The Whitworth Autism Project provides research-based information on the characteristics, causes, and treatments of autism for families, friends, and professional service providers.
How this presentation works

- Through a series of links, the viewer can access a wide range of information about autism. Each slide provides links to continue to more information as well as the option to return to the home page. Many in-text citations throughout the presentation provide links to the original research abstract or full article for further research and study.
- The Characteristics of Autism section provides in-depth information about main characteristics and other common characteristics of autism. It also describes the different elements of Autism Spectrum Disorder (ASD) and addresses the researched increase in the occurrence of autism.
- Research on Autism gives a definition of science, explores the different potential causes of autism, and presents a variety of treatment options with distinctions between science-based research and Complimentary and Alternative Treatments.
  - The Causes section introduces several different categories that each progress into more depth while continuing through the presentation. Each topic includes research and cautions about the possible cause. It is important to follow the progression of links and read all the sections to receive comprehensive information.
  - Treatments also introduces several categories of treatments that then proceed to more specific treatments. A unique aspect of this section is the traffic lights for each specific treatment that give recommendations based on the researched effectiveness of a particular treatment.
- The Resources section provides links to noted websites on autism.
Mission

- Autism is a puzzling behavioral disorder without a clear understanding of cause and with conflicting recommendations for treatment. Families of individuals with autism, and the practitioners who serve them, face a confusing (and sometimes contradictory) set of choices. The Whitworth Autism Project was developed to assist parents and service providers in discriminating information based on sound science from that with little or no evidence and to increase the likelihood individuals with autism are treated safely and effectively.

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Purpose

- The purpose of the Whitworth Autism Project is to provide an information center for families, friends and professionals interested in autism that will:
  - evaluate and critique available research and theory on autism;
  - present summaries to interested parties in a clear, non-technical format;
  - discuss both the probability of usefulness and possible risks associated with recommendations regarding autism; and
  - provide connections to original research publications and useful links.
Characteristics of Autism

Main Characteristics:

1. Unable to build typical social relations
2. Atypical or little (to no) development of language, especially for use in communication
3. Limited scope of behaviors and interests

Can be diagnosed as part of Autism Spectrum Disorder (ASD)
Characteristics of Autism

Other Common Characteristics:
- Limited cognition or inconsistent abilities
- Unusual sensory sensitivities
- Deficits in joint attention
- Deficits in “central coherence”
- Seizure disorders
- Psychiatric disorders
- Sleep disturbances
- Eating problems

Increase in Autism

- Deficits in “mind reading”
- Self-injury and aggression
- Motor deficits
- Unusual talents
- Deficits in conceptual reasoning and comprehension
- Adaptive behavior
- Mortality

Return to Home Page
Main Characteristics

1. *Unable to build typical social relations*
   - Many children with ASD do not exhibit typical social behaviors such as maintaining eye contact, not developing typical relationships with caregivers and peers, and refusing to be held or cuddled (Folstein, 1999). They struggle with grasping social rules and having empathy for others (Hendricks, 1998).
   - Children with autism experience deficits in joint attention, social orientation, and attention to the feelings of others (Dawson et al., 2004). Joint attention is evidenced by following where others point and gaze, pointing to people and objects, responding to a name, and demonstrating visual attention; it typically develops during a child’s first year. Social orientation develops concurrently with joint attention. It is evidenced in infancy when children turn their heads toward social stimuli, such as human faces; toddlers display social orientation by looking toward the source of sound when their name is called (Dawson et al., 2004). Deficits in these skills are one of the earliest indicators of autism (Naber et al., 2008).
Main Characteristics

2. Atypical or little (to no) development of language, especially for use in communication

- Some children with ASD never develop spoken language skills and are mute. Many others do have spoken language skills and repeat certain phrases over and over, without regard to the context or appropriateness of what they are saying – also referred to as echolalia.
- Most children with ASD process literally and have difficulty making inferences, understanding figures of speech, and grasping abstract concepts (Folstein, 1999).
3. **Limited scope of behaviors and interests**

   Many children with ASD exhibit repetitive and stereotypic behaviors. Common behaviors may include rocking back and forth, hand flapping or twisting, playing with one toy for hours or days at a time, or staring at an object for an extended length of time. These interests can be rigid to the point of being obsessive (Folstein, 1999).
Other Common Characteristics

- **Limited cognition or inconsistent abilities**
  - Approximately 70-75% of children with autism also have intellectual impairments. However, many do score higher on performance tests than on verbal assessments (Coolican, Bryson, & Zwaigenbaum, 2008; Folstein, 1999; Frombonne, 2003).

- **Unusual sensory sensitivities**
  - Many children with autism are especially sensitive to particular stimuli. Some children are oversensitive; for example, the weight or fabric of their clothes may be an irritant. Other children are under-responsive and can self-injure without exhibiting signs of pain (Folstein, 1999; Talay-Ongan & Wood, 2000).
Other Common Characteristics

- **Deficits in joint attention**
  - A skill that develops over time, joint attention includes pointing to an object, following another person’s pointing or gazing, and responding to a name. It is vital in the development of other communication skills, and many children with ASD either completely lack or do not fully develop joint attention (Naber, et al., 2008).

- **Deficits in “central coherence”**
  - “Central coherence” is a person’s ability to see the “big picture.” Some children with autism struggle with this skill, and therefore they cannot make predictions about the next minute, next hour, or the next day (Lainhart, 1999).
Other Common Characteristics

• **Seizure disorders**
  - Children with ASD may also have an accompanying seizure disorder. In fact, epilepsy is the most common medical disorder that is coupled with ASD (Canitano, 2007; Volkmar, Lord, Bailey, Schultz, & Klin, 2004).

• **Psychiatric disorders**
  - As many as 65-80% of people with ASD may also have an additional psychiatric disorder (Sterling, Dawson, Estes, & Greenson, 2008) such as depression, anxiety disorders, and obsessive-compulsive disorder, among others.
Other Common Characteristics

• **Sleep disturbances**
  ▫ About 44-83% children experience sleep disturbances (Richdale, 2001), including difficulties falling asleep and wake frequently during the night (Krakowiak, Goodlin-Jones, Picciotto, Croen, & Hansen, 2008).

• **Eating problems**
  ▫ Many children with autism self-restrict their diets in by only eating a particular type, color, or texture of food. It has been reported that 72% of people with ASD consume a narrow diet (Schreck, Williams and Smith, 2004).
Other Common Characteristics

• *Deficits in “mind reading”*
  ▫ Children with ASD struggle with recognizing the emotions, thoughts, beliefs, and intentions of other people (Lainhart, 1999).

• *Self-injury and aggression*
  ▫ Some children with ASD engage in aggressive or self-injurious behaviors (Lainhart, 1999). Aggression could be directed toward family members, teachers, peers, or others. Examples of self-injurious behavior can include head-banging against a wall or furniture, biting, or scratching and hitting oneself.
Other Common Characteristics

- **Motor deficits**
  - Many children with autism have low muscle tone and subsequently little strength, producing clumsiness. Additionally, they may have poor balance or an awkward gait (Folstein, 1999).

- **Unusual talents**
  - Some children with autism may be highly gifted or talented in a certain area. Common areas include music, mathematic calculations, art, reading, computer skills, or puzzles (Cash, 1999; CCD, 2001). Approximately 10% of children with autism display such savant skills. Of that percentage, only 1% are considered to be extraordinary “autistic savants” (Rimland, 1995).
Other Common Characteristics

- **Deficits in conceptual reasoning and comprehension**
  - Individuals with autism may struggle with comprehension and abstract (conceptual) thinking that impacts their performance across many academic content areas (Lainhart, 1999).

- **Adaptive behavior**
  - Considering their IQ, children with autism tend to delay in being toilet trained (Lainhart, 1999). By age 4, 70% are not yet urine trained, and 60% are not bowel trained (Rutter, Greenfeld, & Lockyer, 1967). Most children are trained by the middle of childhood, though problems may continue into adolescence and adulthood, depending on the individual’s mental abilities.

- **Mortality**
  - There have not been any studies done on life expectancy in people with autism. However, many individual die prematurely for other reasons including seizures, drowning, or overlooked infections because of insensitivity to pain or inability to communicate (Bauman & Kemper, 1994).
Autism Spectrum Disorder (ASD)
Children diagnosed with Pervasive Developmental Disorder – Not Otherwise Specified (PDD-NOS) qualify for some, but not all, of the criteria under the other categories of Autism Spectrum Disorder. Children with PDD-NOD are characterized by impairments in social skills. They also exhibit either stereotypic behaviors or impairments in communication and spoken language skills (CDC, 2007).
Rett Syndrome

- Rett syndrome is a neurodegenerative disorder that only affects females. It is known to be caused by a mutation in the MECP2 gene [Committee on Children with Disabilities (CCD), 2001]. Onset occurs around age 1 or 2, after a time of normal development. Characteristics include loss of cognitive and language skills, loss of hand skills, lack in social skills, and stereotypic behaviors such as hand wringing and body rocking. Rett syndrome is a rare disorder.
Childhood Disintegrative Disorder

- With Childhood Disintegrative Disorder, children develop typically for the first two years of their life. Then, their abilities begin to regress slowly. The damages done in the areas of language, social, motor, and play skills are even more distinguished than in autism (CDD, 2001). Children may not be able to maintain eye contact, lose non-verbal communication abilities, and lose bladder and bowel control (DDS, 1999). It is a rare disorder (CDD, 2001).

Return to Autism Spectrum Disorder
Autism

- Autistic Disorder, or “Classic Autism,” is characterized by three defining factors with an onset before age 3. First, the child must exhibit “qualitative impairment” of social communication and contacts; for example, impaired use of non-verbal social communication skills such as eye contact and body position and movements. Second, the child demonstrates “qualitative impairments” in communication; for example, delay or lack of the spoken language skills or repetitive use of the same spoken language. Lastly, the child has limited and repetitive behaviors and interests; for example, having an abnormal preoccupation with one activity for hours at a time (CDC, 2007).
Asperger Syndrome

• Asperger syndrome is characterized by impairments in social situations, particularly with social interactions. These children do not experience language delay, a distinct difference from classic autism, and generally have average to above-average intelligence. Children with Asperger syndrome also display repeated and stereotypical behaviors, such as intensive focus on an object or task or inflexibility in changes to routines. Socially, children may not exhibit appropriate non verbal gestures such as eye contact and body language. They also may have friendships and relationships that are not appropriate for their developmental level (CDC, 2007).
Proposed (Not Disabling) Broader Autism Phenotype (BAP)

- Broader Autism Phenotype (BAP) is a term used to describe the phenotypic expression (observable characteristic) of genes that contribute to the development of ASD; it is exhibited by family members of people with autism (Hurley et al., 2006). Characteristics can include deficits in social and communication skills, limited interests and routines, and difficulties with some practical and structural language (Piven, et al., 1997a; Piven, et al., 1997b; Santangelo & Folstein, 1999).

Return to Autism Spectrum Disorder
Increase in Autism

- There has been a significant increase in autism worldwide. Since the 1960s, over 50 surveys have been published approximating the rate of autism in certain populations. Meta-analyses of reports demonstrate an increased rate in autism spectrum disorder. In the 1970s, 5-10 children per 10,000 were diagnosed with ASD in the United States and United Kingdom; the rates rose significantly in the 1990s to 50-80 children diagnosed with ASD in every 10,000 children in the same countries (Blaxill, 2004). Additionally, the number of children diagnosed with autism has risen substantially more than the number of children diagnosed with disabilities in general. Research now indicates that as many as 1 in every 150 children in the United States develops ASD by the age of 8 (Centers for Disease Control and Prevention, 2007).

- These increases cannot be explained by changes in diagnostic criteria or advancements in case ascertainment. Over time, the diagnostic criteria has, in fact, become more restrictive (Yazbak, 2003). There is also a possibility that case ascertainment is incomplete due to the reluctance to make the diagnosis as well as the typical age of diagnosis (3-6 years) in comparison to the age of onset (30-36 months). Thus, the reported data may in fact underestimate the actual prevalence.
Research on Autism

• Definition of Science
• Causes
• Treatments
  ▫ Science-Based Research
  ▫ Complimentary and Alternative Treatments
Definition of Science

• **Science** is empirically and logically tested evidence accompanied by qualifications.
• **Pseudoscience** is personal testimonials that have not yet been proven. It is characterized by its use of jargon and endorsements.
• **Antiscience** depends on personal interpretation while largely refusing to accept the facts and the authority of science in general. (Green & Perry, 1999)
Neuropathology of the Brain

• Researchers agree that autism is a neurobiological disorder. Evidence that supports this cause of autism includes: a larger than normal brain size in both circumference and volume, developmental anomalies of brain structures, abnormalities in white matter of the brain, neural underconnectivity, and differing levels of the neurotransmitter serotonin. However, a definitive cause is yet to be found.

• Theory about Brain Structure
• Theory about Brain Function

Return to Causes
Theory about Brain Structure

*Brain Volume, Weight, and Size*

- Close inspection has revealed specific differences between the brains of individuals with autism and the brains of average individuals. First of all, the circumference of the brain is larger in people with ASD. Rapid brain growth occurs in children with autism between ages 2-12, resulting in a larger circumference (Folstein, 1999, Piven et al., 1995; Piven et al., 1996). Additionally, brain volume is larger (Aylward, Minshew & Field, 2001). The brains of children with autism weigh 100-200 grams more than the average brain. On the contrary, the brains of adults with autism weigh 100-200 grams less than average. It appears that brain size and volume balance out after age 6 in children with autism.

- The rapid early growth of the brain could be because of reduced neural pruning in the brain, leading to the greater than normal brain volume, weight, and size. Typically, children overproduce neurons. The neurons are later pruned, trimming down unused neurons and maximizing the effectiveness of the remaining neurons and supporting cognitive development. It has been suggested that neural pruning does not occur as often in children with autism.

Continue to Cortical Thickness and the Corpus Callosum
Theory about Brain Structure

Cortical Thickness and the Corpus Callosum

- Studies have shown more cortical thickness in the brain (Hardan et al., 2006). Cortical thickness refers to the thickness of the outer part of the brain. Other studies have revealed smaller-than-average subregions of the corpus callosum (Piven, Bailey, Ranson, & Arndt, 1997) or a proportionally smaller corpus callosum when compared to the larger brain size (Boger-Megiddo et al., 2006). The corpus callosum (also called white matter) is a thick band of fibers connecting the two hemispheres of the brain and is responsible for transmitting information between the two sides. This evidence contributes to the theory that brain function in affected, either because the smaller corpus callosum produces underconnectivity or underconnectivity is a factor in the decreased growth of the corpus callosum.
Theory about Brain Structure

**Brain Tissue**

- Microscopic inspection of postmortem brain tissue exposes a 60% reduction in the Purkinje cells from the cerebellum (Ritvo et al., 1986). The Purkinje cells are essential to the circuitry of the brain. These tissue differences would most likely have occurred during the first trimester of pre-natal development.

- Additionally, postmortem studies have uncovered a reduced number of neurons in the amygdala (Schumann & Amaral, 2006). The amygdala regulates emotions, particularly those of anger and fear. It appears that the brain in people with autism experience rapid growth and later reduction in the amount of neurons in the amygdala.
Cautions Regarding Brain Structure

• In spite of endeavors to acquire donations of brain tissue, few brains of people with autism have been available for research. Thus, the research conducted has not been extensive (Herman, 1996). Additionally, most of the brains autopsied came from young adults; none of the brains have been from children under the age of 5 (Halsey & Hyman, 2001). Furthermore, the brains that have been used for research do not have detailed histories available, so researchers cannot determine whether or not environmental factors, for instance medications, have impacted brain structure (Herman, 1996).
Theory about Brain Function

• Through technological advancements in medical instruments, researchers now have several non-invasive methods through which they can study brain function. These procedures include an electroencephalogram (EEG), a magnetic resonance imaging, functional MRI (fMRI), and a positron emission tomography scan (PET scan). Researchers have used these procedures to study the brain function of individuals with autism.

Specific theories regarding brain function include:

• Seizures
• Serotonin Theory
• Underconnectivity Theory

Return to Neuropathology of the Brain

Return to Home Page
Seizures

- Researchers have confirmed that 46% of children with autism have had seizures and an additional 20% have had epileptiform brain activity without demonstrating any visible signs of a seizure (Hughes and Melyn, 2005). Epileptiform activity is short disturbances in attention and language that does not fully constitute a seizure. For children who experienced autistic regression (loss of language and social skills following typical development), 82% were confirmed with having epileptiform brain activity, 70% of whom had not had such brain activity before the autistic regression (Lewine et al., 1999). Thus, it is believed that seizures might be a factor in the cause of autism, not just an effect. Some researchers suggest using an EEG as part of the testing for diagnosing autism to shed more light on the relationship between seizures and autism.

Continue to Cautions Regarding Brain Function
Serotonin Theory

- The neurotransmitter serotonin is required for communication between cells and is responsible for regulating appetite, concentration, mood, sleep, pain sensation, and other sensory perceptions. Differences in serotonin levels have been found in children with autism (Chugani et al., 1997a, 1999; Cook & Leventhal, 1996, Cook et al., 1997). PET scans have also revealed abnormalities between serotonin and Purkinje cells (Chugani et al., 1997b). The serotonin transporter gene, HTT, is prone to having a shortened form of the DNA sequence (Devlin et al., 2005; Sutcliffe et al., 2005), suggesting that it may be associated with the cause of autism (but does not cause autism by itself). Approximately one-third of people with autism have reliably been found to have increased serotonin in platelets. The increase in the serotonin has yet to be linked to a specific characteristic of autism (Burgess et al., 2006; Cook, 1996).
Underconnectivity Theory

- Researchers suggest that individuals with autism may have difficulty organizing and incorporating information effectively in the white matter of the brain (which connects the two hemispheres together). It would be like a sports team that did not work together and therefore could not be a winning team (Bennett, 2004). People with autism may experience underconnectivity – impaired communication between the parts of the brain. This theory could explain why higher order functions requiring coordination among different parts of the brain seem to be difficult for people with autism (Belmonte et al., 2004). One study found that children with autism used less of the brain when completing a simple task than their average-functioning peers. This reduced functioning may also suggest underconnectivity in the brain (Just et al., 2007).

Continue to Cautions Regarding Brain Function
Cautions Regarding Brain Function

- Evidence supporting brain function should be carefully weighed with caution because there are potentially a number of explanations besides causation. First of all, participants in studies are recommended by their physicians who have reasons to believe their participation would be helpful. For example, a child may exhibit symptoms of underlying seizure activity, so the physician makes a recommendation for a seizure-related study.

- Furthermore, physical evidence associated with a particular condition may actually be an effect of the condition, not a cause of it. For example, abnormal serotonin rates are related to several psychiatric conditions. Therefore, serotonin may not be related to the cause of autism and rather may be an effect. Additionally, medications can be responsible for effecting the levels of serotonin (Posey, Erickson, Stigler, & McDougle, 2006). Also, serotonin in the platelets typically does not suggest differing levels in the brain (Best, 2007).
The Opioid Excess Theory
(Leaky Gut Syndrome)

- Most simply, the Opioid Excess Theory - also referred to as the Leaky Gut Syndrome - argues that children with autism have been exposed to an overload of opioid-like substances. The substances, found in many gluten and casein products, do not completely break down and large proteins leak from the intestines into the blood stream. From there, they reach the brain and affect the central nervous system, impacting the individual’s neurotransmitters and producing an array of symptoms similar to autism.

This theory is connected to:
- Vaccinations Theory
- Gluten and Casein Intolerance Theory
- Immunologic Allergens
- Secretin
**Vaccinations Theory**

*Exposure to the Measles Virus*

- There has been much speculation about the relationship between vaccinations and autism. A number of parents have reported that their children began to regress shortly after receiving the measles, mumps, and rubella (MMR) vaccination. Several researchers have suggested that the virus contained in the vaccination causes intestinal inflammation, changing the structure of the tissue, and allowing neurotoxins to enter the central nervous system and eventually the brain ([Fudenburg, 1996](#); [Gupta, 1996](#); [Halsey & Hyman, 2001](#); [Wakefield et al., 1998](#)). Another theory proposes that the virus diminishes the amount of vitamin A in the body resulting in immunologic and metabolic changes ([Halsey & Hyman, 2001](#)).

[Continue to Exposure to Mercury](#)
Vaccinations Theory

Exposure to Mercury

- Many people have also been concerned about the amount of an organic mercury compound, thimerosal, in vaccinations. Studies have shown that excess exposure does cause brain damage in humans and animals (Normand & Dallery, 2007). Thus, the FDA ordered thimerosal to be removed from all child vaccinations (Geier, D. & Geier, M, 2003).
Cautions Regarding Vaccinations

Theory

Exposure to the Measles Virus

• Studies in numerous countries, including Denmark, Finland, Sweden, the United Kingdom, and the United States, have shown no relation between the rate of autism and the rate of the MMR vaccination (Taylor, 2006). Further, Japan withdrew the administration of the MMR vaccination in the early 1990s, and the rate of autism still continued to increase (Honda, Shimizu, & Rutter, 2005; Honda et al., 1996). A British study in 1999 concluded that there was no connection between the vaccination and autism. In 2000, the National Academy of Sciences' Institute of Medicine’s Immunization Safety Review Committee reviewed evidence and concluded that the vaccination did not cause ASD, though it should continue to be researched in case it is a risk factor for certain individuals. Also in 2000, the American Academy of Pediatrics declared that there was no causal relationship. Unwillingness to have children vaccinated could create a health threat for the surrounding population (HHS, 2001). Lastly, the MMR vaccination was introduced long before the rise in autism was reported. While cases of autism have increased, the rate of vaccinations has remained constant (Kaye, del Mar Melero-Montes, & Jick, 2001).
Cautions Regarding Vaccinations

Exposure to Mercury

- Thimerosal is an organic mercury compound that is broken down into ethylmercury. Ethylmercury differs from methylmercury, which has been known to cause neurological damage. Actually, ethylmercury does not accumulate in the tissues and quickly leaves the body (Normand & Dallery, 2007).
- The Federal Drug Administration (FDA) has placed tight restrictions on the dosage of ethylmercury. Together, the American Academy of Pediatrics and the Center for Disease Control issued a statement maintaining that thimerosal had not caused harm. Regardless, the FDA still ordered for the removal of thimerosal from most vaccinations, though trace amounts may still exist through the manufacturing process (Joint statement, 1999; Normand & Dallery, 2007).
- Denmark and Sweden removed thimerosal from their vaccines in 1992 and still experienced a rise in autism (Stehr-Green et al., 2003). Studies conducted in the United Kingdom also showed no relationship (Andrews et al., 2004; Taylor, 2006).
- However, some children may be sensitive to thimerosal and experience adverse effects (Normand & Dallery, 2007).
Gluten and Casein Intolerance Theory

- After noticing the odd eating habits of several children with autism (i.e. only eating one color of food, eating large amounts of only one food), scientists suggest that these eating habits could be due to the intolerance of specific foods or substances in the food because of abnormal bowel permeability or other reasons [Committee on Children with Disabilities (CCWD), 2001]. Thus, these people put forth the idea that eliminating these substances could potentially change the behavior of children with autism. Urine samples have revealed high levels of opioid-like peptides in people with autism; these peptides could be elevated due to improper breakdown in the digestive system. It is thought that gluten (wheat) and casein (dairy) products could produce the opioid-like peptides, and an elimination diet could change the behaviors of children with autism. There have been several studies conducted on such a diet, but the results have been inconclusive (Shattock, 2001).
Cautions Regarding Gluten and Casein Intolerance Theory

- Research involving the Gluten and Casein Intolerance Theory is controversial for a variety of reasons (Cormier & Elder, 2007; White, 2003). In the first place, it is still questioned as to whether or not the barriers of the brain, intestinal, and blood barriers can be penetrated so that neuropeptides could enter the central nervous system. Secondly, research involving elimination diets have been mixed and therefore inconclusive. On the other hand, elimination diets are becoming increasingly prevalent among children with ASD, whether they demonstrate intolerance to gluten and casein or not. However, elimination diets can be difficult to manage and maintain and may produce stress for the families (CCWD, 2001; Smith, 1996).
Immunologic Allergens

- Research has been conducted looking at the immune systems of children with ASD. There have been several studies pointing to a dysfunctional immune system in people with autism (Ashwood, Wills, & Van de Water, 2006). Researchers speculate that abnormal maternal immunologic reactions during pregnancy could affect neurologic development.
Cautions Regarding Immunologic Allergens

• The results connecting immunologic allergens and autism have been inconsistent and are therefore inconclusive. More efficient and well-designed studies are necessary (Ashwood & Van de Water, 2004). Right now, there is no clear connection between immunologic allergens and the symptoms of autism.

Return to Opioid Excess Theory
Secretin

- After a number of anecdotal reports, several studies were conducted to measure the effectiveness of secretin in children with autism. Secretin is a gastrointestinal hormone used to produce peptidase enzymes in the pancreas. The enzymes aid in the breakdown of proteins and were expected to complete the breakdown of gluten and casein and eventually change the child’s language and behavior.
Cautions Regarding Secretin

- The results of the studies regarding Secretin are weak with few changes (Shattock, 1999b; Chez et al., 2000; Roberts et al., 2001). In spite of the results, the FDA approved Secretin as a treatment for autism in 2002. Side effects may include seizures, hyperactivity, or high fever. Due to the sensitivity of the pancreas, patients should proceed with high caution (Shattock, 1999b).

Return to Opioid Excess Theory
Genetic Evidence

• Researchers have searched for a genetic cause of autism. With the completion of the Human Genome Project in 2003, scientists have now identified all the genes present in human DNA (Human Genome Project Information, 2008). They examine genotypes of families with multiple members who have autism. Researchers also look at candidate genes, which are genes responsible for areas affected by autism (such as communication) to shed evidence on autism’s link to genetics.

• Genetic Inheritance
• Multiple Gene Interaction
• Candidate Genes
Genetic Inheritance

• Family studies, particularly the studies of twins, suggest that there is a genetic component to autism (Folstein, 1999). In twin studies involving autism, approximately half of the identical twins were both affected by ASD. In another study, none of the same-sex fraternal twins were both affected (Folstein & Rutter, 1977; Steffenburg et al., 1989; Bailey et al., 1995). The likelihood that the next-born sibling of a child with autism will have autism is 3-6 in 100, which is 50 to 200 times more likely than merely chance (Jones & Szatmari, 1988; Ritvo et al., 1989).

Continue to Cautions Regarding Genetic Evidence
Multiple Gene Interaction

Multiple Genes

- While the specific genetic component is still unknown, it has been agreed that more than one component is involved (Folstein, 1999). If a single, dominant gene was involved, the chance of inheritance would be 50%; if a single, recessive gene was involved, the possibility of inheritance would be 25%. Families with autism do not demonstrate such straightforward patterns, so multiple gene must be interacting (Rodier, 2000).

Gene-Environment Interaction

- It has also been strongly suggested that environmental factors coincide with the genes to produce autism (Shattock, 1999a). Twin studies show that identical twins, having identical genes, are many times impacted by autism on different levels; therefore, it is likely that the environment plays a role in the production of autism (Folstein, 1999).
Candidate Genes

Scientists are studying genes that are known to control specific functions or characteristics related to ASD, thinking that the specific gene may contribute to the cause of autism. The gene for serotonin production and/or metabolism is an example of a gene that has been examined as a candidate gene. Regardless of the candidate gene being studied, they usually play a role in the development of the brain.

Continue to Candidate Genes and Their Functions
Candidate Genes

Candidate Genes and Their Functions

- Genes on Chromosome 7:
  - HOXA1 – an early developmental gene that produces a certain protein called a transcription factor that modifies the actions of other genes (Rodier, 2000).
  - HOXB1 – aids in the development of the hindbrain.
  - FOXP2 – connected to a rare disorder involving difficulties with language and processing grammar. So far, it has not been linked to autism (Lai et al., 2000).
  - WNT2 – seems to be a variant in people with severe language delays (Wassink et al., 2001).
  - RELN – helps control how brain cells form and organize during the development of the fetus (Persico et al., 2001).

- Chromosome 15:
  - GABA receptor genes – carry the chemical GABA, which transmits messages between nerve cells.
  - Extra segments of DNA have been found in the 15q11-q13 region.

- Chromosome 17:
  - 5-HTT – Serotonin transport gene. Extensive studies have revealed no constant links to autism (Persico et al., 2000).

Continue to More Candidate Genes and Their Functions
Candidate Genes

**Candidate Genes and Their Functions (continued)**

- **Chromosome 9:**
  - DbH – is located near the gene that causes tuberous sclerosis, which is often related to autism. Low levels of DbH have been found in the blood of children with autism as well as in their families.

- **Chromosome 3:**
  - GAT1 – makes a protein that works with GABA. GABA is a chemical that transmits messages between nerve cells. Too much GABA may over-stimulate the brain.
  - OXTR – likely aids in the development of the brain. Studies on mice have shown that too much oxytocin can results in repetitive behaviors.

- **X Chromosome – may be involved since autism occurs more in male than in females**
  - MeCp2 – causes Rett disorder, one of the disorders within the autism spectrum

[Continue to Cautions Regarding Genetic Evidence](#)
Cautions Regarding Genetic Evidence

- Even if a candidate gene is found to be related to autism, the relationship may not be causal, but instead resulting from another cause. Relationships found in candidate genes at this time are only hypothetical. While some genetic causes have been identified, they have only been identified for secondary autism. Secondary autism is autism that is linked to another diagnosed syndrome or disorder, such as Rett Syndrome and only accounts for 5-10% of ASD cases. Idiopathic autism – autism with no other medical connections – comprises 90-95% of ASD cases. There have not been any definite gene associations in idiopathic autism (Grice & Buxbaum, 2006).
Categories of Treatments

- Educational/Behavioral
- Pharmological/Medical
- FDA Approval Process
- Sensory/Neural
- Nutritional/Dietary

Treatments

Return to Home Page
Return to Research on Autism
Science-Based Research

• **Science-Based Research:**
  Research is science-based when the evidence is taken from:
  (1) quantifiable events that can be impartially and precisely observed,
  (2) an orderly and purposeful change in the experimental conditions,
  (3) methods that reasonably exclude any other reasons for the results, and
  (4) when the results have been repeated. (Green, 1996)

• **Support for Evidence-Based Treatment:**
  • [Guidelines for Group Research](#)
  • [Guidelines for Single-Subject Research](#) (most often used in special education and intervention)
  (Weiss & Ferraioli, 2009)
## Guidelines for Group Research

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<td>Big enough group for statistical analysis and to show effects</td>
<td>Compares to a placebo or other treatment</td>
<td>Random assignment, blind raters, social validity, maintenance, and generalization</td>
</tr>
<tr>
<td><strong>Adequate</strong></td>
<td>Big enough group for statistical analysis and to show effects</td>
<td>Compares to a wait-list or other treatment</td>
<td>Random assignment, blind raters</td>
</tr>
<tr>
<td><strong>Weak</strong></td>
<td>Too small a group for statistical analysis</td>
<td>Pre- and post testing only</td>
<td>None of the above</td>
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</table>

(Weiss & Ferraioli, 2009)
# Guidelines for Single-Subject Research

<table>
<thead>
<tr>
<th>Design</th>
<th>Analysis</th>
<th>Additional elements</th>
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</thead>
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<tr>
<td><strong>Strong</strong></td>
<td>3 or more demonstrations of effect</td>
<td>Generalization, maintenance, and social validity</td>
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<tr>
<td>Multiple-baseline, alternating treatments, reversal, combination</td>
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</tr>
<tr>
<td><strong>Adequate</strong></td>
<td>2 or more demonstrations of effect</td>
<td>Addresses one of the above</td>
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<tr>
<td>Multiple-baseline, alternating treatments, reversal, combination</td>
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<tr>
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<td>Addresses none of the above</td>
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<tr>
<td>Pre/post or case study</td>
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</tbody>
</table>

(Weiss & Ferraioli, 2009)
Complimentary and Alternative Treatments

- Complimentary and Alternative (CAM) Treatments are popular treatments that are not supported by scientific or theoretical evidence. Over 500 such treatments have been described (IAN Project, 2009). As many as one third of newly-diagnosed children with ASD have taken part in CAM treatments that have not been proven and could even be dangerous (Wick & Smith, 2009).
Educational/Behavioral Treatments

- Educational and behavioral interventions focus on a wide variety of *skills*, including academic, social, daily living, play, and behavioral skills. The comprehensive programs listed below focus on the behavioral, communication, learning, and social domains.

The most common educational and behavioral interventions include:

- [TEACCH](#) (Treatment of Autistic and related Communication-handicapped Children)
- [LEAP](#) (Learning Experiences: An Alternative Program for Preschoolers and Parents)
- [Project DATA](#) (Developmentally Appropriate Treatment)
- [ABA programs](#) (Applied Behavior Analysis)
TEACCH
(Treatment of Autistic and related Communication-handicapped Children)

• TEACCH was developed by Eric Schopler and his colleagues at the University of North Carolina in the early 1970s. The program promotes valuing the “culture of autism.” It employs structured instruction with the use of specific environment arrangements and visual schedules that work toward building independence.

• Promising Practice – useful, though not yet proven

Return to Educational/Behavioral
LEAP
(Learning Experiences: An Alternative Program for Preschoolers and Parents)

- LEAP concentrates on standard preschool activities in an inclusive classroom environment for 15-25 hours each week. It involves thorough parental training. The program works on a variety of skills using both the developmental and behavioral approaches. Common skills include: language, social interaction, functional, and independent play and work skills along with adaptive behavior.

- Promising Practice – useful, though not yet proven

Return to Educational/Behavioral
Project DATA
(Developmentally Appropriate Treatment)

- Project DATA was developed at the University of Washington employing the developmental and behavioral approaches. As an inclusive early childhood program, it uses straightforward teaching in an extended day format. It provides social and technical support for families as well as support through various transitions.

- Promising Practice – useful, though not yet proven

Return to Educational/Behavioral
ABA programs
(Applied Behavior Analysis)

• Based on B. F. Skinner’s work in Behavior Science, Applied Behavior Analysis comprises of interventions based upon the principles of learning. The process highlights the effects of antecedents (conditions and actions before a response) and consequences (conditions and actions after a response). Through consistent measurement, progress is closely observed and treatment can be modified as necessary. Applied Behavior Analysis has been researched and carefully recorded for over 50 years with people with and without ASD.

• Scientifically Based – supported by convincing evidence

Programs include:
• Lovaas’ ABA Discrete Trial Training
• Koegels’ Pivotal Response Treatment
• Partington & Sunberg’s Verbal Behavior
• Krantz & McClannahan’s Script-Fading
• Additional Program Features
Lovaas’ ABA Discrete Trial Training

• Lovaas’ ABA Discrete Trial Training showed early exhibitions of effectiveness as a treatment. It is a highly structured program that has been reproduced numerous times and also taken to different countries. This home-based program involved one-on-one, adult-initiated interactions 40 hours a week. Modern versions of the program involve natural reinforcers and include the student’s preferred activities. The average cost of the program is $33,000 over three years (saving $208,500 per adult each year). (Zane, Davis, Rosswurm. 2008)

• Early, intensive interventions have demonstrated significant and continued gains in academics, adaptive behavior, language, IQ, and social skills. Repeated studies reveal optimal outcomes of as much as 45% recovery rate. So much so, that the children with ASD could not be differentiated from their typical peers.

• Scientifically Based – supported by convincing evidence
Koegels’ Pivotal Response Treatment

- Koegels’ Pivotal Response Treatment is a naturalistic program that uses natural reinforcers as well as the student’s personal interests. The program stresses pivotal fields of performance, including self-management, motivation, response to numerous cues, and self-initiated interactions. It also includes a high amount of parent involvement and partnership.

- Early and intensive interventions of this program have also shown substantial gains in a variety of skills. Replicated studies suggest recovery rates as high as 45% (optimal outcome) to the point that the children with ASD cannot be distinguished from their typical peers.

- Scientifically Based – supported by convincing evidence
Partington & Sunberg’s Verbal Behavior

- Partington & Sunberg’s Verbal Behavior program is derived from B. F. Skinner’s examination of verbal behavior. Thus, it concentrates primarily on language development. In the program, expressive language skills (intraverbals, mands, and tacts) are taught as building blocks to more complicated language skills. Classroom interventions and parent training are integrated into the program.

- Promising Practice – useful, though not yet proven
Krantz & McClannahan’s Script-Fading

- Krantz & McClannahan’s Script-Fading program was created at the Princeton Child Development Institute. Its primary feature is using scripts to encourage students to participate in the social dance – the giving and taking of conversations. The script is written down or audio taped. Then it is practiced and learned through prompted exchanges. As the students begin to initiate conversation and generalize to various models, prompts are slowly faded as the students develop more self-initiation (Krantz, 2008).

- Promising Practice – useful, though not yet proven

Return to ABA programs
Additional Program Features

Additional program features include:

• JAR (Joint Action Routines)
• Social Stories
• PECS (Picture Exchange Communication System)
• Functional Behavioral Assessment

Return to ABA programs
A JAR is similar to a miniature play, involving a title, theme, specific parts, and scripted lines. To be effective, the JAR must have joint direction as well as opportunities to take turns. The routine should be predictable and able to be duplicated. It should also be meaningful to the student to increase motivation and involvement.

Promising Practice – useful, though not yet proven
Social Stories

• A social story is a basic account of an daily social event that is written from the viewpoint of the student. The story must be written in first-person, present tense, and demonstrate the student’s standpoint. Social stories are used to help a student prepare for an upcoming routine change, learn different social cues, and practice reacting in various social situations that may occur.

• Promising Practice – useful, though not yet proven

Return to Additional Program Features
PECS
(Picture Exchange Communication System)

• PECS was produced by Andy Bondy and Lori Frost (1985) and is based on B. F. Skinner’s 1957 book, *Verbal Behavior*. It is an alternative communication system that uses pictures in place of words. The student is given a set of pictures that he or she exchanges with a partner (a parent, teacher, and so on) for a desired item such as a toy, food, a specific activity, and so more. It is currently the most extensively used procedure. The large majority of students using PECS experienced improvement in their communication skills. In fact, about half of the students ceased using PECS and began speaking naturally within a year of beginning the program.

• Promising Practice – useful, though not yet proven
Functional Behavioral Assessment

- Functional Behavioral Assessment is a problem solving process for use with severe behaviors. It ascertains *why* a student is behaving in a particular, unacceptable fashion (many reasons include self-stimulation, to receive attention or an object, or to avoid fulfilling demands or overstimulation). Then, it uses motivation as a consequence for an acceptable, alternate behavior.

- Scientifically Based – supported by convincing evidence
Pharmological/Medical Treatments

- The pharmological approach is a medically-based system of treatment. Since the cause of autism is still unknown, medical drugs can only be used to treat the behaviors associated with autism, not autism itself. Aggression, sleep disturbance, anxiety, inattention, and seizures are some of the many behaviors that have been treated by medication for individuals with ASD. Types of drugs used to treat people with autism include: amphetamines, antidepressants, and antipsychotics.

- Amphetamines (stimulants)
- Antidepressants - SSRIs (Selective Serotonin Reuptake Inhibitors)
- Antipsychotics (neuroleptics, benzodiazepines)
- Chelation
- Secretin

Return to Treatments
FDA Approval Process

- Pre-Clinical Research
  - Synthesis and purification of the medication
  - Animal Studies
    - Conducted on one rodent and one non-rodent species
    - Purpose is to assess the basic toxicity and pharmacokinetics (how the medication reacts in the body) of the drug

- Phase 1 of the clinical studies
  - Typically conducted in healthy volunteers
  - Researchers look at the human metabolism and potential toxicity

- Phase 2 of the clinical studies
  - Look into the medication’s short-term effectiveness in patients

- Phase 3 of the clinical studies
  - Conducted using a larger group of patients
  - Examines the long-term effectiveness and safety of the medication

- FDA Approved = a drug has been approved for the treatment of a specific disease
Amphetamines

• Amphetamines are stimulants purposed to decrease hyperactivity and impulsivity. Of the children with ASD, 16.7% take some kind of amphetamine. The results have been mixed in the treatment of hyperactivity, inattention, and impulsivity. Potential unpleasant side effects may include: reduced appetite, restrained growth, tics, jitters, and trouble falling asleep, among others. Commonly prescribed amphetamines include: Ritalin/Concerta/Daytrana (a methylphenidate), Adderall (an amphetamine), and Dexidine (a dextroamphetamine).

• Limited Supporting Information – little or no evidence
Antidepressants

- Antidepressants are SSRIs – Selective Serotonin Reuptake Inhibitors. Their principle function is to treat depression and, in some cases, obsessive compulsive disorder. There has been off-label use for a few behaviors connected to autism. Off-label use means the drug has been prescribed for a disease other than its FDA-approved use. Approximately 12.2% of children with ASD take antidepressants. Research has demonstrated effectiveness in treating aggression, anxiety, depression, irritability, language, repetitive behaviors, social interactions, tantrums, and trouble with transitions in children with autism. Adverse side effects are apathy, drowsiness, dry mouth, constipation, fatigue, headache, and nausea, among others. Common antidepressants include: Prozac (fluoxetine), Paxil (paroxetine), and Zoloft (sertraline).

- Limited Supporting Information
Antipsychotics

Benzodiazepines

- Benzodiazepines are commonly referred to as “tranquilizers;” tranquilizers are divided into two categories: major and minor. Major tranquilizers are many times called antipsychotics and include drugs such as Thorazine, Haldol, Clozaril, and Risperdal. Minor tranquilizers are sometimes known as anti-anxiety medications and include Valium, Ativan, and Xanax. Minor tranquilizers are used by 1.6% of children with ASD. They work to sedate continual stimulation and can also reduce spontaneity. Typically, they produce anti-convulsant, anxiolytic (anti-anxiety), and hypnotic effects. Furthermore, they can serve as strong muscle relaxants and sleep inducers.

- Limited Supporting Information – little or no evidence

Continue to Conventional Antipsychotics
Antipsychotics

Conventional Antipsychotics

- Conventional antipsychotics have been approved by the FDA to treat schizophrenia, especially the agitation, unusual behaviors, decreased speech, hallucinations, memory and attention impairment, and lack of interest that are affiliated with the disorder. Their principle function is to block the dopamine-2-receptors. They have been used to treat aggression, irritability, and tantrums in individuals with ASD. These older, first generation medications include Haldol (haloperidol) and Chlorpromazine.

- Limited Supporting Information – little or no evidence

Continue to Atypical Antipsychotics
Antipsychotics

**Atypical Antipsychotics**

- The newer, atypical antipsychotics are thought to function similarly to the conventional medications, though the actual method of operation is unknown. These second generation medications include Risperdal (risperidone), Clozaril (clozapine), Zyprexa (olanzapine), Seroquel (quetiapine), Ziprasidone, and Aripiprazole. Risperdal has shown to be useful in the short-term treatment of aggression, irritability, self-injury, and tantrums. It is the first medication approved by the FDA to be used with autism. Additionally, it is the first antipsychotic drug allowed to be used with children and teenagers. Unpleasant side effects of the medication can include constipation, insulin resistance, sedation, seizures, and weight gain, among others.

- Limited Supporting Information – little or no evidence
Chelation

- Chelation is a treatment that attempts to lower the levels of lead, mercury, or other heavy metals in a person’s body. In this process, an individual takes medication on a regular schedule (i.e. every other week) until the urine levels have become stable. Then, the individual takes lipoic acid that chelates the metal that is securely bound to the cells.

- There have not yet been any scientific research done on chelation therapy with people with ASD. Furthermore, it is unlikely that individuals with ASD have high levels of heavy metals in their systems (Levy & Hyman, 2005). Research in chelation therapy could cause severe side effects and possibly death (Kane, 2006). At least one child has died due to chelation therapy. Therefore, risking this treatment appears to be unlikely and intolerably risky.

- Not Recommended – may cause harm
Secretin

- Secretin is a hormone used in digestion. The hormone is naturally occurring and can be synthetically produced. In treatment, it can be dispensed orally, intravenously, or transdermally. Fourteen well-designed research studies have been administered with hundreds of participants with ASD. The studies have shown the secretin is an ineffective treatment. Thus is may be concluded that secretin is an unsuitable treatment for people with autism spectrum disorder (Williams, Wray, & Wheeler, 2005).

- Not Recommended – may cause harm

Return to Pharmological/Medical
Nutritional/Dietary Treatments

• The nutritional approach is a biologically-based method of treatment based on supplementing or eliminating certain nutrients from an individual’s diet. Some people believe that autism is caused by the incomplete break-down and absorption of specific substances, adverse reactions to food allergens, or a deficit of important nutrients.

• Vitamin Therapy
• Elimination Diets (including Gluten-free and Casein-free Diets)
Vitamin Therapy

- In Vitamin Therapy, a vitamin, mineral, or other nutritional supplement is given in the form of a pill, liquid, injection, cream, or bath. Common supplements include: Vitamins A, B6, B12, C, and D, Magnesium, Dimethylglycine (DMG), Calcium, and Omega 3 Fatty Acids.

- Three small, well-designed studies revealed that Vitamin B6 with Magnesium was ineffective in changing behavior (Findling et al., 1997; Kuriyama et al., 2002; Tolbert, Haigler, Waits, & Dennis, 1993). However, further research could be justified (Nye & Brice, 2005). There have not been any well-designed studies researching the other vitamin, mineral, and supplement therapies in individuals with ASD. Additionally, DMG, intravenous immunoglobulin, Omega-3 fatty acids, and Vitamin C (which has suggested some improvement) have not yet been adequately researched.

- Limited Supporting Information – little or no evidence

Return to Nutritional/Dietary

Return to Home Page
Elimination Diets

• Elimination diets alter the person’s food intake by eliminating one or more elements with the hope of changing behavior. The most popular elimination diet is gluten-free and casein-free diet. Other diets include soy-free, sugar and carbohydrate free, artificial free, yeast free, and a few others (IAN Project, 2009). Several children are even on more than one elimination diet at the same time (IAN Project, 2009). With so many elements being eliminated from a student’s diet, there is a chance that the diet could lead to insufficient nutrition.

• There have been a handful of small, well-designed studies conducted researching the effects of elimination diets. One study concluded that there was no improvement in language, motor, or cognitive skills when using the gluten- and casein-free diet (Knivsberg, Reichelt, Hoiien, & Nodland, 2002). Another study showed no benefit with an elimination diet (Elder et al., 2006). There have not been any scientific studies on any other dietary interventions.

• Limited Supporting Information – little or no evidence

• Gluten-free and Casein-free Diets
Gluten-free and Casein-free Diets

• The Gluten-free and Casein-free diet is the most popular elimination diet. It eliminates all wheat (gluten) and dairy (casein) products from a person’s diet. A small, well-designed study reached the conclusion that there was no gain in cognitive, motor, or language skills by being on this diet (Knivsberg, Reichelt, Hoien, & Nodland, 2002).

• Limited Supporting Information – little or no evidence
Sensory/Neural Treatments

• The Sensory/Neural treatment is a brain-based approach that works to increase the performance of the neural and sensory systems. Since it works on broader systems, it does not work on specific skills and is not educationally based. Common therapies include music therapy, vision therapy, and sensory integration, among a variety of others.

• Music Therapy
• Vision Therapy
• Sensory Integration
• Speech and Language Therapy
• Occupational Therapy
• Auditory Integration
• Art Therapy
• Facilitated Communication
Music Therapy

- Music therapy presents motivational and sensory experiences through music. The therapy is said to influence auditory and visual discrimination as well as proprioceptive control. It is employed to reinforce speech and other behaviors, promote relaxation, and communication information. While music therapy has a long history and certainly a potential for effectiveness, only little research based evidence is currently available (Simpson, 2005).

- Limited Supporting Information – little or no evidence
Vision Therapy

• Vision therapy consists of eye exercises and the wearing of special eyeglass lenses either independent or collaborating with the exercises. The special lenses most commonly used are tinted lenses (Irlen lenses) or Kaplan lenses with prism filters.

• An uncontrolled study suggests that vision therapy could be an effective treatment (Kaplan, Edelson, & Seip, 1998). However, a strong, research-based study has not been completed (Rawstron, Burley, & Elder, 2005). Vision professionals have said that there is no scientific evidence suggesting that eye exercises or special lenses can fix complicated neurological conditions.

• Limited Supporting Information – little or no evidence
Sensory Integration

• Sensory Integrative Therapy involves the stimulation of the proprioceptive, tactile, and vestibular systems with the purpose of diminishing hypo- or hypersensitivity, increasing cognitive functioning, and lessening repetitive or disruptive behaviors. Therapy instances include wearing weighted vests, swinging from a hammock, brushing the body, and applying pressure to the elbows and knees. This type of therapy is usually overseen by an occupational therapist. Sensory Integrative Therapy typically involves 100 hours of treatment in a year and on average costs $16,500 for the year.

• Sensory integration has been a popular treatment option since the 1970s. However, few good scientific studies exist (Dawson & Watling, 2000). On the other hand, the limited results seem to be positive (Simpson, 2005).

• Promising Practice – useful, though not yet proven
Speech and Language Therapy

• Speech and Language Therapy is one of the most popular therapies. Students are recommended to the therapy for work on a specific skill or area, and it is usually part of the school-provided program. In fact, public schools provide 66% of the Speech and Language Therapy funding for children with ASD. Specific practices used in the therapy are also embedded into other treatment programs.

• Promising Practice – useful, though not yet proven
Occupational Therapy

• Occupational therapy is another commonly used therapy. Students are recommended for work on a specific skill or area, and it is usually part of a school-provided program. Public schools provide 61% of the funding for Occupational therapy utilized by children with ASD. Specific therapy methods are also embedded into other treatment programs.

• Promising Practice – useful, thought not yet proven

[Return to Sensory/Neural]
Auditory Integration

- In auditory integration, the care provider pinpoints sounds to which the student is either under- or over-sensitive. Then the student listens to music using headphones. The pinpointed sounds are partially or completely filtered through the music. In Auditory Processing Training, speech sounds are gradually introduced more slowly than in typical speech and are later compressed.
- Some small studies have been conducted and produced mixed results (Sinha, Silove, Wheeler, & Williams, 2005). Thus, further study is necessary to produce conclusive results. The 2002 American Speech and Hearing Association Work Group on Auditory Integration Therapy determined that the treatment had not reached scientific standards to fully validate its use (American Academy of Pediatrics, 1998).
- Limited Supporting Information – little or no evidence

Return to Sensory/Neural
Art Therapy

• Art therapy utilizes art as an interactive means through which non-verbal expression and creativity can flourish. There have been some reports of positive effects through use of the therapy. However, research is limited, and therefore effectiveness cannot yet be determined (Simpson, 2005).

• Limited Supporting Information – little or no evidence
Facilitated Communication

- In Facilitated Communication, the specialist holds the student’s arm, wrist, or hand to assist the student with spelling messages with a keyboard or a board of printed letters. Due to the use of a facilitator, Facilitated Communication is not the same as typing independently or using a computerized assistive communication device.

- The system has been repeated with hundreds of students with ASD. The results indicate that the facilitators, not the students, actually manage the communication, and therefore there is no language improvement (Mostert, 2001). Additionally, alleged cases of abuse while using Facilitated Communication has upset families and caregivers (American Academy of Pediatrics, 1998; Simpson, 2005).

- Not Recommended – may cause harm

Return to Sensory/Neural
Relational Treatments

• The relational approach to treatment is a socially-based theory which suggests that autism deeply impacts interpersonal relations, especially in the areas of engagement and communication. Through this approach, individuals must demonstrate attachment, affect, and bonding.

• Greenspan’s DIR ®/Floortime™ Developmental, Individual Difference, Relationship-based Model
• Son-Rise Program Option Method
• Gentle Teaching
• Holding Therapy
**Greenspan’s DIR ®/Floortime™ Model**
Developmental, Individual Difference, Relationship-based

- **Greenspan’s DIR ®/Floortime™ Developmental, Individual Difference, Relationship-based Model** (DIR) focuses on relationships with parents, caregivers, teachers, therapists, peers, and other people based on the individual’s needs and interests. With the intention of collaborating with other therapies, DIR is a play-based system built upon the child’s natural interests which steadily expands the student’s attention, expression, and interaction. The program costs $10,000 annually. This intervention has potential to be an effective program, but there have not yet been enough well-designed and peer-reviewed studies to verify its effectiveness (National Research Council, 2001).

- Limited Supporting Information – little or no evidence

[Return to Relational]
Son-Rise Program Option Method

- The **Son-Rise Program Option Method** was developed by Barry and Samahria Kaufman. Their home-based program follows the child’s lead to promote motivation as the parents “join” any repetitive or non-repetitive action of the child with the hope of conveying acceptance. There have not yet been any scientific studies completed to test the efficacy of the program for people with ASD (Simpson, et al., 2006).

- Limited Supporting Information – little or no evidence

[Return to Relational](#)
Gentle Teaching

- Gentle teaching is a non-aversive treatment that attempts to reduce defiant and inappropriate behaviors by understanding them to be a mode of communication and reacting to the meaning of the behaviors. The caregiver uses a variety of responses including task analysis, decreasing demands, fading assistance, choice making, and other methods dependent upon small and instantaneous changes in the person’s behavior. This treatment is founded upon a value philosophy that highlights the needs of an individual.
- There has not yet been science-based research conducted with this method. However, aspects of the treatment are grounded in behavior analysis which has a strong research base (Jones & McCaughey, 1992).
- Limited Supporting Information – little or no evidence
Holding Therapy

- During Holding Therapy, the caregiver holds the individual until he or she “surrenders” the struggle and looks into the caregiver’s eyes. This therapy can cause distress and anxiety along with a loss of trust between the individual and the caregiver. There has been no scientific research of Holding Therapy with people with ASD.

- Not Recommended – may cause harm
Resources

- Association for Science in Autism Treatment
- Autism National Committee
- Autism Research Centre
- Autism Research Group
- Autism Research Institute
- Autism Society of America
- Autism Speaks
- Cambridge Center for Behavioral Studies – Autism
- Interactive Autism Network
- National Institute of Mental Health – Autism Spectrum Disorders
- National Institute of Neurological Disorders and Stroke – Autism Information
- Research Autism
- Yale Child Study Center – Autism/PDD

Return to Home Page
Frequently Asked Questions about Autism

- What is Autism Spectrum Disorder (ASD)?
- What are the main characteristics of autism?
- Has autism really increased?
- Do vaccinations cause autism?
- Do gluten and casein cause autism?
- Is eliminating gluten and casein an effective treatment?