays): visiting make-believe shopping mall/zoo/movie theater, etc.
3. Manipulative: Construction puzzles
4. Creative: Music, Arts and craft, Audiovisual
5. Learning: Books games skills
6. Drawing / painting for the purpose of emotional expression

Figure 3: Use of music in play

Figure 4: Role playing

Figure 4: Construction based play

What does a Play Therapy session look like?

During the play therapy session, the therapist creates a safe environment. The child is taken to the playroom and encouraged to explore toys that are age-appropriate. When the child is allowed spontaneous expression through play, they may pick up toys that indicate their emotional state or draw something to share their challenges. The therapist gives unconditional play, regards, empathy, non judgment approach

while interacting with the child further facilitating the child's growth. Moving forward, the therapist chooses which strategy to employ (directive, indirective, or a combination of both) based on the objectives agreed with the parents and the child's level of functioning.

How can Play Therapy benefit?

1. Increases self-confidence
2. Improves self regulation leading to reduced stereotypical behavior
3. Improves decision making and problem solving skills
4. Resolution of emotional barriers
6. Learn basic or advance gross motor and fine motor skills
7. Improves self-expression
8. Increases cognitive functioning
9. Encourages creativity and imagination
10. Develops better social skills
11. Develops adaptive skills
12. Reduces hyperactivity
13. Enhances understanding of emotions and problems

Figure 6: Play therapy to enhance socialization

Figure 7: Encouraging creativity

CHAPTER 21

MAKING CHILD INDEPENDENT

- Activities of Daily Living
- Dressing
- Bathing
- Toileting
- Brushing
- Eating

What are Activities of Daily living?

Activities of Daily living (ADL) are the routine tasks a person performs in his day as per following the daily schedule. It includes activities like Brushing, Bathing, Toileting, Eating, Dressing, etc. They are also called life skills and are learnt in the comfort of home over a period of time with many repetitions and starting from a very young age.

What is the Importance of ADL training for a child with Autism?

As all of us know it is important for a person to be independent in all their daily tasks, it is all the more important to train children with Autism to be independent because-

- It gives a sense of accomplishment to them and it helps them in self-care.
- This leads to increased confidence in them which further helps in improved self-regulation.
- It has been observed that children who are independent in their daily living skills can function better and can follow their daily routine with very minimal to no assistance needed. So the caregiver burden is reduced.

What Strategies can be used for building ADL skills in children?

As our children with Autism learn things differently, it is important to teach them daily living skills in a different way. The following strategies can be used for them-

- **Imitations and learning body parts** - for learning any activity of daily living, it is very important to know the body parts. Teach them body parts through imitations, doing it in front of the mirror so they can get visual feedback of the body parts. You can also use body part rhymes and songs for the same.
- **Using visuals** - Using Visuals help the kids in understanding what task is expected to be done and it helps them transition smoothly from one step of the task to the other. Eg.using visuals for toileting in the correct order helps them break down the steps, and makes it easier to follow the task and master the skill.
- **Step-by-step modeling** - Modeling each step of the ADL skill is the key to help them learn as the kids with Autism are very good visual learners. They learn the skills better by copying the actions, multiple repetitions of the steps every day and introducing one step at a time. Only introduce the next step when the child has mastered the first.

How can I teach my child to dress independently?

- First start with teaching them how to undress as that is an easier learnt skill. Undressing pants is the easiest so start with that as independence in this skill will build on their confidence.
- Further, teach them to undress their t-shirts.
- As the child learns to undress, later teach them to dress pants first and then t-shirts.
- It is important to teach them all these skills in front of the mirror so there is always visual feedback given to them which makes learning these tasks easier.

How can I teach Buttoning to my child?

- Start with teaching how to unbutton first as that is an easier learnt skill.

Figure 1: Dressing skills

- For unbuttoning, start with keeping the shirt in front of the child on a table and let the child look at it and learn to unbutton it for added visual feedback.
- As the child learns to unbutton the shirt in front of him/her, make them wear the shirt, button the shirt, take the child in front of the mirror and now let them unbutton independently and thus, the task is mastered.
- Now teach the child buttoning in the same way- first learning with a shirt on the table and then wearing it and buttoning in front of the mirror.

Figure 2: Buttoning skills

How can I teach my child how to take a bath?

- If your child is sensitive to tactile input and doesn't prefer having water over their face or hair, then always start with giving them a deep-pressure input
- Practice simulated bathing at regular transition times using their favorite doll or a soft toy, this helps them in breaking down the steps and understanding the expectations of the task
- Demonstrating bathing step by step by naming the body parts and making a rhyme that connects these body parts help in sequencing applying the soap or

shower gel for these kids.

- Practicing the task of applying soap using a loofah in front of the mirror also helps in improving the body awareness that is needed for this skill.

How can I teach my child to brush their teeth?

- Kids with Autism may have Oral Tactile Sensitivities, using a vibrating toothbrush helps as it provides a deep tactile input and the bristles will not be over-sensitive to the kids because of the constant vibration input.
- Teaching brushing skills through demonstration works best for the kids along with a sing-along song that will be the same every time they brush their teeth. This helps them link the task to the song and know what has to be expected at that time.
- Give them counts for how long they are supposed to brush on each side and at the end of the count, they will shift to the other side.

Figure 2: Adaptive tools to teach Brushing

How can I make mealtime more effective?

- Make mealtimes fun for toddlers because many of them have oral tactile sensitivities. Encourage them to flip through colored picture books, and play with some musical toys.
- It is important to be comfortable around food so it also encourages them to play with food- mashing fruits, dipping fingers in the yogurt, playing with wheat dough, etc.
- By all means, **do not give any screen time** while eating because then the kids do not pay attention to food and it further affects their digestion and they start having digestive discomforts.
- Place finger foods in front of them to encourage independently picking up the food and eating.

- Similarly encourage the use of spoons and forks.



Figure 4: Different Ways for Effective Mealtime

How to teach a child Shoe Lace tying?

- First start with taking laces of two different colors and teach them to tie the first knot on a lacing board.
- Once they learn to tie the first knot, then teach them to make the butterfly bow and then tie the butterfly bow.

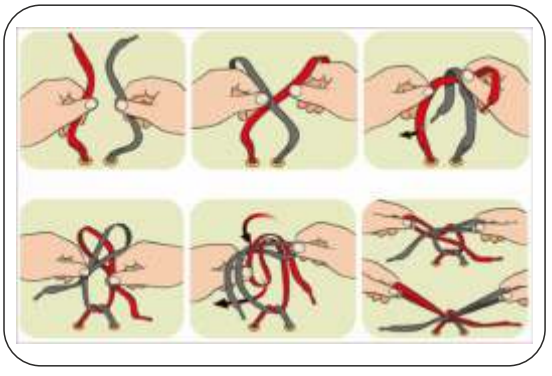



Figure 5: Shoe Lace tying training

What are ways in which I can Toilet train my child?

- **Fundamental goals in toilet training**

1. The ability to independently complete the sequence necessary for successful healthy toileting.
2. Improved hygiene and improved self-confidence.
3. Reduce Physical discomfort that comes from soiled clothes.

- **Reasons why toilet training can be difficult for children with ASD.**

1. Language-difficulty in understanding commands
2. Dressing-difficulty in donning & doffing clothes
3. Fears-fear of falling into a toilet seat
4. Need for routine
5. Difficulty using different toilet environments

- **Phases for Toilet Training**

1. Planning Phase
2. Setting up Phase
3. Implementation Phase

How do parents plan and set up for successful toilet training? (Planning & Setting Up):

- **Observe Your Child:**

1. Track when they usually pee or poop and watch for signs (like fidgeting or holding their belly).
2. Talk to Your Pediatrician: Check for any medical concerns or advice on using suppositories.

- **Create a Comfortable Environment:**

1. Reduce distractions like noise, and use a fun visual chart with simple steps (like sitting, wiping, and flushing).
2. Use a consistent bathroom for training.
3. Get a child-friendly potty seat that's secure and fits well.
4. Introduce short practice sessions of sitting on the toilet, even with clothes on at first.

5. Prepare rewards like stickers, snacks, or songs for motivation.

How do parents implement the toilet training plan effectively? (Implementation)

- **Create a Routine:**

1. Take your child to the toilet every 30-45 minutes with a simple cue like "Let's go potty!"
2. Praise their efforts immediately, whether they go or not.

- **Break It Down into Steps:**

1. Start with simple actions like walking to the toilet and sitting down.
2. Gradually add other steps: pulling pants down, wiping, and flushing.

- **Handle Common Challenges:**

1. For pooping, ensure they eat enough fiber and drink water; use a footstool to help with posture.
2. If your child resists sitting, try a toy or book for distraction and increase sitting time gradually.
3. If scared of flushing, let them do it from a distance and work closer over time.

- Use Suppositories if Needed: After consulting with a doctor, you can use suppositories at the same time daily and guide them to the toilet right after.

How do I track progress and keep it consistent? (Tracking & Adjusting):

- **Keep a Log:** Track when your child pees or poops and adjust toilet times based on their natural habits.
- **Gradually Reduce Reminders and Rewards:** Slowly fade out your prompts and rewards as your child gets more comfortable. Eventually, they will learn to go independently.
- **Celebrate Success:** With patience and consistency, your child will be on their way to independent toilet use.

NOTE:-

- Before starting any intervention, the child needs to be **WEANED OFF THE DIAPER.**
- Extended diaper use for children with autism is problematic because children

may become so accustomed to using a diaper that they often demonstrate resistance to toilet-training procedures and will prefer to wait for a diaper to void.

CHAPTER 22

AQUATIC THERAPY

- Aquatic Therapy
- Benefits of Aquatic therapy
- Types of Aquatic therapy
- Safety measures of Aquatic therapy

What is Aquatic Therapy?

Aquatic therapy is the use of water and its properties to perform activities by qualified personnel for restoration, extension, maintenance and quality of function for adults or children with acute, transient or chronic disabilities.

Why Aquatic Therapy?

After immersing a child in water at chest level,80% of unloading can be experienced by a child.

Proprioceptive inputs can be increased by movement as the muscle experiences greater resistance.

Water is beneficial for memory and cognition.

What are the benefits of aquatic therapy?

- To improve coordination and body control
- To improve cognition
- For improving respiratory capacity
- To improve balance
- Helps to reduce sleep disturbances
- To reduce sensory issues
- To improve social skills
- To improve oral motor and speech
- For pressure seeking
- To reduced joint proprioception
- To reduce hyperactiveness from kid
- To improve attention span and concentration
- Any physical issues (posture, toe-walking, intoeing, muscle tightness)

What are the benefits of aquatic therapy over land based therapy?

- It becomes easier to perform activities in water than on land as their confidence and activity participation increases.
- It helps to improve blood circulation for deep muscles in water.
- It enhances proprioceptive inputs by movement as muscles in water gets more resistance.

Why water as a medium for therapy?

Since water is a good medium,children enjoy being in water and activities are more fun which helps children to do activities more efficiently

What are the different types of aquatic therapy?

Aquatic Therapy includes therapeutic movements or exercises performed for optimum benefits. The techniques included are:

Water Specific Therapy, Bad-Ragaz ring method, Clinical Ai-chi, Aquatic exercises, Aqua -aerobics, myofascial mobilization and Passive relaxation or Watsu.

Aquatic Therapy Intervention:

The beginning of the exercise session focuses on mental adjustment and getting comfortable in water.The rotations will help the patient to understand the body movement and control in water by giving different impacts to different groups of muscles.This helps to get patients adapted in the aquatic environment.

Activities that can be done in water:

1) Walking in water
2) Reach outs in water
3) Activities to improve command following
4) Activities to improve eye contact
5) Rotations in water
6) Ball catch and throw
7) Stair climbing
8) Squatting
9) Kneel walking-forward and backyard
10) Blowing in water

11) Walking on treadmill

Aquatic therapy is done by a Certified Trained Aquatic Therapist.

Therapy sessions vary based on age,assessment and the severity of spectrum disorder. The child can have 2-3 sessions per week.

The activities should be done under supervision of a trained therapist.

What are the contraindications and relative contraindications?

- Open wounds which we cannot cover with bandages
- Any recent episode of seizure
- Not toilet trained
- Any active (fever, nausea, cold, vomiting)
- Any skin allergies
- Nov-verbal communication (if not able to do by gestures)
- Uncontrolled seizures
- Active infection (nasal, ear)
- Unstable angina

What are the Safety Measures required?

The certified person takes care of safety measures to prevent risk of fall in the pool and inhalation of water.

The therapies should be goal oriented on land and in water which helps to improvise the concerned issues.The aquatic therapy should work as a team from different departments and help to achieve the same goal.

Figure 19.1 Reach Outs in water

Figure 19.2 Rotations in water

Figure 19.3 Walking in water

Figure 19.4 Breathing exercise in water

Figure 19.5 Ball catch and throw in water

Figure 19.6 Core strengthening activity in water

CHAPTER 23

NUTRITION AND DIET

- Nutritional problems in Autism
- Do Different types of diet for Autism
- Dietary guidelines

The child's food intake has a major positive or negative impact on various bodily functions such as brain development, neurotransmitter production, digestive health, immune system etc.

Nutritional Problems in Autism are as follows:

- Children with Autism may have Selective eating behaviour, Limited food preferences or Food Intolerances. As a result, they could be having nutritional deficiencies and gastrointestinal problems.
- Poor nutrition intake could lead to the changes in Biochemical parameters.
- The common gastrointestinal symptoms are chronic diarrhoea/constipation, bloating, gastrointestinal inflammation & abdominal pain. Which in turn could

alter the cognitive function and behaviour of the child.

- Dietary modifications are needed to add the necessary nutrients in the diet. Removing food components like Sugar, food preservatives, Gluten, Casein etc. could help to enhance nutrient absorption and to improve gastrointestinal symptoms.

Different Types of Diets for Autism:

- **Gluten Free Casein Free diet:** The Gluten-Free, Casein-Free (GFCF) diet is often considered for individuals with autism. One theory is that children could have high sensitivity towards gluten and casein. This causes formation of peptides and their absorption into the bloodstream and it may bring negative changes in a child's behaviour.These peptides appear to have chemical structure similar to opiates that can cross the blood brain barrier and cause symptoms like delayed social and language skills & some behavioural issues.
- **Feingold diet:** This diet focuses on eliminating food additives, flavouring agents, sweeteners, and artificial food colours. This diet is intended to reduce hyperactive behaviour and improve concentration.
- **Specific Carbohydrate diet:** This diet aims to reduce certain carbohydrates. Reducing the carbohydrate intake helps to reduce bacterial or yeast overgrowth in the body. Carbohydrates such as Gluten, Lactose, sucrose, high-fructose corn syrup, fructose, maltose, fructooligosaccharides, and any processed sugar are to be avoided.
- **Yeast-free Diet:** It consists of removing fermented foods, sugar, and yeast containing foods. It helps in behavioural as well as gut related issues. Adding probiotics in diet could help to restore gut imbalance due to yeast overgrowth. Foods with antifungal components like garlic, oranges, grapefruit, Lemon, calves, and cinnamon could be added to the diet.
- **The Nemechek Protocol:** It aims to reconstruct the brain by targeting autonomic dysfunction. The Nemechek Protocol seeks to decrease brain inflammation by addressing small intestinal bacterial overgrowth (often called SIBO). There is an important connection between the brain and the gut, so treating SIBO is a sensible way to address brain inflammation–which itself is a common problem for our kids with autism.

What is Picky Eating?

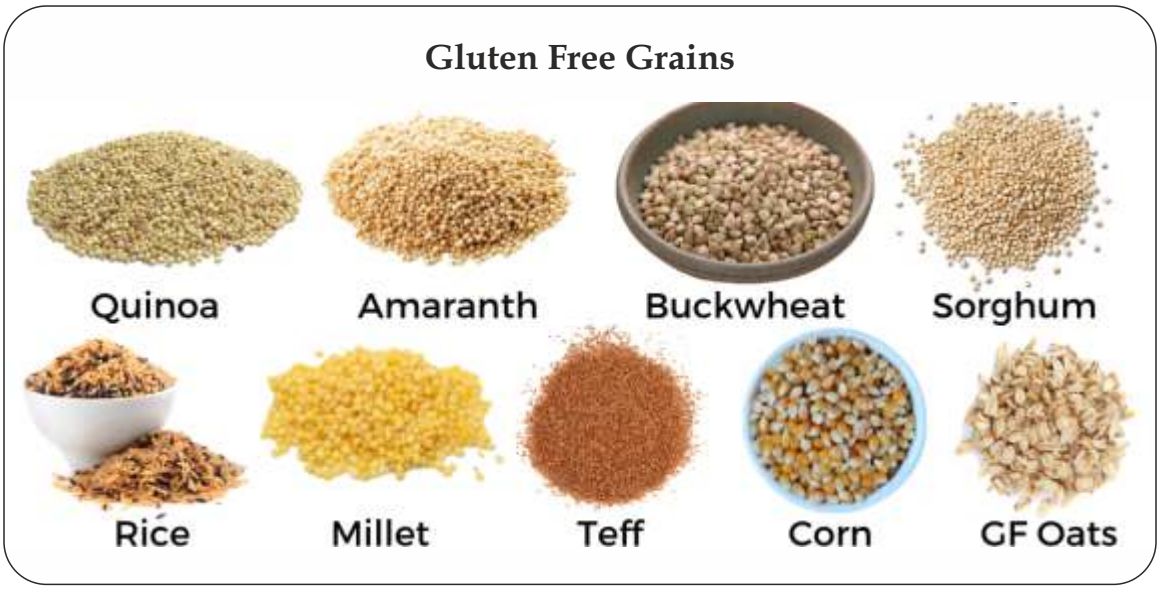
- ● When a child eats less than 30 foods in their diet then it is called picky eating. They tend to eat their favourite food every day.
- ● Many times the child could be unwilling to touch or taste the new food. They

should be continuously exposed to the new foods until they accept it.

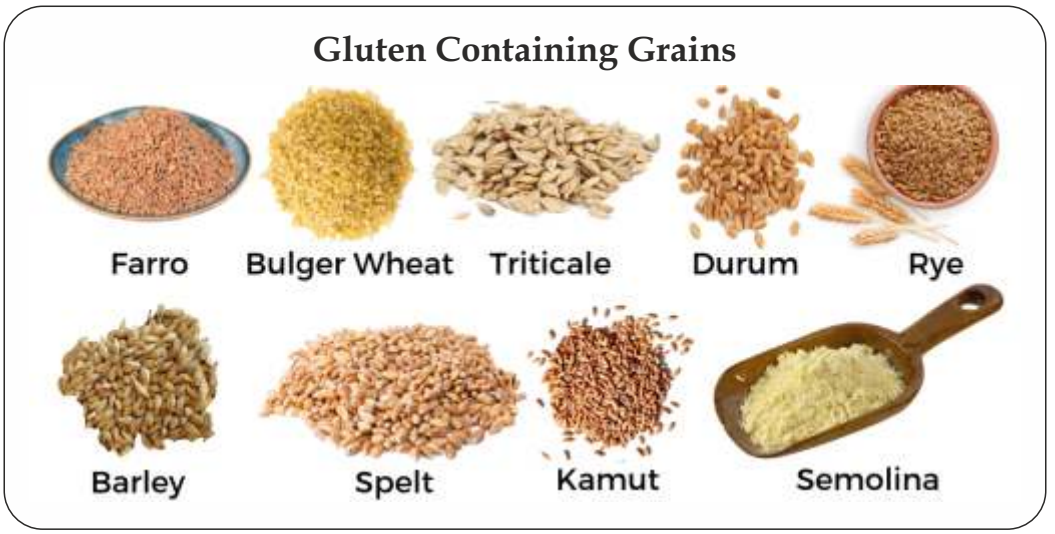
- Ruling out sensory issues, dental problems or gastrointestinal problems would also help.

Dietary Guidelines to enhance the quality of your child's diet:

- Give small and frequent meals.
- Give plenty of water daily
- Do not allow children to skip meals
- Focus on reducing the consumption of fast food or packaged food in the diet.
- All Foods Should be as natural as possible.
- Make them chew food properly before swallowing.
- If having difficulty in chewing, modify the food consistency as per need.
- Limit fried foodstuff.
- Add vegetables in the form of grated salads, soups or Vegetable fingers.
- Fruits can be given in the form of small cubes, smoothies, juices.
- Try to alter the textures of food as per child's preference.Try to hide new food inside favourite food like make mix veg patty with potato and shape them like french fries, if child likes french fries.
- Slowly decrease intake of sugars and use jaggery. Dates or Honey for sweetness.



- Start including new foods in the diet first and then remove the harmful food substances like processed food.
- Maintain food dairy.
- Try to incorporate a colourful variety of food. Read labels carefully for Sugar, gluten & casein.
- All children on elimination diets should be under the care of a nutritionist.



Gluten Free Casein Free Food

Diet Consultation

Casein Containing Foods

Gluten Containing Foods	Gluten Free Grains
Wheat flour (atta), whole wheat, broken wheat, refined flour (maida), semolina (sooji), Noodles, Pastas, Bread, rye, regular oats and barley.	Rice, tapioca (cassava), arrowroot, buckwheat , bajra, Amaranth , jowar (sorghum), ragi, quinoa and singhara atta (water chestnut flour), gluten free oats.
Casein Containing Foods	Casein Free Foods
Milk and milk products like cheese, paneer, butter, Ice cream, cream, Yogurt (Curd)	Coconut milk, Almond milk, walnut milk Rice milk, Dairy free Yogurt like coconut yogurt, Tofu (Soybean Paneer), ghee (clarified butter
Sweets like gulab jamun, kheer, porridge, rasgulla, Bengali sweets, sheera, shrikhand, custard, cake, pastries, yoghurt, éclairs, chocolates, milk cakes, jalebis.	moong dal halwa with jaggery, carrot halwa, doodhi halwa with dates, sliced fruit with little honey or dry fruits (dates,figs,raisins)
Foods To Be Avoided	Foods To Be Included
Noodles, Pastas (Macaroni, Spaghetti, Etc), Oats, Bread, Brolls, Bread Sticks, Breadcrumbs, Wheat Flakes, Sevaiyan And Broken Wheat (Dalia/Lapsi/Thulli).	Use chivda (pressed rice or poha), murmura (puffed rice), , rice noodles, rice or pulse papad, and gluten free bread.

Snacks like pizza, burgers, kulcha, namkeen, bhujiya, upma, seviyan, crackers and biscuits (made from refined flour/wheat).	Eat idli, vada, aloo pattice (without bread/bread crumbs), roasted pulses, Ragi porridge.
Tinned and canned vegetables and fruits vegetable sauces, instant curry mixes, baked beans and baking powder.	Eat freshly cooked vegetables and Fresh fruits, Nuts and Dry fruits.
Processed meats	Eat freshly cooked fish(fresh water), eggs and chicken.
Simple Sugar (Table Sugar)	Honey,Dates, Jaggery (in limited amounts)
Food Colours, additives, preservatives, monosodium glutamate, sugary drinks, flavour enhancers, carbonated beverages, Packaged sauces like Soy sauce	Freshly cooked meal using fresh ingredients as much as possible

Gluten Free Casein Free Food Options

Indian Food Options	
Breakfast	• Vegetable Idli • Plain dosa / Palak dosa/ Beetroot dosa/ Carrot dosa/ Uttapam +Sambar and Chutney • Poha • Upma (made from rice Suji, Jowar suji) • Sabudana Khichdi • Besan chilla/ Moong dal chilla/ Green Moong Chilla • Ragi Flour Dosa with Coriander Chutney • Sevai Upma (use rice sevai) • Jowar (sorghum) flour Paratha (Potato/ Palak/Beetroot/Carrot/ Green Peas) • Gluten free roti (made from Jowar Flour, Bajra Flour, nachni roti) + Veg curry or Omlet • Garden cress seeds(Halim) kheer with almond milk and jaggery • Ragi porridge (Roast ragi flour, cook in water, add milk alternative, honey or jaggery, dry fruit powder)

Lunch/ Dinner	• Jeera rice + Dal palak • Vegetable Pulao/ Palak Pulao + vegetable curry • Jowar roti/ Bajra roti / Makki roti/ Singhara roti/ Rajgira (Amaranth Flour) Roti + Vegetable Curry + Dal curry • Bajra Khichdi • Moong dal khichdi with vegetable • Quinoa Pulao • Rice flour Roti/ Dosa with Chicken Curry/ Fish Curry/ Egg Curry

Continental Food Options	
Breakfast	• Almond flour pancake with banana • Boiled sweet potato + scrambled egg • Gluten free cereal with Almond milk/ Walnut milk/ Rice milk • Quinoa porridge (cook quinoa separately, boil milk alternative , add honey, fruits, dry fruits and then quinoa) • Millet porridge (Roast millet flour, cook in water, add dairy free milk, honey or dates) • Gluten Free Oats Porridge in Almond Milk/ Water • Oats Smoothie (Add gluten free oats, Apple, Banana, Honey or Dates in Almond Milk/ Rice Milk/ Coconut Milk and blend it together) • Gluten Free Bread + Omelet/ Scrambled Eggs
Lunch/ Dinner	• Gluten free vegan wraps • Rice + Vegetable Stew/ Chicken stew/ Mutton Stew • Rice + Lentil Soup • Homemade Pizza (make millet flour flat bread, spread homemade tomato sauce with added herbs, add vegetables, use dairy free cheese or grate boil potato on top) • Quinoa with chicken salad • Stir fry mix vegetable with chicken • Roasted sweet potato/ Mashed Potato + Chicken Stew + stir fry veg • Gluten Free Pasta/ Gluten Free Noodles with Sauteed Vegetables • Quinoa salad (Boiled Quinoa with Zucchini, Red, Yellow, Green Bell Peppers, Corn, and Mushrooms)

CHAPTER 24

ROLE OF PHYSIOTHERAPY IN AUTISM

- The Role of Physiotherapy in Autism
- Commonly Observed Motor Symptoms in Autism
- Strategies for Managing Physical Difficulties in Autism
- Orthosis Prescription in Autism
- Role of Physiotherapists in Autism Without Visible Physical Challenges

What is the role of physiotherapy in autism?

- Children with autism may achieve early gross motor milestones such as sitting, crawling and independent standing within their expected time frame. However, the **quality** of their movements may be **stereotypical or immature** compared to their peers.
- These early motor skills form the **foundation** for later motor abilities that require more **refined movement control.**

- As a result, children with autism may struggle to achieve much higher skills such as ball catching and throwing, jumping, balancing on a beam, hopping, climbing stairs independently etc.
- Physiotherapy is the key component in the treatment of motor dysfunction in children with Autism.
- A physiotherapist will assess a child's neuromuscular and musculoskeletal sys, evaluate overall motor functioning, identify the underlying difficulties and develop an intervention program to improve these areas and enhance motor development.
- Low levels of physical activity and high levels of sedentary behaviours contribute to Obesity in autism.
- Due to **low muscle tone** and lack of physical activity, some children may develop **medial weight-bearing** while walking, which can lead to flat feet or pronated feet.

What are the commonly observed symptoms related to motor issues?

Signs	Related presentation
(A) Postural Deviations	1. Slouched protracted shoulder 2. Kyphotic posture in sitting 3. Lordotic posture in standing 4. 'W' posture in sitting
(B) Tightness of muscles	1. Pectoral muscles (due to slouched posture) 2. Hamstrings 3. Ilio Psoas 4. Adductor Magnus (Due to W sitting) 5. Tendo-achilles (Due to excessive toe walking)
(C) Muscle Weakness / Hypermobile Joints	1. Winging of scapula 2. Hyperlordosis of lumbar spine 3. Hyperextension of Elbow and Knee joint 4. Flat feet / Pronated Feet 5. Easy Fatigability

What strategies can be used for Physical difficulties in Autism?

(A) Stretching exercises:

Fig 21.1 - Hamstring muscle: " Passively take the hip joint till the tolerance level of the child and stretch for 30 seconds !"

Figure 1: Hamstring muscle: "Passively take the hip joint till the tolerance level of the child and stretch for 30 seconds!"

Figure 2: Adductor muscle of the hip- "Ask the child to attain butterfly posture and stretch for 30 seconds ! "

Figure 3: Calf muscle - "Hold the ankle and stretch it towards the leg"

(B) Balance Training :

Figure 2: Standing on the balance board - "Stand on the balance board and maintain your balance while playing catch and throw with the ball."

Figure 5: Walking on unstable surfaces: "Maintain your balance as you walk across the unstable surface of the bolster."

Figure 6: Swinging while completing a given task - "Maintain your balance on a moving swing while placing clips into a box."

(C) Strengthening Exercises :

Figure 7: Prone extension on a gym ball - "Lie on your tummy on the gym ball, lift your chest, and hold the small ball like a superhero!"

Figure 8: Sitting on a gym ball while doing an activity - " Sit on the gym ball and maintain your balance while I gently move it."

Figure 9: Crab pose - "Hold the crab position while I count to 30.

Figure 10: Pelvic bridging - "Lift your hips up into a bridge position and hold until I count to 30."

Figure 11: Push the bolster with firm pressure to activate your back muscles and improve proprioception.- "Push the bolster as hard as you can !"

(D) Motor Planning and Coordination of activities:

Figure 12: Obstacle crossing - "Cross the hurdles while you look down"

Figure 12: Combination of all the activities: "Complete the given task before I count 20! "

What is the role of orthosis in managing physical challenges in children with autism?

Orthoses like Ankle-Foot Orthoses (AFOs), Supramalleolar Orthoses (SMOs), and foot insoles help improve gait, posture, and balance in children with autism. AFOs support ankle control and reduce toe-walking, SMOs provide stability for mild ankle instability and enhance balance, and insoles correct foot alignment in conditions like flat feet. When combined with therapy, they promote better mobility and functional independence.

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Figure 14: For flat feet- Insole/ arch support

Figure 15: For pronated feet: Supra Malleolar Orthosis (SMO)

How can a physiotherapist support an autistic child who does not present with obvious physical impairments?

Even if a child has no obvious physical issues, a physiotherapist can still play a valuable role by supporting overall development and daily function. They can help:

- Improve participation in daily routines at home
- Develop new movement skills
- Enhance coordination and body awareness
- Improve play and social interaction through movement
- Build motor imitation skills
- Increase physical fitness and stamina

CHAPTER 25

VISION THERAPY IN AUTISM

- What is Vision Therapy
- Role of Vision Therapy in Autism
- Who Vision Therapy Helps
- Vision Exercise Program for Children with Autism
- Activities To Improve Visual Perception and Eye Contact
- Safety and Benefits of Vision Therapy in Children with Autism

What is Vision Therapy?

Vision therapy is a treatment designed to improve visual skills like eye coordination, focusing, and visual processing. It involves personalized exercises, often including eye tracking, focusing tasks and visual-motor activities. There are numerous visual issues that can be treated non-surgically with vision therapy, including crossed **lazy eye** (amblyopia), **eye turn** (strabismus), and **convergence insufficiency.**

What is the Role of Vision Therapy in Autistic Children?

Vision therapy can support individuals with autism by improving visual processing, reducing sensitivity to light or busy environments, and encouraging better eye contact. It helps the brain make better sense of what the eyes see, leading to improved comfort and function in daily life.

Who Vision Therapy Helps?

Autistic children may experience a range of visual difficulties, such as strabismus (squint), amblyopia (lazy eye) or difficulty in maintaining visual attention during interactions. Vision therapy can be considered as soon as any visual dysfunction is identified. However, it is most effective in children above the age of 4, as they are generally better able to understand and follow instructions during therapy sessions. It is essential that any vision therapy be initiated under the guidance of a qualified ophthalmologist.

Visual symptoms in individuals with Autism Spectrum Disorder (ASD) can be categorized into **hyper** (over-sensitivity or over-focus) and **hypo** (under-sensitivity or attraction) to visual stimuli. These symptoms are related to differences in how individuals process sensory information.

Hyper (Over-sensitivity)	Hypo (Under-sensitivity)
• Focusing on tiny pieces of dust/particles. • Aversion to dark and bright light. • Dislike of sharp flashes of light. • Looking down most of the time. • Covering/closing eyes at bright lights.	• Attracted towards light. • Looking intensely at objects or people. • Moving fingers or objects in front of the eyes. • Fascination in objects that reflect light or are highly coloured.

What does a vision therapy program include for children with Autism?

A. Positioning:

- The child should be made to sit in supported sitting in order to focus on visual input only. The supported sitting is therefore a good position to start visual stimulation. If a specific one eye is weaker, patching should be done to a good eye.

B. Introduction to visual stimulus:

- Use tactile and verbal stimulation to assist with the location and identification of object. Use torch/flash light for focusing any below pattern sheet/ toys in a dark room.

(Fig. 1, 2)

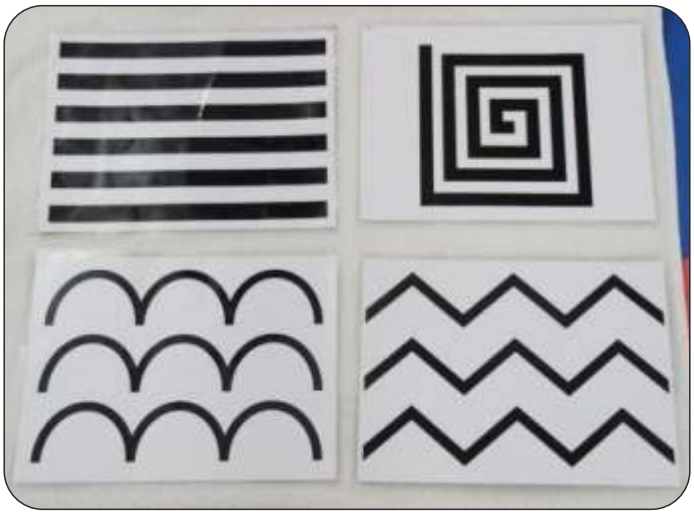

Figure 1: Different pattern sheets for vision therapy

a. Tracking the lines under beam of light: Tracking with eyes/ fingers of different patterns with help of laser light or flash light in the dark room. (Fig 2)

Figure 2: Flash light toys used in dark room for vision therapy

b. Bate's method: If the child has nystagmus (abnormal movement of eyeball sideways) Keeping two objects equidistant from the eyes and moving one object in different direction while keeping the other object stable, & telling the child to keep focus on 1st object & then second object.

c. Visual tracking of laser light or flash light/torch light on the wall of the dark

room to recognize basic numbers or letters.

d. Hand-Eye Co-ordination Exercises: Bouncing ball, colouring picture, solving puzzle, playing shuttle , picking small objects.etc. There are so many fun computer and electronic games but working on paper/pen tasks not only helps in hand coordination, but also on the visual. Our eyes learn to work together, learning skills such as problem solving and visual scanning.

Which activities improve visual perception and eye contact?

- Puzzles & Matching Games: Boost visual discrimination and recognition.
- Maze tracing & Dot-to-dot activities: Improve tracking and hand-eye coordination.
- Shape sorting, block patterns, and visual sequencing tasks: Strengthen spatial relationships and visual memory.
- Hidden picture games or "I Spy": Encourage focused visual attention.
- Interactive play (peek-a-boo, rolling a ball): Naturally encourages looking at others.
- Using favorite toys near the therapist's face: Draws the child's gaze upward.
- Mirror play: Helps children become comfortable with their own and others' faces.
- Turn-taking games: Builds social connection and often leads to spontaneous eye contact.

Who does vision therapy and for how long?

Vision therapy helps improve visual skills and is provided by professionals like occupational therapists, physiotherapists, or optometrists. For autistic children, therapy should begin with short sessions to prevent overstimulation. It's recommended to keep sessions under 25 minutes, done twice a day, five days a week, for about a year. Starting gradually helps children stay comfortable and benefit more from the therapy.

How Safe and Effective Is Vision Therapy for Children with Autism?

Vision therapy is safe and gentle for children. It doesn't cause any harm or side effects. The only thing to be careful about is not giving too much visual activity at once, as it can make the child feel tired or irritated. When done slowly and at the right pace, vision therapy can help improve eye movement, focus, and how a child understands what they see. This can make learning, coordination, and even social skills like eye contact easier for children with autism.

CHAPTER 26

NEW AGE REHABILITATION

- Assistive technology introduction
- How to choose appropriate assistive technology
- Benefits of assistance technology

What does "Assistive technology" mean?

Any tool, piece of machinery, computer programme, or other product used to increase, maintain, or enhance a person's ability to operate is considered an assistive technology.

What assistive technology should you choose for your child?

- The option is typically one you make with a group of therapists and consultants skilled at matching various assistive technologies to particular needs. The assistive technology team may include family physicians, conventional and special educators, speech-language pathologists, occupational therapists for

rehabilitation, and other professionals, including consultation representatives from assistive technology manufacturers.

- The purpose of employing assistive technology is to provide knowledge through their asset, i.e., those without impairments, who find technology helpful. Technology also opens doors for those with disabilities. Assistive technology can be divided into three categories- low, medium, and high.

1. "Low" Technology aids and appliances

- These are visual support techniques that are usually affordable and equipment that is simple to use.
- An illustration would be modified pencils, coloured paper, adaptable paper, magnifying glasses, dry-erase boards, clipboards, laminated photos, highlighter tape, etc.

2. "Mid" Technology aids and appliances:

- Battery-powered devices, basic electronic gadgets, assistive technology, and limited technological breakthroughs
- As an illustration, consider voice output devices, tape recorders, language masters, overhead projectors, timers, and calculators.

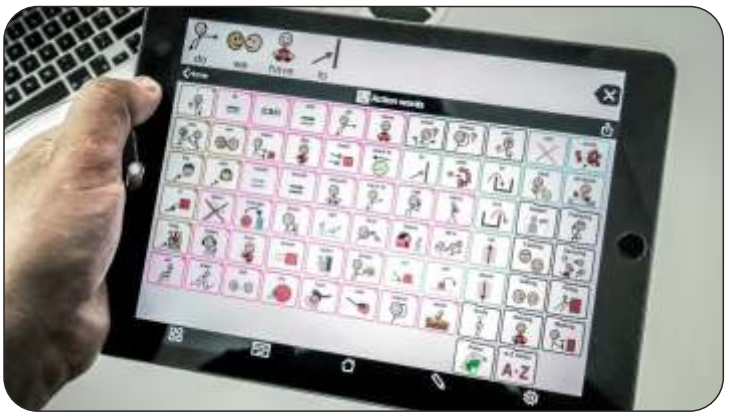

Figure 1: Augmentative and Alternative Communication (AAC) tool

Figure 2: Time Timer MOD

3. "High" technology aids and appliances:

Examples include tablets, communication-enhancing software, video cameras, PCs with adaptive hardware, sophisticated voice output devices and robots.

What is Artificial Intelligence?

Artificial Intelligence (AI) is the field focused on creating smart machines that can

think and learn like humans. It uses rules or algorithms to help machines solve problems and make decisions. AI sys can predict problems and react to them in a smart and adaptable way. One of AI's key strengths is its ability to learn from large amounts of data and recognise patterns and connections between different pieces of information.

How is AI advancing in healthcare and addressing challenges for individuals with Autism Spectrum Disorder (ASD)?

AI has the potential to solve important challenges in healthcare, especially for people who struggle with social interactions, like those with Autism Spectrum Disorder (ASD). Experts in digital health believe that AI can help find signs of ASD early and provide better treatment. For example, tools like CanvasDx look at behaviour patterns and home videos to help doctors figure out if a child is at risk for autism, which can lead to an earlier diagnosis. There's also an application that tracks eye movements and emotional reactions to detect autism in babies as young as twelve to eighteen months old. The screening instruments used to detect ASD are connected to eye-tracking technology, which is a simple and direct measure. These AI tools help doctors catch autism early, so children can get the support they need sooner, leading to better outcomes.

Figure 3: AI in Autism

How have AI-enhanced techniques helped in autism therapy?

AI has greatly improved autism therapy, especially in helping children develop social skills needed for everyday interactions. Many autistic children find it difficult to understand social cues, start conversations, or respond appropriately. AI-powered tools, using smart learning and real-time feedback, create structured and flexible learning environments where children can practice at their own speed. Virtual assistants and AI simulations help in improving communication, recognizing emotions, and learning how to respond in different situations. In group settings, AI-powered social robots help children take turns, demonstrate proper social behaviours, and give gentle, non-judgemental feedback. Many of these AI tools also use fun, interactive, and game-like features, making therapy sessions more engaging. This increased interest and motivation helps children participate

more actively, which is key to their learning and development. EG: New-age techniques like robot-assisted techniques and virtual reality.

How does AI help parents and care-givers help children with ASD?

AI tools are a great help for parents and teachers, giving them useful insights into a child's progress and suggesting ways to support their learning. These tools also reduce the time spent on paperwork and planning, allowing caregivers to focus more on meaningful interactions with the child. For therapists and educators, AI provides valuable data to create more personalised and effective strategies for helping children with autism. By using AI in therapy, experts have developed smarter, data-driven approaches that improve social skills and help children engage better in real-world situations.

What is robot-assisted therapy?

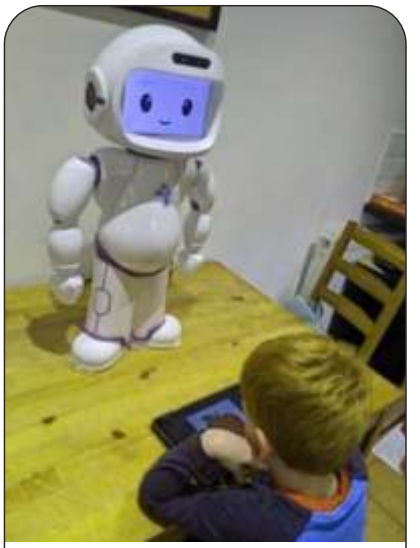

Figure 4:
Robot-assisted therapy

Robot-assisted therapy uses robots to assist individuals with special needs through social interaction. It improves the outcome of traditional human therapy and has been extremely successful with Autism Spectrum Disorder. Social robots are commonly used for ASD and are designed to target different therapeutic scenarios and activities with varying outcomes such as eye contact, imitation, emotion recognition, expression, self-initiated interactions, etc. Some popular robots designed for therapy with individuals on the spectrum are Milo, by Robots4Autism; Qtrobot, by LuxAI; and Nao, by Softbank Robotics. Robot-assisted therapies (Robots4Autism, Qtrobot) and supervision of therapists. In this, individuals work through different modules for communication, social, emotional and behavioural skills that are decided by therapists. For example, if the module selected by the therapist is about recognising emotions or facial cues, the robot's face shows different emotions such as anger, sadness, happiness, etc., and the individual can choose from the screen the emotion that the robot is depicting. Robot-assisted therapies are highly motivating for individuals with Autism Spectrum Disorder due to the simple, predictable, and non-intimidating nature of robots compared to humans. Children feel attracted towards robots; thus, they enjoy and positively engage in interaction with them. They are also less stressed and more responsive to feedback during therapy.

- The writing, reading, communication, learning, and positive behaviour of children on the spectrum can be improved with assistive technology. behaviour
- Individuals that use assistive technology are more independent and able to communicate effectively with others.
- Sensory kit examples: An excellent tool for meeting the sensory needs of people with ASD is a sensory kit. It might contain many things that could help reduce stress, annoyance, and/or resulting behaviours while enabling the person to pay more attention to regular activities and responsibilities.

What is Virtual Reality?

Virtual Reality (VR) is a computer-based technology that simulates the real-world environment to improve the social skills of the user with an interactive and immersive experience in real time. It is an effective therapeutic tool for a wide range of disorders, including autism. It can artificially create sensory experiences such as touch, hearing, smell, and sight. VR consists of visual representations based on everyday life settings, which are presented on a screen. It involves the use of a head-mounted display, projection, monitors, haptic devices, etc. The use of VR mainly focuses on the auditory and visual sensory output. It creates a setting identical to the real world with reduced or manipulated information. In a virtual environment, objects can be added or removed, and various scenarios can be created, which may not be feasible in a real-world setting due to social constraints and resource challenges.

Figure 5: Mini write and wipe board

VR can be implemented in head-mounted visual display (HMD) sys, head and body tracking, CAVE (Cave Automatic Virtual Environment) automatic VEs or room-like displays, and other technologies. Therapists can personalize the VR content based on the patient's needs. Meaningful goals are established for every patient along with an instruction plan to implement the procedures for teaching and evaluating the achievement of the set goals. The range of training interventions that can be used in VR including skills of social skills and adaptation and communication skills, emotional skills, daily living skills and cognitive functions. Avatars and virtual elements contribute to the training in recognition of facial expressions and body gestures.

Future trends: How can technology benefit kids and students with autism spectrum disorders?

1. **Communication:** Improving a child's ability to communicate is the most frequent way that technology is used to support autistic youngsters. For instance, one app might be designed for a youngster who is nonverbal, while another might assist social cues to develop into effective verbal communication abilities. For instance, Proloquo2Go and Speech Bulbs 2 are available for Apple and Android devices.

2. **Visual schedules:** Using reminders and visual timetables on smartphones and tablets, children can practice daily living and self-care skills while also completing tasks. For instance, a visual plan with illustrations for an evening routine might help the child learn to manage time and progressively master a pattern on his or her own, including everything from an after-school snack to homework to brushing teeth and everything in between. The visual timetable can be taped to surfaces like the refrigerator or the wall of a child's room.

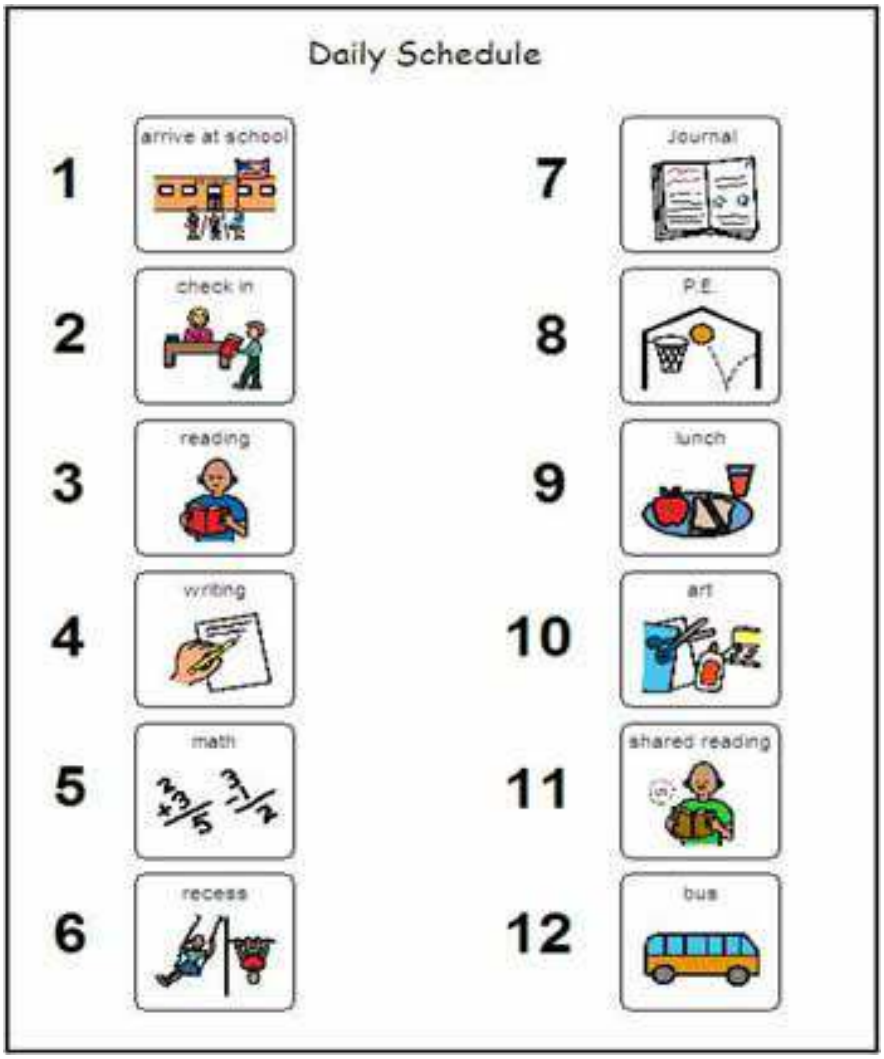

Figure 6: Visual schedules

3. **Decision-making:** People with autism who struggle with making choices can utilize technology to communicate about choices and develop decision-making abilities that will be crucial as they get older and into adulthood. A parent can use a smartphone or tablet to indicate the item they want in a restaurant rather than placing a child's order.

4. **Technology can be a motivating tool for autistic children.** A smartphone or tablet is two examples. The usage of an iPad or a favourite game app as a reward for excellent behaviour, such as finishing a task or receiving an assessment for homework, can assist in assuring the inculcation of good behaviour.

5. **Video modelling:** Teaching skills visually is referred to as video modelling. A teacher, educator, parent, or individual themselves may be seen in the video executing a task or assessment, or they may be seen in the video being taught the necessary skills and procedures. A child with autism can view these movies as many times as necessary to acquire crucial skills. Because watching these videos requires using a tablet or smartphone, the learner is more likely to be skilled at using this type of instruction. A wide range of skills, such as hygiene and job tasks, can be aided by video modelling. For instance, I wrote social skills stories that are only sold in the Apple Store.

6. **Social networking:** Compared to more conventional ways, social networking can sometimes make it easier for adult students with autism to make friends. He or she may benefit from making acquaintances or interacting online to practice the skills that may be useful in the classroom, workplace, or community. For instance, online groups are made up of people with autism.

7. **Support at home and work:** For certain students and young adults with autism, technology can be very useful at home and work. For instance, a step-by-step checklist can assist a child with autism in staying on top of things and completing them successfully and orderly. It can also assist a youngster to grow more autonomous at work or at home to have reminders and notes about each case assignment if he or she forgets something, as opposed to continually asking other family members or coworkers.

Examples of technology that can be used with children.

1. PECS is one such app that allows children to communicate their needs and emotions.

2. Breathe, Think, and Do with Sesame is one such app for lower grade-schoolers to learn about mindfulness. Kids learn soothing breathing techniques with the aid of an adorable monster to help them deal with circumstances that could be upsetting or unpleasant, such as putting on shoes, saying goodbye to parents, repairing a block tower, standing in queue, and going to bed in the dark.

Depending on your child's specific difficulties, each situation can be reviewed. There is also a section for parents that is filled with advice and techniques.

3. Dreamy Kid: It is targeted at children aged 8 and up, with its programmes most suited for children who have trouble with anxiety, settling down at bedtime, or self-confidence. There are numerous techniques, such as the "rainbow body-scan," "schoolwork mastery meditation," and "confidence affirmations," as well as a variety of calming, ambient background sounds, to help your child fall asleep.

4. Headspace for Kids: is divided into five sections, which are Calm, Focus, Kindness, Sleep, and Wake Up. Each one offers three age-specific programmes focused on breathing exercises, visualizations, and focus-based meditation for the following age ranges: 5 and under, 6–8, and 9–12. Children are more likely to be engaged by the amusing cartoons thanks to Andy Puddicombe, a former monk and co-founder of Headspace, whose soothing voice is used throughout.

CHAPTER 27

CAREER AND VOCATION

- Vocational Rehabilitation
- Challenges in vocation selection
- Overcoming challenges

"For every unique mind, there's a unique career — the goal is to discover, not to compare."

1. How Can You Build a Bright Career for Your Child?

Vocational Rehabilitation (Vocational Rehabilitation) offers hope. It's a structured process that begins in young adulthood, guiding individuals to integrate into society and become productive, independent members.

2. How Does Vocational Rehabilitation Help?

Vocational Rehabilitation helps young adults with autism overcome the barriers they face in entering, sustaining, or re-entering the workforce.

Figure 1:
Making Opportunities

Figure 2: Building Skills for a Brighter Future

3. What Are the Goals of Vocational Rehabilitation?

- **Prepare individuals for employment:** Training equips individuals with autism with job-ready skills.
- **Help them obtain and maintain jobs:** Support is provided to secure suitable work and sustain employment.
- **Ensure long-term job retention and development:** The goal is to foster career growth and workplace success over time.

4. Who Makes Up the Vocational Rehabilitation Team?

- **The individual:** Central to the process, their strengths and interests guide planning.
- **Family members:** Offer insight, motivation, and ongoing support.
- **Occupational therapist:** Builds daily living and work-related functional skills.
- **Psychologist:** Supports emotional regulation and behavioral strategies.
- **Speech therapist:** Enhances communication and social interaction.
- **Physiotherapist:** Improves physical strength, endurance, and posture for work tasks.
- **Special educator/trainer:** Provides structured teaching of job skills.
- **Employment support professionals:** Facilitate placement and workplace integration.

5. How Does Vocational Rehabilitation Work for the Individual?

Vocational Rehabilitation is individualized and tailored to each person's unique

strengths, preferences, and goals.

- **Pre-vocational assessment:** Helps define realistic job goals based on strengths.
- **Skill assessment and training:** Builds functional, cognitive, and social competencies for the workplace.
- **Emphasis on adaptive tools:** Technology and supports enable task completion and independence.
- **Supportive environment creation:** Workplaces are tailored to suit the individual's needs.

The ultimate goal is to create a supportive work environment that aligns with the individual's interests and skills.

6. What Are the Main Obstacles During the Process?

Common challenges faced by individuals with autism include:

- Difficulty with socialization and communication
- Struggles in understanding and using language
- Sensory sensitivities
- Need for structured support

Environmental barriers also play a role:

- Limited accessibility
- Lack of job-support services
- Insufficient social support sys

7. How Do We Overcome These Challenges?

- **Skill training:** Focused practice improves communication, regulation, and job performance.
- **Compensatory strategies**: Cognitive supports like task sequencing and time management aid independence.
- **Coworker/employer training:** Promotes awareness and inclusion in the workplace.
- **Workplace adaptations:** Modifications reduce barriers and improve performance.

8. How Do Recent Advances in Technology Help?

Assistive technology plays a vital role in supporting individuals with autism.

Examples:

- Mobile phones, tablets, iPads
- Video modeling and video-based training
- Audio-visual reminders for routine tasks
- Organization apps for **time management and task sequencing**

These tools **enhance social interaction**, aid in **communication,** and support **workplace integration.**

Figure 3: Use of headphones to reduce auditory stimulation

9. How Can Sensory Needs Be Managed in the Workplace?

To address sensory challenges, the following tools and techniques can be used:

- Fidget toys
- Chewing gum
- Background music or noise-cancelling headphones
- Weighted clothing
- Adjusted lighting and seating arrangements

These **sensory accommodations** help improve focus and productivity.

Job Types and Suitable Job Profiles for Individuals with Autism

Job Type	Example Job Profiles	Core Skill Sets Required
Administrative & Data Entry	Data Entry Operator, Record Keeper, Office Assistant	Attention to detail, typing, time management, minimal social interaction

Retail & Customer Support	Store Assistant, Inventory Stocker, Labeling and Tagging	Basic math, organization, motor skills, structured routine
Hospitality & Services	Housekeeping Assistant, Kitchen Helper, Table Setter	Routine following, motor coordination, task sequencing, basic social interaction
IT & Tech Support	Junior Programmer, Software Tester, Technical Assistant	Logical reasoning, computer skills, pattern recognition, low verbal interaction roles
Creative & Artistic	Graphic Designer, Handicraft Maker, Painter	Fine motor skills, creativity, visual perception, self-expression
Manufacturing & Packaging	Assembler, Packing Assistant, Sorting and Quality Check	Repetitive task comfort, hand-eye coordination, attention to detail
Agriculture & Gardening	Nursery Assistant, Organic Farming Helper, Landscape Maintenance	Physical strength, sensory comfort with outdoors, motor skills
Back-Office & Support Roles	Document Scanner, Photocopier Assistant, Filing Clerk	Routine work, minimal distractions, moderate to low interaction, attention to detail

CHAPTER 28

COUNSELING FOR PARENTS

A Heart to Heart

- Parental/ Family counseling
- Approaches in counseling

Parental/Family Counseling: Walking the Journey Together

Raising a child with Autism Spectrum Disorder (ASD) is a unique journey—filled with moments of joy, growth, and discovery, but also with emotional challenges, confusion, and deep fatigue. Families often find themselves juggling a whirlwind of emotions—love, fear, frustration, guilt, and hope—all at once. That's why parental and family counseling isn't just helpful—it's essential.

When a child is diagnosed with autism, it doesn't just affect them—it changes the rhythm of the whole family. Siblings may wrestle with feelings of jealousy or embarrassment, sometimes feeling overlooked. Parents, meanwhile, may feel isolated or overwhelmed, wondering if they're doing enough or doing it right. It's in

these quiet, unseen struggles that family counseling steps in to offer guidance, healing, and hope.

Why Family Counseling Matters?

Family counseling provides a space to pause, reflect, and reconnect. It's about supporting the entire family as they navigate the world of autism together—because no one should walk this path alone.

1. Support for Parents

Parents are the backbone of the family, yet they're often expected to stay strong without acknowledging their own emotional needs. Counseling gives parents a place to breathe, share openly, and be heard without judgment. Whether it's the pain of watching their child struggle or the guilt of not having all the answers, this space allows for healing and renewal.

2. Support for the Child

Children with autism are incredibly perceptive. They often sense stress in the household, even if they can't fully express it. When families participate together in counseling, children feel seen, included, and supported. It reinforces the message: "You are not alone—we're in this together."

3. Strengthening the Whole Family

Counseling encourages unity. It helps families learn tools to handle everyday challenges—whether it's creating routines, managing meltdowns, or building communication skills. Most importantly, it helps everyone understand each other better, building empathy, patience, and resilience.

Figure 1: A sneak peak into an individual parental counseling session.

What Does Counseling Help With?

- Processing the diagnosis and its impact on daily life.
- Creating a supportive home environment.
- Learning effective communication strategies.
- Managing stress, anxiety, and burnout.
- Reducing feelings of isolation and helplessness.
- Promoting self-care and emotional regulation.

What are the approaches to Family Counseling?

There is no one-size-fits-all solution. Counseling is tailored to the unique needs of each family, using a variety of approaches:

1. Cognitive Behavioral Therapy (CBT)

CBT helps families understand the link between thoughts, feelings, and behaviors. For example, a parent feeling defeated may be guided to reframe their thinking: "I'm struggling" can shift to "I'm learning and growing every day." Therapists often assign small, practical tasks that promote progress and confidence.

2. Psychodynamic Therapy

This approach explores deeper emotional patterns—perhaps unresolved grief, past trauma, or unspoken fears. By understanding what lies beneath the surface, parents can begin to heal old wounds and respond more mindfully to present challenges.

3. Syic Family Therapy

Here, the family is seen as a dynamic sy where everyone's actions affect one another. The therapist helps uncover unspoken rules, relationship patterns, and communication styles that might be contributing to stress. Together, the family learns how to shift these patterns in a healthier direction—building stronger bonds in the process.

4. Parent Support Groups

There's something incredibly powerful about sitting in a room (or even on a Zoom call) with people who just get it. Support groups create a sense of belonging and shared understanding. These groups offer:

- A safe space to share stories, fears, and successes
- Practical advice and ideas from people who've been there

- Emotional validation and friendship
- Guidance on navigating sys like healthcare, education, and therapy

Sometimes, simply hearing someone say, *"I've been through that too,"* can ease the weight of uncertainty.

5. Sibling Counseling for Autism Spectrum Disorder

Siblings of children with ASD may feel confused, overlooked, or emotionally conflicted. Sibling counseling offers them a safe space to express feelings, understand autism better, and develop healthy coping skills. It fosters empathy, strengthens sibling bonds, and supports overall family harmony.

Why Counseling Matters?

Counseling isn't just about solving problems—it's about building a foundation of **love, trust, and resilience.** It empowers families to turn toward each other, rather than away, during hard times. It reminds parents that their best is enough, and that seeking help is not a sign of weakness—but an act of strength and devotion.

Every family's journey with autism is different, but they all share one thing: they are stronger together. With the right support, families can not only manage the challenges—they can grow through them.

Figure 2: A glimpse of a motivational workshop for parents.

CHAPTER 29

MEDICAL MANAGEMENT

- Medication For Behavior
- Sleep & Epilepsy
- Supplements And Nutrition

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder which shares symptoms with other neuropsychiatric diseases. Currently, there is no medication that can cure ASD or all of its symptoms. However, some medications can help manage some symptoms, especially certain behaviors.

Psychotropic Medications for autism can be categorized as

1. Medications for management of Behavioral symptoms (e.g. Hyperactivity, Irritability and Aggression).
2. Medications for management of sleep.
3. Medications for management of epilepsy.

Medications for management of Behavioral symptoms

Some drugs commonly used to alleviate symptoms associated with ASD are described below:

1. Risperidone:

It is the first FDA-approved drug for children with autism. A second generation antipsychotic drug.

Role: It provides temporary remedial for aggression, hyperactivity, inattention and self-injurious behavior seen in children with autism.

Mechanism of Action: It alleviates dopaminergic and serotonergic pathway activity in the brain. These two pathways are responsible for psychological, behavioral process (movement, cognition, executive functions, reward, motivation, neuroendocrine control) and emotional and biological processing (depression, sleep, appetite, circadian rhythm, cognitive function) respectively.

The drug is metabolized in the liver.

Age: 4 yrs. and older. The earlier the drug administration the better the ease in symptoms.

Dosage: Tablets are prescribed for oral administration. Can be taken with or without food (should not be mixed with Tea or carbonated drinks).

Initial Dosage:

0.25mg per day – < 20kg Children

0.5mg per day – >20kg Children

The dosage is increased up to 2-10mg per day, after 10-11 months of initial dosage. All medicines should be taken under supervision of expert doctor. .

Drawback: If used solely, it's effect varies from patient to patient and does not guarantee cure of core symptoms. Symptoms may return if pause in drug consumption.

Side Effects: Fatigue or drowsiness, excess salivation, excess weight gain, attention deficit.

2. Aripiprazole:

It was given FDA approval in 2009 for use in autism. A second generation antipsychotic drug.

Role: It treats irritability, hyperactivity, repetitive behaviors and inappropriate

speech in children/adolescents.

Mechanism of Action: It partially blocks dopamine and serotonin receptors.

Dosage: Oral solution and tablet - route of administration. Can be taken with or without food (not to consume with a high fat meal).

Initial Dosage:

Initially 2mg/day which can be gradually increased to 5mg/day

max-15mg/day

Side Effects: Tardive dyskinesia (uncontrollable stiff, jerky movements of face and body), heart problems, tremor, muscle rigidity, sedation, drooling and weight gain.

3. Methylphenidate:

Role: The drug is prescribed along with Risperidone or Aripiprazole, to alleviate the side effects as to improve attention and control weight gain by suppressing appetite. It also treats hyperactivity, inattention, and irritability.

Mechanism of Action: It acts as a norepinephrine and dopamine reuptake inhibitor (NDRI), thereby increasing their concentration and prolonging their action.

Dosage: Oral administration. Can be taken with food to alleviate GI upset.

Initial Dosage: 18 mg and can be increased to 36 mg

Side Effects: Loss of appetite, abdominal discomfort, temper, irritability and headache.

4. Atomoxetine:

Role: The drug is prescribed along with Risperidone or Aripiprazole, to alleviate the side effects such as hyperactivity, inability to focus and weight gain.

Mechanism of Action: Enhances norepinephrine hormone (Dopamine is the precursor) by selectively blocking its reuptake and increasing its concentration.

Dosage: Oral administration. Can be taken with or without food.

Initial Dosage: 0.5 mg/kg daily and can be gradually increased to 1.2mg /kg daily.

Side Effects: Increased blood pressure and heart rate.

5. Neuroleptics (haloperidol):

Role: Improves maladaptive behavior.

Dosage: Usually dose is 0.05 mg/kg per day

Mechanism of action: It blocks the dopamine neurotransmission, thereby relieving delusions and hallucinations.

Side-effects: Excessive sedation, increased irritability and dystonic reactions observed above the optimal dose range

6. Quetiapine:

Role: Quetiapine is an atypical antipsychotic drug that treats irritability, inattention and hyperactivity.

Dosage: 10-17 yrs of age -50 mg once day in evening which may be increased by your doctor.

Mode of action: It blocks dopamine and serotonin receptors.

Side-effects: Can cause suicidal thinking or behavior in children and adolescents and should not be given to children under 10 years of age.

Contraindications: Cannot use in treatment of psychosis

7. Buspirone

Role: Reduces anxiety, irritability, and temper outbursts.

Dosage: 2.5-5 mg/day

Mode of Action: It blocks serotonin receptors and thus reduces anxiety.

Contraindications: hypersensitivity reaction with buspirone have been observed.

Avoid the use of monoamine oxidase inhibitors (MAOI) within 14 days before or after buspirone administration as it might develop serotonin syndrome or elevate Blood pressure

Side effects: may cause nausea, vomiting, dizziness, drowsiness and gastric distress

8. Clonidine

May be used in patients 6-11 years of age, used to control hyperactivity.

Mode of action : Belongs to the class of imidazoline receptor agonists, centrally-

acting antiadrenergic agents.

Medications for management of sleep

1. Melatonin:

It is a hormone produced by the brain. It is produced more when it's dark and less when it's light.

Role: Autistic people have less melatonin levels. Melatonin supplements help in treating sleep issues, by aiding them to sleep for longer time and less disturbance at night. Thereby, improving their daytime behavior.

Dosage: Oral administration as a pill. Should be given in the evening (7 p.m.) and takes time to begin the effect.

1 mg to 6 mg. The child's age or weight is not associated with melatonin dose response.

Side effects: Rare occurrence of loose stools.

Medications for management of epilepsy

1. Valproate:

Role: It controls seizures and reduces repetitive behaviors, core symptoms in ASD patients.

Mechanism of Action: It leads a chain of activity which ultimately increases GABA concentration by reducing its degradation. GABA helps to control fear and anxiety in overexcited neurons.

Dosage: Oral administration as a tablet. Taken with food (avoid alcohol and dairy products).

10 to 15 mg/kg twice a day.

Side effects: Weight gain, hair loss, carnitine depletion, hepatotoxicity, abnormal liver function tests, hyperammonemia, and pancreatitis.

2. Levetiracetam:

Role: Used in the treatment of partial onset seizures and improved attention, hyperactivity, rapid mood changes and aggressive behaviors.

Mechanism of Action: It indirectly affects GABAergic neurotransmission.

Dosage: 10mg/kg twice a day .Oral administration as a tablet. Taken with food.

Side effects: Depressive symptoms, suicidal ideation, and behavioral

abnormalities.

3. Brivaracetam :

Used for Epilepsy

Initial dose: 0.5 to 1.25 mg/kg orally twice a day; Maintenance dose: 0.5 to 2.5 mg/kg orally twice a day

4. Topiramate:

Role: It is used with risperidone to reduce irritability, stereotypical behavior, and hyperactivity. It is only helpful for the treatment of behavior in selective individuals with ASD.

Mechanism of Action: It acts on GABA receptors and glutamate receptors.

Dosage: Initially 25mg per day for children more than 2 yrs

Oral administration as a tablet. Taken with food (Avoid Ketogenic diet)

Side effects: Metabolic acidosis, mood changes, suicidal thoughts and kidney stones.

5. Midazolam

Role: medicine works in the brain to stop both cluster and prolonged seizures. It is used in case of emergency . Spray is given through the nose and is absorbed quickly.

Mechanism of Action: acts on glycine receptors and produces a muscle-relaxing effect.

Dosage: 2 puffs in each nostril if seizure last for more than a 1 minute.

Side effects: Sleepiness, Headache, Runny nose , Nasal discomfort,Throat irritation.

Supplements and probiotics

Studies have observed several nutritional deficiencies such as vitamin D, B, C and omega-3 fatty acids that may occur in children with ASD, because of which dietary supplements can be considered as a complementary and alternative treatment for ASD.

The prevalence of feeding problems, such as food selectivity and unusual eating patterns is high in ASD. Food selectivity may result in nutritional deficiency and may impact the severity of the symptoms. Dietary supplements can be used to manage nutritional deficits in children with ASD.

Children with autism spectrum disorders (ASD) have long been prescribed vitamins, minerals, and natural supplements to help with sleep, gastrointestinal distress, and boost low vitamin levels, all of which are common in children and adults with ASD.

Commonly used supplements in ASD:

VITAMIN D

Vitamin D plays an important role in brain development and its function. It helps in neurotransmitter synthesis, assists the brain in forming new connections and strengthens connections that are already present. It also reduces neuroinflammation.

VITAMIN B6

Vitamin B6 found in typical multivitamins is inactive form , therefore active form P5P (pyridoxine 5 Phosphate) should be supplemented.

This vitamin is broken down in the body by an enzyme (PLP), and some research suggests this enzyme is not as effective in children with autism. The PLP enzyme is needed for the proper production of dopamine in the body, which helps control the brain's reward centers.

METHYL B-12

The B-12 vitamins are a "family" of vitamins that each play an important role in the functioning of the nervous system and body. Methyl B-12 has the ability to act on specific pathways within the brain, which results in more fuel or power for certain brain processes. It also interacts with folic acid to produce cells in the body.

VITAMIN B2

Vitamin B2 is involved in the proper development and function of the nervous system, including the brain. B2 is a important co factor in folate cycle. It helps in mitochondrial function and improves energy production. Active form of vitamin B2 ,Ribose 5 phosphate should be given.

Methyl folate (B9)

Folic acid is a vital B-vitamin essential for DNA synthesis, neurotransmitter production, myelination, and cellular methylation which are all critical for brain development and function.. However, in many individuals with autism the ability to convert folate to its active form (methylfolate) is affected which leads to low folate levels in the brain. Therefore, active forms of Folic Acid i.e. Methyl folate or Folinic acid should be given instead of Folic acid.

Vitamin B7

B7- Biotin is important for memory, concentration and cognition. It improves neurotransmitter activity and mitochondrial function.It has neuroprotective properties.

MAGNESIUM

Magnesium is also a vital nutrient, ensuring proper functioning of the brain and muscle cells. Magnesium is found in many foods, especially seeds and nuts, whole grains, and leafy vegetables.

Vitamin B6 and magnesium are typically implemented together, as B6 can sometimes cause unpleasant symptoms, such as upset stomach, and the magnesium appears to counteract this.

MELATONIN

Melatonin is a hormone produced in the body that is responsible for regulating our sleep/wake cycles.

Often, children with autism have difficulties with sleep and therefore it is frequently used to treat insomnia, or difficulty with falling asleep and/or staying asleep).

OMEGA-3/FISH OIL

Omega 3 fatty acids are essential for brain and eye development in humans. Two types of Omega 3s are found in seafood, while the third type is found in plant oils.

VITAMIN C

Vitamin C plays an important role in the human body, as it supports the production of neurotransmitters (chemicals that help our cells communicate) and helps protect the body against free radicals. Vitamin C is also essential for a healthy immune system.

VITAMIN A

Vitamin A is crucial for children's brain development, supporting neuronal differentiation, and overall cognitive function

GLUTATHIONE

It is a potent antioxidant, which offers numerous health benefits, including protecting cells from damage, supporting detoxification, boosting immunity. Many children of Autism have glutathione deficiency which increases oxidative stress. If

homocysteine level is low then glutathione supplementation is required.

PROBIOTICS

Many children with autism are prone to have gastrointestinal (GI) issues, including abdominal pain, constipation, and diarrhea. There are many hypotheses regarding the cause of these symptoms, including inflammation and abnormal microbes found in the digestive tract.

Gut bacteria found within the GI tract actually act as messengers, sending signals and communicating with different parts of the body, including the brain. It is thought that an imbalance in this bacteria in the gut can have an effect on areas such as mood, attention, stress, and sleep.

More research on the potential causes is needed, however, it is clear that gastrointestinal problems are a common occurrence in children with ASD. Probiotics are live microorganisms that can provide health benefits when consumed. Generally, they are found in a supplemental powder form, but they are also found in food such as yogurt.

Probiotics help to improve or restore the balance in the GI tract. The most promising research regarding probiotics and autism has involved animal studies. One rigorous study found that the use of a certain strain of probiotic actually reduced some autism-like behaviors in mice, such as social avoidance and repetitive actions. This research has not been expanded to humans yet, however, it indicates the use of probiotics may be a beneficial supplement for children with autism.

Who can prescribe supplements:

Pediatrician or a registered dietitian, along with blood work, will be able to tell you where your child is lacking nutritionally and which supplements to be given.

Benefits of supplements and probiotics:

Considering the early onset and chronic nature of ASD, dietary supplements might be the priority selection for families, as it can be early or long-time administered in younger children. Supplements are also relatively safe, cheap, effective, and time saving.

Things to consider:

It should be noted that before beginning any type of supplement regimen for your child, it is always important to consult with their pediatrician.

CHAPTER 30

ALTERNATIVE TREATMENT

- Medication For Behavior
- Sleep & Epilepsy
- Supplements And Nutrition

Nemechek Protocol

What is Nemechek Protocol

The Nemechek Protocol was developed by Patrick Nemechek, DO, to address the issues in children with neurological and developmental disorders. The Nemechek Protocol is an approach that aims to reconstruct the brain by targeting autonomic dysfunction. It works to support the body's ability to control inflammation, by strengthening the immune system. The protocol is made up of four different components:

- Repair

- Restore
- Reverse
- Maintain

Dr. Nemechek believes that the symptoms of disease can be eliminated by restoring equilibrium in the body.

According to Dr Nemechek, symptoms in autism are related to bacterial overgrowth in the gut, which leads to syic inflammation in the body, ultimately causing altered immune cell response in the brain.

How does it work in Autism?

Dr. Nemecheck believes many children with neurological dysfunction and developmental delays are suffering from inflammatory damage that leads to cumulative brain injury. This inflammation may lead to a build-up of propionic acid, which leads to white cell dysfunction (also called "microglia"), which causes neurons not to "prune" correctly, creating developmental delays.

The treatment involves a two-step process that aims to rebalance intestinal bacteria and omega fatty acids, which in turn allows the child's brain to begin to heal and function properly. The Nemechek Protocol recommends the use of fish oil, extra virgin olive oil while cooking. These are used mainly to reduce gut inflammation, restore omega 3:6 balances, and aid in cellular repair. The Protocol also includes Prebiotic inulin and antibiotic rifaximin.

What are the benefits of Dr. Nemechek protocol ?

All supplements that are recommended in the protocol are natural, which makes them safe and inexpensive while being highly effective.

What are the side effects?

Given the protocol's natural substances, there is little risk for adverse side effects. For the chemical reactions to occur as designed, patients must discontinue other supplements while on the protocol, including probiotics and vitamins. Patients may continue to use prescription medications.

Ayurveda in Autism

What is Ayurvedic treatment for Autism?

Ayurveda is one of the ancient branch of medicine. This science proposes three pillars of the human body, i.e Vata, Kapha, and Pitta doshas. Ayurveda believes that good health happens when your mind, body, and spirit are perfectly balanced.

Any imbalances can lead to health problems. It has proved to be significantly effective in managing and treating some of the symptoms of autism. An early intervention is reported to be more effective.

Autistic spectrum disorders are categorized as an Unmada, in ayurvedic science. The whole concept of unmada incorporates exhibiting various types of inappropriate behaviors as a result of the distortion of the normal mind, intellect, conscious awareness, memory, desire, manner, and behavior.

What does it consist of?

- Changes in diet – for example, avoiding processed foods and following a vegetarian or vegan diet
- Herbal medicine
- Yoga
- Massage
- Meditation
- Breathing exercises
- Acupuncture
- Panchakarma

Ayurvedic medications that are commonly used in Autism:

1. **Brahmi:** Scientifically known as Bacopa monnieri. It is used to improve memory and reduce forgetfulness. It is also said to increase the grasping power, intellect, and speech. It corrects the abnormality of emotions, personality, and mood of an autistic individual.
2. **Ashwagandha:** Scientifically known as Withania somnifera, Low GABA activity is known to cause cognitive impairments; Ashwagandha has a high affinity for gamma-aminobutyric acid (GABA) receptors and can improve cognitive abilities in ASD.
3. **Shankhapushpi:** Scientifically known as Convolvulus pluricaulis. It is used to manage epilepsy and improve learning, manage behavioral issues.
4. **Centella Asiatica:** This Ayurvedic herb is used as a medication for behavioral issues, speech disorders, and epilepsy, making it a very useful drug for treating autism.

How does Ayurvedic therapy work for autism?

There are three main therapeutic streams promoted by Ayurveda in the treatment

of Autism Spectrum Disorders (Unmada).

- Daiva Vyapasraya is used to build confidence.
- Yukti Vyapasraya (rational medical management)- holistically prescribing medications, therapies, diet, and activities to maintain the overall body balance.
- Satvavajaya is used for Mind or Self-Management Techniques such as cognitive, behavioral, and spiritual skills and training strategies

Who needs it?

- Manas - which means mind
- Buddhi-means intellect
- Samjna Jnana - an aware presence
- Bhakti - meaning ability or willingness to connect with others
- Seela - manners or how to behave socially
- Cheshta - Activities
- Achara - learned skills
- In Unmada one, multiple or all the above said domains get affected, which can be commonly seen in ASD.

Who can administer this medicines:

1. Ayurvedic practitioners offer Ayurveda at private clinics and health care centers.

Duration of the Ayurvedic management:

Depending upon the intensity of the symptoms, recommended duration of Panchakarma can be approximately 3 weeks to 5 weeks along with the oral medicines for 2-3 years. Repetition of therapies in small classes, either individually or intermittently in combination, can provide significant benefits and can be long-term support for the autistic child.

Benefits include:

Ayurvedic treatment has a good potential to reduce the symptoms of autism without causing the adverse effects on growth of the body in growing stage

Side effects of the treatment:

There are no proven side effects of any of ayurvedic medications according to literature as they are made from natural substances.

What is homeopathy?

Homeopathy believes that the body can cure itself. Small amounts of natural substances, like plants and minerals are used to make the medicines, which are believed to stimulate the healing process. Homeopathy has a vast scope in treating autism and the homeopath can up-bridge his knowledge, enable holistic development and overcome the challenges of children with autism. There is limited and conflicting evidence that homeopathy treatment can be used to treat ASD. However, some of the characteristics of ASD can be addressed using homeopathy management.

What does it consist of?

Commonly used homeopathy medications in ASD include Carcinosin, Agaricus, Cuprus Metallicum, Androctonus, and Helleborus. This medicine helps in managing symptoms of ASD such as obsessive behavior, stubbornness, mood disturbances, and occasionally associated sleep issues and gastrointestinal problems.

How does it work?

- Minimizes the side effects of anti-psychotic and anti-epileptic medications.
- Boosts the immune system to reduce the occurrence of infection
- Controls hyperactive, impulsive and aggressive behaviour
- Restores or normalizes sleep pattern, appetite and bed wetting habits
- Improves sensory dysfunction
- Reduces auditory and visual perceptual difficulties

Who needs it ?

- Homeopathy can be used to treat following symptoms of ASD
- Motor coordination issues
- Impairments in intellectual function
- Poor attention span
- Gastrointestinal issues
- Sleep disturbances

Who can administer this homeopathy medicines:

An qualified registered homeopaths can practice homeopathy in India.

Homeopathy is one of the common treatment approaches in India and there are

more than 20,000 registered homeopathy practitioners.

Benefits of homeopathy treatment:

- Homeopathic medicines are pleasant in taste and does not have pungent smells; hence they are easy to administer to children with ASD.
- Homeopathic medications are made from natural substances and hence are safe to administer without fear of toxicity or side effects.
- Homeopathy medicine has also been known to be non addictive and is therefore safe to use for longer duration.

Side effects of the homeopathy treatment:

As homeopathic medicines are made up of natural substances, there are very minimal or no side effects of them.In some patients allergic responses can be observed, which are also a rare occurrence.

SECTION C

NEWER INTERVENTIONS

CHAPTER 31

CELL THERAPY IN AUTISM

- Introduction to Cell therapy
- Mechanism of Cell therapy
- Improvements observed after Cell therapy in Autism

What is cell therapy?

Cell therapy is an evolving field of regenerative medicine. It involves the use of healthy, specialised cells, which help to repair, regenerate, and replace damaged cells, thereby bringing about a biological healing.

What are the different types of Stem Cells?

Stem cells are broadly classified into four types -

- Embryonic cells - Obtained from embryo
- Umbilical cord derived cells - Obtained from umbilical cord

- Adult cells - Obtained from bone marrow or fat
- Induced pluripotent cells

Embryonic cells have various ethical and safety issues. Therefore, they are not used widely.

Adult cells are the most widely used types of cells due to their safety, abundant availability, and obtainability. There are no ethical concerns with autologous bone marrow cells.

Cell transplantation can be of two types:

i) Allogenic (cells obtained from a donor)

ii) Autologous (cells obtained from the patient's own body)

Autologous cell transplantation is safe as it does not involve the risk of rejection.

What is the mechanism of action of Cell therapy?

Administered cells home towards the site of damage and carry out the repair and regeneration process. The repair process is either direct via differentiation and replacement of damaged/dead cells or indirect via paracrine (releasing chemical molecules) mechanisms. Cells on administration release certain useful molecules known as trophic (growth) factors.

These molecules help in regulating the immune system, which is dysregulated in autism. They help in reducing inflammation and oxidative stress.

Improve the blood and oxygen supply to the damaged parts of the brain by a process called angiogenesis, which is the formation of new blood vessels.

How does cell therapy help in autism?

In autism, certain brain areas are not functioning normally. This can be seen in PET CT scan of the brain (Figure 1). There is a presence of inflammation, immune dysfunction, hypoperfusion (less blood and oxygen supply), and oxidative stress along with disrupted brain connectivity. When cells are administered, they migrate and home towards the abnormally functioning brain areas. Cell therapy, via paracrine mechanism, helps in neuroprotection, immunomodulation, regulates immune dysfunction, reduces inflammation, promotes angiogenesis, improves oxygenation and blood supply to the affected brain areas, and repairs brain connectivity. These mechanisms result in the restoration of lost functions, thereby improving the symptoms and quality of life of individuals affected with autism. Cell therapy may help in the integration of these individuals in mainstream living and education.

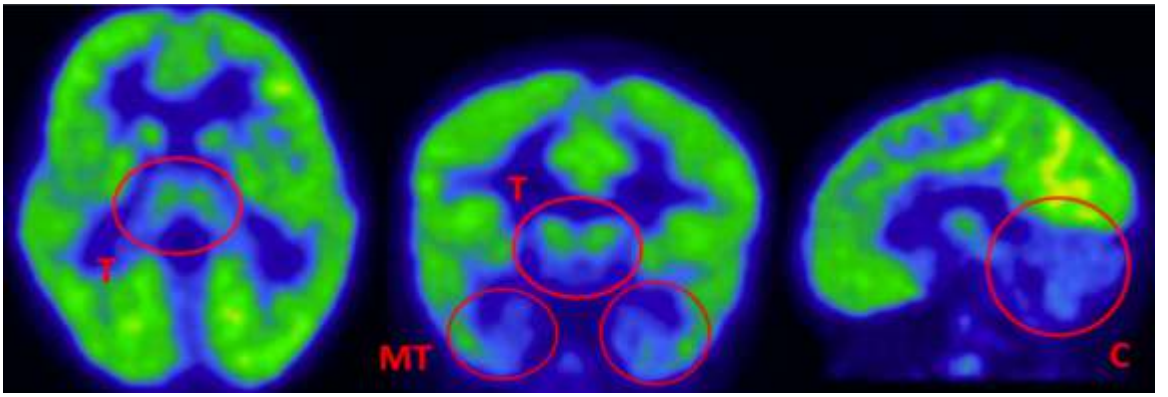

Figure 1: PET-CT scan showing damage in the brain of a child with autism. This is represented by the blue colour depicting hypometabolism / low-functioning areas, i.e., the thalamus (T), Medial temporal cortex (MT), and Cerebellum ©.

What does cell therapy do that only rehabilitation and medicines cannot do?

The outcome of conventional medical treatments and rehabilitation therapies is limited in autism. They only help in the management of symptoms but do not address the core problem of low/abnormal functioning brain areas. Whereas cell therapy addresses this core underlying issue by improving the brain metabolism and making the previously abnormal brain areas function better. Improved metabolic activity further results in functional recovery. Once this abnormal brain is repaired, individuals with autism may respond better to the conventional treatments and result in enhanced recovery. Cell therapy has better outcomes than conventional treatments.

Information on Cell Therapy done at NeuroGen BSI

How is cell therapy done?

This is a one-day procedure done in 3 simple steps with only 2 injections. There is no surgery or stitches involved.

Step 1: Bone marrow aspiration: (done in the operation theater)

This is done by putting a needle into the hip bone after making the area numb with mild anesthetic and sedative so that the patient does not experience pain. The bone marrow is aspirated from inside the bone, which takes about 20 minutes.

Step 2: Cell separation: (done in the cell laboratory)

The bone marrow removed from the patient is taken to the cell laboratory, where the cells are separated from the remaining cells of the bone marrow by the density gradient method. This takes about 3 hours.

Figure 2: Steps in Cell Therapy

Step 3: Cell injection: (done in the operation theater)

Injection of cells into the spinal fluid is done with a very thin needle at the lower back level (L4-5 space) after giving mild anesthesia with sedation. The cells are injected this way, which takes about 20 minutes.

How safe is cell therapy?

Autologous cell therapy, where cells are taken from and injected into the same patient, has no risk of any major irreversible side effects or complications. At NeuroGen BSI, we only use this safest form of autologous bone marrow-derived cell therapy. However, in patients who already had a history of seizures/abnormal EEG before cell therapy, there were incidences of increased frequency of seizures reported in a few patients. These were treated with medicines and did not have any impact on the improvements. Hence, all the patients with a previous protocol, history of seizures, and/or abnormal EEG are given precautionary antiepileptics as a part of the protocol, which significantly reduces the possibility of the occurrence of seizures after cell therapy.

What is the success rate of cell therapy in autism?

At NeuroGen BSI, the success rate of cell therapy in autism is as shown in the graph and the table given below. More than 86% of the patients improved out of 2457 patients after cell therapy. The patients improved in various symptoms such as attention and concentration, command following, eye contact, sitting tolerance, social interaction, hyperactivity, communication, speech, stereotypical behavior, aggressiveness, behavior, and self-injurious behavior. Improvements were also observed on scales such as the Indian Scale of Autism Assessment (ISAA) and the Childhood Autism Rating Scale (CARS).

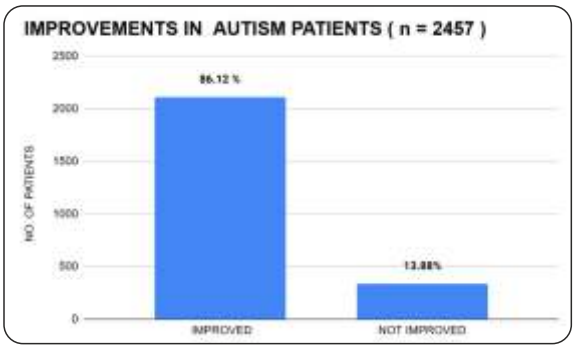

Figure 3: Percentage improvement observed in Autism patients After cell therapy

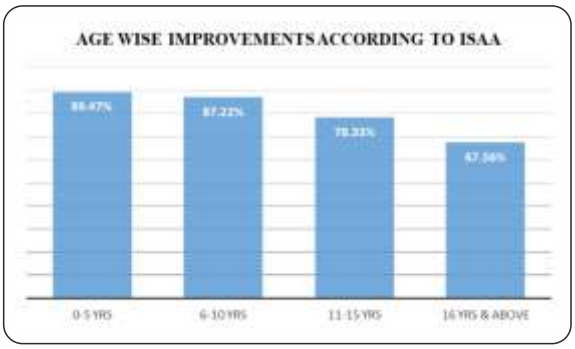

Figure 4: Percentage improvement observed in Autism patients based on age.

Symptoms	Percentage Improvements
Social Interaction	62.11 %
Eye contact	76.52 %
Attention/Concentration	76.54 %
Stereotypical behaviour	56.27 %
Aggressiveness	47.7 %
Hyperactivity	58.7 %
Self-injurious behaviour	47.7 %
Sitting tolerance	66.4 %
Command following	79.4 %

Speech	59 %
Communication	57.17 %
ISAA	86.12 %
CARS	85.70 %

Table 1: Symptomatic improvements observed after cell therapy in autism patients

What symptoms of autism show improvements after Cell Therapy?

There is a significant improvement in the following symptoms in the patients with autism treated at NeuroGen BSI:

A) Hyperactivity

B) Eye contact

C) Attention span

D) Speech and communication

E) Response to commands

F) Overall behavior

G) Fine motor activity

H) Self-stimulatory behavior

I) Social awareness as well as interaction with peers

J) Cognition and understanding

K) Improvement in academic performance at school.

What are the objective improvements seen after Cell Therapy?

Objective improvements are recorded on PET-CT scans of the brain performed before and 6 months after cell therapy. Generally, mesial temporal, thalamus, and cerebellum areas of the brain show hypometabolism (low functioning) in autism. These areas are seen as blue on the PET CT scans. After cell therapy, these damaged/low-functioning areas turn green, which indicates improved brain metabolism.

Below are the representative images indicating the objective improvements:

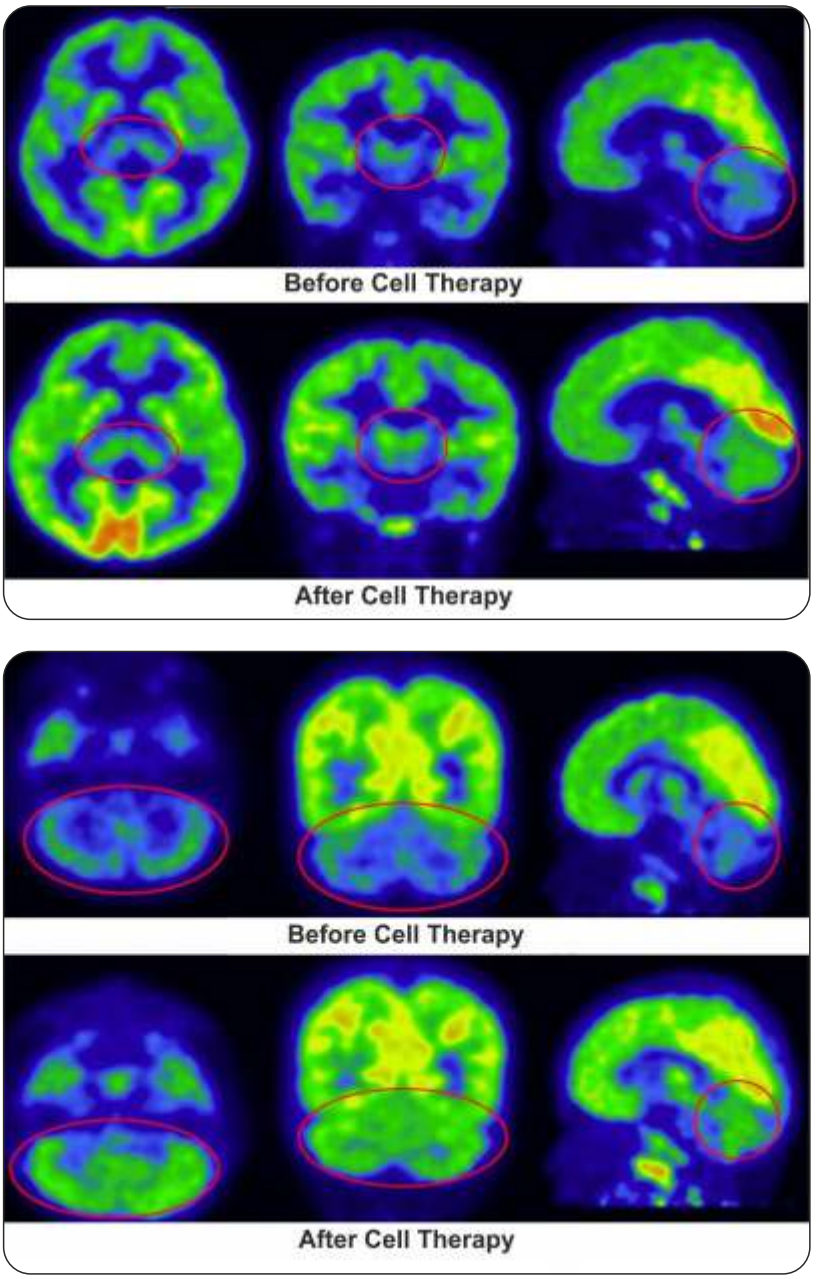

Figure 5: Comparative PET CT scans of autism patients performed before and after cell therapy. Significant improvements were observed in the medial temporal lobe, thalamus, and cerebellum.

What are the functions of these low-functioning areas?

There are mainly three areas of the brain that are low-functioning, which are the cerebellum, thalamus, and medial temporal cortex.

The cerebellum coordinates voluntary movements such as posture, balance,

coordination, and speech, resulting in smooth and balanced muscular activity. It is also important for learning motor behaviors, higher functions such as interpreting touch, vision, hearing, speech, emotions, reasoning, and learning, fine motor movement control, controlling balance, equilibrium, and muscle tone, initiating reflexes for sensory information, and coordinating complex skeletal movements. Low function in the cerebellum can lead to hyperactivity & speech challenges, etc.

The thalamus relays information between different subcortical areas and the cerebral cortex. regulate consciousness, sleep, awareness, arousal, and alertness; recognise and integrate various sensory inputs, including touch, pain, pressure, movement, auditory, olfactory, and visual stimuli. It also plays a role in emotions and recent memory. Low function in the thalamus can lead to sensory issues.

The medial temporal lobe is principally concerned with memory establishment and maintenance, long-term memory, learning, comprehending visual stimuli, retrieval of the learnt information, and spatial localisation. Low functioning in this area can lead to behaviour issues and learning difficulties.

What is the scientific evidence that cell therapy works in autism?

Worldwide, there are many studies that are published that show the efficacy of cell therapy in autism. The studies demonstrated that cell therapy is a safe, feasible, and therapeutic option for patients with autism, having no major adverse effects. Our clinical results showing safety and efficacy of cell therapy in autism have been documented in fifteen scientific papers published in international and national peer-reviewed medical journals. The first paper in the world published about the results of cell therapy in autism was by NeuroGen Brain and Spine Institute. The full text of these articles can be read at w**ww.neurogen.in/scientific-publications.**

How many patients with autism have been treated at NeuroGen BSI?

We have treated over **6322 patients** with autism from more than **103 different countries** across the world.

Figure 6: Children from 5 different continents undergoing treatment at our centre at the same time.

Figure 7: Parents whose children are receiving cell therapy at NeuroGen from 6 continents - USA (North America),United Kingdom (Europe), Australia, Rwanda (Africa), Qatar (Asia) & Brazil (South America).

What is the assurance of quality of Cell Therapy services at NeuroGen BSI?

a. NeuroGen BSI is ISO 9001:2015 certified

b. The Cell laboratory at NeuroGen BSI has both of the following certifications:

i) GLP (Good Laboratory Practice)

ii) GMP (Good Manufacturing Practice)

ISO 9001:2015 | Good Laboratory Practice | Good Manufacturing Practice

Figure 7: Information to help you make informed decisions.

How should I decide whether my child, who has autism, should undergo cell therapy?

If, despite all attempts at rehabilitation and special education, the child still has limitations that are not letting him/her integrate into mainstream living and education, then it might be worthwhile considering cell therapy as an option. In addition, if the PET-CT scan of the child's brain shows a moderate to severe degree of hypometabolism, then cell therapy can be an effective mode of treatment.

How should I choose a good center for cell therapy for my child?

The following criteria should be kept in mind:

- The centre should be using the safe type of cell therapy, which is the autologous type of adult cell therapy.
- The centre should have an established track record of treating many patients with proven safety and efficacy.

- The centre should have published their clinical results in peer-reviewed medical and scientific journals in both international and national journals.
- The centre should be dedicated for treatment of neurological conditions only.

List of 14 Scientific Publications in medical journals published by NeuroGen BSI documenting the safety and efficacy of cell therapy in Autism

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2. Sharma A, Gokulchandran N, Sane H, Kulkarni P, Nivins S, Maheshwari M, Badhe P. Therapeutic Effects of Cellular Therapy in a Case of Adult Autism Spectrum of Disorder. International Biological and Biomedical Journal. 2018 Mar 15;4(2):98-103.
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4. Sharma A, Gokulchandran N , Sane H, Kulkarni P, Pai S. A Case of Autism Showing Clinical Improvements after Cellular Therapy along with PET CT Evidence. J Stem Cell Res Ther. 2017;2(4):00070.
5. Alok Sharma, Hemangi Sane, Nandini Gokulchandran, Prerna Badhe, Pooja Kulkarni and Suhasini Pai. Stem Cell Therapy in Autism Spectrum Disorders.Recent Advances in Autism. SMGroup. 2017
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7. Sharma A, Gokulchandran N, Sane H, Patil A, Shetty A, Biju H, Kulkarni P, Badhe P. Amelioration of autism by autologous bone marrow mononuclear cells and neurorehabilitation: A case report. American Journal of Medical Case Reports. 2015;3(10):304-9.
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Neuropsychiatric Disorder Tackled by Innovative Cell Therapy-A Case Report in Autism. J Stem Cell Res Transplant. 2014;1(1): 4.

10. Sharma A, Gokulchandran N, Sane H, Kulkarni P, Thomas N, Paranjape A, Badhe P. Intrathecal autologous bone marrow mononuclear cell transplantation in a case of adult autism. Autism. 2013 Sep;3(2):113.

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12. Sharma A, Badhe P, Gokulchandran N, Kulkarni P, Mishra P, Shetty A, Sane H. An improved case of autism as revealed by PET CT scan in patient transplanted with Autologous bone marrow derived mononuclear cells. J Stem Cell Res Ther. 2013 May;3(139):2.

13. Sharma A, Gokulchandran N, Sane H, Nagrajan A, Paranjape A, Kulkarni P, Shetty A, Mishra P, Kali M, Biju H, Badhe P. Autologous bone marrow mononuclear cell therapy for autism: an open label proof of concept study. Stem cells international. 2013;2013. Article ID 623875, 13 pages.

14. Sharma A, Chopra G, Gokulchandran N, Lohia M, Kulkarni P. Autologous Bone Marrow-derived Mononuclear Transplantation in Rett Syndrome. Asian Journal of Paediatric Practice. 2011;15(1).

CHAPTER 32

HYPERBARIC OXYGEN THERAPY IN AUTISM

- Introduction to HBOT
- Mechanism of HBOT
- Advantages of HBOT in ASD

What is HBOT?

- Hyperbaric oxygen therapy (HBOT) is a safe, effective, and non-invasive intervention used in a wide variety of medical conditions, including autism.
- "Hyper" means more and "Baric" means pressure i.e., this therapy uses pressure to distribute more oxygen into the brain, blood, cerebrospinal fluid, etc.
- The patient inhales 100% oxygen at a pressure greater than normal atmospheric pressure in an enclosed, specially designed, pressurized chamber.

What does it consist of?

HBOT involves sitting or lying in a special enclosed chamber known as a hyperbaric chamber and breathing oxygen as the pressure inside the chamber is increased gradually.

There are different types of hyperbaric chambers:

1. **Monoplace hyperbaric chambers,** which can accommodate one person.
2. **Multiplace chambers** are larger and can accommodate two or more people at the same time. In a multiplace chamber, patients breathe oxygen through a mask or a hood.

How does it work in autism?

Studies have shown that in autism, functions of some areas of the brain are affected due to cerebral hypoperfusion (low blood supply), hypoxia (low oxygen supply), and inflammation. HBOT works by improving oxygen supply to the less functioning areas of the brain; it improves circulation in the brain and helps in toxin removal. It also reduces inflammation of the brain. Scientific studies have shown that HBOT treatment in children with Autism helps improve cognition, behaviour, language, and communication and sensory behaviour along with reducing aggression and hyperactivity.

How is it done?

The HBOT chamber is a closed space. On day 1, the treatment is done for a therapeutic time of 30 mins at 1.3 ATA. The pressure is slowly escalated every day until it reaches 1.8 ATA for a therapeutic time of 45 mins and is sustained at the same pressure and time until the 10th session. The child can be accompanied by the parent/caretaker. They can watch TV or sleep inside the chamber during the session.

Figure 1: Patient accompanied by a caregiver inside HBOT chamber

How will the patient feel during/after HBOT?

The patient may experience the following while in the HBOT chamber:

1. Pressure or fullness in the ear as experienced during flight takeoff or landing
2. The patient may feel slightly warm in the chamber, but the temperature soon returns to normal once desired pressure is obtained.
3. After HBOT is complete, the patient may feel tired or hungry. This is due to transient low blood sugar.

What are the benefits of HBOT?

- Improved sleep
- Improved behavior
- Become more calm and less aggressive
- Improved focus and attention
- Improved bowel function
- Less Sensory Disturbance
- Improved Cognition
- Improved Language and communication

Who can do HBOT and for how long ?

Hyperbaric oxygen therapy is carried out at specialised clinics by trained experts. A maximum of 40 sessions can be given at a time.

What are the contraindications for HBOT?

- Ear surgeries or ear infection
- Uncontrolled and active seizures (daily/weekly/monthly) with or without medicine
- Adenoids/Enlarged tonsils
- High fever
- Upper respiratory tract infection - cough and cold
- Metal implants outside the body
- Surgery of Chest/Lungs

- COPD/ Asthma
- Blood disorders like congenital spherocytosis
- Any pacemaker
- Epidural implants/ Epidural pain pumps
- Untreated Pneumothorax

What are the side effects?

Usually there are no major side effects of HBOT if done by experts with proper precautions. Some minor temporary side effects may include ear fullness, fatigue, and lightheadedness. Very

rarely if proper precautions are not taken, then serious complications can occur, which may include damage to the lungs, buildup of fluid or rupture of the middle ear, damage to the sinuses, changes in vision causing nearsightedness or myopia, and oxygen poisoning, which can cause lung failure, fluid in the lungs, or seizures.

Precautions before procedure

- Oxygen is not flammable by itself; however, it accelerates combustion. Thus, the chamber and whatever/whoever that goes into the chamber must be free from combustible materials such as oil, grease, alcohol, or petroleum-based products, electrical appliances, or materials capable of creating static electricity. Oil-based cosmetics, deodorants, creams, Vaseline, and any type of hairspray should not be used. Combustible materials such as paper, magazines, and excess bedding (lint and dust are a fire hazard) should not be used.
- 100% cotton clothing should be worn inside the chamber.
- Electrical appliances in the chamber, except ECG, EEG and thermocouples, should not be used.
- Chemical warming devices (hand warmers), sparking toys, battery-operated devices, cigarette lighters, matches, etc., should not be used in the chamber.
- Unapproved earplugs, hard or impermeable contact lenses, or dentures should not be used inside the chamber. Permeable contact lenses ('soft' lenses) may be worn.
- To avoid hypoglycemia have food ½ hr before HBOT.

What are soft HBOT home chambers?

Soft HBOT (hyperbaric oxygen therapy) home chambers are portable, flexible chambers designed for use at home to deliver mild hyperbaric oxygen therapy.

Typically operate at a lower pressure of 1.3 to 1.5 ATA (atmospheres absolute), compared to clinical chambers that go up to 2.0–3.0+ ATA. Most soft chambers don't deliver 100% oxygen like hospital-grade HBOT; instead, they use concentrated oxygen through a mask or nasal cannula.

CHAPTER 33

OZONE THERAPY IN AUTISM

- Introduction of ozone therapy
- Mechanism of Ozone therapy
- Best route of administration of ozone in ASD patients
- Perks of ozone therapy in Autism

What is Ozone therapy?

Ozone therapy is a non-invasive, cost-effective alternative medicine therapy that has been used extensively for many years for several medical conditions, including autism. Its therapeutic benefits have been proven with minimal side effects. It was first used topically on the battlefields of World War I for disinfection

Figure 1: Ozone generator

and wound healing purposes, and the doctors found out that ozone not only treated the infection but also had a haemodynamic, anti-microbial, and anti-inflammatory effect.

What is Ozone therapy?

Ozone therapy is a non-invasive, cost-effective alternative medicine therapy that has been used extensively for many years for several medical conditions, including autism. Its therapeutic benefits have been proven with minimal side effects. It was first used topically on the battlefields of World War I for disinfection and wound healing purposes, and the doctors found out that ozone not only treated the infection but also had a haemodynamic, anti-microbial, and anti-inflammatory effect.

What does it consist of?

Ozone therapy consists of the administration of a mixture of 5% to 0.5% ozone (O_3) and 95% to 99.5% oxygen (O_2) in varying therapeutic concentrations. Ozone is generated from 100% pure medical grade oxygen. Medical ozone has been used to treat various conditions, including infections, wounds, cardiovascular diseases, neurological disorders, gastrointestinal diseases, orthopedic conditions, etc.

How does Ozone therapy work in Autism?

- In autism, there is immune dysregulation, inflammation, and oxidative stress. Various areas of the brain are hypofunctioning, and brain signalling is hampered due to damaged, hypoxic, and hypoperfused cells.
- Ozone works by improving oxygenation to the damaged areas of the brain. It also exhibits antioxidant, immunomodulatory, and anti-microbial properties. It helps in the removal of toxins, reduces oxidative stress and inflammation, and regulates immune dysfunction .
- Increased oxygenation fastens the healing process.
- Improves gut health as it is an excellent germicide. It kills bacteria, fungi, parasites, and viruses in the gut. It also improves the liver detox mechanism.

How is ozone therapy done?

- Ozone can be administered via in-ear insufflation (Figure 2) or rectal insufflation (Figure 3) During in-ear insufflation, Ozone is absorbed in the ear canal and on the tympanic membrane.
- Rectal insufflation is an extremely effective route of ozone delivery that consists of ozone administration via a rectal bag wherein ozone gets dissolved in the

blood circulation of the bowel and gives a syic effect.

- Usually, 10 sessions of ozone therapy are given through the rectum and ear. Ear ozone is given for 5-10 minutes. The concentration of ozone that must be given rectally is calculated based on the child's weight.

Figure 2: Ear insufflation of ozone

Figure 3: Ozone administration via Rectal route

Benefits of ozone therapy:

Ozone therapy leads to improvement in the following:

- GI tract issues-gut- constipation, gas, indigestion, diarrhea, bloating
- Oxygenation throughout body and brain
- Immune system
- Endocrine sys
- Behavioral issues
- Aggression
- Sleep
- Anxiety
- Speech
- Reduces oxidative stress via antioxidant effect
- Liver detoxification

Who does ozone therapy and for how long ?

Medical practitioners trained in the preparation and administration of ozone can perform ozone therapy. All patients with autism spectrum disorder can be given ozone therapy. Multiple sessions are given to each child; the frequency of therapies is decided by the experts. However, 10 sessions in two weeks have shown to demonstrate beneficial outcomes.

Contraindications to medical ozone:

- G6PD deficiency
- Hyperthyroid state
- Thrombocytopenia (deficiency of platelets in the blood)
- Bleeding disorders
- Acute hypoglycemic state
- Ear insufflations are contraindicated in cases of seizures, ear surgeries/implants, and ear infections (ASOM)

What safety measures are to be taken for Ozone therapy?

Safety measures to be taken:

- Check BP before ozone administration.
- Check blood sugar levels before ozone administration
- G6PD levels should be in the normal range.
- In case of seizure, implant, or any ear problem, ear ozone should be avoided, and only rectal ozone should be given.
- Take probiotics after rectal ozone.

Are there any side effects of ozone therapy?

Ozone therapy, when administered correctly, is safe and does not have any major side effects.

Minor side effects of ozone therapy include transient nausea, a puckish feeling while taking ear ozone, which is temporary, temporary headaches, bleeding from any orifices (only if there is any active bleeding), increased frequency of stools, and hypoglycemia. If ozone is directly inhaled, it can cause severe irritation to the eyes and respiratory passages and lungs, further triggering asthma, choking, or shortness of breath. If ozone is accidentally inhaled, then take vitamin C tablets.

What is ozone cupping?

Ozone cupping is a holistic therapy that combines ozone therapy with traditional cupping techniques to treat localised areas of the body. It's mainly used to improve circulation, detoxify tissues, promote healing, and reduce pain and inflammation.

- It's the fusion of both: Ozone therapy and Cupping technique
- A **suction cup** is applied to the skin.
- Instead of just creating vacuum pressure, the cup is **filled with ozone gas**, which is then held on the skin under pressure for several minutes.
- The ozone gas is **absorbed through the skin,** targeting the tissues underneath.
- In Autism Ozone Cupping is done on cheeks to stimulate oromotor muscles and to improve speech.

CHAPTER 34

DEEP TISSUE MOBILIZATION & ACUPRESSURE

- Acupressure
- Benefits of DTM & Acupressure
- Deep Tissue Mobilization
- Types of Acupressure

What is Acupressure?

Acupressure uses pressure to stimulate specific acupoints for therapeutic purposes and stimulates these points to treat the diseases. Each of these therapies produces healing on the internal organs of the body through well-defined points on the body surface.

It is simply a non-pharmacological intervention on the body to treat a wide range of conditions by applying pressure to specific acupoints.

It is the massage of acupoints performed with the fingertips, knuckles, thumbs,

elbows, or suitable devices to achieve effective treatment that would last from several minutes to hours post a single treatment.

What is Deep Tissue Mobilization (DTM)?

It involves applying sustained pressure using slow, deep strokes to target the inner layers of your muscles and connective tissues.

It essentially signals the body to "turn on" its own self-healing or regulatory mechanisms. For children with autism, deep tissue mobilization is an effective form of stimulation used to help relax the body.

What are the benefits of DTM and Acupressure for Autism?

Children with autism often face issues with sleep patterns. Deep tissue mobilization reduces sensory arousal, which enhances sleep quality, reduces nightly waking, and decreases sleep latency, i.e., the time taken to fall asleep.

Acupressure massage stimulates pressure receptors underneath the skin. This has been known to optimize the functioning of the vagal nerve, which induces a state of relaxation of the body. Stimulation of pressure receptors via acupressure may also increase serotonin and dopamine levels, which are the body's natural 'happiness' hormones. It also decreases heart rate and the

stress hormone cortisol. Pressure stimulation also increases activation in the brain's left frontal lobe, reducing depressive tendencies.

How does Acupressure and DTM help in Autism?

Deep pressure touch works because the weight or pressure applied provides proprioceptive input. This input could calm the central nervous system, which aids the processing of sensory information.

It may also bring full relaxation, which helps to reduce anxiety and daily frustrations.

Massage provides proprioceptive input, which can help regulate the child's sensory system and thus help in dealing with the numerous sensory issues; for children who are tactile defensive, massage can help to desensitise the skin.

Massage helps regulate the nervous system. For children who are always on the go with lots of energy, massage can be calming, encourage stillness, and help with concentration.

Acupressure helps to decrease tissue adhesion, promote relaxation and regional blood circulation, and increase parasympathetic nerve activity and intramuscular temperature, along with a reduction in neuromuscular excitability.

Figure 1: Acupressure

What are the types of Acupressure?

Acupressure types are as follows:

- Shiatsu (Japanese acupressure)
- Jin Shin Do's (Body-mind acupressure)
- Auricular acupressure (AA)
- Tapas acupressure technique (TAT)

What are the contraindications for DTM and acupressure?

Acupressure and DTM are very safe procedures with minimal contraindications. Acupressure and DTM are contraindicated in any skin condition such as active skin infection, skin allergies, and unhealed wounds on the skin surface; chronic heart condition; or any other major chronic condition.

CHAPTER 35

NEUROFEEDBACK IN AUTISM

- Neurofeedback introduction
- Benefits of Neurofeedback
- Indications and contraindications of Neurofeedback

What is Neurofeedback?

Neurofeedback is a technique in which the brain is trained to improve its functionality using an instrument that provides information on the activity of the brain.

What does it consist of?

Neurofeedback procedure is a non-invasive technique that consists of EEG recording of the patient obtained using electrodes and immediately sending the feedback via various audio/visual stimuli that can be seen on a computer screen.

Based on this, a treatment plan/protocol is made by the experts for every individual to determine which brain areas need to be trained and the location on the scalp to perform the training.

How does it work in autism?

In autism, brain networks are abnormally organized and are affected due to abnormal interactions between brain regions. The brain circuitry is under-connected, and synaptic pruning (elimination of old and damaged synapses in the brain) is also affected. Neurofeedback works by developing new brainwave patterns, improving brain connectivity, and tuning the brain circuitry. This helps improve social interaction, behaviour, and communication in autism. These improvements help patients with autism function more effectively and improve their quality of life.

How is it done?

Patients have one or more sensors attached to their scalp. These sensors record the patient's brain waves on a computer screen as lines, graphs, or a simple game. For example, the game might show a moving car or a rising and falling ball. The person is asked to make the line, graph, or object move with their brain. As desirable brain activity increases, the video game moves faster, or the ball rises. Undesirable brain activity slows the ball down. The positive patterns on the

screen motivate patients to do activities that are desirable and help the brain to gradually learn new patterns.

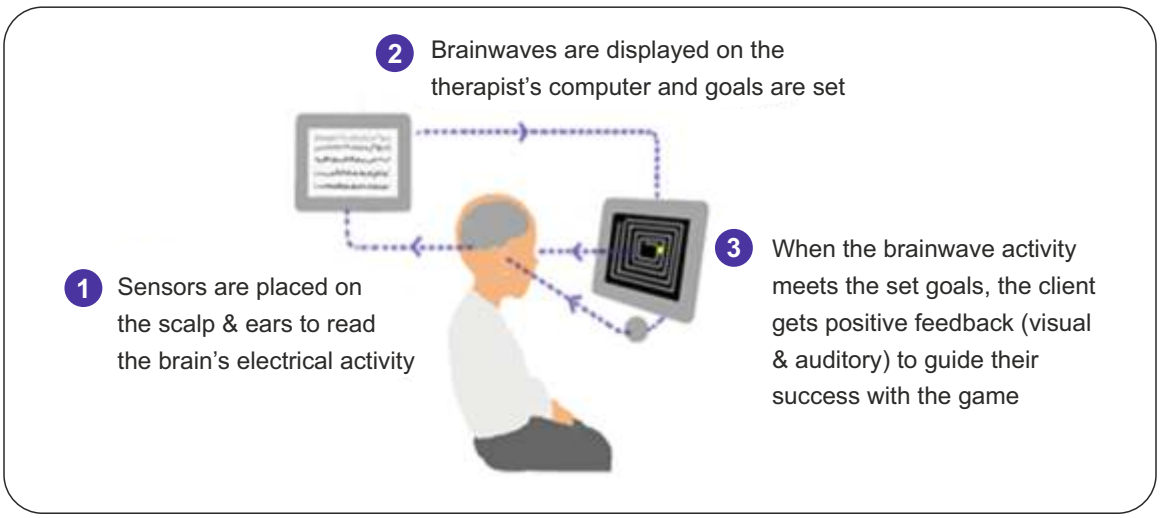

Figure 1: Neurofeedback unit

What are the benefits of Neurofeedback?

Improvements of neurofeedback include but are not limited to the following:

- Reduced stimming
- Reduction of emotional outbursts
- Substantial reduction and/or elimination of ritualistic behaviours.
- Improved concentration and focus.
- Increased initiation of touch and contact
- Improvement in clarity of speech patterns
- Overall improvement of social skills
- Improvement in command following
- Reduced impulsivity and hyperactivity
- Increased imagination and creativity
- Ability to cope with the seemingly sudden change without feeling overwhelmed.

Who does Neurofeedback and for how long?

Mental health professionals like psychologists, counsellors, and family therapists who are certified neurofeedback practitioners can perform neurofeedback training.

The number of sessions varies depending on the need of the patient. Neurofeedback sessions are usually given over six months to see its effectiveness. Each session may last for 20-60 minutes, alternating between training and rest.

Contraindications for Neurofeedback?

There are no contraindications for neurofeedback training; however, children with a history of seizures may be at a higher risk of getting seizures with neurofeedback treatment.

What are the side effects?

Neurofeedback therapy is incredibly safe for individuals with autism. Some patients may experience minor side effects such as fatigue, nausea, anxiety, depression, headaches, dizziness, irritability, cognitive impairment, internal vibrations, muscle tension, and/or social anxiety.

CHAPTER 36

BIOMEDICAL TREATMENTS IN AUTISM

- Biomedical treatments introduction
- Mechanism of Biomedical treatment in Autism
- Benefits of Biomedical treatments in Autism

What is biomedical treatment?

Biomedical therapies are complementary and alternative treatment modalities that target specific brain processes to ameliorate symptoms associated with autism.

What does it consist of?

Biomedical treatments are a combination of dietary modifications, digestive enzymes, multivitamins, and mineral supplements such as B vitamins, antioxidants, vitamin E, co-enzyme Q10, Melatonin, omega-3 fatty acids, micronutrients, N-acetylcysteine (NAC), etc.

How does it work in autism?

Children with autism have disrupted biochemical processes that lead to the accumulation of abnormal metabolites along with abnormal synthesis, regulation, and metabolism of vital biochemicals, hormones, or neurotransmitters, leading to harmful effects. They also have intestinal inflammation, digestive enzyme abnormalities, oxidative stress, immune dysfunction, and impaired detoxification. Biomedical interventions help in improving these physiological abnormalities, thereby improving the symptoms and quality of life of the affected individuals.

How is it done?

- Biomedical treatments for autism are developed by determining which metabolic processes have been affected. Tests such as organic acid test (OAT), gut microbiome test, vitamin deficiency, methylation, glutathione, amino acids, heavy metal poisoning, etc. are performed. Based on the test results, an individualised treatment plan is developed for the patient.
- Major treatment is focused on healing the digestive system of the patient. Diet, enzymes, and medications are recommended to heal, and the vitamins and mineral supplements work to treat nutritional deficiencies and the immune system. Special formulations of digestive enzymes along with nutritional, mineral, and vitamin supplements, are given. A healthy gluten-free, casein-free diet along with the elimination of processed foods, food additives, and preservatives is suggested.
- Allergy tests are conducted to address food allergies such as soya, corn, eggs, etc.
- Medications for acid reflux are prescribed.
- Antimicrobials and probiotics are suggested to treat infections.
- To improve the immune system, invasive treatments include transfer factor therapy, Intravenous Immune Globulin (IVIG) therapy, etc.
- A combination of alternative medicine treatments such as homoeopathy, acupuncture, kinesiology, etc., is also suggested.
- Combinations of antioxidants, vitamins, and minerals are given to address high oxidative stress, abnormal redox metabolism, and mitochondrial dysfunctions.
- Heavy Metal Detoxification Program

What are the benefits of biomedical treatments?

Biomedical treatment can improve the following symptoms in autism:

- Cognitive functions

- Attention
- Sensory behavior
- Immune function
- Digestion
- Gut and bowel function
- It can also improve vocabulary and sentence structure, social interaction, adaptability, and social play.

Who does biomedical treatments and for how long?

Biomedical treatments are administered only by medical professionals. The duration of the intervention depends on the need of the patient.

What are the side effects?

Biomedical treatments do not have any serious adverse effects, but some patients may have a few minor side effects such as nausea and emesis, increased irritability and hyperactivity, increased insomnia, increased gastroesophageal reflux, constipation, increased appetite, fatigue, and drowsiness.

CHAPTER 37

GUT DETOX

- Gut Detox introduction
- Medications and probiotics
- Rectal ozone
- Anti-biofilm
- Gut detox meal plan

What is GUT DETOX, and how does it help with autism?

Gut detox focuses on helping clear out harmful substances that can build up in the digestive system. For children with autism, this process can help balance the bacteria in the gut, which is closely linked to brain function

a) **Medications and probiotics :** A gut microbiome test helps assess the health of the gut by analysing the different types of microbes present. The test uses microbiome sequencing to identify the various microbial species in the gut and then analyses patterns within them. The report can identify harmful pathogens in the gut, such as bacteria, fungi, and parasites. Based on the types of

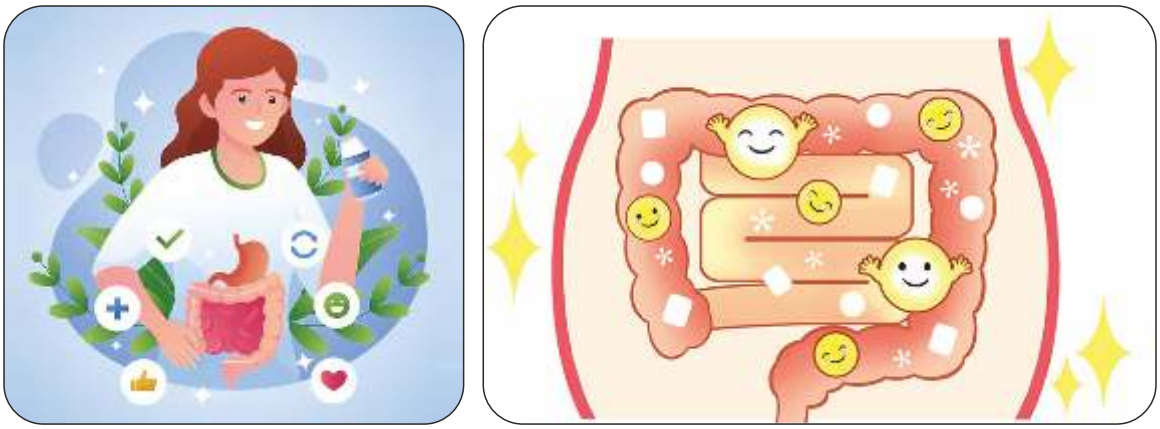

Figure 1: Gut detox supports the gut-brain axis, promoting mental clarity and overall physiological balance.

pathogens found, the doctor can recommend specific treatments, like antibiotics, antifungals, or anti-parasite medications. Additionally, the report identifies a lack of good microbes and the need for prebiotics and probiotics to help improve the gut microbiome.

b) **Rectal ozone** is a powerful molecule made up of oxygen atoms. Medical ozone is created using only the purest medical-grade oxygen. It consists of a mixture of 0.5 to 5% ozone and 95 to 99.5% oxygen. Ozone also acts as an immune system booster and has strong germicidal properties, making it effective in fighting infections. Ozone kills bacteria, fungi, viruses, and parasites.

One of the amazing uses of ozone in AUTISM is rectal ozone therapy, which can help remove pathogens from the gut and cleanse the digestive system. This treatment supports overall gut health and indirectly brain function.

c) **Anti-biofilm:** In autism there are biofilms in the gut due to chronic infection. Biofilms are communities of microorganisms, like bacteria, surrounded by a protective matrix made up of polysaccharides, proteins, and DNA. These biofilms can be problematic for several reasons. Bacteria within biofilms are more resistant to antibiotics than free-floating bacteria, making them harder to treat. The protective matrix makes it difficult for antibiotics and the immune system to reach and eliminate them.

Certain treatments can help break down biofilms, making them more vulnerable to the natural germicidal activity of the gut and antibiotics. These treatments also support gut health, boost immunity, reduce inflammation, improve digestion, and enhance nutrient absorption and energy levels.

d) **Gut detox meal plan:** The gut microbiome report includes a 3-month gut detox plan by food items. It has 3 phases, i.e., removal of pathogen , restoration of good microbiome, and maintenance of gut health.

SECTION D

LIVING WITH AUTISM

CARE FOR CAREGIVERS

The family is viewed as a continuous process with several behavioral models. A neuro-developmental disorder not only changes the emotional dynamics between you and your child, but it also stresses the emotional conversations between you and your family. We think that for parents and other family members to support their child through this journey, they must be emotionally ready to accept the diagnosis. You need to recognize and comprehend your child's "special" needs. Improved quality of life and attempts to normalize this "given" circumstance require persistent assistance from caregivers. The devoted care from caregivers is not easy. Living with a person who needs caregiving can make you struggle for your time. It can lead to caregiver burnout, which means, a state of feeling overwhelmed by the responsibilities to take care of, being physically and mentally exhausted, and being undervalued for the support you are providing. As a caregiver, you might tend to neglect your well-being and be focused on your loved ones;but Care for Caregivers is also very important. Although it might be challenging to discern indicators of stress, there are several ways to determine whether you could be under excessive pressure, which can be a physical response

or an emotional response.

Why is caregiver well-being important?

Caregivers play a central role in supporting children with special needs. Their emotional, physical, and mental health directly affects the quality of care they provide. When caregivers are supported, the entire family benefits. Prioritizing caregiver wellness is not optional—it's essential.

What are some signs of caregiver burnout or stress?

Burnout and chronic stress can show up in many ways. Common signs include:

- Constant fatigue, even after rest
- Emotional irritability or frequent mood swings
- Memory issues or mental fog
- Loss of interest in hobbies or social connection
- Feelings of invisibility or being underappreciated
- Recurring physical symptoms (e.g., headaches, back pain, illness)
- Overuse of caffeine, medications, or screens to cope

Recognizing these signs early can help in taking proactive steps to recover.

What can be done to prevent or manage caregiver burnout?

1. **Delegating and Accepting Assistance**

   Seeking help from family, friends, or professional services can ease the load. Delegating tasks—such as housework or errands—frees up valuable time for rest, reflection, or connection.

2. **Reclaiming Pockets of Time**

   Moments when the child is at school or resting can be used for renewal. This time can be spent connecting with loved ones, enjoying personal interests, or engaging in calming activities.

3. **Emotional Expression**

   Caregivers benefit from safe spaces where emotions can be expressed freely. Whether through conversation, writing, or therapy, processing feelings helps lighten the emotional load.

4. **Peer Support and Community Connection**

Support groups offer solidarity and strength. Sharing experiences with others facing similar challenges can foster empathy, share valuable resources, and reduce isolation.

5. **Mindful Practices**

   Simple practices like deep breathing, yoga, or guided meditation can provide moments of calm throughout the day. Even short pauses can make a meaningful impact on mental health.

6. **Re-engaging with Joyful Activities**

   Gardening, music, drawing, puzzles, reading—hobbies like these can reconnect caregivers with their sense of self, providing moments of peace and identity beyond the caregiving role.

7. **Cognitive Reframing**

   Replacing harsh internal judgments with compassionate, realistic thoughts helps build resilience. For example, shifting from "nothing is going right" to "this is difficult, but manageable" can restore clarity and hope.

8. **Strengthening Support Networks**

   Maintaining relationships with friends, family, or spiritual communities creates a foundation of emotional safety and connection—both vital during long-term caregiving.

9. **Prioritizing Rest and Sleep**

   Adequate rest helps regulate emotional and physical functioning. Creating a consistent sleep routine or allowing space for short periods of rest during the day can have lasting benefits.

10. **Practicing Self-Compassion**

    Caregivers deserve the same empathy, patience, and kindness extended to others. Recognizing personal limits and offering oneself grace are essential parts of sustainable caregiving.

What should caregivers always remember?

- Caregiving is an act of deep strength and compassion.
- Well-supported caregivers create healthier environments for children.
- Every small effort toward self-care contributes to sustainable caregiving.
- Support, rest, and emotional expression are not luxuries—they are necessities.

Figure 1: Counseling session for caregiver

SOCIAL INCLUSION AND DISABILITY – A PATH TO AN INCLUSIVE SOCIETY

Understanding Social Inclusion and Its Importance

What is social inclusion, and why is it important?

Social inclusion is the process of ensuring that all individuals, regardless of their abilities or disabilities, have equal access to opportunities, resources, and social participation. It is a fundamental aspect of human rights and social justice, aiming to remove barriers that prevent individuals with disabilities from fully integrating into society. Historically, people with disabilities have faced discrimination, exclusion, and limited access to essential services such as education, employment, and healthcare.

Over the past few decades, societies have made significant progress in promoting inclusivity through policies, awareness programs, and rehabilitation interventions. Social inclusion is not just about physical accessibility but also about creating environments where individuals with disabilities are respected, valued, and provided with opportunities to lead fulfilling lives. This requires a collaborative

approach involving legal frameworks, societal attitudes, community engagement, and support sys to foster true inclusivity.

Figure 1: Social inclusion for people with Disabilities

How does social inclusion impact individuals with disabilities?

For individuals with disabilities, social inclusion means full participation in all aspects of life, including education, employment, healthcare, recreation, and social interactions. A truly inclusive society ensures equal access to opportunities, removes physical and social barriers, fosters awareness, and implements supportive policies. Creating an environment where individuals with disabilities are actively included not only benefits them but also enriches communities by promoting diversity and inclusivity.

What are the challenges faced in achieving social inclusion for individuals with disabilities?

Despite global efforts, several barriers continue to hinder the full social inclusion of individuals with disabilities. Physical barriers such as inaccessible buildings, transportation sys, and digital platforms make navigation difficult. Additionally, the lack of assistive technologies prevents many individuals from independently performing daily activities. Beyond physical limitations, social stigma and discrimination often lead to exclusion from education, employment, and community engagement. Institutional barriers, including poorly implemented policies and limited access to quality rehabilitation services, further exacerbate these challenges. Addressing these issues requires targeted interventions at

multiple levels, combining legal measures, public awareness initiatives, and support sys.

Strategies to Enhance Social Inclusion

How can social inclusion be promoted for individuals with disabilities?

Enhancing social inclusion requires a coordinated effort from governments, communities, businesses, and individuals. Strengthening legal frameworks is essential, with international agreements such as the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD) guiding national policies. Educational and workplace initiatives play a crucial role in fostering understanding and creating supportive environments. Infrastructure must be designed with universal accessibility in mind, incorporating features such as ramps, elevators, tactile pathways, and adaptive digital technologies. Moreover, inclusive employment practices, community-based programs, and advocacy efforts can ensure that individuals with disabilities have opportunities to participate fully in society.

What role does rehabilitation play in social inclusion?

Rehabilitation serves as a bridge to social inclusion by enhancing the functional independence and participation of individuals with disabilities. It involves skill development, assistive technology support, sensory and motor integration therapy, and advocacy services. By addressing specific needs, rehabilitation empowers individuals to lead independent lives and contribute meaningfully to their communities. However, rehabilitation must go beyond clinical interventions, focusing on sustainable sys that promote long-term empowerment and accessibility.

Can you provide examples of successful social inclusion initiatives?

Several global initiatives highlight effective strategies for social inclusion. Finland's inclusive education system integrates students with disabilities into mainstream schools through individualized learning plans and assistive technologies. Microsoft's Autism Hiring Program demonstrates how neurodiverse individuals can thrive in professional environments when provided with appropriate support. India’s Community-Based Rehabilitation (CBR) program has successfully facilitated vocational training, assistive device distribution, and employment opportunities for individuals with disabilities, particularly in rural areas. These initiatives emphasize the importance of community-based approaches in fostering inclusivity.

The Future of Social Inclusion

What does the future hold for social inclusion and disability rights?

The journey toward full social inclusion is ongoing, requiring continuous commitment and collaboration. Future advancements will rely on policy strengthening, technological innovations, increased public awareness, and community-led initiatives. Governments must ensure the effective implementation of disability rights, while businesses and organizations should embrace inclusive practices. Technological developments in assistive devices and digital accessibility will further bridge gaps in inclusion. By prioritizing these efforts, societies can create environments where individuals with disabilities are fully included and valued members.

LET'S HEAR FROM PARENTS

Family Stories of Children From 6 Continents Treated At NeuroGen

United Kingdom

My name is Laigy and I am a mom of two kids' vasim, 10 years old and isha, 8 years old. My both kids are diagnosed with ASD. Vasim born as a full term baby via emergency C section. He was absolutely fine and reached all his milestones as normal. I noticed a change in vasim at the age of 1 and half. He gone into a quite phase, like he stopped making baby noises, noticeable lack if eye contact, not responding to his name etc. That was the time his baby sister was born, so we thought he might be responding to the overwhelming situation in that way. At the age of 2.5 years I was really concerned about his communication skills as he was completely mute. So as per the system here I informed the health care worker assigned for him to come and do an assessment on him. They also realized the situation and did all the assessment and finally at the age of four we got his diagnosis of ASD.

Since then we were looking for help or anything to improve quality of his life. Finally we found about the cell therapy at neurogen. We contacted the hospital through the website and the response was brilliant. They answered all our doubts, was very good at reassuring us and finally we decided to give a try and vasim had his first cell therapy there at 2019 December. We came back to uk after the treatment he started his schooling in a normal state school. It took more than 6 months for noticeable changes in him. He started saying names, small words which was a great relief for us as he was completely mute before. Every single day he started showing lots of improvement, his eye contact, attention span all improved significantly. We had a second shot again in the year 2021. Our family &friends are so happy and amused to see the improvement vasim had after the cell therapy. His school agreed to continue him in the normal state school, he is in year 3 now and he can read, write and speak well.

On the other hand I have noticed the same kind of changes in my daughter too. So I went to the hospital here and isha got the diagnosis of ASD & PICA. Since vasim had the treatment already we didn't hesitate to take isha to neurogen for cell therapy and she had her first shot at the age of 3 and half in 2020. She also had most of the symptoms like lack of communication, no eye contact, hyperactivity etc. she also

had a second shot with her brother in 2022. Isha is going to a special school here in uk, she is showing significant improvements too. She responds to her name now. She maintains eye contacts well, started responding /following simple instructions. She is showing improvements in her communication and social skills. She is learning swimming and music instrument's at her school.

It was a miracle that we came to know about neurogen and cells therapy. We can't imagine how our life would be without doing the therapy for my kids. ASD is not 100 % curable but we can make a change in their lives with the support of cell therapy. When we see our kids are socialising with others it gives a peace of mind that they could lead a normal life in this society with some minimal help. When you can notice that my elder son looking after, protecting, correcting his younger sister that gives a relief in your mind. It leaves a hope that Even though both are autistic they will support each other in the future.

No words could express how thankful we are to DR. ALOK SHARMA, Dr. NANDINI and the amazing team for doing such a wonderful amazing contribution to the society. The ease, peace of mind, the hope they leave in the mind of parents /carers of the kids with autism is beyond imaginable.

- Mrs. Laigy R.
Mother of Vasim & Isha, UK

Cambodia (Asia)

In 2023, a teacher shared a video in our Telegram group - Dr. Alok Sharma was giving a talk in Dubai about regenerative therapy. He shared two patient stories that touched something deep inside me. For the first time in a long while, I felt a glimmer of hope… hope that maybe, just maybe, things could get better for our daughter. Not long after, I heard about NeuroGen through a center. I decided to attend a seminar by Dr. Alok and Dr. Nandini. Almost 2000 parents were there, just like me—searching, waiting, hoping. That seminar felt like a light at the end of a very long and dark tunnel. And when I visited NeuroGen again later, I was surprised to feel that same warmth, that same sense of comfort and trust, all over again.

Before the procedure, our daughter's understanding of the world was so limited. She didn't even know we were her parents. It's hard to put into words how that feels as a mother… to look into your child's eyes and not be recognized. But now… now, she not only knows us—she calls us. She says "mama," "papa." Every time she says it, it feels like a miracle.

She understands safety now. She's aware of danger. She's becoming more independent day by day. Before the procedure, we had endless sleepless nights—nights filled with worry, tears, and exhaustion. Now, she sleeps through the night peacefully… and so do we.

The first two months after the procedure were hard. We didn't see many changes and doubt began to creep in. But then, slowly, beautifully, things began to shift.

Earlier, we were terrified to take her out—her hyperactivity made it almost impossible. But today? Today, if you saw her, you wouldn't even know. She blends right in with other kids, not because she's the same, but because she's found her own rhythm.

She's become independent in ways we never even dared to dream of. She rides a bicycle with joy. She dresses herself. And my heart swells every time I watch her carefully apply her own lipstick, looking in the mirror with a little smile—so proud of herself.

This journey hasn't been easy, but it's been full of grace and quiet victories. And if our story gives even one parent the courage to hope again, then it's worth sharing. Because sometimes, healing begins with just one small spark of belief.

- Sopich Pin
Father of Pichmalinda Pin
Cambodia

Their dedication and positive attitude are truly commendable. Yes I am talking about all Doctors, Nurses and Staff Members at NeuroGen Hospital. Dr. Alok Sharma is one of the pioneers in the fields of cell therapy in India and is really doing a very great job by giving hope to those who have lost it through their journeys due to neurological conditions.

I always think about when my son is going to be independent, will he be able to live on his own, what is his future because he got diagnosed with Autism at 2.5 years old. He was struggling in different areas like cognition, understanding, speech, behaviour etc.

A friend had taken his child to NeuroGen. The child had damage in the brain at the time of birth and hence had many physical issues. Many doctors said physiotherapy and medications are the only way to manage a child's condition as brain damage cannot be repaired. However, Dr. Alok Sharma said brain damage can be repaired with Cell Therapy. It is unbelievable to see how well the child is doing after taking cell therapy treatment. She had strongly recommended Cell Therapy to my son.

After Cell therapy my son showed great improvements in terms of their cognitive abilities, reduced tightness, improved chewing, whereas improvements in socialization with eye contact, reduced hyperactivity, fine motor skills, improved problem solving and leading much better lives now after Cell Therapy. I'm truly grateful for the care and professionalism I received throughout my son's cell therapy at NeuroGen. The entire team made me feel safe, informed, and supported during what could have been an overwhelming process. We still have the childrens case managers calling and messaging us to ensure they are doing well. I would recommend Neurogen to any special needs parents. It is indeed a ray of hope in challenging situations for parents of differently disabled children. This is a very noble work done at NeuroGen and thank you for your service.

By Shveta Patel,
Mother of JP
United States of America

HOSEA 4:6

"MY PEOPLE ARE DESTROYED FROM LACK OF KNOWLEDGE"

"Look at this one, he is in his own world! This one is a little better. Your sons are autistic." Those were the crushing words from a paediatric neurologist, barely 10 minutes of our consultation. The most devastating moment was being told that there is no cure or treatment, except to take them to a play school as well as follow a strict diet. It felt like a death sentence, then, and truly, I did start dying slowly from that moment. The children were only 2 years old, and I wondered how life would be from that moment onwards.

But even long before diagnosis, by the time my triplet sons, Lenny, Ricky, and Eric were 12 months, I knew something was wrong. I could not place my fingers to what exactly it was, and my family thought I was going crazy. I cried often, and my heart was saddened. My sisters and close friends came to check what was wrong, but their verdict was that the children were ok, they did not see anything wrong. This was the same verdict given by several paediatricians, in different hospitals. Simply, that my sons were showing some delayed milestones, as a result of their extreme prematurity, born at 28 weeks, coupled by the fact that they are boys, as well as being multiples. All these factors contributed to their delayed miles. But what exactly was I seeing that others were not privy to? For starters, at 1 year of age, none of my sons recognized me as their mother. At first, I thought it's because we had many caregivers in the house, and so every week, I had a "me time" with one of my sons where I would take one to my room, and just have him get to experience me

without the other two. One of them showed the slightest interest in me. That notwithstanding, none of them really gave me eye-contact, nor a smile. All they were interested in was jumping on the bed, or simply running around. The other strange thing included smelling every food before eating, smelling people, and being aggressive. By age 3 years, they had lost the few words they had and they had become silent children. Sleeping was very difficult, and until age 3.5 years, they hardly slept for 5 straight hours. They spent their day running from one end of the house to the other, without exhaustion. Going outdoors was extremely difficult because they did not know danger, and besides, they all had eloping tendencies.

MATTHEW 6:23

"THE EYE IS THE LAMP OF THE BODY. SO, IF YOUR EYE IS HEALTHY, YOUR WHOLE BODY WILL BE FULL OF LIGHT, BUT IF YOUR EYE IS BAD, YOUR WHOLE BODY WILL BE FULL OF DARKNESS. IF THEN THE LIGHT IN YOU IS DARKNESS, HOW GREAT IS THE DARKNESS!"

My entire household was extremely exhausted, and distressed. There was no light, but darkness. It hit me hard, and slowly I was deep in clinical depression. I lost the taste of life, and as months moved by, and my sons became even more challenging to look after and manage their safety, thoughts of hopelessness slowly crept into my life. My once happy and positive outlook of life, changed into a difficult and painful existence. I wanted nothing in life, and the thought of death seemed the only consolation to end my suffering. Slowly, suicide thoughts became appealing, and it's by God's grace that I did not perish during those dark days.

"LOSS IS LIKE A WIND, IT EITHER CARRIES YOU TO A NEW DESTINATION OR IT TRAPS YOU IN AN OCEAN OF STAGNATION. YOU MUST QUICKLY LEARN HOW TO NAVIGATE THE SAIL, FOR STAGNATION IS DEATH."

~Val Uchendu ~

Causes of ASD is still unclear, but recent scientific knowledge challenges the traditional view of autism as an untreatable disease. The most trying, confusing and depressive period is that following autism diagnosis. Finding the right treatment path is the key to providing the child with the best outcome in life.

This parent handbook, is the compass that parents need to navigate their journey with their special needs children, in order to arrive at the right destination. Without this, it's like swimming in the vast ocean, where you spend so much time and energy moving in a circle without much progress

"START BY DOING WHAT'S NECESSARY; THEN DO WHAT'S POSSIBLE; AND SUDDENLY YOU ARE DOING THE IMPOSSIBLE."

~ Francis of Assisi ~

There is something completely freeing and peaceful once I found the right team working with my sons. From age 3.5 years, my sons worked under a team comprising special education, occupational therapist, and sensory integration, who had a very rich set of activities working on their cognitive aspects, social skills, communication, academics, and sensory integration. It was then that I stopped struggling mentally, and found some semblance of peace, allowing me to start recovering my mental health as my son's progress began. Two years later, in 2017, I met the Neurogen team, and started in earnest, the journey of healing my sons' brains through cell treatment and neurorehabilitation therapies. We are in a beautiful season, and my family is now beginning to enjoy the trappings of a beautiful functioning brain. We are starting to live a more normal life as the children continue to recover and become more independent and interact with their world, something that was impossible before. When I look back at the dark period where I attempted to end my very life, I am reminded that if I had access to a parent handbook showing me the path to take, I would have been spared. Today, I have no fear of tomorrow, and what the future holds for my sons, because they are healing and will be completely independent to live an independent quality of life.

As a parent, I congratulate the team behind this parent hand book, and hope that the book reaches every parent of a child with autism to give them light and the roadmap of their new journey following autism diagnosis. With this book, no parent should ever experience loss of direction.

- Mrs. Mercy
Mother of Kairichi Triplets
Kenya

Australia

Embracing Progress: A Journey of Love and Breakthroughs

When our young child was diagnosed with autism here in Australia, it felt like everything we knew had suddenly changed. Although we had support around us, the uncertainty about what the future would hold was overwhelming. Everyday tasks—like drinking independently or holding a pen—became huge obstacles in our child's development.

Our journey took a positive turn with the support from NeuroGen and their innovative cell therapy. Before their intervention, communication was a real struggle for our child, often limited to single words. Simple activities like holding a pen or drinking from a cup were difficult and frustrating. But after starting therapy with NeuroGen, we began to see remarkable changes. Our child began forming two- to three-word sentences, like "I want this," and started gaining independence in tasks that once seemed impossible.

NeuroGen didn't just offer cell therapy-they took a holistic approach, looking at our child's overall health, checking for issues like gut problems or deficiencies. This comprehensive care made all the difference.

What truly stood out about the NeuroGen team was their understanding, empathy, and dedication to tailoring their approach to our child's unique needs. They didn't just help us see significant progress; they helped us embrace the beauty of neurodiversity. With every milestone-big or small-we became more confident in our ability to advocate for our child and celebrate their growth.

Through this experience, we've learned that autism brings its share of challenges, but with the right support, it can also lead to amazing breakthroughs. Every bit of progress is a victory, and we've learned that hope and resilience guide the way to a brighter future.

To every parent facing similar struggles: you are not alone. The road may be tough, but with love, dedicated support, and unwavering belief, our lives can transform in ways we never imagined.

Our journey shows that with courage and support, small steps can lead to giant leaps."

- Gururaja & Pavani
Parents of VK
Australia

Brazil (South America)

Let's Hear It from Parents: A Transformative Journey to NeuroGen Treatment

When we first learned about cell therapy, it felt like a distant hope. My husband and I were on a mission to find something that would help our son, who was still young at the time. We had exhausted all the usual treatments, therapies, and recommendations from local doctors, but nothing seemed to make a lasting difference. That's when we stumbled upon Dr. Alok Sharma's work on YouTube—a game-changer. As we dove deeper into his research, we found ourselves watching countless videos, feeling a mix of awe and hope. The more we learned, the clearer it became: this was something different.

In Brazil, cell therapy were barely talked about. When we approached local therapists or doctors, we were met with skepticism. They would tell us that it didn't work, that it was merely a false hope. But we couldn't shake the feeling that we had to explore this further. The concept of regenerating chronic cells in the brain through cell therapy gave us a new kind of hope—a hope that, despite the odds, could potentially change our son's life.

After extensive research, discussions with doctors, and understanding more about cell therapy, we decided to take the leap. We set our sights on Neurogen in India, even though it was far from our home in Brazil. We were convinced that the potential benefits far outweighed the distance. Our son, still only five years old, was at the perfect age for development, and we felt this could be the turning point we had been desperately searching for.

The journey itself was as transformative as the treatment. From the moment we arrived at the airport, we felt welcomed. The warmth and hospitality from the Neurogen team made all the difference. The team went out of their way to accommodate our cultural differences—ensuring that even the food was adjusted to match our lifestyle, which helped ease the transition. The entire medical procedure was handled with such care and professionalism. From the nurses who were attentive to our every need, to Dr. Alok Sharma, who oversaw the treatment, the experience was smooth and reassuring. The procedure itself was safe and well-explained, which alleviated any apprehension we had.

Currently after the treatment we are able to notice significant changes in our child like improvement in his attention and concentration, better understanding of commands, increase in his sitting tolerance etc. He is able to engage in interaction with other children at his school which was a remarkable achievement for us. His speech and vocabulary has also increased.

What stood out the most, however, wasn't just the medical aspect of the treatment; it was the sense of belonging and support we felt throughout our stay. Despite being

in a completely foreign country, we felt at home. We weren't just patients; we were individuals treated with kindness and respect. This was more than just a treatment center—it was a community. And for me, that was the most important part of the experience.

As we head back home to Brazil, we carry with us not just the hope for our son's improvement, but a deep sense of gratitude. We are hopeful, encouraged by the progress we've seen so far, and excited about what the future holds. I can say with certainty that the decision to pursue this treatment at Neurogen was one of the best choices we've ever made for our family. The journey was far from easy, but it was well worth it, and we're returning home with a renewed sense of optimism and belief in the power of cell therapy.

- Beatriz Carolina
Mother of BR

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Autologous bone marrow mononuclear cell administration in a large cohort of 1,011 patients with autism spectrum disorder: a retrospective observational study

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Background: This retrospective observational study analyzed the therapeutic efficacy of autologous bone marrow mononuclear cells (BMMNCs) in a large cohort of patients with autism spectrum disorder (ASD).
Methods: Overall, 1,011 patients with ASD who received intrathecal administration of autologous BMMNCs were included. Changes in symptoms and outcome measures—the Indian Scale of Autism Assessment (ISAA) and Childhood Autism Rating Scale (CARS)—were recorded. Brain positron emission tomography computed tomography (PET/CT) was used to objectively assess changes in brain metabolism.
Results: At a mean follow-up of 19.3 months, 90.6% of patients showed improvement after cell therapy. Symptomatic improvements were observed in attention and concentration, command following, eye contact, sitting tolerance, social interaction, hyperactivity, communication, speech, stereotypical behavior, aggressiveness, and self-injurious behavior. Patients who received multiple doses of cell therapy demonstrated better outcomes, and improvements were seen across all age groups and regardless of disease severity. Changes in ISAA and CARS scores were statistically significant ($P<0.05$). Comparative PET/CT scans of 401 patients revealed improved metabolism in the amygdala, hippocampus, parahippocampal gyrus, caudate nucleus, cerebellum, mesial temporal lobe, thalamus, and superior and middle temporal poles, which corresponded to symptomatic improvements. No major adverse events were reported. Nine of the 1,011 patients experienced seizures, four of whom had a prior history. These events were managed with medication, with improvements still observed in the nine patients.
Conclusions: Intrathecal transplantation of autologous BMMNCs, combined with neurorehabilitation, yields positive outcomes for patients with ASD. This approach helps reduce the degree of impairment and improves quality of life.

Keywords: Autism spectrum disorder; Bone marrow; Mononuclear cells; Positron emission tomography computed tomography; Cell therapy

91% of patients improved.

Comparison of pre- and post-therapy PET-CT scans in 401 patients demonstrated improved metabolic activity in multiple brain regions which correlated with the observed clinical improvements.

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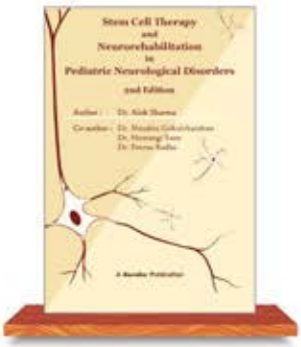

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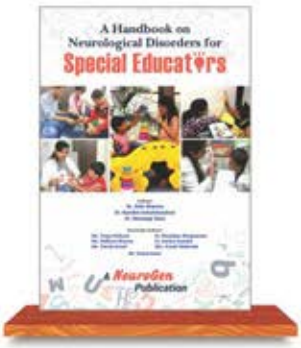

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