

Autism Spectrum Disorder

Goals & Objectives

Course Description

“Autism Spectrum Disorder” is an asynchronous online continuing education program for physical therapists and physical therapist assistants. The course focuses on the etiology, symptomology, screening and diagnosis, behavioral traits, treatment strategies, and social impact of autism spectrum disorder.

Course Rationale

The information presented in this course is critical for physical therapists and physical therapist assistants in all settings who work with individuals who are afflicted with autism spectrum disorder. A greater understanding of this condition will facilitate the development of effective treatment programs that address the specific challenges faced by individuals with this disorder.

Course Goals & Objectives

Upon completion of this course, the participant will be able to:

1. identify the symptoms associated with ASD
2. Identify the etiologic factors for ASD
3. recognize the symptomology associated with ASD
4. Identify ASD associated conditions
5. identify and differentiate ASD screening methodologies
6. identify the criteria and mechanisms used to diagnose ASD
7. identify and differentiate ASD treatment interventions, strategies, and methodologies
8. define the educational rights of individuals with ASD
9. recognize the challenges experienced by adults with ASD

Course Provider – Innovative Educational Services

Course Instructor - Michael Niss, DPT

Target Audience – physical therapists and physical therapist assistants

Course Educational Level – Introductory / intermediate

Course Prerequisites – None

Method of Instruction/Availability – Online text-based course available continuously.

Criteria for Issuance of CE Credits - A score of 70% or greater on the course post-test.

Continuing Education Credits – 5 hours

Fees - \$49.95

Conflict of Interest – No conflict of interest exists for the presenter or provider of this course.

Refund Policy - Unrestricted 100% refund upon request. The request for a refund by the learner shall be honored in full without penalty or other consideration of any kind. The request for a refund may be made by the learner at any time without limitations before, during, or after course participation.

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Course Outline**

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Overview

Autism spectrum disorders (ASD) are a group of neurodevelopmental disorders characterized by impaired social interaction and communication and by restricted or repetitive behaviors. These features are generally identified by the age of 3 years and are frequently associated with other physical and mental health conditions. The developmental challenges and associated problems in individuals with ASDs vary widely. Symptom presentation and degree of impairment can vary not only among individuals but also within the same individual over time.

Epidemiology

Studies measuring autism spectrum disorder (ASD) prevalence - the number of children affected by ASD over a given time period - have reported varying results, depending on when and where the studies were conducted and how the studies defined ASD.

In a government survey on ASD prevalence, the Centers for Disease Control and Prevention (CDC) found that the current rate of ASD was higher than in past U.S. studies. Based on health and school records of 8-year-olds in 14 communities throughout the country, the CDC estimates that around 1 in 68 American children have ASD. Boys have approximately four to five times higher incidence than girls for ASD.

Experts disagree about whether this shows a true increase in ASD prevalence. Since the earlier studies were completed, guidelines for diagnosis have changed. Also, many more parents and doctors now know about ASD, so parents are more likely to take their children to be diagnosed, and more doctors are able to properly diagnose ASD. These and other changes may help explain some differences in prevalence numbers. Even so, the CDC report confirms other recent studies showing that more children are being diagnosed with ASD than ever before.

Etiology

Autism is a complex neurodevelopmental disorder with variability in symptom onset and presentation. The heterogeneity in autism phenotypes suggest that these syndromes are caused by multiple factors, much like what has been shown in cancer etiology. A complex interaction among environmental and genetic factors determines risk. Both the genetic and environmental contributions to autism risk are expected to vary among individuals. There is an urgent need to identify environmental risks for autism, as this information can be used to reduce harmful exposures and reduce the incidence of ASDs.

Genetic Factors

In identical twins who share the exact same genetic code, if one has ASD, the other twin also has ASD in nearly 9 out of 10 cases. If one sibling has ASD, the other siblings have 35 times the normal risk of also developing the disorder. Researchers are starting to identify particular genes that may increase the risk for ASD.

Most people who develop ASD have no reported family history of autism, suggesting that random, rare, and possibly many gene mutations are likely to affect a person's risk.

Having increased genetic risk does not mean a child will definitely develop ASD. Many researchers are focusing on how various genes interact with each other and environmental factors to better understand how they increase the risk of this disorder.

Using genome widescreens, scientists have identified a number of genes that might be involved in autism. Although some analyses suggest that as many as 12 genes might be involved in ASDs, the strongest evidence points to areas on:

Chromosome 2 - Scientists know that areas of chromosome 2 are the neighborhoods for "homeobox" or HOX genes, the group of 38 different genes that control growth and development very early in life. Expression of these HOX genes is critical to building the brain stem and the cerebellum, two areas of the brain where functions are disrupted in ASDs.

Chromosome 15 – Genome-wide screens and cytogenetic research show that a part of this chromosome may play a role in autism. Genetic errors on this chromosome cause Angelman syndrome and Prader Willi syndrome, both of which share behavioral symptoms with autism. Cytogenetic errors on chromosome 15 occur in up to 4 percent of patients with autism.

Chromosome 16 - Genes found on this chromosome control a wide variety of functions that, if disrupted, cause problems that are similar or related to symptoms of autism. For example, a genetic error on this chromosome causes tuberous sclerosis, a disorder that shares many symptoms with autism, including seizures. So, regions on this chromosome may be responsible for certain similar behavioral aspects of the two disorders.

Chromosome 17 – Strong evidence exists that this chromosome can cause problems, such as galactosemia, a metabolic disorder that, if left untreated, can result in mental retardation. Chromosome 17 also contains the gene for the serotonin transporter, which allows nerve cells to collect serotonin. Serotonin is involved in emotions and helps nerve cells communicate. Problems with the serotonin transporter can cause obsessive-compulsive disorder (OCD), which is marked by recurrent, unwanted thoughts (obsessions) and/or repetitive behaviors (compulsions).

The Reelin (RELN) gene on chromosome 7 –This gene plays a crucial role in the development of connections between cells of the nervous system.

Researchers think that abnormal brain connectivity plays a role in autism, which makes Reelin a good candidate. In addition, persons with autism and their parents and siblings have lower levels of certain types of the Reelin protein, which may mean that gene is not functioning normally.

The HOX D1 gene – This homeobox gene is critical to the formation of certain brain structures. This gene is involved in Duane syndrome, a disorder that causes eye-movement problems and sometimes occurs with autism.

Gamma-amino-butyric acid (GABA) pathway genes – GABA compounds are neurotransmitters, which mean they help parts of the nervous system communicate with each other. GABA receptor genes are involved in early development of parts of the nervous system and help with communication between these parts throughout life. A problem in the GABA pathway can cause some of the symptoms of ASDs. For instance, epilepsy may result, in part, from low levels of GABA compounds. Many persons with autism also have epilepsy and also show low levels of GABA.

Environmental Factors

The largest and most rigorous twin study of its kind found that shared environment influences susceptibility to autism more than previously thought. (Hallmayer, 2011) The study found that shared environmental factors - experiences and exposures common to both twin individuals - accounted for 55 percent of strict autism and 58 percent of more broadly defined autism spectrum disorders (ASD). Genetic heritability accounted for 37 percent of autism and 38 percent of ASD. Random environmental factors not shared among twins play a much smaller role.

Many environmental factors such as family medical conditions, parental age and other demographic factors, exposure to toxins, and complications during birth or pregnancy are all currently being investigated. Prenatal exposure to the teratogens thalidomide and valproic acid have been shown to increase risk for features of autism spectrum disorders.

Epidemiologic research in more recent years have shown more modest associations of autism risk with obstetric complications, gestational age and neonatal birth weight. Stimulated by the rising prevalence in autism in the past 20 years, attention has turned to industrial chemicals and other toxicants in the environment.

As with genes, it's likely that more than one environmental factor is involved in increasing risk for ASD. And, like genes, any one of these risk factors raises the risk by only a small amount. Most people who have been exposed to environmental risk factors do not develop ASD.

Vaccines

Many studies that have investigated whether there is a relationship between vaccines and autism spectrum disorders (ASD). Credible contemporary research has not established any causative relationship between vaccines and the development of ASD in children.

Children in the United States receive several vaccines during their first 2 years of life, around the same age that ASD symptoms often appear or become noticeable. A minority of parents suspect that vaccines are somehow related to their child's disorder. Some may be concerned about these vaccines due to the unproven theory that ASD may be caused by thimerosal. Thimerosal is a mercury-based chemical once added to some, but not all, vaccines to help extend their shelf life. However, except for some flu vaccines, no vaccine routinely given to preschool aged children in the United States has contained thimerosal since 2001. Despite this change, the rate of children diagnosed with ASD has continued to rise.

Other parents believe their child's illness might be linked to vaccines designed to protect against more than one disease, such as the measles-mumps-rubella (MMR) vaccine, which never contained thimerosal.

Symptomology

Symptoms of autism spectrum disorder (ASD) vary from one child to the next, but in general, they fall into three areas: Social impairment, Communication difficulties, and Repetitive and stereotyped behaviors.

Children with ASD do not follow typical patterns when developing social and communication skills. Parents are usually the first to notice unusual behaviors in their child. Often, certain behaviors become more noticeable when comparing children of the same age.

In some cases, babies with ASD may seem different very early in their development. Even before their first birthday, some babies become overly focused on certain objects, rarely make eye contact, and fail to engage in typical back-and-forth play and babbling with their parents. Other children may develop normally until the second or even third year of life, but then start to lose interest in others and become silent, withdrawn, or indifferent to social signals. Loss or reversal of normal development is called regression and occurs in some children with ASD.

Social Impairment

Most children with ASD have trouble engaging in everyday social interactions. According to the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition - Text Revision*, some children with ASD may:

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- Make little eye contact
- Tend to look and listen less to people in their environment or fail to respond to other people
- Do not readily seek to share their enjoyment of toys or activities by pointing or showing things to others
- Respond unusually when others show anger, distress, or affection.

It is suggested that children with ASD do not appropriately respond to emotional cues in human social interactions because they may not pay attention to the social cues that others typically notice. For example, children with ASD may focus on the mouth of the person speaking to them instead of on the eyes; which is where children with typical development tend to focus. Children with ASD also appear to be drawn to repetitive movements linked to a sound, such as handclapping during a game of pat-a-cake. These findings suggest that children with ASD may misread or not notice subtle social cues - a smile, a wink, or a grimace - that could help them understand social relationships and interactions. For these children, a question such as, "Can you wait a minute?" always means the same thing, whether the speaker is joking, asking a real question, or issuing a firm request. Without the ability to interpret another person's tone of voice as well as gestures, facial expressions, and other nonverbal communications, children with ASD may not properly respond. Likewise, it can be hard for others to understand the body language of children with ASD. Their facial expressions, movements, and gestures are often vague or do not match what they are saying. Their tone of voice may not reflect their actual feelings either. Many older children with ASD speak with an unusual tone of voice and may sound sing-song or flat and robot-like.

Children with ASD also may have trouble understanding another person's point of view. For example, by school age, most children understand that other people have different information, feelings, and goals than they have. Children with ASD may lack this understanding, leaving them unable to predict or understand other people's actions.

Communication Issues

According to the American Academy of Pediatrics' developmental milestones, by the first birthday, typical toddlers can say one or two words, turn when they hear their name, and point when they want a toy. When offered something they do not want, toddlers make it clear with words, gestures, or facial expressions that the answer is "no."

For children with ASD, reaching such milestones may not be so straightforward. For example, some children with autism may:

- Fail or be slow to respond to their name or other verbal attempts to gain their attention
- Fail or be slow to develop gestures, such as pointing and showing things to others
- Coo and babble in the first year of life, but then stop doing so

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- Develop language at a delayed pace
- Learn to communicate using pictures or their own sign language
- Speak only in single words or repeat certain phrases over and over, seeming unable to combine words into meaningful sentences
- Repeat words or phrases that they hear, a condition called echolalia
- Use words that seem odd, out of place, or have a special meaning known only to those familiar with the child's way of communicating.

Even children with ASD who have relatively good language skills often have difficulties with the back and forth of conversations. For example, because they find it difficult to understand and react to social cues, children with Asperger syndrome often talk at length about a favorite subject, but they won't allow anyone else a chance to respond or notice when others react indifferently.

Children with ASD who have not yet developed meaningful gestures or language may simply scream or grab or otherwise act out until they are taught better ways to express their needs. As these children grow up, they can become aware of their difficulty in understanding others and in being understood. This awareness may cause them to become anxious or depressed.

Not every child with an autism spectrum disorder will have a language problem. A child's ability to communicate will vary, depending upon his or her intellectual and social development. Some children with autism may be unable to speak. Others may have rich vocabularies and be able to talk about specific subjects in great detail. Most children with autism have little or no problem pronouncing words. The majority, however, have difficulty using language effectively, especially when they talk to other people. Many have problems with the meaning and rhythm of words and sentences. They also may be unable to understand body language and the nuances of vocal tones.

Below are some patterns of language use and behaviors that are often found in children with autism.

Repetitive or rigid language - Often, children with autism who can speak will say things that have no meaning or that seem out of context in conversations with others. For example, a child may count from one to five repeatedly. Or a child may continuously repeat words he or she has heard, a condition called echolalia. Immediate echolalia occurs when the child repeats words someone has just said. For example, the child may respond to a question by asking the same question. In delayed echolalia, the child will repeat words heard at an earlier time. The child may say "Do you want something to drink?" whenever he or she asks for a drink.

Some children with autism speak in a high-pitched or singsong voice or use robot-like speech. Other children with autism may use stock phrases to start a conversation. For example, a child may say "My name is Tom," even when he

talks with friends or family. Still others may repeat what they hear on television programs or commercials.

Narrow interests and exceptional abilities - Some children may be able to deliver an in-depth monologue about a topic that holds their interest, even though they may not be able to carry on a two-way conversation about the same topic. Others have musical talents or an advanced ability to count and do math calculations. Approximately 10 percent of children with autism show “savant” skills, or extremely high abilities in specific areas, such as calendar calculation, music, or math.

Uneven language development - Many children with autism develop some speech and language skills, but not to a normal level of ability, and their progress is usually uneven. For example, they may develop a strong vocabulary in a particular area of interest very quickly. Many children have good memories for information just heard or seen. Some children may be able to read words before 5 years of age, but they may not comprehend what they have read. They often do not respond to the speech of others and may not respond to their own names. As a result, children with autism sometimes are mistakenly thought to have a hearing problem.

Poor nonverbal conversation skills - Children with autism often are unable to use gestures, such as pointing to an object, to give meaning to their speech. They often avoid eye contact, which can make them seem rude, uninterested, or inattentive. Without meaningful gestures or the language to communicate, many children with autism become frustrated in their attempts to make their feelings and needs known. They may act out their frustrations through vocal outbursts or other inappropriate behaviors.

Repetitive and Stereotyped Behaviors

Children with ASD often have repetitive motions or unusual behaviors. These behaviors may be extreme and very noticeable, or they can be mild and discreet. For example, some children may repeatedly flap their arms or walk in specific patterns, while others may subtly move their fingers by their eyes in what looks to be a gesture. These repetitive actions are sometimes called “stereotypy” or “stereotyped behaviors.”

Children with ASD also tend to have overly focused interests. Children with ASD may become fascinated with moving objects or parts of objects, like the wheels on a moving car. They might spend a long time lining up toys in a certain way, rather than playing with them. They may also become very upset if someone accidentally moves one of the toys. Repetitive behavior can also take the form of a persistent, intense preoccupation. For example, they might be obsessed with learning all about vacuum cleaners, train schedules, or lighthouses. Children with ASD often have great interest in numbers, symbols, or science topics.

While children with ASD often do best with routine in their daily activities and surroundings, inflexibility may often be extreme and cause serious difficulties. They

may insist on eating the same exact meals every day or taking the same exact route to school. A slight change in a specific routine can be extremely upsetting. Some children may even have emotional outbursts, especially when feeling angry or frustrated or when placed in a new or stimulating environment.

No two children express exactly the same types and severity of symptoms. In fact, many typically developing children occasionally display some of the behaviors common to children with ASD.

Related Disorders

Rett syndrome and childhood disintegrative disorder (CDD) are two very rare forms of ASD that include a regression in development. Only 1 of every 10,000 to 22,000 girls has Rett syndrome. Even rarer, only 1 or 2 out of 100,000 children with ASD have CDD.

Rett Syndrome

Rett syndrome is a neurological and developmental disorder that mostly occurs in females. Infants with Rett syndrome seem to grow and develop normally at first, but then stop developing and even lose skills and abilities. For instance, they stop talking even though they used to say certain words. They lose their ability to walk properly. They stop using their hands to do things and often develop stereotyped hand movements, such as wringing, clapping, or patting their hands.

Most cases of Rett syndrome are caused by a mutation on the MECP2 gene, which is found on the X chromosome.

Beginning between 3 months and 3 years of age, most children with Rett syndrome start to show some of the following symptoms:

- Loss of purposeful hand movements, such as grasping with fingers, reaching for things, or touching things on purpose
- Loss of speech
- Balance and coordination problems, including losing the ability to walk in many cases
- Stereotypic hand movements, such as hand wringing
- Breathing problems, such as hyperventilation and breath holding, or apnea when awake
- Anxiety and social-behavioral problems
- Intellectual and developmental disabilities

There are a number of other problems common among those who have Rett syndrome. But having these problems is not necessary to get a diagnosis of Rett syndrome. These problems can include:

- Scoliosis (occurs in approximately 80 percent of girls with Rett syndrome)

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- Seizures
- Constipation and gastro-esophageal reflux
- Cardiac or heart problems, specifically problems with the rhythm of their heartbeat
- Problems feeding themselves, trouble swallowing and chewing
- Problems with sleep, specifically disrupted sleep patterns at night and an increase in total and daytime sleep.

The onset of Rett syndrome symptoms in four stages:

- Early Onset Phase – Development stalls or stops.
- Rapid Destructive Phase – The child loses skills (regresses) quickly. Purposeful hand movements and speech are usually the first skills lost.
- Plateau Phase – Regression slows, and other problems may seem to lessen or improve. Most people with Rett syndrome spend most of their lives in stage 3.
- Late Motor Deterioration Phase – Individuals may become stiff or lose muscle tone; some may become immobile.

Most girls with Rett syndrome live until adulthood. They will usually need care and assistance throughout their lives

Childhood Disintegrative Disorder (CDD)

Childhood Disintegrative Disorder affects very few children, which makes it hard for researchers to learn about the disease. Symptoms of CDD may appear by age 2, but the average age of onset is between age 3 and 4. Until this time, children with CDD usually have age-appropriate communication and social skills. The long period of normal development before regression helps to set CDD apart from Rett syndrome. CDD appears to affect boys more often than girls.

Children with CDD experience severe, wide-ranging and obvious loss of previously-obtained motor, language, and social skills. The loss of such skills as vocabulary is more dramatic in CDD than in classic autism. Other symptoms of CDD include loss of bowel and bladder control.

ASD Associated Conditions

Sensory Problems

Many children with autism spectrum disorder either overreact or underreact to certain sights, sounds, smells, textures, and tastes. For example, some may:

- Dislike or show discomfort from a light touch or the feel of clothes on their skin
- Experience pain from certain sounds, like a vacuum cleaner, a ringing telephone, or a sudden storm; sometimes they will cover their ears and scream

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- Have no reaction to intense cold or pain.

Researchers are trying to determine if these unusual reactions are related to differences in integrating multiple types of information from the senses.

Sleep Problems

Children with ASD tend to have problems falling asleep or staying asleep, or have other sleep problems. These problems make it harder for them to pay attention, reduce their ability to function, and lead to poor behavior. In addition, parents of children with ASD and sleep problems tend to report greater family stress and poorer overall health among themselves.

Fortunately, sleep problems can often be treated with changes in behavior, such as following a sleep schedule or creating a bedtime routine. Some children may sleep better using medications such as melatonin, which is a hormone that helps regulate the body's sleep-wake cycle. Like any medication, melatonin can have unwanted side effects. Treating sleep problems in children with ASD may improve the child's overall behavior and functioning, as well as relieve family stress.

Intellectual Impairment

Many children with ASD have some degree of intellectual disability. When tested, some areas of ability may be normal, while others, especially cognitive and language abilities may be relatively weak. For example, a child with ASD may do well on tasks related to sight (such as putting a puzzle together) but may not do as well on language-based problem-solving tasks. Children with a form of ASD like Asperger syndrome often have average or above-average language skills and do not show delays in cognitive ability or speech.

Seizures

One in four children with ASD has seizures, often starting either in early childhood or during the teen years. Seizures, caused by abnormal electrical activity in the brain, can result in short-term loss of consciousness (blackouts), convulsions, and staring spells.

Sometimes lack of sleep or a high fever can trigger a seizure. An electroencephalogram (EEG) can help confirm whether a child is having seizures. However, some children with ASD have abnormal EEGs even if they are not having seizures.

Seizures can be treated with anticonvulsant medication. Some seizure medicines affect behavior; changes in behavior should be closely watched in children with ASD. Anticonvulsants usually reduce the number of seizures but may not prevent all of them.

Fragile X Syndrome

Fragile X syndrome is a genetic disorder and is the most common form of inherited intellectual disability, causing symptoms similar to ASD. The name refers to one part of the X chromosome that has a defective piece that appears pinched and fragile when viewed with a microscope. Fragile X syndrome results from a mutation on a single gene. This mutation, in effect, turns off the gene. Some people may have only a small mutation and not show any symptoms, while others have a larger mutation and more severe symptoms.

Around 1 in 3 children who have Fragile X syndrome also meet the diagnostic criteria for ASD, and about 1 in 25 children diagnosed with ASD have the mutation that causes Fragile X syndrome.

Because this disorder is inherited, children with ASD should be checked for Fragile X, especially if the parents want to have more children. Other family members who are planning to have children may also want to be checked for Fragile X syndrome.

Tuberous Sclerosis

Tuberous sclerosis is a rare genetic disorder that causes non-cancerous tumors to grow in the brain and other vital organs. Tuberous sclerosis occurs in 1 to 4 percent of people with ASD. A genetic mutation causes the disorder, which has also been linked to cognitive dysfunction, epilepsy, and many other physical and mental health problems. There is no cure for tuberous sclerosis, but many symptoms can be treated.

Gastrointestinal Problems

Some parents of children with ASD report that their child has frequent gastrointestinal (GI) or digestion problems, including stomach pain, diarrhea, constipation, acid reflux, vomiting, or bloating. Food allergies may also cause problems for children with ASD. It's unclear whether children with ASD are more likely to have GI problems than typically developing children.

Some studies have reported that children with ASD seem to have more GI symptoms, but these findings may not apply to all children with ASD. For example, a study found that children with ASD in Minnesota were more likely to have physical and behavioral difficulties related to diet (for example, lactose intolerance or insisting on certain foods), as well as constipation, than children without ASD (Nikolov, 2009) The researchers suggested that children with ASD may not have underlying GI problems, but that their behavior may create GI symptoms (for example, a child who insists on eating only certain foods may not get enough fiber or fluids in his or her diet, which leads to constipation.)

Some parents may try to put their child on a special diet to control ASD or GI symptoms. While some children may benefit from limiting certain foods, there is no strong evidence that these special diets reduce ASD symptoms.

Psychological Disorders

There is considerable evidence that children and adolescents with autistic spectrum disorders (ASD) are at increased risk of anxiety, depression, and other psychological disorders. Management of these co-occurring conditions with medications or behavioral therapy can reduce symptoms that appear to worsen a child's ASD symptoms. Controlling these conditions allow children with ASD to focus more on managing the ASD.

Developmental Screening

ASD diagnosis is often a two-stage process. The first stage involves general developmental screening during well-child checkups with a pediatrician or other early childhood health care provider. Children who show some developmental problems are referred for additional evaluation. The second stage involves a thorough evaluation by a team of doctors and other health professionals with a wide range of specialties. At this stage, a child may be diagnosed as having autism or another developmental disorder.

Many people, including pediatricians, family doctors, teachers, and parents, may minimize signs of ASD at first, believing that children will “catch up” with their peers. Early intervention can reduce or prevent the more severe disabilities associated with ASD. Early intervention may also improve the child's IQ, language, and everyday functional skills, also called adaptive behavior.

Developmental screening is a short test to tell if a child is learning basic skills when they should, or if they might have delays. Screening for ASD is not the same as diagnosing ASD. Screening instruments are used as a first step to determine whether a child needs more testing. During developmental screening the health care professional might ask the parent some questions or talk and play with the child during an exam to see how she learns, speaks, behaves, and moves. A delay in any of these areas could be a sign of a problem.

All children should be screened for developmental delays and disabilities at:

- 9 months
- 18 months
- 24 or 30 months
- Additional screening might be needed if a child is at high risk for developmental problems due to preterm birth, low birth weight or other reasons.

In addition, all children should be screened specifically for ASDs at:

- 18 months
- 24 months

- Additional screening might be needed if a child is at high risk for ASDs (e.g., having a sister, brother or other family member with an ASD) or if behaviors sometimes associated with ASDs are present

It is important for health care providers to screen all children for developmental delays, but especially to monitor those who are at a higher risk for developmental problems due to preterm birth, low birth weight, or having a brother or sister with an ASD. If any signs of a problem are noted, a comprehensive diagnostic evaluation is needed.

Screening Tools

Screening tools are designed to help identify children who might have developmental delays. Screening tools can be specific to a disorder (for example, autism) or an area (for example, cognitive development, language, or gross motor skills), or they may be general, encompassing multiple areas of concern. Some screening tools are used primarily in pediatric practices, while others are used by school systems or in other community settings.

Screening tools do not provide conclusive evidence of developmental delays and do not result in diagnoses. A positive screening result should be followed by a thorough assessment. Screening tools do not provide in-depth information about an area of development.

When selecting a developmental screening tool, the following should be taken into consideration:

- Domains Being Screened
What are the questions that need to be answered?
What types of delays or conditions do you want to detect?
- Psychometric Properties
These affect the overall ability of the test to do what it is meant to do.
 - The sensitivity of a screening tool is the probability that it will correctly identify children who exhibit developmental delays or disorders.
 - The specificity of a screening tool is the probability that it will correctly identify children who are developing normally.
- Characteristics of the Child
For example, age and presence of risk factors.
- Setting in which the Screening Tool will be Administered
Will the tool be used in a physician's office, daycare setting, or community setting? Screening can be performed by professionals, such as therapists, nurses, or teachers, or by trained paraprofessionals.

Screening Tools for General Development and ASDs:

- **Ages and Stages Questionnaires (ASQ)**
Developed by Diane Bricker, Ph.D. and Jane Squires, Ph.D. It identifies children four months through five years experiencing developmental delays. This is a general developmental screening tool. A parent-completed questionnaire that has a series of 19 age-specific questionnaires. It screens communication, gross motor, fine motor, problem-solving, and personal adaptive skills; results in a pass/fail score for domains. Available at: <http://agesandstages.com/what-is-asq/>
- **Communication and Symbolic Behavior Scales (CSBS)**
Developed by Amy M. Wetherby, Ph.D., CCC-SLP, and Barry M. Prizant, Ph.D., CCC-SLP. It has 24 multiple choice questions to be completed by a parent or caregiver. It is used to identify developmental delays in children from six through twenty-four months of age. Available at: <http://firstwords.fsu.edu/pdf/checklist.pdf>
- **Parents' Evaluation of Developmental Status (PEDS)**
This is a general developmental screening tool. Parent-interview form; screens for developmental and behavioral problems needing further evaluation; single response form used for all ages; may be useful as a surveillance tool. It can be administered by a wide range of health care professionals or office staff. Available at: <http://www.pedstest.com/default.aspx>
- **Modified Checklist for Autism in Toddlers (M-CHAT)**
Parent-completed questionnaire designed to identify children at risk for autism in the general population. The M-CHAT is an expanded American version of the original CHAT from the U.K. The M-CHAT has 23 questions using the original nine from the CHAT as its basis. Its goal is to improve the sensitivity of the CHAT and position it better for an American audience. Available at: http://www2.gsu.edu/~psydlr/Diana_L._Robins,_Ph.D..html
- **Screening Tool for Autism in Toddlers and Young Children (STAT)**
This is an interactive screening tool designed for children when developmental concerns are suspected. It consists of 12 activities assessing play, communication, and imitation skills and takes 20 minutes to administer. Available at: <http://kc.vanderbilt.edu/triad/training/page.aspx?id=821>

Screening Tools for High-Functioning Autism or Asperger Syndrome

Until recently, screening tools often did not identify children with mild ASDs, such as those with high-functioning autism or Asperger syndrome. Today, there are some tools that reliably screen for social and behavioral impairments in children without significant language delay. Selected examples of screening tools for high-functioning autism or Asperger syndrome:

- **Autism Spectrum Screening Questionnaire (ASSQ)**
A 27-item parent- and teacher-completed checklist; the ASSQ is a useful brief screening device for the identification of Asperger syndrome and other high-functioning ASDs in children and adolescents with normal intelligence or mild mental retardation. Available at: <http://agesandstages.com/what-is-asq/>

- **Australian Scale for Asperger's Syndrome**
Questionnaire designed to identify behaviors and abilities indicative of Asperger syndrome in children during their primary school years. Available at:
<http://www.aspergersyndrome.org/Articles/The-Australian-Scale-for-Asperger-s-Syndrome.aspx>
- **Childhood Asperger Syndrome Test (CAST)**
Parent-completed questionnaire to screen for autism spectrum conditions. Available at: http://www.autismresearchcentre.com/arc_tests

Family Involvement

Parents can be reliable sources of information about their children's development. Evidence-based screening tools that incorporate parent reports (e.g., Ages and Stages Questionnaire, the Parents' Evaluation of Developmental Status, and Child Development Inventories) can facilitate structured communication between parents and providers to discover parent concerns, increase parent and provider observations of the child's development, and increase parent awareness. Such tools can also be time and cost efficient in clinical practice settings.

Screening children and providing parents with anticipatory guidance (educating families about what to expect in their child's development, how they can promote development, and the benefits of monitoring development) can also improve the relationship between the provider and parent. By establishing relationship-based practices, providers promote positive parent-child relationships, while building the strongest possible relationship between the parent and provider. Such practices are fundamental to quality services.

American Academy of Neurology and the Child Neurology Society Clinical Practice Recommendations:

Developmental Surveillance and Screening for Autism Spectrum Disorders

1. Developmental surveillance should be performed at all well-child visits from infancy through school age, and at any age thereafter if concerns are raised about social acceptance, learning, or behavior.
2. Recommended developmental screening tools include the Ages and Stages Questionnaire, the BRIGANCE® Screens, the Child Development Inventories, and the Parents' Evaluations of Developmental Status.
3. Because of the lack of sensitivity and specificity, the Denver-II (DDST-II) and the Revised Denver Pre-Screening Developmental Questionnaire (R-DPDQ) are not recommended for appropriate primary-care developmental surveillance.
4. Further developmental evaluation is required whenever a child fails to meet any of the following milestones: babbling by 12 months; gesturing (e.g., pointing, waving bye-bye) by 12 months; single words by 16 months; two-word spontaneous (not just echolalic) phrases by 24 months; loss of any language or social skills at any age.

5. Siblings of children with autism should be monitored carefully for acquisition of social, communication, and play skills, and the occurrence of maladaptive behaviors. Screening should be performed not only for autism-related symptoms but also for language delays, learning difficulties, social problems, and anxiety or depressive symptoms.
6. For all children failing routine developmental surveillance procedures, screening specifically for autism should be performed using one of the validated instruments: the Checklist for Autism in Toddlers (CHAT) or the Autism Screening Questionnaire.
7. Laboratory investigations, including audiologic assessment and lead screening, are recommended for any child with developmental delay and/or autism. Early referral for a formal audiologic assessment should include behavioral audiometric measures, assessment of middle ear function, and electrophysiologic procedures using experienced pediatric audiologists with current audiologic testing methods and technologies. Lead screening should be performed in any child with developmental delay and pica. Additional periodic screening should be considered if the pica persists.

Screening for ASDs in Children Age Six and Older

Although the core impairments in individuals with ASDs are commonly identified in early childhood, a considerable number of children are not recognized as being at risk for ASDs until school age or later. In these cases, families, educators and/or young adults themselves may have concerns regarding social and communication impairments and atypical behaviors. Screening instruments designed for young children are not particularly useful in this age group. However, several screening instruments are available for use with older children and adolescents up to age 18. Professionals may consider additional sources of information across environments prior to referral, including behavioral observations, history provided by parents, and/or records about the child's developmental trajectory. Ultimately, if the professional or parent still has questions about ASD, referral for further evaluation is warranted.

Myths About Developmental Screening

Myth #1 - There are no adequate screening tools for preschoolers.

Fact - Although this may have been true decades ago, today sound screening measures exist. Many screening measures have sensitivities and specificities greater than 70%

Myth #2 - A great deal of training is needed to administer screening correctly.

Fact - Training requirements are not extensive for most screening tools. Many can be administered by paraprofessionals.

Myth #3 - Screening takes a lot of time.

Fact - Many screening instruments take less than 15 minutes to administer, and some require only about 2 minutes of professional time.

Myth #4 - Tools that incorporate information from the parents are not valid.

Fact - Parents' concerns are generally valid and are predictive of developmental delays. Research has shown that parental concerns detect 70% to 80% of children with disabilities.

Referral for Diagnostic Services

When concerns arise that an individual may have an ASD, the family is consulted, and a referral is made to a physician, psychologist, or other health or mental health professional who is licensed and qualified to make a diagnosis. Best practice suggests scheduling referrals as quickly as possible. The importance of expedited referrals cannot be overemphasized because it has been found that, on average, children with ASDs are typically not diagnosed by a qualified professional until 13 months after initial screening.

Communicating Concerns to Parents

Communicating professional concerns to parents regarding their child's developmental progress is often difficult. The American Academy of Pediatrics (AAP) provides the following recommendations for clinicians:

- Explain in advance that all children of a certain age are screened for developmental concerns.
- Be sure that parents understand that screening is not a diagnosis; it gives the health care provider information about parental concerns and is a starting point for discussion.
- Discuss screening results in person, not on the phone. If only one parent is present, offer to meet again with both parents or another support person identified by the parent.
- Referral to an early intervention program may be the first step. Be able to explain what early Intervention is, and make parents aware that early intervention provides developmental services based on established eligibility criteria such as language delay, not based on a diagnosis. Early intervention providers do not typically provide diagnoses, though they may or suggest that a child be evaluated by a specialist in order to determine a diagnosis.
- If a referral to a specialist is indicated, be sure that the parents understand your concerns in addition to their own.
- Use language that leaves room for parents to anticipate possible results of a more detailed evaluation: e.g., The child "may be behind other children her age in

this area” or “seems to be having more difficulty than we would expect in a couple of areas.” Or “The specialist has a lot of experience helping children, and will make recommendations for us to follow over time.”.

- Provide information about accessing early intervention as soon as concerns are raised. If possible, identify someone to help parents make appointments.
- Try to get a sense of whether the parents are likely to follow through with your recommendations.

Comprehensive Diagnostic Evaluation

Currently, there are no biomedical markers or laboratory tests for identifying children who meet the diagnostic criteria for an ASD. Accurate identification is entirely dependent on obtaining a complete developmental history and on direct interaction and behavioral observations. The importance of informed clinical judgment by health or mental health professionals responsible for diagnostic evaluation of an ASD cannot be overemphasized. Although identification of an ASD is usually made during childhood, it is important to recognize that an ASD is typically a lifelong disability that affects the individual’s adaptive functioning from childhood through adulthood to varying extents. To diagnose an ASD, the clinician must be familiar with typical and atypical child development, including age-appropriate behaviors, and have training and clinical experience with the ASD population. Because ASDs have been found across a range of cognitive abilities, differential diagnosis requires familiarity with the presentation of ASD in individuals with impaired, average, and advanced cognitive abilities. Furthermore, clinicians must be skilled at distinguishing ASD from other types of childhood psychiatric and developmental disorders.

ASD can sometimes be detected at 18 months or younger. By age 2, a diagnosis by an experienced professional can be considered very reliable. However, many children do not receive a final diagnosis until much older. This delay means that children with an ASD might not get the help they need.

A team that includes a psychologist, a neurologist, a psychiatrist, a speech therapist, or other professionals experienced in diagnosing ASD may perform this evaluation. The evaluation may assess the child’s cognitive level, language level, and adaptive behavior (age-appropriate skills needed to complete daily activities independently, for example eating, dressing, and toileting).

Because ASD is a complex disorder that sometimes occurs along with other illnesses or learning disorders, the comprehensive evaluation may include brain imaging and gene tests, along with in-depth memory, problem-solving, and language testing. Children with any delayed development should also get a hearing test and be screened for lead poisoning as part of the comprehensive evaluation.

Although children can lose their hearing along with developing ASD, common ASD symptoms (such as not turning to face a person calling their name) can also make it

seem that children cannot hear when in fact they can. If a child is not responding to speech, especially to his or her name, it's important to test whether a child has hearing loss.

**American Academy of Neurology and the Child Neurology Society
Clinical Practice Recommendations:**

Diagnosis and Evaluation for Autism Spectrum Disorders

1. Genetic testing in children with autism, specifically high-resolution chromosome studies (karyotype) and DNA analysis for Fragile X, should be performed in the presence of intellectual disability (or if intellectual disability cannot be excluded), if there is a family history of Fragile X or undiagnosed intellectual disability, or if dysmorphic features are present. However, there is little likelihood of positive karyotype or Fragile X testing in the presence of high-functioning autism.
2. Selective metabolic testing should be initiated by the presence of suggestive clinical and physical findings such as the following: evidence of lethargy, cyclic vomiting, or early seizures; presence of dysmorphic or coarse features; evidence of intellectual disability cannot be ruled out; or if occurrence or adequacy of newborn screening is questionable.
3. There is inadequate evidence to recommend an electroencephalogram study in all individuals with autism. Indications for an adequate sleep-deprived electroencephalogram with appropriate sampling of slow wave sleep include clinical seizures or suspicion of subclinical seizures and a history of regression (clinically significant loss of social and communicative function) at any age, but especially in toddlers and preschoolers.
4. Recording of event-related potentials and magneto-encephalography are research tools at the present time, without evidence of routine clinical utility.
5. There is no clinical evidence to support the role of routine clinical neuroimaging in the diagnostic evaluation of autism, even in the presence of megalencephaly.
6. There is inadequate supporting evidence for hair analysis, celiac antibodies, allergy testing (particularly food allergies for gluten, casein, *Candida*, and other molds), immunologic or neurochemical abnormalities, micronutrients such as vitamin levels, intestinal permeability studies, stool analysis, urinary peptides, mitochondrial disorders (including lactate and pyruvate), thyroid function tests, or erythrocyte glutathione peroxidase studies.

Diagnostic Tools

There are many tools to assess ASD in young children, but no single tool should be used as the basis for diagnosis. Diagnostic tools usually rely on two main sources of information: parents' or caregivers' descriptions of their child's development and a professional's observation of the child's behavior.

In some cases, the primary care provider might choose to refer the child and family to a specialist for further assessment and diagnosis. Such specialists include

neurodevelopmental pediatricians, developmental-behavioral pediatricians, child neurologists, geneticists, and early intervention programs that provide assessment services.

Selected examples of diagnostic tools:

- **Autism Diagnosis Interview – Revised (ADI-R)**
A clinical diagnostic instrument for assessing autism in children and adults. The instrument focuses on behavior in three main areas: reciprocal social interaction; communication and language; and restricted and repetitive, stereotyped interests and behaviors. The ADI-R is appropriate for children and adults with mental ages about 18 months and above.
- **Autism Diagnostic Observation Schedule – Generic (ADOS-G)**
A semi-structured, standardized assessment of social interaction, communication, play, and imaginative use of materials for individuals suspected of having ASD. The observational schedule consists of four 30-minute modules, each designed to be administered to different individuals according to their level of expressive language.
- **Childhood Autism Rating Scale (CARS)**
Brief assessment suitable for use with any child over 2 years of age. CARS includes items drawn from five prominent systems for diagnosing autism; each item covers a particular characteristic, ability, or behavior.
- **Gilliam Autism Rating Scale – Second Edition (GARS-2)**
Assists teachers, parents, and clinicians in identifying and diagnosing autism in individuals ages 3 through 22. It also helps estimate the severity of the child's disorder. http://psychcorp.pearsonassessments.com/haiweb/cultures/en-us/productdetail.htm?pid=076-1602-321&Community=CA_Ed_AI_ADHD

Diagnostic Criteria

In addition to the tools above, the American Psychiatric Association's Diagnostic and Statistical Manual – Fifth Edition (DSM-V) provides standardized criteria to help diagnose ASD.

Diagnostic Criteria for Autistic Disorder - 299.00

- A. Persistent deficits in social communication and social interaction across multiple contexts, as manifested by the following, currently or by history (examples are illustrative, not exhaustive; see text):
1. Deficits in social-emotional reciprocity, ranging, for example, from abnormal social approach and failure of normal back-and-forth conversation; to reduced sharing of interests, emotions, or affect; to failure to initiate or respond to social interactions.
 2. Deficits in nonverbal communicative behaviors used for social interaction, ranging, for example, from poorly integrated verbal and nonverbal

Autism Spectrum Disorder

communication; to abnormalities in eye contact and body language or deficits in understanding and use of gestures; to a total lack of facial expressions and nonverbal communication.

3. Deficits in developing, maintaining, and understanding relationships, ranging, for example, from difficulties adjusting behavior to suit various social contexts; to difficulties in sharing imaginative play or in making friends; to absence of interest in peers.

Specify current severity:

Severity is based on social communication impairments and restricted, repetitive patterns of behavior.

B. Restricted, repetitive patterns of behavior, interests, or activities, as manifested by at least two of the following, currently or by history (examples are illustrative, not exhaustive; see text):

1. Stereotyped or repetitive motor movements, use of objects, or speech (e.g., simple motor stereotypes, lining up toys or flipping objects, echolalia, idiosyncratic phrases).
2. Insistence on sameness, inflexible adherence to routines, or ritualized patterns of verbal or nonverbal behavior (e.g., extreme distress at small changes, difficulties with transitions, rigid thinking patterns, greeting rituals, need to take same route or eat same food every day).
3. Highly restricted, fixated interests that are abnormal in intensity or focus (e.g., strong attachment to or preoccupation with unusual objects, excessively circumscribed or perseverative interests).
4. Hyper- or hyporeactivity to sensory input or unusual interest in sensory aspects of the environment (e.g. apparent indifference to pain/temperature, adverse response to specific sounds or textures, excessive smelling or touching of objects, visual fascination with lights or movement).

Specify current severity:

Severity is based on social communication impairments and restricted, repetitive patterns of behavior.

C. Symptoms must be present in the early developmental period (but may not become fully manifest until social demands exceed limited capacities, or may be masked by learned strategies in later life).

D. Symptoms cause clinically significant impairment in social, occupational, or other important areas of current functioning.

E. These disturbances are not better explained by intellectual disability (intellectual developmental disorder) or global developmental delay. Intellectual disability and autism spectrum disorder frequently co-occur; to make comorbid diagnoses of autism spectrum disorder and intellectual disability, social communication should be below that expected for general developmental level.

Severity Levels of Autism Spectrum Disorder

Level 3 – “Requiring very substantial support”

Social Communication: Severe deficits in verbal and nonverbal social communication skills cause severe impairment in functioning, very limited initiation of social interactions, and minimal response to social overtures from others. For example, a person with few words of intelligible speech who rarely initiates interaction and, when he or she does, makes unusual approaches to meet needs only and responds to only very direct social approaches.

Restrictive, Repetitive Behaviors: Inflexibility of behavior, extreme difficulty coping with change, or other restricted/repetitive behaviors markedly interfere with functioning in all spheres. Great distress/difficulty changing focus or action.

Level 2 – “Requiring substantial support”

Social Communication: Marked deficits in verbal and nonverbal social communication skills; social impairments apparent even with supports in place; limited initiation of social interactions; and reduced or abnormal responses to social overtures from others. For example, a person who speaks simple sentences, whose interaction is limited to narrow special interests, and has markedly odd nonverbal communication.

Restrictive, Repetitive Behaviors: Inflexibility of behavior, difficulty coping with change, or other restrictive/repetitive behaviors appear frequently enough to be obvious to the casual observer and interfere with functioning in a variety of contexts. Distress and/or difficulty changing focus or action.

Level 1 – “Requiring support”

Social Communication: Without supports in place, deficits in social communication cause noticeable impairments. Difficulty initiating social interactions, and clear examples of atypical or unsuccessful response to social overtures of others. May appear to have decreased interest in social interactions. For example, a person who is able to speak in full sentences and engages in communication but whose to-and-fro conversation with others fails, and whose attempts to make friends are odd and typically unsuccessful.

Restrictive, Repetitive Behaviors: Inflexibility of behavior causes significant interference with functioning in one or more contexts. Difficulty switching between activities. Problems of organization and planning hamper independence.

Diagnostic Criteria for Social (Pragmatic) Communication Disorder – 315.39

- A. Persistent difficulties in the social use of verbal and nonverbal communication as manifested by all of the following:
 - 1. Deficits in using communication for social purposes, such as greeting and

sharing information, in a manner that is appropriate for social context.

2. Impairment in the ability to change communication to match context or the needs of the listener, such as speaking differently in a classroom than on a playground, talking differently to a child than to an adult, and avoiding use of overly formal language.

3. Difficulties following rules for conversation and storytelling, such as taking turns in conversation, rephrasing when misunderstood, and knowing how to use verbal and nonverbal signals to regulate interaction.

4. Difficulties understanding what is not explicitly stated (e.g., making inferences) and nonliteral or ambiguous meaning of language (e.g., idioms, humor, metaphors, multiple meanings that depend on the context for interpretation.)

- B. The deficits result in functional limitations in effective communication, social participation, social relationships, academic achievement, or occupational performance, individually or in combination.
- C. The onset of the symptoms is in the early developmental (childhood) period; however, deficits may not become fully manifest until social communication demands exceed limited capacities.
- D. The symptoms are not attributable to another medical or neurological condition or to low abilities in the domains of word structure and grammar, and are not better explained by autism spectrum disorder, intellectual disability (intellectual developmental disorder), global developmental delay, or another mental disorder.

Intervention Plan

Assessment for intervention planning gathers information in all areas of individual functioning that may be impacted by an ASD or by an associated or co-morbid condition. All individuals diagnosed with ASD are assessed in the following domains: cognitive and academic functioning; adaptive functioning; social, emotional, and behavioral functioning; communication; comprehensive medical examination; sensory and motor functioning; and family functioning. This list provides guidance for the key areas to be assessed to inform intervention planning; it is not an exhaustive list. In addition, professionals involved in assessment for intervention planning are encouraged to consider available data from all prior assessments including assessments conducted in healthcare, educational, or other service settings. (Some assessment data may be derived during the diagnostic evaluation and does not need to be repeated during this step of the process.) Although each essential component is explored for all individuals diagnosed with ASD, assessment for intervention planning is tailored to the unique needs of each individual and his or her family.

Identify Goals

Discussion of broad intervention goals typically begins well before assessment for intervention planning or development of an intervention plan. At the outset of screening or diagnostic evaluation, individuals, parents, and providers often express hopes for new skills, behavior changes, and long-term improvements. Assessment data are used to continue the discussion of intervention goals. Individuals, families, and providers collaborate to identify specific areas in which intervention is needed. Intervention goals reflect individual strengths and needs, as well as family values and preferences.

Goal selection includes consideration of characteristics such as the individual's level of cognitive functioning, capacity for functional communication, and the severity of social impairments. Professionals share their expertise with families as they collaborate to identify intervention priorities. For young children and other individuals with cognitive impairments, a principal focus of intervention often is the development of communicative intent and functional communication, whether that is in the form of verbal language, sign language, or augmentative/alternative communication.

Functional communication remains one of the strongest predictors of adaptive outcome for individuals with autism spectrum disorders across the lifespan. For school-aged children or other individuals who have acquired reasonable capacity for functional communication, attention typically turns to the acquisition of academic and social skills. The transition to adolescence and young adulthood critically involves identity formation and the acquisition of skills to become valued, contributing members of society.

Community context also is considered. For example, in a metropolitan area, ability to use public transportation may be directly related to increasing independence, while the same skill may be less relevant in rural communities.

Intervention needs are discussed in terms of long-term outcomes, short-term goals, and current objectives. For some, it may be easiest to focus on specific skills or behaviors of concern that are addressed to meet short-term goals. Others may begin by thinking about long-term outcomes and work backward to identify the short-term goals that are needed to achieve the desired long-term results. Regardless of the sequence that is followed, at this stage in the intervention planning process, attention to current objectives and short-term goals is needed in order to select effective interventions to address those specific needs. It often is helpful to focus on goals to address outcomes that can occur in the next 6 to 12 months. In the education planning process, an Individualized Education Program (IEP) is typically written for one year.

Goals and objectives typically are identified in the following broad areas:

- improving core ASD symptoms in areas such as language, communication, play skills, social skills, or behavioral flexibility;
- decreasing or eliminating challenging behaviors such as intrusive stereotypic preoccupations or perseverations, self-injury, or aggression;

- improving academic engagement or achievement;
- accessing vocational or other services related to post-secondary transition;
- addressing associated concerns such as attention problems, seizures, anxiety, sleep, or gastrointestinal symptoms.

Intervention planning is enhanced when attention is given to developing goals and objectives that have the following characteristics:

- Assessment data are used as a starting point or baseline from which goals are identified.
- Goals clearly state what the individual will be able to do as a result of the intervention. Use of jargon or vague language is avoided.
- Goals are specific, measurable, and observable. This sometimes is referred to as “The Stranger Test” – anyone working with the individual should be able to interpret the goal.
- Goals are developmentally appropriate.
- Goals are relevant to the individual, family, and community context (sometimes referred to as social validity).
- Goals reflect purposeful individual behavior – they state what the individual will do rather than what they will not do.
- The number of goals is appropriate based on the individual’s unique characteristics, the setting, frequency of services, and other relevant variables.

Select Interventions

Evidence-based practice provides a framework for selecting effective interventions based on the best available research, individual characteristics, and professional expertise. Families and professionals collaboratively review available research evidence to identify effective interventions that can address individual intervention goals and provide a good fit for other individual characteristics. For example, if improving conversation skills is identified as a goal, information about effective interventions is reviewed to identify interventions that have been demonstrated to improve communication skills. Potential intervention options are further evaluated based on their fit with individual characteristics such as age, level of communication skills addressed, or availability in the community.

For each goal or objective in the intervention plan, the plan indicates the specific interventions that will be used to address that goal. Interventions are applied and combined in diverse ways to meet individual goals. For example:

- a comprehensive intervention may address multiple goals,
- a focused intervention may be used in isolation or in combination with other focused interventions to address a goal, or

- the same focused intervention or combination of focused interventions may be applied to different skills or behaviors to address multiple goals.

The intervention plan also describes who is responsible for implementing the intervention, including the role of parent or caregiver involvement, and provides other relevant details such as the intervention setting or frequency or duration of the intervention.

Required components of an intervention plan may vary based on specific requirements by providers, programs, funders, or settings. In educational settings, when an Individualized Education Program is developed, the plan documents special education services, related services, and any supplemental aids or services provided to enable the goals.

Monitor Progress

When an intervention is implemented, it is important for families and providers to determine whether the intervention is working. Intervention plans include an explicit description of the data collection procedures that will be used to monitor the individual's progress in response to the intervention. Data from the initial assessment for intervention planning or other data collected prior to beginning the intervention serve as a baseline – the yardstick by which progress is measured. Comparison between baseline data and progress monitoring data helps families and providers determine if the intended changes in behavior are occurring.

If progress monitoring is not based on comparing pre-intervention and post-intervention data, then families and providers are really just guessing about the intervention effectiveness. Progress monitoring procedures included in the intervention plan answer the following questions: What types of data will be collected, using what procedures, where, by whom, and how often?

The types of data used to monitor progress depend on the specific goal being monitored. It is important to establish procedures that will provide the kind of information needed to determine if an intervention is working. Some types of behavioral data that often are collected for progress monitoring purposes include data about frequency, duration, and latency of targeted behavior.

Different techniques may be used to collect data such as direct observation (e.g., continuous observation or time sampling), informant questionnaires, clinician-rated measures, self-report, self-monitoring systems, or other types of data (e.g., school behavior log or student products such as actual assignments). It is important to use manageable techniques for collecting data; if procedures are too cumbersome, data may not be collected or the quality or usefulness of the data may be compromised. Emphasis should be placed on establishing systematic procedures that collect valid and reliable data. Validity means that the data collection procedures are actually collecting

information that the data are intended to provide. Reliability means that the procedures produce consistent information.

Reasons for continuing an intervention or making changes must be discussed and clearly defined. Discussions include questions such as: If progress is noted, does the amount or degree of progress justify continuation of the intervention? Alternatively, if there is no progress or only minimal improvement, are there components of the intervention that need adjustment or is selection of a new intervention most appropriate? Informed professional judgment is important in interpreting data, weighing risks and benefits, assessing interactions among different interventions, and evaluating factors that might be interfering with an intervention. It is important for interventions to be implemented for a long enough time period to allow them to produce intended results.

The amount of time allowed before a change is expected varies, depending on the type of intervention and the nature of the improvement expected. (At times, an effective intervention may result in an initial increase in a problem behavior before a reduction begins to occur.) Professionals also assist in determining if an intervention is being accurately and consistently implemented. Environmental variables that may be interfering with the intervention are considered.

During the progress monitoring phase, it is important for families and providers to be honest about any difficulties in implementing the intervention so that interventions can be modified or discontinued based on accurate information. Interventions often require revision and adjustments to further tailor the intervention to a specific individual. Before an intervention is discontinued, families and providers should consider the following:

- Are the goals stated clearly enough?
- Have the relevant variables been identified for determining if the intervention is working?
- Have all relevant experts been consulted?
- Has treatment integrity been assessed?

Progress monitoring in schools as mandated by federal disability laws follows many of the same principles that pertain to other settings. Some of the differences between progress monitoring in the educational system and progress monitoring in healthcare or other community-based systems relate to the timing and frequency of monitoring. For example, under Part B of IDEA, a child's Individualized Education Program (IEP) will include a statement on how the child's progress toward the IEP annual goal is measured and when periodic reports on the child's progress toward meeting annual goals will be provided. The IEP is reviewed at least annually. A reevaluation to determine ongoing eligibility for special education services must be done at least once every 3 years. Under Part C of IDEA, the Individualized Family Service Plan (IFSP) is reviewed every 6 months and meetings are held once a year.

In addition to monitoring progress as specified in IEPs and IFSPs, many schools implement school-wide progress monitoring to ensure that all students, including those with disabilities, are making progress toward curriculum standards. Student academic achievement is measured for all students in the fall, winter, and spring of the school year. Some schools use general outcome measures, also known as curriculum-based measurements (CBM).

Learning Styles of Individuals with ASD

Individuals with ASD have the capacity to learn a variety of concepts and skills. However, because of unique communication and sensory motor processing issues, it is critical that instruction is designed with their individual learning styles in mind. Learning styles are based on:

Individual Strengths - Individuals with ASD exhibit varied cognitive strengths and challenges (e.g., visual, auditory memory, spatial, kinesthetic). Careful assessment should be integrated to identify an individual's unique profile to tailor instruction and accommodations.

Individual Interests - Individuals with ASD may focus on specific topics of interest. This focus may allow them to develop a unique perspective, a specific skill, or a depth of understanding; therefore, it is important to support and expand areas of interest and not extinguish them. Indeed, these interests can lead to meaningful leisure activities and employment outcomes.

Individual Motivators - These motivators come from every person's need to derive reward for pursuits and interactions. Professionals, through instruction, build in assumptions of successful motivators such as grades, praise, stickers, etc. It is important to identify, with the help of family and the individual, the motivators that will provide incentives toward learning. Individuals with ASD often have unusual motivators that include completion of tasks, sensory-based stimuli, special interests, tactile-based stimuli, pace of activity, etc. Clinicians need to understand and tolerate motivators that will not inhibit the learning environment.

Communication Style - Individuals with ASD have unique abilities and difficulties with regards to communication and language. The communication process can be made difficult because professionals may assume individuals do not understand and then make conclusions based on individual input or non-input. Clinicians who are most effective in the communication process use multiple strategies simultaneously such as visual, auditory, written, symbolic, etc.

Sensory Motor Processing - Sensory motor proficiency involves the taking in of information from one's body and the environment through a variety of sensory channels, interpreting and understanding these sensations, and developing a

response to them. Sensory systems include auditory, visual, tactile, proprioceptive, vestibular, olfactory, and gustatory. Individuals with ASD may rely heavily on one or two sensory channels to compensate for deficits in other modalities. Preferences for specific sensory systems may therefore result in learning styles that are different from typically-developing peers. For example, individuals may need to pair a motor activity with learning new material such as isometric exercises paired with multiplication tables.

Pattern of Skill Development - The premise of instruction is to teach in a sequential pattern of skill development. Individuals with ASD may have highly developed skills in one area and be delayed in others. Professionals should not assume that with a highly developed skill there are not gaps in learning. Clinicians may need to treat holistically rather than sequentially.

Treatment

Treatment Overview

There is no cure for ASD and no global consensus on which intervention strategy is most effective. Chronic management is often required to maximize functional independence and quality of life by minimizing the core autism spectrum disorder features, facilitating development and learning, promoting socialization, reducing maladaptive behaviors, and educating and supporting families.

Autism spectrum disorders affect multiple developmental domains. The complexity of these disorders necessitates a range of services that are tailored to the needs of families, from screening and referral services through diagnosis, assessment for intervention planning, and treatment. A comprehensive approach typically requires the involvement of a team of professionals from a number of disciplines (e.g., primary and specialty physicians, nurses, psychologists, speech-language professionals, audiologists, occupational therapists, physical therapists, social workers, behavioral and educational specialists, teachers).

While advances have been made in early diagnosis and the promotion of early intervention for ASD, few current sources for the comparative effectiveness of treatment interventions exist. Clinicians and families are left to choose among the interventions in part based on what is available to them, what is covered by commercial insurance or Medicaid, or what they can afford out of pocket. Sometimes, a clinical course of action is based on the most common or popular treatments at a given time. Many therapies are not covered by insurance, and a primary reason for insurance denial from private insurers is that no evidence-based resources for this condition exist. Additionally, insurers may find it confusing to distinguish among therapies or to sort out which approaches have an evidence base and which are still experimental.

The delivery and organization of care for individuals with ASD therefore tends to be fragmented, with pieces scattered about in the primary care, school, and specialty clinical settings. This makes it especially important for families and caregivers to have clear information on effectiveness of treatment components. Treatment outcomes may be highly variable across diagnostic groups and developmental stages and in the presence or absence of co-morbidities. Family context and the child's home and school environment may also alter the effectiveness of treatment. Therapeutic approaches should therefore be tailored to an individual child to the extent possible to optimize effectiveness.

Previous reviews of the literature have noted limited quality and consistency in studies assessing ASD therapies, and an umbrella review found methodological weaknesses in systematic reviews of psychosocial interventions. While controlled trials seem to be increasing, much research is observational, generally with small sample sizes, limited follow-up, and limited discussion of the durability of treatment gains once active therapy ends. As the prevalence of ASD has increased, the available treatment options have also increased, but evidence overall for many interventions can only be considered preliminary. The need for synthesized research that evaluates the evidence base for various treatments and identifies gaps in the current literature that may drive the research agenda is great.

Comprehensive treatment programs target behaviors and development more broadly instead of focusing on a specific behavior of interest. Positive effects seen with these approaches in terms of cognition and language have led to the suggestion that beginning intensive therapy (25 to 30 hours/week) at an earlier age may lead to greater improvements.

Early Intervention

Early intervention is the public program that provides supports and services to eligible children, birth to age three, and their families under Part C of the Individuals with Disabilities Education Act (IDEA). State participation in the Federal Part C program is voluntary and currently all 50 states and territories have a Part C - Early Intervention System to focus on the needs of children with developmental delays under the age of 3.

Early intervention has been associated with gains in verbal and nonverbal communication, higher intelligence test scores, and improved peer interactions.

Intensive behavioral therapy during the toddler or preschool years can significantly improve cognitive and language skills in young children with ASD. There is no single best treatment for all children with ASD, but the American Academy of Pediatrics recently noted common features of effective early intervention programs. These include:

- Starting as soon as a child has been diagnosed with ASD
- Providing focused and challenging learning activities at the proper developmental level for the child for at least 25 hours per week and 12 months per year

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- Having small classes to allow each child to have one-on-one time with the therapist or teacher and small group learning activities
- Having special training for parents and family
- Encouraging activities that include typically developing children, as long as such activities help meet a specific learning goal
- Measuring and recording each child's progress and adjusting the intervention program as needed
- Providing a high degree of structure, routine, and visual cues, such as posted activity schedules and clearly defined boundaries, to reduce distractions
- Guiding the child in adapting learned skills to new situations and settings and maintaining learned skills.

Using a curriculum that focuses on:

- Language and communication
- Social skills, such as joint attention (looking at other people to draw attention to something interesting and share in experiencing it)
- Self-help and daily living skills, such as dressing and grooming
- Research-based methods to reduce challenging behaviors, such as aggression and tantrums.
- Cognitive skills, such as pretend play or seeing someone else's point of view
- Typical school-readiness skills, such as letter recognition and counting.

For children younger than age 3, these interventions usually take place at home or in a childcare center. Because parents are a child's earliest teachers, more programs are beginning to train parents to continue the therapy at home.

Domains of Treatment

Categorizing ASD interventions is complicated because there is a significant overlap of the targeted behaviors and skills. Generally speaking, there are four distinct areas of treatment focus:

- Behavior
- Communication
- Social
- Academic

Effective ASD interventions should have goals that address one or more of these domains.

Behavioral Interventions

These interventions are designed to reduce problem behavior and teach functional alternative behaviors or skills through the application of basic principles of behavior change. Treatments falling into this category reflect research representing the fields of applied behavior analysis, behavioral psychology, and positive behavior supports.

Behavioral interventions consist of numerous intervention techniques that use consequences to strengthen learning in children with ASD. They are used to reduce unwanted behaviors and to teach acceptable alternative (more functional) skills. To determine which intervention(s) is most appropriate, the child is observed under different environmental conditions to determine which consequence that follows the child's behavior is most likely maintaining the behavior. When one or more consequences are known to be maintaining a child's behavior, specific intervention techniques can be chosen to effectively teach new or replacement skills.

These treatments most frequently utilize Applied Behavior Analysis (ABA). Applied Behavioral Analysis is defined as the science in which the principles of the analysis of behavior are applied systematically to improve socially significant behavior, and in which experimentation is used to identify the variables responsible for change in behavior. (Thompson, 1984) Applied behavior analysis is a psychological approach that uses the theory of behaviorism to modify human behaviors as part of a learning or treatment process. By functionally assessing the relationship between a targeted behavior and the environment, the methods of ABA can be used to change that behavior. ABA has become widely accepted among health care professionals and used in many schools and treatment clinics. ABA encourages positive behaviors and discourages negative behaviors in order to improve a variety of skills.

Social Interventions

The social impairment seen in ASD takes many forms and can vary greatly from one child to the next. Therefore, interventions focused on enhancing social behavior and competence in children with ASDs should be targeted with respect to the child's age, developmental level, and peer group. Interventions for very young children may focus on teaching parents how to engage their child and encourage back-and-forth play. At preschool and early childhood levels, interventions may focus on playing with peers, understanding emotions, and learning the basics of turn-taking and initiating and responding to social interactions. In the later elementary years and into adolescence, interventions may focus more on teaching perspective-taking and social problem-solving and understanding peer group social norms. Given that social impairments are a core feature of ASD, numerous skill-based approaches have tried to address this vulnerability through direct instruction within individual (e.g., Social Stories) or group (e.g., Skill streaming, Children's Friendship Training) formats. Other approaches aim to foster the development of social skills solely through structured interactions with peers (e.g., Lego therapy).

Intervention Strategies & Methodologies

Antecedent Interventions

These interventions involve the modification of situational events that typically precede the occurrence of a target behavior. These alterations are made to increase the likelihood of success or reduce the likelihood of problems occurring. Treatments in this

category reflect research representing the fields of applied behavior analysis (ABA), behavioral psychology, and positive behavior supports (PBS).

Behaviors are more or less likely to occur when a child encounters certain changes in his/her immediate surroundings. Antecedent interventions consist of several ways to use the influence of environmental events (including people, places, and things) to increase or decrease the likelihood that a specific behavior will occur. The likelihood that a child's behavior can be increased or decreased by altering the immediate environment is an efficient way to improve behavior. A well-timed spoken word, the presence of a particular person, showing the reinforcer before the response you want to occur, and presenting a visual sign are common examples of antecedent events that can be used to control behavior. The following methods are categorized as antecedent interventions: prompting, stimulus control, environmental modification, and time delay.

Prompting

Prompting is a behaviorally based antecedent teaching strategy. A prompt is a verbal, physical, or gestural cue presented to a child to stimulate a child's response. Modeling a specific behavior or arranging objects in a particular order can also be a form of prompting. Even a pause while waiting for a child to respond can be a prompt. Types of prompts are categorized from least to most intrusive. Teaching begins using the least intrusive prompt. Prompts need to be faded as quickly as possible after the child learns to respond in order to avoid prompt dependence.

When instruction is given to the child with an ASD, e.g. "pick up toys," a correct and quick response is expected. The instruction is a request to respond to a specific stimulus (in this case a verbal instruction) and a specific response is expected to occur. If the child hesitates or doesn't seem to understand the purpose of the instruction, the instruction is supplemented with a prompt to increase the chance that the child will respond and be reinforced for responding. Prompts occur in different forms (e.g., verbal, physical, gestures, and modeling) and are graduated from least intrusive to most intrusive. The goal is to teach the child to respond consistently to the instruction and not to depend on a prompt.

Domains: academic

Stimulus Control

Stimulus control refers to the influence of an environmental stimulus on the occurrence of a response because reinforcement was presented only when the stimulus was present. The ring of the telephone has stimulus control of answering the phone because reinforcement typically follows answering the phone. A stimulus that controls a behavior is also an antecedent, i.e., the stimulus is present before the response occurs. Identifying and changing the antecedent may prevent or reduce interfering and challenging behaviors in the classroom or at home. Stimulus control and corresponding environmental

modifications can be used to reduce repetitive, stereotypical, self-stimulatory, and self-injurious behaviors in learners with ASD.

Domains: behavior, social, academic

Environmental Modification

Environmental modifications are used to change the stimulus conditions in the setting where the child with ASD engages in inappropriate behavior. To more quickly achieve a reduction in negative behavior, other evidence-based interventions, including non-contingent reinforcement, functional communication training, and behavioral momentum (high probability request sequence), are used. Extinction and/or differential reinforcement are sometimes combined with stimulus control and environmental modification interventions.

Domains: behavior, social, academic

Time Delay

Time delay is a practice that focuses on fading the use of prompts during instructional activities. This practice is always used in conjunction with prompting procedures such as least-to-most prompting, simultaneous prompting, and graduated guidance. With this procedure, a brief delay is provided between the initial instruction and any additional instructions or prompts.

When any form of prompting is used during instruction, it is appropriate to consider time delay as a way of reducing (fading) the use of prompts, which in turn reduces the likelihood of encouraging prompt dependence in the child. Prompts used during instruction are gradually reduced by inserting a delay (a few seconds) between the instruction and the moment of offering a prompt; i.e., the length of time between the instruction and the prompt is gradually increased which gives the child a chance to respond before the prompt occurs.

Domains: communication, social, academic

Differential Reinforcement

Differential reinforcement procedures are behaviorally based strategies that focus reinforcement on alternative, incompatible, other, or lower rates of the interfering behavior in order to replace it with more appropriate behavior. Differential reinforcement means reinforcing one response class and withholding reinforcement for another response class. Differential reinforcement can be used to reduce problem behaviors by providing reinforcement contingent on the occurrence of a behavior other than the problem behavior or reinforcing the problem behavior at a reduced rate of reinforcement. Differential reinforcement can be used to strengthen incompatible behavior or alternative behavior.

When a child is engaging in multiple behaviors, some good and some bad, differential reinforcement is used to selectively increase one or more desirable behaviors over a period of time. If a child is motivated to respond in order to collect a reinforcer, presentation of the reinforcer provides the child with information that the specific response that earned the reinforcer was the correct response. The likelihood that the child will engage in that same response is increased. With one type of differential reinforcement, undesirable behaviors are ignored while behaviors that approximate the desired behavior are selectively reinforced.

Domains: behavior, communication

Discrete Trial Training

Discrete Trial Training (DTT) is a structured teaching strategy that involves distinct and repetitive responses following a specific stimulus, and resulting in reinforcement. Each trial is typically defined as (A) Antecedent, (B) Behavior, and (C) Consequence, and has a definitive beginning and end, thereby, being 'discrete'.

Key elements of using DTT to teach young children with ASD include breaking skills into small chunks (behaviors) so each chunk can be taught directly and learned to mastery before chaining the behaviors together. In addition, teaching typically involves the use of prompting and fading (dependent on child's needs) and there needs to be a rich supply of child-specific reinforcers given (e.g., toys, objects, games) contingent on the child's responses. Behaviors can be shaped dependent on the speed and value of the reinforcers after a response. For instance, an easy or mastered response can be reinforced with a low-preferred reinforcer such as a "high five!" whereas a new and difficult response can be reinforced with a high-preference reinforcer such as jumping on a trampoline or swinging on a swing.

The prompting procedures used in DTT can be physical and/or verbal, such as holding and manipulating a child's hands to demonstrate clapping, or saying "it's red" after being shown a red car and asked, "what color?" Prompting procedures are very important in DTT as the child should always be prompted to give the correct response, also known as errorless learning. Errorless learning contributes to a positive learning environment, prevents the child from performing and practicing errors, and may reduce a child's frustration.

As DTT is highly structured and some young children with ASD may display avoidance or escape behaviors to this type of learning environment, the adult should use positive pairing, so he or she is viewed by the child as a reinforcer. Positive pairing can be achieved by engaging in preferred activities with the child or being the source of obtaining what the child wants or enjoys (reinforcer).

Domains: behavior, communication

Extinction

Extinction is a behaviorally based strategy that withdraws or terminates the reinforcer of an interfering behavior to reduce or eliminate the behavior. Extinction is a behavioral technique used to reduce or eliminate the occurrence of undesired behavior. Extinction refers to withholding or preventing a reinforcer that has previously followed a behavior, which causes the probability of the behavior to decrease. An example of extinction occurs when a child's whining is ignored after whining was previously followed by the child getting attention.

If it is determined through observation that one or more reinforcers are maintaining a child's behavior, then extinction is appropriate as a reduction procedure. Ensuring that reinforcers are effectively eliminated requires careful observation and preparation including training. Extinction as a reduction procedure is known to be more effective when combined with other techniques such as differential reinforcement and instructions.

Domains: behavior, communication

Functional Behavioral Assessment

Functional behavioral assessment (FBA) is a systematic approach in which data are collected to determine the underlying function or purpose of problem behavior. FBA is the process of gathering and analyzing information about a child's behavior and accompanying circumstances to determine the purpose or intent of the actions. FBA consists of describing the interfering or problem behavior, identifying antecedent or consequent events that control the behavior, developing a hypothesis about the cause of the behavior, and testing the hypothesis.

Data collection is an important part of the FBA process. Often, practitioners use functional communication training, differential reinforcement, response interruption/redirection, extinction, and stimulus control/environmental modification to address these problem behaviors in individuals with ASD. FBA determines the appropriateness of the child's present setting and helps identify positive interventions to reduce or replace unwanted behaviors. FBA targets skills in the domains of behavior and communication, usually with a focus on decreasing inappropriate behavior and teaching or increasing appropriate communicative alternatives.

Domains: behavior, communication

Functional Communication Training

Functional communication training (FCT) is a systematic practice of replacing inappropriate or ineffective behaviors with more appropriate or effective behavior that serves the same function. FCT is used to create or strengthen alternative (more acceptable) behaviors in the presence of negative or unacceptable behavior. Teaching a more functional alternative communication skill allows the child to effectively earn the same reinforcer that was maintaining the problem behavior.

Replacement skills include more appropriate forms of communication such as signing, pointing, talking, and the use of alternative and augmentative communication (AAC) devices. The assumptions underlying the use of functional behavioral assessment are that behaviors do not occur in a vacuum and that negative or inappropriate behaviors can be a form of communication, including an attempt to escape, an attempt to gain something, or a form of sensory stimulation.

FCT requires a functional behavioral assessment to identify the reinforcers that maintain the problem behavior. After this is accomplished, those same reinforcers can be used to develop an alternative behavior that replaces the problem behavior. FCT includes teaching vocalizations and sign language, and using assistive devices, communication boards, picture cards, and other communication methods.

Domains: behavior, communication

Reinforcement

Reinforcement is a behaviorally based consequence teaching strategy. Positive reinforcement occurs when a behavior is followed immediately by the presentation of a stimulus that causes the frequency of the behavior to increase. Negative reinforcement occurs when a behavior is followed by the termination or withdrawal of a stimulus that causes the frequency of the behavior to increase in the future. A stimulus is a reinforcer only if it increases the frequency of future behavior. There are different types of stimuli, including edible foods, sensory impressions, tangible objects, activity-related events, and social stimulation that can serve as reinforcers. For an individual child, selection and use of a specific reinforcer must be validated as reinforcing for that child.

Domains: behavior, communication, social, academic

Response Interruption/Redirection

The practice of response interruption/redirection (RIR) requires blocking the child from engaging in the targeted behavior. When the behavior occurs, the child is immediately redirected (prompted) to engage in a more appropriate behavior. This intervention is appropriate in cases where reinforcement is assumed to be automatic. In other words, the child's behavior is reinforcing in itself and is not dependent on external reinforcers. Blocking the behavior therefore prevents the reinforcing event. RIR is particularly useful with persistent interfering behaviors that occur in the absence of other people, in a number of different settings, and during a variety of tasks.

It is thought that repetitive motor movements that are nonfunctional for children with ASD can be automatically reinforcing. A functional analysis can be used to determine if automatic reinforcement is a factor.

Such behaviors might include hand flapping, vocal repetitions, mouthing objects, pica, and self-injurious behaviors. RIR requires more supporting resources to implement. These behaviors often are not maintained by attention or escape. Instead, they are more likely maintained by sensory reinforcement and are often resistant to intervention

attempts. RIR is particularly effective with sensory-maintained behaviors because teachers/practitioners interrupt learners from engaging in interfering behaviors and redirect them to more appropriate, alternative behaviors.

Domains: behavior, communication, academic

Task Analysis and Chaining

Task analysis and chaining is a behaviorally based antecedent teaching strategy that breaks down steps and links them for prompting. Task analysis is the process of identifying the individual steps of a specific behavioral skill. The purpose of task analysis is to make teaching the skill more manageable and enable a child to begin learning the individual steps at the child's level of readiness. Typically, other evidence-based practices are used along with task analysis to enhance the child's success in acquiring skill.

The individual sequence of steps (movements) in completing a specific skill, primarily in teaching adaptive skills, is identified by analyzing the task to be taught and then reinforcing the successful completion of the next step in this sequence. As the child completes an individual step, the next step is reinforced and becomes part of the chain of steps that defines the skill being taught. After the individual sequences of movements that define the skill are identified, observation of the child's ability to engage in the task will indicate where in the sequence to begin teaching.

Domains: behavior, communication, social, academic

Cognitive Behavioral Interventions

Cognitive behavioral interventions (CBIs) are designed to change negative or unrealistic thought patterns and behaviors with the aim of positively influencing emotions and life functioning. CBIs are comprised of multiple interventions that are uniquely crafted for each individual and his/her needs. Cognitive behavioral techniques are known to work best with individuals who are verbal and have higher intelligence. The intervention process focuses on informing individuals about their emotional issues, assisting them in recognizing bodily responses, and organizing alternative responses to negative thoughts and feelings. The intervention process involves teaching problem solving typically in a group format. Modeling prosocial behavior, offering opportunities for role-playing and rehearsing positive responses to typical situations with peers are part of the treatment. Obtaining solid measures of generalization of new skills to the real-world following CBI has been problematic.

Domains: behavior, communication, social, academic

Joint Attention Intervention

Joint attention is a strategy in which a child and a parent or another individual engage in mutual interest or show attention to the same object, activity or experience. Joint attention includes a range of behaviors such as eye gaze and gestures. The majority of

infants and toddlers with ASD do not have good joint attention skills. Infants and toddlers with ASD may demonstrate some form of joint attention if they are trying to get something they want, such as a cookie, but they typically do not seek out another person for social attention. Generally, a toddler with ASD will not run up to their dad and show him a picture he or she just drew or want a hug, acts typically seen in children without ASD.

Joint attention skills are very important as they are linked to positive outcomes in later communication and social skills; therefore, it is important to teach joint attention skills during early intervention. Joint attention includes the following types of behaviors:

- A parent and child looking at an object together,
- A parent and child making eye contact,
- A child pointing to an object to show their interest to his or her parent,
- Playing with or sharing the focus on a toy together,
- Trying to gain a child/parent's attention by "catching his or her eye" or gesturing to him or her, and
- A child sharing facial expressions with a parent, such as smiling or winking

Domains: behavior, communication, social, academic

Modeling

Modeling interventions rely on an adult or peer providing a demonstration of the target behavior that should result in an imitation of the target behavior by the individual with an ASD. Modeling can include simple and complex behaviors. This intervention is often combined with other strategies such as prompting and reinforcement. Modeling is a simple and inexpensive way of teaching a large number of skills to children with ASD. For the child capable of attending, watching an adult or peer engage in the target behavior is a prompt for the child to imitate the target behavior and be immediately reinforced. Modeling is more effective with children who have already learned some of the steps in the specific skill being modeled.

Domains: behavior, communication, social, academic

Video Modeling

Video modeling utilizes assistive technology as the core component of instruction and allows for pre-rehearsal of the target behavior or skill via observation. It is a mode of teaching that uses video recording and display equipment to provide a visual model of the targeted behavior or skill. Types of video modeling include basic video modeling, video self-modeling, point-of-view video modeling, and video prompting.

Basic video modeling involves recording someone besides the learner engaging in the target behavior or skill (i.e., models). The video is then viewed by the learner at a later time. Video self-modeling is used to record the learner displaying the target skill or behavior and is reviewed later. Point-of-view video modeling is when the target behavior or skill is recorded from the perspective of the learner. Video prompting involves

breaking the behavior skill into steps and recording each step with incorporated pauses during which the learner may attempt the step before viewing subsequent steps. Video prompting may be done with either the learner or someone else acting as a model.

Use of video technology is effective for visual learners. Almost any social, adaptive, or play skill can be taught using video modeling. Videotaped sequences of the targeted behavior can include verbal and motor responses and serve as a “rehearsal” before the skill is attempted. The child with ASD can participate in the videotape of the modeled behavior which inherently makes the experience more interesting.

Domains: behavior, communication, social, academic

Naturalistic Interventions

Naturalistic teaching is a structured form of presenting learning opportunities in the child’s natural environment utilizing the child’s natural motivation and reinforcers, such as using a child’s interest in trains to ask for and play with the train set.

For children with ASD, naturalistic teaching is implemented to increase generalized language and social skills, and differs from other teaching methods as it is child-oriented rather than adult-oriented. For instance, the child takes the lead on selecting an activity, and the adult uses this selected activity as a ‘teachable moment;’ an opportunity to be intentional in working with the child on a teaching goal. Naturalistic teaching involves an intentional plan to include opportunities throughout a child’s typical daily schedule. By incorporating teachable moments through the day, any activity or routine can become a teaching opportunity, such as brushing teeth, eating, playing ball, or looking at a book.

The key to successful naturalistic teaching is to plan the child’s goals and objectives and then identify the activities that can offer teachable moments. Once a learning opportunity has been identified, it is important to reinforce the child’s communication (attempts) and encourage him or her to elaborate on the response(s). The teaching moment should remain brief and reinforcing so the child does not avoid future interactions and all adults in the child’s life should be trained to identify similar teachable moments so the child can generalize among settings, people and activities. If a child does not respond in a teachable moment, such as reaching for a favorite doll, verbal prompts are used, saying, “What do you want?” “What is this?” or “doll,” with time-delays to allow the child to respond. Prompting within naturalistic teaching is individualized by the child’s specific communication needs.

Domains: behavior, communication, social, academic

Parent Implemented Interventions

These strategies recognize and use parents as the most effective teachers of their children. Parent-implemented Intervention entails parents directly using individualized intervention practices with their child to increase positive learning opportunities and acquisition of important skills. Parents learn to implement such practices in their home and/or community through a structured parent training program. Parents receiving 12 to

18 hours of training in basic teaching techniques can be very effective in promoting their child's development. Parent training can occur in group formats with six to eight families participating or individually in one-to-one training as an adjunct to the child's treatment program. Some school districts offer parent training sessions that include basic ABA principles, procedures for teaching self-help, self-regulation, and limited communication skills.

Domains: behavior, communication, social

Peer Mediated Interventions

Peer mediated interventions are designed to increase social engagement by teaching peers to initiate and maintain interactions. These interventions involve teaching children without disabilities strategies for facilitating play and social interactions with children on the autism spectrum. Peers may include classmates or siblings. These interventions may include components of other treatment packages (e.g., self-management for peers, prompting, reinforcement, etc.).

Common names for intervention strategies include peer networks, circle of friends, buddy skills package, Integrated Play Groups, peer initiation training, and peer mediated social interactions.

Children who show a personal interest in children with ASD are candidates for peer mediated interventions. These interventions can be implemented with pairs or small groups of learners. With young children, i.e., 3 to 8 years of age, practitioners can use peer-initiation training to help children with ASD acquire communication and social skills. Social networking strategies are more appropriate for older learners i.e., 9 to 18 years of age. Peer mediated training has been shown to have positive effects on academic, interpersonal, and personal-social development, and may be the largest and most empirically supported type of social intervention for learners with ASD.

Domains: behavior, communication, social

Picture Exchange Communication System™

The Picture Exchange Communication System™ (PECS™) was created by Andy Bondy, PhD, and Lori Frost, MS -CCC -SLP. PECS uses the physical handing over of pictures or symbols to initiate communicative functions. This intervention involves the application of a specific augmentative and alternative communication system based on behavioral principles that are designed to teach functional communication to children with limited verbal and/or communication skills.

PECS is designed to teach functional communication to children 3 to 12 years old. Because communication is initiated by the child in a natural environment toward a familiar person, the child with an ASD learns to communicate socially. Using PECS, learners are taught to give a small picture of the desired item to a communicative partner in exchange for the item. PECS is appropriate for children who speak ineffectively, have significant articulation problems, or are poorly motivated to speak. There are six progressive training phases of PECS instruction:

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1. Teaching the child to request by initiating the exchange
2. Increasing the distance between the child and the communication partner discriminating between multiple images
3. Learning the “I want” image in order to expand sentence structure
4. Learning to correctly recognize, “What do you want?”
5. Expanding responses to “What do you ...?” questions.

Domains: behavior, communication, social

Pivotal Response Training

Pivotal response training (PRT) focuses on targeting “pivotal” behavioral areas, such as motivation to engage in social communication, self-initiation, self-management, and responsiveness to multiple cues, with the development of these areas having the goal of very widespread and fluently integrated collateral improvements. Key aspects of PRT intervention delivery also focus on parent involvement in the intervention delivery and on intervention in the natural environment such as homes and schools with the goal of producing naturalized behavioral improvements.

PRT is a naturalistic intervention approach based on the principles of applied behavior analysis (ABA). Teaching is designed to promote the child’s ability to interpret and respond to a broad range of environments. Strengthening the child’s personal motivation and initiative by developing “pivotal” behaviors are essential values in this approach.

PRT is child directed and relies on naturally occurring teaching opportunities and naturally occurring consequences. Motivation and initiation are increased by allowing choices, turn-taking, reinforcing attempts to respond, and interspersing periodic reinforcement for tasks already mastered. Pivotal behaviors are those behaviors that are central to wide areas of a child’s functioning, and when promoted, they are believed to produce improvement in many non-targeted behaviors.

Areas that are targeted as pivotal include:

- A. **Multiple cues** - teaching responses to a variety of cues and reducing stimulus over-selectivity (in which children with ASD typically over generalize and have a small responding repertoire, such as saying “dog” to every animal they see). Although this generalization is common in all young children, for those with ASD this deficit continues whereas other infants and toddlers without ASD learn to distinguish different characteristics and adapt their response repertoires.
- B. **Motivation** - (measured as the child’s responding) is targeted as a pivotal area as increases in motivation can lead to better social skills, higher responses in completing tasks and activities and also increase speed of responding. For instance, if Stacie is motivated to color her picture, she will finish it faster than if she was unmotivated.
- C. **Self-management** - teaching in the area of self-management has demonstrated greater independence outcomes as the focus of responsibility is shifted from the parent to the child. The child will learn to make choices and monitor behavior so

he or she can learn to function in different environments and learn that his or her behaviors cause environmental change.

Domains: behavior, communication, social

Schedules

These interventions involve the presentation of a task list that communicates a series of activities or steps required to complete a specific activity. Schedules are often supplemented by other interventions such as reinforcement. Schedules can take several forms including written words, pictures or photographs, or workstations.

Schedules are meant to help children understand and manage the daily events in their lives. A schedule is a set of pictures that communicates a sequence of activities for a specific activity or event. Pictures can serve the function of visual schedules in which children are “shown” what to do, or what comes next in their day. Using visuals are very successful with children with ASD as they are generally visual learners.

For an infant or toddler, these visual schedules can be adapted to simply using one or two pictures so the child knows what he or she has to do, such as holding a picture of a car when a car ride is the next activity (perhaps a non-preferred activity). These pictures may help to smooth transitions from one activity to the next so the child feels safe when their environment changes, as many children with ASD do not like change and find transitions very difficult.

Domains: behavior, communication, social, academic

Self-Management

Self-management interventions promote independence by teaching individuals with ASD to regulate their behavior by recording the occurrence/nonoccurrence of the target behavior and securing reinforcement for doing so. Initial skills development may involve other strategies and may include the task of setting one’s own goals.

Reinforcement is a component of this intervention, with the individual with ASD independently seeking and/or delivering reinforcers. Examples include checklists (using checks, smiley/frowning faces), wrist counters, visual prompts, and tokens.

The goal of self-management for the individual with an ASD is to shift supervision and control from a parent, teacher, caregiver, job coach, or employer to the individual. Three separate skill areas are required for successful self-management.

- Self-monitoring produces self-awareness of an individual’s behavior and the individual is taught to monitor a targeted behavior.
- Self-evaluation teaches an individual how to determine if the goal, e.g., reduced self-injury, was met.

- Self-reinforcement is initiated by the individual after the goal is met.

Domains: behavior, communication, social, academic

Social Communication Intervention

These psychosocial interventions involve targeting some combination of impairments such as pragmatic communication skills and the inability to successfully read social situations. Even when they are able to communicate verbally, children and adolescents with ASD often display poor ability to understand most of what is communicated during social conversation. Because children and adolescents with ASD are less skilled in generalization and transfer of skills, social communication instructions should be offered in multiple settings with consistent intervention programming across trainers. Social communication interventions include Social Stories™ video modeling, social problem solving, pivotal response training, scripting procedures, computer-based interventions, priming procedures, prompting procedures, and self-monitoring.

Domains: communication, social

Social Narratives

Story-based interventions identify a target behavior and involve a written description of the situations under which specific behaviors are expected to occur. Most stories aim to increase perspective-taking skills and are written from an “I” or “some people” perspective. The most well-known story-based intervention is Social Stories™. Stories may be supplemented with additional components (e.g., prompting, reinforcement, discussion, etc.). Social Stories™ seeks to answer “who,” “what,” “when,” “where,” and “why” to improve perspective-taking.

Written narratives describe specific social situations in some detail and are aimed at helping individuals to adjust to situations or to adapt their behavior.

Domains: behavior, communication, social

Social Skills Intervention

Social skills intervention is offered as small-group instruction with a shared goal or outcome of learned social skills in which participants can learn, practice, and receive feedback. These interventions seek to build social interaction skills in children and adolescents with ASD by targeting basic responses (e.g., eye contact, name response) to complex social skills (e.g., how to initiate or maintain a conversation).

Social skills groups are used to teach ways to appropriately interact with typically developing peers. Social skills groups typically involve small groups of two to eight individuals with disabilities and a teacher or adult facilitator. Most social skill group meetings include instruction, role-playing or practice, and feedback to help learners with ASD acquire and practice skills to promote positive social interactions with peers. Two examples are:

UCLA/Lovaas-based Approaches – An intervention approach that primarily employs techniques derived from principles of ABA within highly structured contexts. Interventions generally include high intensity (many hours per week) one-on-one instruction with primary emphasis on discrete trial techniques which introduce a stimulus (instruction/cue) to which a child may respond. Responses may be reinforced/rewarded, and the trial of stimulus-potential response-reward is repeated to promote mastery.

These programs additionally emphasize incidental teaching and parent training in terms of promoting generalization of skills.

Early Start Denver Model - This is an intervention approach that emphasizes learning within naturalistic contexts such as caregiving relationships, play, and daily routines. The parents are typically included as co-therapists and incidental teaching (involves structuring education in line with a child's ongoing/typical activities; parent training to allow parents to continue training at home and in other settings) is a primary emphasis.

It frequently employs techniques derived from principles of applied behavior analysis within such contexts and/or focus on developing core play and relationship skills (Floortime, Relationship Development Intervention).

Domains: behavior, communication, social

Augmentative and Alternative Communication

Augmentative and Alternative Communication (AAC) is the term for a variety of tools and strategies that support individuals with communication impairments or little functional speech. AAC either enhances or “augments” the speaker’s communication or offers an “alternative” to vocal speech. AAC is divided into two main categories: aided and unaided.

Aided AAC involves using an external object for communication. Various forms of aided AAC include communication devices, such as electronic communication boards in which the child presses a button to elicit an electronic voice output (also known as assistive technology). These range from simple devices with a few communication outputs to highly advanced computers. It is also possible to have a same-age, same-sex peer to record the vocals for the output. Less technical forms of AAC include using pictures as communications, for instance, the child exchanges a picture of a cup for some juice, or points to a graphic symbol of a slide to communicate a want to go outside and play. For children who use aided AAC systems, it is important that the communicative partners understand how the system works, ensures the system is reachable to the child at all times, and any high technology devices must be fully charged or have spare batteries on hand.

Some high-tech devices may be too advanced for very young children which may contribute to frustration and inappropriate behaviors. Therefore, it is probably best to begin with simple pictures on cards, or simple single pictures on electronic devices for this young population.

Unaided AAC systems do not require an external object in order for the child to communicate. An example of an unaided system is sign language, in which a child uses his or her hands, or other symbols, signs, and gestures. Again, the consideration is that the communicative partner understands the system used, especially if the signs or gestures are child-specific

The use of AAC with infants and toddlers with ASD is a complex area as the unique needs and communication impairments among this population vary. Not all children with ASD will require AAC, but, for some, the use of an AAC system can temporarily (until speech develops) or permanently aid their functional communication.

Domains: communication, social

Treatment and Education of Autistic and Communication related handicapped Children (TEACCH) - Originally developed in the 1970s at the University of North Carolina at Chapel Hill, TEACCH involves structured teaching and therapeutic techniques that encompass a “whole life” approach. Instruction is based on neuropsychological characteristics of individuals with ASD, this intervention involves a combination of procedures that rely heavily on the physical organization of a setting, predictable schedules, and individualized use of teaching methods. These procedures assume that modifications in the environment, materials, and presentation of information can make thinking, learning, and understanding easier for people with ASD if they are adapted to individual learning styles of autism and individual learning characteristics.

A TEACCH classroom is more structured than the average special day class, i.e., the physical environment and all program activities are designed uniformly, with separate, defined spaces for each task, including spaces for individual work, shared group activities, and play/social activities. The program relies heavily on visual learning – a learning strength for many children with ASD. Activities for students are driven by schedules made up of pictures and words into a sequence of activities that help each child move smoothly between activities throughout the day. The structure of the TEACCH program makes it easier for children with ASD who typically find it difficult to make transitions between activities and places without schedules.

Domains: behavior, communication, social, academic

Supported Employment

Supported employment focuses on enabling a person with an ASD to secure and maintain a paid job in a regular work environment by providing appropriate training and support. Supported employment services are designed to assist older individuals with ASD who often experience challenges with learning, social contact, and managing their behavior that prevent them from meaningful opportunities for employment. Supported employment services are designed to offer intensive individualized supports to prepare the individual for employment. During the transition from school to work, most supported

employment programs do the following to prepare learners to work: assess interests and skill levels, identify potential work places that align with the individual's work strengths, provide assistance during the transition from school to work place, and provide a job coach.

Domains: behavior, communication, social, academic

Technology-based Treatment

Technology-based treatments present instructional materials using the medium of computers or related technologies. Treatment studies of children with ASD have demonstrated measurable improvements in communication, attentional control, self-regulation, problem solving, and emotional recognition using different forms of technology. Some technology-based interventions are designed for long-term use as assistive tools (e.g., voice-output communication devices) whereas others are introduced as a provisional instructional aide to be faded after the child's training goals are achieved. Cell phones, Bluetooth headsets, PDA s, MP3 players, tablets, and video and auditory recording equipment, and computers are a few examples of the most popular devices currently available for use in treatment programs. These devices can be used to provide tactile and auditory prompts, model appropriate behavior, improve reading skills and conversational speech, and promote spontaneous requesting. These easy-to-operate devices are low cost, readily available forms of technology that can be beneficial for treating children with ASD if appropriately applied.

Domains: behavior, communication, social, academic

Computer-Aided Instruction

Computer-aided instruction (CAI) includes the use of computers to teach academic skills and to promote communication and language development and skills. It includes computer modeling and computer tutors. CAI can be used effectively to address academic and communication/ language skills. In the academic domain, evidence-based research focused on vocabulary and grammar. Within the communication domain, evidence-based studies targeted communicative functions and initiations.

Domains: communication, social, academic

Visual Supports

Visual supports are tools that enable a learner to independently track events and activities. Visual supports are any tool presented visually that offers guidance to an individual as he or she moves through the day. Visual supports might include, but are not limited to, pictures, written words, objects within the environment, arrangement of the environment or visual boundaries, schedules, maps, labels, organization systems, timelines, and scripts. They are used across settings to support individuals with ASD s. Visual supports have been used effectively in classroom settings and home settings. Visual supports are intended to be used as one component of comprehensive programming for individuals with ASD.

Domains: behavior, communication, social, academic

Multi-component Interventions

These interventions involve a combination of multiple treatment procedures that are derived from different fields of interest or different theoretical orientations. Depending on the goals of the intervention program, in some instances several differently oriented but mutually beneficial interventions are combined to achieve the optimal outcome. Special education in-home teaching techniques could be combined with ABA interventions to produce an optimal outcome. Different disciplines, e.g., speech and language or assistive technology, can be combined with ABA approaches to achieve an outcome. Multi-component programs are likely to be appropriate for social skills training in which separate interventions (e.g., computer games, small group live modeling, curriculum driven training for parents to promote generalization, and teacher generated supports) are combined.

Domains: behavior, communication, social, academic

Pharmaceutical Interventions

There are no medications that can cure ASD or treat the core symptoms. However, there are medications that can help some people with ASD function better. For example, medication might help manage high energy levels, inability to focus, depression, or seizures.

It is important to note that medications might not affect all children in the same way. Parents and health care professionals must closely monitor a child's progress and reactions while he or she is taking a medication to be sure that any negative side effects of the treatment do not outweigh the benefits.

Some medications can help reduce symptoms that cause problems for a child in school or at home. Many other medications may be prescribed off-label, meaning they have not been approved by the U.S. Food and Drug Administration (FDA) for a certain use or for certain people. Doctors may prescribe medications off-label if they have been approved to treat other disorders that have similar symptoms to ASD, or if they have been effective in treating adults or older children with ASD. Doctors prescribe medications off-label to try to help the youngest patients, but more research is needed to be sure that these medicines are safe and effective for children and teens with ASD.

At this time, the only medications approved by the FDA to treat aspects of ASD are the antipsychotics risperidone (Risperdal) and aripipazole (Abilify). These medications can help reduce irritability (aggression), self-harming acts, or temper tantrums; in children ages 5 to 16 who have ASD.

Risperidone

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Risperidone has been approved by the Food and Drug Administration (FDA) for treating irritability in children 6 to 17 years of age with Autistic Disorder. Risperidone was shown to be effective in treating aggression, hyperactivity, and irritability. There is marginal evidence of beneficial effect on sleep problems.

Risperidone's benefit in suppressing maladaptive behavior appears to be maintained for at least 6 months following the initiation of treatment.

Medical treatment with risperidone can potentially reduce emotional distress, aggression, hyperactivity, repetitive behavior, and self-injury.

The most significant side effects are weight gain (with increased risk of metabolic complications) and sedation (drowsiness, particularly at the beginning of treatment or with dosage increases). The incidence of extrapyramidal symptoms, i.e., muscle stiffness or tremor, is low. These side effects may limit the use of risperidone and the risks must be balanced with the benefit. At a minimum, yearly monitoring of lipids and fasting blood sugar is recommended.

Aripiprazole

Aripiprazole is approved by the Food and Drug Administration for treating irritability in children 6 to 17 years old with Autistic Disorder. Aripiprazole has demonstrated improvement in challenging behaviors including emotional distress, aggression, hyperactivity, and self-injury. Social or communication symptoms were not improved with this medication.

Studies using aripiprazole demonstrated improvement in a parent-reported measure of challenging behavior. A parent-reported hyperactivity and noncompliance measure also showed significant improvement. Repetitive behaviors showed improvement with aripiprazole. Aripiprazole can cause significant side effects including marked weight gain, drowsiness, and risk of extrapyramidal symptoms (side effects, including muscle stiffness or tremor, that occur in individuals taking antipsychotic medications). These side effects may limit use of this drug and the risks must be balanced with the benefit. At a minimum, yearly monitoring of lipids and fasting blood sugar is recommended.

Off-label Medications

Some medications that may be prescribed off-label for children with ASD include the following:

- **Antipsychotic medications** - Commonly used to treat serious mental illnesses such as schizophrenia. These medicines may help reduce aggression and other serious behavioral problems in children, including children with ASD. They may also help reduce repetitive behaviors, hyper-activity, and attention problems.
- **Antidepressant medications** - Fluoxetine (Prozac) or sertraline (Zoloft), are usually prescribed to treat depression and anxiety but are sometimes prescribed to reduce repetitive behaviors. Some antidepressants may also help control aggression and anxiety in children with ASD. However, researchers still are not sure if these medications are useful.

- **Stimulant medications** - Evidence indicates that methylphenidate, a psychostimulant, is effective in reducing symptoms of inattention and hyperactivity in children with ASD. Psychostimulants treat hyperactivity and inattention in patients diagnosed with attention deficit hyperactivity disorder (ADHD). However, the response rates are lower in children with ASD than those seen in children with typical ADHD. Side effects such as significant agitation, which were reported in open-label studies, are not documented in controlled studies. Research is lacking on the benefit and tolerability of sustained release preparations of methylphenidate and other psychostimulants. Methylphenidate improved symptoms associated with hyperactivity in the ASD population and could possibly improve social communication. Psychostimulants (e.g., methylphenidate) have been shown to be ineffective in the treatment of irritability. Psychostimulants are also ineffective in the treatment of stereotyped behaviors.

Nutritional Interventions

Many nutritional interventions have been proposed and developed. However, none of these treatments have the scientific support needed for widespread recommendation. An unproven treatment might help one child, but may not help another.

Many biomedical interventions call for changes in diet. Such changes include removing certain types of foods from a child's diet and using vitamin or mineral supplements. Dietary treatments are based on the idea that food allergies or lack of vitamins and minerals cause symptoms of ASD. Some parents feel that dietary changes make a difference in how their child acts or feels.

A range of dietary supplements with potential neurologic effects show some benefit in other chronic neurological conditions, but have not yet been adequately investigated for use in treatment of ASD.

Magnesium-vitamin B6 and two amino acid-related compounds, L-carnosine and dimethylglycine, show some potential anticonvulsant activity and have been tried in ASD for potential positive behavioral effects.

Reduced levels of free polyunsaturated fatty acids (PUFAs) have been reported in a range of neuropsychiatric conditions including ASD. Supplementations with agents containing PUFAs, such as fish oil and evening primrose supplements, have been considered for their possible benefits in ASD.

Some observational data suggest benefit of a ketogenic diet, a high fat, low carbohydrate diet, in some patients with epilepsy and seizures refractory to standard therapy and this strategy has also been explored in ASD.

Allied Health Interventions

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Several allied health interventions address core symptoms of ASD as well as associated difficulties and deficits.

Speech and Language

Teaching children with autism how to communicate is essential in helping them reach their full potential. There are many different approaches to improve communication skills in a child with autism. The best treatment program begins early, during the preschool years, and is tailored to the child's age and interests. It also addresses both the child's behavior and communication skills and offer regular reinforcement of positive actions. Most children with autism respond well to highly structured, specialized programs. Parents or primary caregivers as well as other family members should be involved in the treatment program so it will become part of the child's daily life.

Communication difficulties, both verbal and nonverbal, are inherent in the diagnosis of ASD. The typical sequence of communication development is disrupted. As a result, communication skills can range from nonverbal, gestural and the use of single words, to verbal conversation, and may include:

- Perseveration - repetitive verbal and physical behaviors.
- Echolalia - immediate and/or delayed "echoing" of words, music, phrases or sentences.
- Hyperlexia - precocious knowledge of letters and words or a highly developed ability to recognize words but without full comprehension.
- Dactolalia - repetition of signs, pronoun reversals, inappropriate responses to yes or no questions, and difficulty responding to "wh" questions.

For some younger children, improving verbal communication is a realistic goal of treatment. Parents and caregivers can increase a child's chance of reaching this goal by paying attention to his or her language development early on. Just as toddlers learn to crawl before they walk, children first develop pre-language skills before they begin to use words. These skills include using eye contact, gestures, body movements, and babbling and other vocalizations to help them communicate. Children who lack these skills may be evaluated and treated by a speech-language pathologist to prevent further developmental delays. For slightly older children with autism, basic communication training often emphasizes the functional use of language, such as learning to hold a conversation with another person, which includes staying on topic and taking turns speaking.

Experts estimate that as many as 25 percent of all children with autism may never develop verbal language skills. For some of these children, the goal may be to acquire gestured communication, such as the use of sign language. For others, the goal may be to communicate by means of a symbol system in which pictures are used to convey thoughts. Symbol systems can range from picture boards or cards to sophisticated

electronic devices that generate speech through the use of buttons that represent common items or actions.

As a core feature of ASD, communication difficulties are an important target of treatment. Frequently, verbal communication is the target of treatment, but establishing functional nonverbal communication for children who do not speak also can be the primary goal. Two approaches to increasing speech and language are: Responsive Education and Prelinguistic Milieu Teaching (RPMT), and the Picture Exchange Communication System (PECS).

Responsive Education and Prelinguistic Milieu Teaching (RPMT) – RPMT is a two-component system aimed at both parents and children. It is play-based, and encourages gestural, non-word vocal, gaze use, and later, word use for intentional communication around play, including for turn-taking, requesting and commenting. Parents are taught methods of playing with their children that are thought to facilitate communication, in particular to use linguistic mapping, in which they put into words a child’s immediately preceding nonverbal message. Once prelinguistic communication is achieved, Milieu Language Teaching is incorporated, in which prompts are used to encourage verbal imitation and questions are asked to evoke spoken communication.

Picture Exchange Communication System (PECS) – PECS uses pictures or symbols to teach children to communicate spontaneously. The approach relies on behavioral techniques, especially reinforcement techniques. Providers prompt children to pick up and exchange a symbol/picture for a desired object. The process may include fading those prompts until competency is achieved. PECS can be used while intensive work to increase speech is in progress, and may provide an interim or additional means of communication. PECS relies on immediate positive reinforcement with the child obtaining the desired object upon successfully indicating his desire for it with the corresponding picture.

When designing intervention strategies, it is important to understand both the individual’s receptive (comprehensive) and expressive communication skills. Stressful situations that increase anxiety often interfere with the ability to communicate. Difficulty understanding humor, idioms (“keep your eye on the paper”), sarcasm, and other complex forms of verbal and written expression is common. Even the highly verbal individual may understand and use literal (concrete) language, but have difficulty with abstract concepts needed for higher order thinking skills. A person’s communication ability usually changes over time. Therefore, it is important to maintain an ongoing communication assessment from diagnosis through adulthood as this provides current information, which is necessary to support appropriate communication strategies. Supporting all forms of communication – verbal, signing, pictorial, augmentative devices (and often a combination of more than one) – promotes learning.

Occupational and Physical Therapy

Although sensory sensitivity and dysfunction are not core features of ASD, they are frequently described as challenges for some children with ASD. Sensory Integration (SI) is specialized therapy based on the premise that the brain's response to basic sensory input must be normalized before higher-order processes can be addressed. The approach anticipates that a child who is better able to process, modulate, and integrate sensory information will then be better able to acquire higher-order skills. The sensory system includes vestibular, proprioception, tactile, auditory, visual, olfactory, and gustatory.

Sensory integration is the way our bodies and central nervous systems gather, organize, and process information about the physical world around us. Too much sensory input can overload the nervous system causing a physical stress response (e.g., fight, flight, or freeze): too little sensory input can cause us to be lethargic and hinder the learning process.

There are three types of sensory interventions: Sensory Diet, Sensory Break, and Environmental Accommodation

Sensory Diet - A sensory diet is a highly regimented and structured set of sensory activities that are done at frequent, predetermined times and in various environments. This diet helps to “feed and organize” the nervous system throughout the day. A sensory diet should be built into the child's routine at home and school. Parents and/or paraprofessionals may need additional training and guidance from the therapist to supervise these sensory activities.

Sensory Break - A second type of sensory intervention is a sensory break. These breaks are utilized when the child begins to show signs of over-responsiveness or under-responsiveness. Unlike the sensory diet, these breaks may occur at different times throughout the day based on the child's need.

Environmental Accommodations - The final type of sensory intervention considers environmental accommodations. Many children can benefit from simple changes in their surroundings. These accommodations can include: removing some of the visual stimulation from the classroom walls; preferred and alternative seating; small group instruction; alternative art mediums; and some assistive technologies, like low glare paper and pencil grips.

Complementary and Alternative Medicine (CAM) Interventions

Complementary and Alternative Medicine (CAM) is variably defined but generally refers to medical therapies and practices that are not commonly taught at medical schools or available at major hospitals and clinics in the United States. They might include massage, acupuncture, chelation (a treatment to remove heavy metals like lead from the body), biologicals, or body-based systems (like deep pressure). Current research

shows that as many as one third of parents of children with an ASD may have tried complementary or alternative medicine treatments.

Interventions have been proposed based on theories of autism causation such as heavy metal poisoning, dietary factors, and auditory hypersensitivity. A growing range of insufficiently assessed interventions challenge families and providers to find a meaningful and appropriate balance in management that considers safety and efficacy while respecting parents' rights to pursue help for their affected children. Anecdotal reports of intervention efficacy exist for most CAM treatments; however, to date, there have been very few high quality randomized controlled trials conducted on CAM interventions for ASD.

Educational Interventions

Two federal disability laws, the Individuals with Disabilities Education Act (IDEA) and Section 504 of the Rehabilitation Act of 1973 (Section 504), govern services to qualified students with disabilities in public schools.

Educational evaluation and assessment is a mandatory process under the Individuals with Disabilities Education Improvement Act of 2004 (IDEA). Part B of IDEA requires that the student meets the eligibility criteria under one or more of the eligibility categories specified in the law and demonstrates a need for special education services. Public schools do not diagnose students but instead determine eligibility for services. During the course of the educational evaluation to determine eligibility, educators draw upon information from a variety of sources and ensure that information obtained from these sources is documented and carefully considered.

IDEA mandates that consideration be given to the results of evaluations from outside providers, but public schools are not required to accept the results or use them in program development. Sometimes this statement is misinterpreted to mean that educators do not have to accept the diagnosis of ASD or other medical conditions. It is not the role of educators to challenge a medical diagnosis. However, a medical diagnosis alone is not sufficient to establish students' eligibility for special education services if they are in the 3- to 21-year age range. Eligibility decisions are based on evaluation of child behaviors in the educational environment to determine if the child satisfies the criteria under an education category specified in IDEA, whether the condition adversely affects the child's educational performance, and whether the child needs special education services.

For individuals who meet eligibility criteria, IDEA provides services to children from birth to 36 months of age under Part C of the Act and students age 3 years to 21 years or until graduation from high school under Part B of the Act. Infants and toddlers with a medical diagnosis of an ASD are automatically eligible for services under Part C of IDEA. Students with a medical diagnosis of ASD may or may not meet the eligibility criteria under Part B of IDEA or Section 504 during some or their entire school career,

depending on the challenges the student experiences in accessing and benefiting from the education program.

Most children with ASD receive at least some treatment in an educational setting, beginning with preschool. For children with ASD, educational interventions often aim at promoting personal independence and social responsibility. Educational interventions have focused both on traditional areas of academic progression/achievement, as well as on addressing social, cognitive, and behavioral issues in classrooms or through specialized instruction. These interventions include the Treatment and Education of Autistic and Communication related handicapped Children (TEACCH) program, early intervention center or classroom-based instruction, and computer-based approaches.

Impact of ASD on Families

Families are impacted by having a child with an ASD. Parents of children with ASDs experience greater stress, depression, anxiety, and other negative health outcomes than parents of children with other disabilities (Waisman Center, 2008). Further, caring for a child with an ASD is complicated and often requires access to many support services, including primary and specialty health care, early intervention and special education services, services provided by mental health providers, and other community resources such as specially trained childcare and respite providers.

Families often report significant gaps in care, difficulties navigating the complex care system, and financial strain that add to the challenges of raising a child with an ASD. Current estimates indicate that ASD-related costs to society range from \$35 to \$90 billion annually (Ganz, 2007).

Each family responds to the challenge of autism in its own way. Most parents agree that caring for a child with autism requires tremendous energy, patience, resourcefulness and flexibility. Often, adaptations are necessary.

Parenthood is demanding enough, but when a child has social, communication and behavior problems, getting through a typical day can be exhausting and frustrating. Many families face huge challenges caring for a child with autism:

- The continual support and supervision most children with autism need takes time and energy away from other family members and needs.
- The daily activities of home life - from breakfast to bedtime - can be enormously complicated and disrupted by the needs of the child with autism. The intricate supports the child may require can transform even a simple meal into a highly stressful activity.
- Community outings, holidays, social events and even a trip to the grocery store often must be carefully orchestrated to minimize anxiety and confusion for the child with autism. As a result, families are often isolated and limited by their child's autism.

- Even when the child with autism lives outside the family home, the emotional, physical and financial toll on parents can run very high.

Autism disrupts the typical relationship between siblings. It may be especially difficult for other children to understand why the child with autism gets so much of your attention. They may feel rejected or embarrassed by their sibling's communication and social difficulties. Some young siblings worry that they will "catch" autism and others wonder if they'll be responsible for their brother or sister's care.

Although each family is different, the supports many families need include:

- Information and knowledge about autism. It helps to understand the disability.
- Skilled respite care. Even the most dedicated parents need a break.
- Practical, expert help to organize daily living for the child with autism and teach self-care skills in the home.
- Effective strategies for dealing with difficult behaviors.
- Help in finding and accessing services and resources in the community.
- Support and understanding from family, friends, and neighbors.
- Contacts and friendships with other families who have children with autism.

ASD after Childhood

The transition process from childhood to adulthood involves multiple dimensions including the need for appropriate healthcare services. This transition is impacted by different cultures within the pediatric and adult healthcare systems. The child-centered system is based on family-centered practice and a Medical Home Model which stresses the importance of a relationship with a primary care practitioner who partners with the child and family to assure that their medical and non-medical needs are recognized and managed appropriately. Other services, including medical specialty care, often involve center-based multi-disciplinary teams, school and community-based interventions, and private or government-funded healthcare services. Generally, these services are accessible and available across the state. In contrast, in the adult-oriented system of care, patient-clinician relationships are typically one-to-one and problem focused. In addition, there is less expertise in chronic childhood conditions, there are fewer multi-disciplinary teams of providers and fewer educational and community supports, and access to health insurance coverage is more variable.

Healthcare transitions are most effective when preceded by collaborative discussions involving the healthcare providers, patients and their families, and when these conversations begin years before the anticipated transition. An analysis of the National Survey of Parents of Children with Special Healthcare Needs (Lotstein et al., 2009) identified the key components of successful healthcare transitions for adolescents and young adults as:

- A. Encouragement for the patient to take as much decision-making responsibility as possible at each developmental stage

- B. Practical information on available adult services
- C. Guidance on recommended adult health-care providers, and
- D. Information relating to expected changes in health insurance

This same study noted the high frequency of failure to meet these goals indicating that nearly 60% of parents/guardians reported that their transition process failed to meet the expected four core measures for transition. In this survey, only 42% reported a discussion regarding the shift of care to an adult provider and 34% had discussed changes in health insurance.

Teen Years

For many children, moving from elementary school to middle or junior high is one of those difficult transition periods. The complexity of the school environment is one factor to consider. Frequently, students move from one primary classroom teacher with one set of classmates to a school where students move from class to class on an hourly basis, which may involve a different set of peers in each setting. Styles of classroom management, structure, and expectations may differ greatly from class to class. Frequent movement in crowded and noisy hallways can add to the stress of the situation. For many students, learning to operate a locker combination and to manage the transfer of materials can be an overwhelming process, especially when time between classes is short. This transition frequently occurs as the student is experiencing significant changes in his or her body: hormonal changes, growth spurts, and emotional highs and lows. It is critical for students with ASD at these times to have a supportive team of adults and peers to anticipate, observe, listen, and problem solve alongside the emerging adolescent. A multi-disciplinary team collaborating and strategizing across delivery systems can be a very necessary and effective support system to help the student with an ASD and his/her family through difficult transition periods

The teen years can be a time of stress and confusion for any growing child, including teenagers with autism spectrum disorder (ASD).

During the teenage years, adolescents become more aware of other people and their relationships with them. While most teenagers are concerned with acne, popularity, grades, and dates, teens with ASD may become painfully aware that they are different from their peers. For some, this awareness may encourage them to learn new behaviors and try to improve their social skills. For others, hurt feelings and problems connecting with others may lead to depression, anxiety, or other mental disorders. One way that some teens with ASD may express the tension and confusion that can occur during adolescence is through increased autistic or aggressive behavior. Teens with ASD will also need support to help them understand the physical changes and sexual maturation they experience during adolescence.

Transition to Adulthood

The second major transition that occurs for all students is the transition from school to adult living. This occurs at graduation from high school or at the age of 21 for some students with disabilities. Depending on the student's preferences and interests, this transition could be to post-secondary education, employment, or adult services. Planning for this significant transition is a required component of the IDEA and becomes part of the IEP process at the age of 16 or sooner, depending on the needs of the student. It is a requirement for the student with a disability to be invited to the IEP meeting when the meeting's purpose is to consider post-secondary goals.

The parent or student of majority age can positively impact the planning process for post-secondary transition by providing consent for the public school to invite to IEP meetings representatives of agencies responsible for providing for or paying for transition services. Section 504 of the Rehabilitation Act of 1973 is broader in scope than IDEA, extending protections against discrimination on the basis of disability to eligible persons attending, employed by, or served by any institution or agency that receives federal funds. However, under Section 504, there are no specific requirements related to transition or post-secondary transition planning. Therefore, only if the student is also a student identified under IDEA and under an IEP will post-secondary transition planning and courses be formally addressed. Students with a 504 Plan or an IEP who are transitioning from public school to post-secondary training or an institution of higher education may benefit by checking in advance with a school administrator regarding 504 policies in place on campus.

The public schools' responsibility for providing services ends when a child with ASD reaches the age of 22. At that time, some families may struggle to find jobs to match their adult child's needs.

Another important part of this transition is teaching youth with ASD to self-advocate; this means that they start to take on more responsibility for their education, employment, health care, and living arrangements. Adults with ASD or other disabilities must self-advocate for their rights under the Americans with Disabilities Act at work, in higher education, in the community, and elsewhere.

Adults with ASD

Some adults with ASD, especially those with high-functioning autism or with Asperger syndrome, are able to work successfully in mainstream jobs. Nevertheless, communication and social problems often cause difficulties in many areas of life. They will continue to need encouragement and moral support in their struggle for an independent life.

Many others with ASD are capable of employment in sheltered workshops under the supervision of managers trained in working with persons with disabilities. A nurturing environment at home, at school, and later in job training and at work, helps persons with ASD continue to learn and to develop throughout their lives.

The public schools' responsibility for providing services ends when the person with ASD reaches the age of 22. The family is then faced with the challenge of finding living arrangements and employment to match the particular needs of their adult child, as well as the programs and facilities that can provide support services to achieve these goals.

There are many options for adults living with ASD. Below are some examples of possible living arrangements:

- **Independent living.** Some adults with ASD are able to live on their own. Others can live in their own home or apartment if they get help dealing with major issues, such as managing personal finances, obtaining necessary health care, and interacting with government or social service agencies. Family members, professional agencies, or other types of providers can offer this assistance.
- **Living at home.** Government funds are available for families who choose to have their adult child with ASD live at home. These programs include Supplemental Security Income, Social Security Disability Insurance, and Medicaid waivers. Information about these programs and others is available from the Social Security Administration (SSA).
- **Other home alternatives.** Some families open their homes to provide long-term care to adults with disabilities who are not related to them. If the home teaches self-care and housekeeping skills and arranges leisure activities, it is called a "skill-development" home.
- **Supervised group living.** People with disabilities often live in group homes or apartments staffed by professionals who help with basic needs. These needs often include meal preparation, housekeeping, and personal care. People who are more independent may be able to live in a home or apartment where staff visits a few times a week. Such residents generally prepare their own meals, go to work, and conduct other daily activities on their own.
- **Long-term care facilities.** Although the trend in recent decades has been to avoid placing persons with disabilities into long-term-care institutions, this alternative is still available for persons with ASD who need intensive, constant supervision. Unlike many of the institutions years ago, today's facilities view residents as individuals with human needs and offer opportunities for recreation and simple but meaningful work.

Supplemental Information

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Autism Spectrum Disorder

Post-Test

1. Boys have approximately four to five times higher incidence than girls for ASD. (p. 4) A. True
B. False
2. Which of the following is NOT considered a possible etiological factor for Autism Spectrum Disorder? (p. 4-7)
 - A. HOX genes on chromosome 2
 - B. RELN gene on chromosome 7
 - C. ASD4 gene on chromosome 12
 - D. Prenatal exposure to valproic acid
3. Credible contemporary research has not established any causative relationship between vaccines and the development of ASD in children. (p. 7) A. True B. False
4. Which of the following is NOT a typical symptom associated with ASD? (p. 7)
 - A. Social impairment
 - B. Cognitive impairment
 - C. Communication difficulties
 - D. Repetitive behaviors
5. A 3-year-old girl suddenly stops talking. Her parents also notice she is often out of breath and frequently wrings her hands. These symptoms are consistent with _____. (p. 11-12)
 - A. Rett syndrome
 - B. Reyes syndrome
 - C. Fragile X syndrome
 - D. Tuberous sclerosis
6. Which of the following is NOT a condition associated with ASD? (p. 12-15)
 - A. Hypersensitivity to certain sounds
 - B. Insomnia
 - C. Seizures
 - D. Hypertonicity and clonus
7. Which developmental screening tool is used to identify developmental delays in children 6-24 months of age and consists of 24 multiple choice questions? (p. 16-17)
 - A. Ages and stages Questionnaires (ASQ)
 - B. Communication and Symbolic Behavior Scales (CSBS)
 - C. Parents' Evaluation of Development Status (PEDS)
 - D. Modified Checklist for Autism in Toddlers (M-CHAT)
8. Screening tools that incorporate information from the parents are not valid. (p. 20)
A. True B. False
9. A diagnosis of ASD is positively confirmed through biomedical markers and laboratory testing. (p. 21) A. True B. False

Autism Spectrum Disorder

10. There is strong evidence to support the role of routine clinical neuroimaging in the diagnostic evaluation of ASD. (p. 22) A. True B. False
11. The Autism Diagnosis Interview – Revised (ADI-R) is a clinical diagnostic instrument used for assessing autism in children and adults. (p. 23) A. True B. False
12. A child with severe deficits in verbal and nonverbal social communication and has extreme difficulty coping with change would be classified as Level _____. (p. 25)
 - A. 1
 - B. 2
 - C. 3
 - D. 4
13. Which of the following is NOT associated with Social Communication Disorder? (p. 25-26)
 - A. Poor ability to greet others
 - B. Unable to take turns in conversation.
 - C. Difficulty making inferences
 - D. Onset of symptoms is in early teens
14. Functional communication remains one of the weakest predictors of adaptive outcome for individuals with autism spectrum disorders across the lifespan. (p. 27) A. True B. False
15. Differences between progress monitoring in the educational system and progress monitoring in healthcare relate primarily to terminology. (p. 30) A. True B. False
16. Sensory motor proficiency involves taking in information through a variety of sensory channels, interpreting and understanding these sensations, and developing a response to them. (p. 31-32) A. True B. False
17. There is no global consensus on which intervention strategy is most effective for treating individuals with ASD. (p. 32) A. True B. False
18. Early intervention has been associated with gains in verbal and nonverbal communication, higher intelligence scores, and improved peer interactions. (p. 33) A. True B. False
19. Which of the following is NOT one of the identified domains of treatment? (p. 34)
 - A. Behavior
 - B. Communication
 - C. Sensory
 - D. Academic
20. Antecedent interventions involve the modification of situational events that typically precede the occurrence of a target behavior. (p. 35-36) A. True B. False
21. Which treatment methodology incorporates child selected activities with “teachable moments” to facilitate learning? (p. 43)
 - A. Differential reinforcement
 - B. Discrete trial training
 - C. Naturalistic teaching
 - D. Pivotal response training

Autism Spectrum Disorder

22. The only medications FDA approved to treat aspects of ASD are _____. (p. 51-53)
- A. fluoxetine and sertraline
 - B. risperidone and aripiprazole
 - C. Prozac and methylphenidate
 - D. Abilify and Zoloft
23. It is estimated that as many as _____ of all children with autism may never develop verbal language skills. (p 54-55)
- A. 10%
 - B. 15%
 - C. 25%
 - D. 33%
24. _____ is specialized therapy based on the premise that the brain's response to basic sensory input must be normalized before higher-order processes can be addressed. (p 55-56)
- A. Perceptual Normalization
 - B. Sensory Integration
 - C. Receptive Synthesis
 - D. Neurological Orientation
25. Which of the following statements regarding the Individuals with Disabilities Education Act (IDEA) is TRUE? (p. 57-58)
- A. Public schools are responsible for both diagnosing students and determining eligibility for services.
 - B. A medical diagnosis of ASD is sufficient to establish a child's eligibility for special education services.
 - C. Part B of the Act provides services to students age 3 years to 21 years or until graduation from high school.
 - D. Individuals age 22 and older are covered by Part C of the ACT.

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