CHAPTER 3
Interventions: A Review of Therapies, Models, and Strategies

Someone you love has been diagnosed with autism – what treatments are available for autism? What can you do to help them to reach their full potential? How can you help them to cope in the world?

Autism has no common cause and no known cure. Be wary if someone claims to be able to "cure" autism, especially if the only information available is from the person promoting the "cure." This chapter will describe a variety of treatment options for autism, guidelines for choosing treatments, things to consider when choosing treatments, and how to determine if a treatment really helped.

Because there is no common cause, because autism is a spectrum disorder – that is, symptoms range from mild to severe – and because each individual with autism is "uniquely autistic," there is no "one-size-fits-all" treatment. This puts the burden of determining what treatments will work best for a particular individual directly on the family and the professionals working with the family. Treatments and therapies can vary widely in cost and focus.

Choosing Interventions

Choosing appropriate intervention(s) for your child can be confusing; the amount of information available in print and on the Internet is overwhelming. The following are some important questions to help parents and caregivers make decisions regarding the best interventions for their child:

- Does the program/therapy and anticipated outcomes address your specific concern?
- Does the method meet the unique strengths/challenges/goals for my child?
- Are there any harmful side effects associated with this treatment? What are the potential risks? Is there any risk involved in discontinuing the intervention?
- Are there any activities, foods, and so on that will be restricted during treatment?
- What positive effects of treatment would I hope to see?
- What are the short-term and long-term effects?
- Can the treatment be integrated into my child's current program?
- How will the goals/outcomes be evaluated? How will I know if the child is making progress toward desired outcomes? What method will be used to evaluate the child's progress?
- What is the cost of treatment? Will my insurance company pay for the treatment?
- How much time does the treatment take? Can I realistically devote the time required to the treatment?

- Has this treatment been validated scientifically? Have I collected information about this from a variety of sources?
- Was I able to interview other parents and professionals about the treatment? If so, did I list pros, cons, and other areas of interest?
- Do proponents of the treatment claim that this procedure can help nearly everyone? If so, this should be seen as a "red flag" to slow down and be more careful in consideration of this technique, considering the wide range of abilities represented on the autism spectrum.
- What do the professional involved with my child think about the treatment's appropriateness?
- Are there alternatives that are less restrictive or better supported by evidence?

Determining Effectiveness

Stephen M. Edelson, Ph.D., Center for the Study of Autism, Salem, OR (2007), offers these important tips for parents and caregivers to help determine if a particular treatment is effective:

- **Implement one treatment at a time** Change one thing at a time, allowing plenty of time to see the effects of a treatment. (Edelson suggests at least two months)
- **Keep your own data** Keep a daily record prior to the intervention as well as during the intervention. Your personal record can help you determine if any changes are taking place.
- **Seek objective information** Consider, if possible, not telling other adults your child may come in contact with about the new treatment to prevent biased feedback.
- **Collect data from those involved in treatment implementation** Ask teachers or clinicians to keep written data. After a period of time, compare others' data with your own.
- **Note unexpected or unanticipated changes** Make note of surprising or unexpected changes your child may exhibit.
- **Educate yourself about the treatment** Be sure you learn as much about the treatment as possible before beginning. Look for both positive and negative information. Be aware of possible side effects.

As mentioned, no one treatment will have the same impact on all individuals with ASD. For this reason, it is important to make informed choices and use written data to monitor effectiveness.

Research on Autism Interventions

Individuals with autism spectrum disorders require individually designed interventions that meet their needs. In fact, no one intervention has been universally identified as being effective for all children with ASD. It is important, however, that parents and school professionals work together as a team to select empirically valid techniques (National Research Council, 2001; Olley, 1999).

You should conduct a careful research and review of the information available on the intervention you are considering. Many books and research journals can aid you in your search. As you read about various autism therapies, keep in mind the research that has been conducted on whatever therapy you intend to implement.

To say that a methodology is grounded in scientifically-based research means there is reliable, independent evidence that a given program or practice is effective for some individuals on the autism spectrum. To obtain reliable evidence about a reading strategy or instructional practice, for example, an experimental study may be done. Many studies involve using an experimental group that uses the intervention and a control group that does not to see if the method is effective in teaching children to read. Other studies on autism interventions use a single subject design. Ultimately, family members and professionals together must determine whether a particular strategy or method is effective or if a scientifically based method is suitable for an individual student.

Research is derived from theory and practice. While not all methodologies are currently founded in empirically based research (studies that follow specific scientific rules), many are backed by anecdotal reports (observations of individual cases by parents, caregivers, and professionals) of effectiveness. Care must be taken to evaluate each methodology on its merits and appropriateness for the particular needs of the individual with ASD.

Definition of Evidence-based Practices

The National Professional Development Center on ASD has developed the following definition of evidence-based practices. To be considered an evidence-based practice for individuals with ASD, a practice must be supported by research studies published in peer-reviewed scientific journals that use:

- **Randomized or quasi-experimental design studies** Two high quality experimental or quasi-experimental group design studies,
- **Single-subject design studies** Three different investigators or research groups must have conducted five high quality single subject design studies, or
- **Combination of evidence** One high quality randomized or quasi-experimental group design study and three high quality single subject design studies conducted by at least three different investigators or research groups, across the group and single subject design studies.

High quality randomized or quasi-experimental design studies do not have critical design flaws that create confounds to the studies, and design features allow readers/consumers to rule out competing hypotheses for study findings. High quality in single subject design studies is reflected by a) the absence of critical design flaws that create confounds and b) the demonstration of experimental control at least three times in each study. This definition and criteria are based on:

Horner, R., Carr, E., Halle, J., McGee, G., Odom, S., & Wolery, M. (2005). The use of single subject research to identify evidence-based practice in special education. Exceptional Children, 71, 165-180.

Nathan, P. & Gorman, J. M. (2002). A guide to treatments that work. NY: Oxford University Press.

Odom, S. L., Brantlinger, E., Gersten, R., Horner, R. D., Thompson, B., Harris, K. (2004). Quality indicators for research in special education and guidelines for evidence-based practices: Executive summary. Arlington, VA: Council for Exceptional Children Division for Research.

Rogers, S.J.,& Vismara, L.A. (2008). Evidence based comprehensive treatments for early autism. Journal of Child Clinical Psychology, 37(1), 8-38.

Evidence-Based Practices

The National Professional Development Center on ASD has identified the following interventions as meeting the criteria for evidence-based practices. The National Professional Development Center on Autism Spectrum Disorders is a multi-university center to promote the use of evidence-based practice for children and adolescents with autism spectrum disorders. The Center operates through three sites that include the FPG Child Development Institute at the University of North Carolina at Chapel Hill, the M.I.N.D. Institute at University of California at Davis Medical School, and the Waisman Center at the University of Wisconsin at Madison. Each year, three states are selected through a competitive application process for a two-year partnership with the Professional Development Center. Kentucky was chosen as one of these three states in 2008. The Center works in coordination with each state's Department of Education, Part C agency, and University Center for Excellence in Developmental Disabilities to provide professional development to teachers and practitioners who serve individuals from birth through twenty-two years with autism spectrum disorders.
http://autismpdc.fpg.unc.edu/

Prompting is a behaviorally-based teaching strategy in which learners are assisted in some way to complete a task or activity. There are different kinds or levels of prompting that vary in the amount and type of assistance that are provided. Physical prompts, for

example, may be provided by touching learners (usually on the hand) and physically guiding them. Verbal prompts may be provided by giving learners extra verbal instructions. For example, when a learner is directed to "Throw the tissue in the trash," he or she might be verbally prompted by an adult for each step of the task, e.g., "Stand up, pick up the tissue, walk to the trash can, and put the tissue in the trash can." Not all prompts are verbal. For instance, gesture prompts (e.g., pointing) provide nonverbal cues to learners regarding what they are to do next.

Time Delay is a process for either fading prompt use or for preventing learners from becoming prompt dependent. When implementing time delay, the teacher waits for a pre-determined period of time (typically between 5-10 seconds) after the instruction is given before the answer is prompted. For example, with a learner who is dependent on verbal prompts to identify planets, a time delay procedure might be added with the instructor waiting several seconds after the instruction before they prompt the child to point.

Reinforcement is a core behavioral principle and includes anything that a person does or says that increases the likelihood of a behavior happening again. In other words, when people are reinforced, they are more likely to repeat the same behavior. For example, if a learner performs a skill (let's say tying his/her shoe) and someone says "Great job, you are so grown up!" and the learner continues to work on tying the shoe, we can assume that the verbal praise was reinforcing.

Task Analysis and Chaining is a teaching technique that consists of breaking a task down into small steps (i.e., task analysis) and then teaching each step until the learner can do the complete task. This technique is especially useful with skills that are physical or routine (e.g., self-care, work tasks). Chaining can be taught as either forward (i.e., start to finish) or backward (i.e., beginning at the last step of the task and then teaching the steps in reverse order). The decision to use forward or backward chaining depends on the type of task and characteristics of learners.

Shaping involves the reinforcement of successive approximations of a desired behavior to assist learners in reaching a more appropriate level of skill attainment. Shaping is a strategy used naturally by parents of typically developing children. For example, when children first begin to use utensils to eat, parents praise them for utensil use, even when much of the food ends up on the child, the parent, or their surroundings. Over time, parents praise the child only for actually getting the food to his or her mouth. Shaping is often used for promoting speech development. When children begin to speak, adults reinforce vocalizations and word approximations and then encourage children to say the word correctly. For example, a child may say, "Nana." The adult caregiver acknowledges and replies, "Nana. That's right, say, 'Banana.'" Shaping is especially useful with learners who give up easily or who have a long way to go from initial skill use to actual skill proficiency.

Computer-Assisted Instruction (CAI) includes the use of computers to teach. Research in this area has shown an evidence-base for the use of CAI in teaching language/communication, reading (including spelling and vocabulary), and math.

Differential Reinforcement of Other/Alternative Behaviors (DRO, DRA, DRI) Reinforcement is provided for desired behaviors while inappropriate behaviors are ignored. Reinforcement can be provided when the learner is not engaging in the targeted inappropriate behavior (DRO), when the learner is engaging in a specific desired behavior other than the inappropriate behavior (DRA), or when the learner is engaging in a behavior that is physically impossible to do while exhibiting the inappropriate behavior (DRI).

Discrete Trial Teaching (DTT) is a one-to-one instructional approach that teaches skills in a planned, controlled, and systematic manner. DTT is used when a learner needs to learn a skill best taught in small repeated steps. Each trial or teaching opportunity has a definite beginning and end, thus the descriptor discrete trial. Within DTT the use of antecedents and consequences are carefully planned and implemented. Positive praise, sometimes with tangible rewards, is applied to reinforce desired skills or behaviors. Data collection is an important part of DTT and supports decision-making by providing the teacher with information about the learner's beginning skill level, progress and problems, skill acquisition and maintenance, and generalization of learned skills or behaviors.

Extinction is a strategy based on applied behavior analysis and is used to reduce or eliminate unwanted behavior. Extinction involves abruptly withdrawing or terminating the positive reinforcer that maintains an inappropriate target behavior. This abrupt withdrawal results in the stopping or extinction of behavior. The target behavior is likely to increase in frequency and intensity before it is extinguished as the learner seeks to elicit the reinforcers previously provided. Extinction is often used with differential reinforcement to increase a learner's use of appropriate behaviors while discouraging their use of inappropriate behaviors.

Functional Behavioral Assessment (FBA) is a systematic way of determining the underlying function or purpose of a behavior so that an effective intervention plan can be developed. FBA consists of describing the interfering or problem behavior, identifying antecedent or consequent events that control the behavior, developing a hypothesis of the behavior, and testing the hypothesis. Data collection is an important part of the FBA process.

Functional Communication Training (FCT)- emerged in the mid 1980s from the literature on functional behavioral analysis (FBA) as a systematic practice to replace inappropriate or ineffective behavior serving a communicative function with a more appropriate or effective behavior or skills. It is widely used and promoted in the literature related to positive behavioral support (PBS). Within FCT, the targeted behavior is analyzed to determine its communicative function and then an alternative behavior is taught to replace it. In addition, the associated FBA identifies contingencies in the natural setting(s) that may be maintaining the undesired behavior.

Independent Work Systems promote independence by organizing tasks and activities in ways that are comprehensible to individuals with ASD. Specifically, work systems are visually structured sequences that provide opportunities to practice previously taught skills, concepts, or activities. These systems clearly communicate which activities to

complete; how many activities to complete; how to know when the work is finished; and what happens after the work is completed.

Naturalistic Interventions include techniques that closely resemble typical interactions and occur in naturally occurring settings, routines and activities. Naturalistic strategies are considered learner-centered, in that the learner plays an active role in determining multiple aspects of the instructional interaction (e.g., choice of location, materials, persons involved).

Parent Training Parents are often in a position to be the most effective teachers of their children with ASD. Many of the studies in the evidence-base for other types of instructional practices include parents as facilitators. There are some common guidelines for supporting parents to implement evidence-based practices outside of school settings.

Peer-Mediated Instruction/Intervention (PMII) is designed to increase the social engagement of children and youth with autism spectrum disorders (ASD) by teaching their peers to initiate and maintain interactions with children with autism. Specifically, the goals of PMII are to teach peers ways in which they can talk and interact with children and youth with ASD, increase the frequency with which children and youth with ASD interact with typically developing peers, extend peers' social initiations and focal children's interaction across activities in the classroom, minimize teachers'/adults' support (i.e., prompts and reinforcement), and promote interactions between typically developing peers and children and youth with ASD that are positive and natural in quality.

Picture Exchange Communication System (PECS) has been used to help children and youth with ASD develop a system for communicating with teachers, parents, and peers. PECS was initially developed at the Delaware Autistic Program by Andrew Bondy and Lori Frost as an alternative communication system and has since been demonstrated in the research literature to promote speech development and production. There are six phases of PECS instruction, with each phase building on the last. The phases are: 1) Teaching the physically assisted exchange; 2) Expanding spontaneity; 3) Simultaneous discrimination of pictures; 4) Building sentence structure; 5) Responding to, "What do you want?" and 6) Commenting in response to a question.

Pivotal Response Training (PRT) is an approach that teaches the student to respond to naturally occurring learning opportunities and to seek out such opportunities. PRT builds on children's initiative and their own interests, and it is particularly effective for developing communication, language, play, and social behaviors. PRT was developed to create a more efficient and effective intervention by enhancing four pivotal learning variables: motivation, responsivity to multiple cues, social initiations, and self-regulation.

Positive Behavioral Support (PBS) is a tiered prevention and intervention approach that uses a variety of evidence-based practices to increase positive behaviors and reduce interfering behaviors. PBS is based on the principles of ABA and focuses on identifying specific conditions in the environment that trigger interfering behaviors as well as those that support appropriate behavior.

Response Interruption & Redirection The physical prevention (e.g., blocking) of a learner's presentation of an interfering behavior and immediate redirection to another, more appropriate activity.

Self-Management is a method by which learners are taught to monitor and take data on their own behavior. This method is typically used with older, high -functioning learners who are capable of reflecting on their actions. Learners can be taught to self-monitor a variety of things such as alertness, activity level, concentration, and problematic behaviors.

Social Skills Groups Social skills are best learned in the context of social situations. Research has shown that teaching skills in a natural setting can lead to improvement in social skills. Teaching and applying social skills in a support group format where opportunities are provided for interacting and practicing social skills is also a successful approach in which participants (disabled and non-disabled) often report that they value the friendships they gain as much, if not more than, the skills learned during such programs.

Social Stories are interventions that describe social situations in some detail (highlighting relevant cues and offering examples of appropriate responding) and are aimed at helping the individual adjust to changes in routine, adapt their own behavior based on the social and physical cues of a situation, or to teach specific social skills or behaviors. They are individualized and typically are quite short, perhaps including pictures or other visual aides. Sentence types used in constructing social stories include descriptive, directive, perspective, affirmative, control, and cooperative. Refer to the work of Gray (2005) for specific instructions on creating effective social stories.

Stimulus Control and/or Environmental Modification involves manipulating aspects of the environment that are known to impact a learner's behavior. For instance, if a learner needs to access reading materials independently, then we place the materials in an obvious location and make sure that the learner has access to them. If we know that a learner is more likely to tantrum in classrooms with fluorescent lights, different lighting should be used.

Video Modeling is a teaching method that uses assistive technology (computers, digital cameras, etc.) as the core component of instruction. Video modeling is a growing evidence-based practice for teaching individuals with ASD and other disabilities. Video modeling has been used to teach a wide range of behaviors, including social/emotional skills, adaptive behavior, life skills, academics, and play skills. Video modeling can be applied in several formats, but each involves the following basic components: (a) the individual being taught or other models are videotaped performing some targeted behavior, (b) the video recording is then played back to the learner, and (c) the learner is prompted or asked to perform the behavior. Variations of video modeling include self-modeling, point-of-view modeling, and video prompting.

Visual Supports are tools that enable a learner to independently track events and activities. Visual supports may include any tool presented visually that is used to support an individual throughout his or her daily routine. Visual supports include the

use of pictures, written words, gestures, objects within the environment, arrangement of the environment or visual boundaries, schedules, maps, labels, organization systems, timelines, and scripts. There are a number of visual strategies, including first-then cards, visual schedules, visual lists, and prompt/cue cards. In addition, many other strategies include visual strategies, such as Power Cards and the 5-point scale.

Voice Output Communication Aids (VOCA)/Speech Generating Devices, sometimes referred to as Speech Generating Devices (SGD), are electronic devices that are portable in nature and can produce either synthetic or digital speech for the user. These devices may be used with graphic symbols, as well as with alphabet keys and are used to teach communication skills to learners with limited verbal ability.

Elements of Effective Programs for Children with Autism

Revised and organized by Nancy Dalrymple, 2004
For STAR Program at Weisskopf Child Evaluation Center, Department of Pediatrics, School of Medicine, University of Louisville

As part of the National Early Childhood Technical Assistance Center sponsored Forum on Autism Spectrum Disorders (1997-2001), a group of representatives from model programs reached consensus on core elements of effective programs. These have been published in various formats since they were formulated.

Program Element	Brief Definition
Earliest Possible Start to Intervention	Children receive services appropriate to their needs as soon as they are identified as having ASD. However, the U.S. National Research Council (NRC) Committee on Educational Interventions for Children with Autism (2001) recommend entry into intervention programs as soon as an ASD diagnosis is seriously , rather than waiting until it is confirmed.
Individualization of Services for Children and Families	Adjustments to goals, intervention strategies, and evaluation criteria are made for each child and family receiving services, determined by the child's needs, strengths, and interests and the families concerns, priorities, and resources.
Systematic, Planned Teaching	Instruction or intervention that is carefully thought out, logical, and consistent with a conceptual or theoretical basis and involves planning, implementing, and assessing, intervention steps; each step is intentional, coordinated with an overall approach, and builds toward meaningful goals.

Specialized Curriculum	A core curriculum to address specific needs of children with ASD, includes these key areas: attending to elements of the environment, imitating others, language comprehension, use of language, playing appropriately with toys and interacting socially with others.
Intensity of Engagement	Engagement refers to the amount of time a child is attending to, and actively participating in, the social and nonsocial environment. Intensity of engagement is sometimes expressed as the percent of enrolled time that is spent in teaching interactions, or in activities in which the child is actively learning. The time that a child is engaged in learning opportunities may occur during program time and in home or community settings.
Family Involvement	Includes family involvement in their own child's program; services provided to families primarily because their child has ASD; services provided to families that are not directly related to ASD but may impact on overall family functioning; family support and networking; and family involvement in the overall program.
Program Elements That Are Part of Some, But Not All Programs	
Structured Environments	Arranging the environment, instructional materials, and teaching interactions to elicit, facilitate, or support specific skill attainment or development, including the use of environmental arrangements or visual cues to organize or schedule activities, to facilitate choices, and to define work, play, or rest spaces.
Developmentally Appropriate Practices	Practices that have been designed for all young children; programs are guided by information about child development and learning, each individual child's strengths, needs, preferences, and knowledge of the social and cultural contexts in which children live.
Intervention in Setting with Typical Children or in Natural Environments	Some or all interventions occur in settings with typical children. This may include fully integrated settings in childcare, preschools, recreation activities, and other supports in home and community.

Additionally the **National Research Council's Committee on Educational Interventions for Children with Autism (2001) as reported in Educating Children with Autism**, Washington, DC: National Academy Press (available on-line at www.nap.edu/books) states:

- Active engagement in intensive instructional programming should be provided for a minimum of an equivalent of a full school day for 5 days a week (minimum of 25 hours per week), including full year programming depending on the child's chronological and developmental age.
- Teaching opportunities should be planned, repeated, and generally organized into brief periods of time for very young children (15 – 20 minute intervals), with sufficient amounts of adult attention in one-to-one and very small group instruction in order to meet individual goals.
- There should be no more than two young children with ASD per adult in a classroom.
- There should be mechanisms for ongoing assessment and program evaluation that are conducted in order to measure child progress and make adjustments in programming.

Dawson and Osterling (1997) in a chapter, Early Intervention in Autism from Guralnick: *Early Intervention*, Brookes Publishing add:

- There needs to be a functional approach to behavior where the purpose of the behavior is understood and the necessary skills to replace the behavior are taught.
- Transition planning and implementation are important for future success.

There are many theories and approaches to early intervention for children with ASD, but there is agreement that it needs to be collaborative, able to be generalized to natural environments, and be family-centered. Further, effective intervention appears to be relatively intense, intrusive and interactional, requiring adaptations from both the child and others in the child's environment (Bristol & Schopler, 1993). It's important that families and the people providing services have accurate, current information about autism as well as an understanding of the child's individual needs. These are then translated into individually appropriate strategies. Some of the debate in early childhood education for children with ASD stems from attempts to mesh strategies that are teacher-directed and behaviorally-defined with programs that are child-centered and teacher-facilitated where the environment provides much of the structure. Most children benefit from a combination of approaches and need consistency across therapist, teachers, caregivers, parents, and all who teach and interact with them daily. Children with autism are diverse and more information is needed about what works with each child. It is essential to continually assess needs and progress in a collaborative way so that the changing needs of the child are met. This requires good data keeping through a variety of means, then data interpretation to make adjustments.

Promising Practices: Models and/ or Programs

The following interventions do not meet the criteria for evidence-based practices as determined by the National Professional Development Center on ASD. Further research is needed to determine efficacy of these programs and /or models.

The following programs and /or models may be effective in supporting individuals with ASD in a variety of settings, such as home, community, and educational settings.

Integrated Play Groups The concept of Integrated Play Groups was developed by Pamela J. Wolfberg, Ph.D. Based on the nature of play among peers without disabilities Dr. Wolfberg established a format that promotes socialization and imagination in children with autism and other developmental delays. Integrated Play Groups follow rules for creating an appropriate play environment, including play areas and selected materials; preparing the typical peers for play; use of assessments and measurements of progress; as well as play guidance. Integrated Play Groups focus on social communication, especially in the autistic deficit areas of imitation, joint attention, and imaginative and creative play.

SCERTS Model™ stands for Social Communication, Emotional Regulation, and Transactional Support. The SCERTS Model™ is a comprehensive model that is based on a developmental perspective and was designed to support individuals with ASD. The SCERTS Model™ is interdisciplinary in its approach, in that it addresses social communication and emotional regulation throughout the child's daily activities and routines, and guides and supports parents and caregivers through a multidisciplinary team effort. The model uses the knowledge base and experience of general and special educators, speech language pathologists, occupational therapists, child psychologists, psychiatrists, and social workers. The SCERTS Model™ is not prescriptive, nor is it a curriculum. Instead, it is based on fundamental beliefs and values that address the core deficits of ASD. The model is systematic, semi-structured, but flexible, so that the individual goals of the family and child with ASD can be addressed at specific developmental levels. The model is based on the belief that children learn best when they are emotionally regulated and can communicate within a social context. The SCERTS Model™ was systematically developed to be implemented based on those beliefs. It is does not exclude other educational models, but accepts them within its framework of intervention as appropriate.

Relationship Development Intervention (RDI), created by Steven Gutstein, Ph.D. is modeled on how typical children become competent in the world of emotional relationships. It is an intervention approach quite different from the typical social skills programs currently available. RDI uses assessment information to develop clear, specific, developmentally appropriate treatment objectives and customized activities. The RDI curriculum is composed of six levels, each representing a dramatic developmental shift in the central focus of relationships. The six levels are: Novice,

Apprentice, Challenger, Voyager, Explorer, and Partner. RDI provides a path for people on the autism spectrum to learn friendship, empathy, and a love of sharing their world with others. Language comes alive when integrated with real emotion. People with ASD learn not only to tolerate but to enjoy change, transition, and going with the flow. The path begins at the edge of each person's current capability and carefully, systematically teaches the skills needed for competence and fulfillment in a complex world.

D.I.R./Floortime Dr. Stanley Greenspan and his colleague Serena Weider created the Developmental-Individual Differences-Relationship (D.I.R.)-based model as an intervention for children with autism and other developmental delays. Greenspan and Weider (1998) specify six functional milestones of development in this order: self-regulation and interest in the world, intimacy, two-way communication, complex communication, emotional ideas, and emotional thinking. According to the authors, these milestones lay a foundation for more advanced learning since they are based upon emotional interactions usually developed early in life. The D.I.R. model uses a comprehensive evaluation, including developmental history, biomedical assessment, current functioning, child-caregiver interactions, auditory processing, sensory processing, sensory modulation, motor and perceptual motor functioning, and family patterns, to develop a comprehensive intervention plan for the child and family. The primary goal of the D.I.R.-based intervention is to enable children to form a sense of themselves as intentional, interactive individuals and to develop cognitive language and social capabilities from this basic sense of intentionally. Part of the D.I.R. method uses "floortime," which is an intensive, one-to-one experience during a 20- to 30-minute period when a caregiver physically gets down on the floor and interacts with the child. The focus is on relationships, based on Greenspan and Weider's belief that the more intellectual functions of the brain do not develop without a constant source of relating. During floortime, the adult follows the child's interest or intent, even if the interest is a self-regulatory behavior, in order to encourage interaction. For example, if the child spins the wheels on a car, the adult may help him or spin a different wheel. The adult may limit the number of toys available so that the child has to interact to get more toys. The goal is not just to follow the lead of the child but also to help the child expand his interactions. According to the authors, the four goals of floortime are two-way communication, logical thought, attention and intimacy, and the expression and use of feelings and ideas.

Priming a way of letting a child know what to expect or what is coming. You can prime for a short or a long period of time. For example, you may prime a child for a Saturday shopping trip by going over where you will go, when you will go, how long you will be there, and the things you need to accomplish at each place. You may also identify what behavior is expected for each stop. Typically, you would put the same information in a visual format to cue the child throughout the trip. For example, you may have a visual schedule for the day that you look at with the child as you discuss the day.

5-Point Scale is a technique used to help a child break down an abstract concept into a visual system that is easier to understand. For example, a concept such as using appropriate voice volume can be broken down into a 5-point scale, with 1=no voice,

2=whisper, 3=normal voice/dinnertime, 4=loud voice/playing outside, and 5=screaming. A visual representation of the scale is used as the scale is introduced and explained to the child. It is reviewed repeatedly so it becomes very familiar. A picture of the scale is later used as a visual support to remind the child to use an appropriate voice level. The teacher points first to the level the student is using, and then slides her finger down to the appropriate level for a given situation. For example, if the child was screaming while the family was in the store, the parent would point to number 5, then move her finger down to 3 – an acceptable level.

Power Cards, developed by Elisa Gagnon, is a strategy to teach a child appropriate behavior for a particular situation. The Power Card strategy relies on the power of a child's special interest. It includes a story in which the person or object of special interest behaves appropriately in a situation in which the child is having difficulty. The child is given a small card, which includes approximately three points to guide appropriate behavior, along with a picture or some visual reference to the person or special interest to cue the child.

Social Interpretation Strategies are an important element of social skills instruction. Strategies involve systematically breaking down hypothetical or past social experiences of the child in a visual manner. An adult facilitates this breakdown, and then discusses other choices the child could make in a similar situation, as well as the consequences of different choices. Examples of social interpretation strategies include: social autopsies, Situation Options Consequences Choices Strategies Simulation (SOCCSS), cartooning, and flowcharts (i.e., *The Way To A*).

Home Base For many individuals with ASD, the world, in particular the school environment can cause a great deal of anxiety. In such cases, a Home Base may be assigned. The Home Base is a place where the child feels comfortable and can relax. The child is always allowed to leave her current setting and go to Home Base when she feels her anxiety level rising. A self-calming technique, this strategy recognizes that a child may have to remove herself from an environment in order to calm down.

Graphic Organizers are visual ways to organize information or materials. These can range from idea webs and Venn diagrams to color-coding folders and books for each school subject. Graphic organizers can be effective tools for helping a child organize the environment, as well as organize information to enable learning.

Related Services

Communication Interventions

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, word approximations, the use of single words, to verbal conversation. When designing intervention strategies, it is important to understand both the individual's receptive (comprehension) and expressive

communication skills. Stressful situations that increase anxiety often interfere with the ability to communicate. Challenging behavior can also serve as a means of communication for children with delayed communication. A Functional Behavior Assessment (FBA) can identify the function of behavior and functional communication training can be conducted.

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.

Speech-Language Therapy During therapy, the child's functional communication skills, or the child's *intent* (such as requesting and protesting), are assessed. Programs are then developed to address communication deficits and improve communication skills. Therapy may occur in natural and individual settings or in small groups. Families will always be involved in the therapy process in order to facilitate functional communication across various situations. Parent and caregiver training is a vital component of speech-language therapy, ensuring maximization of its benefits.
Be sure to choose a speech-language pathologist (SLP) who holds a Certificate of Clinical Competence from the American Speech-Language-Hearing Association (ASHA). The SLP is a skilled professional who can address the following areas of concern:

Receptive language refers to the understanding of spoken or written messages as well as other forms of language. This includes such components as the identification of objects, actions, adjectives, prepositions, and people.

Expressive language refers to the production of language. This includes such things as sentence structure, verb tenses, regular/irregular plurals, and length of utterance.

Articulation/phonology includes developing speech sound production, the use of tongue, lips, and teeth to produce speech sounds.

Oral-motor skills include improving the range, rate, complexity, strength, and coordination of oral motor movements. This strategy may also include massaging of cheeks, lips, and gums, brushing teeth, and methods to decrease teeth grinding.

Feeding and swallowing includes ability to close lips, manipulate food with tongue, age-appropriate chewing pattern, and safe swallowing. Other areas that can be addressed include oral desensitization to different tastes, textures, smells, temperatures, and consistencies of foods.

Social skills/play skills includes appropriate social language, the ability to read facial expressions, the ability to understand social cues/body language, and age-appropriate play skills such as sharing, taking turns, and playing independently or with others.

Pragmatics is the use of language in social context.

Cognition refers to the mental process of knowing, including aspects such as awareness, perception, reasoning, and judgment. (Source: dictionary.com)

Alternative or augmentative communication (AAC) refers to the use of any device, technique, symbol system, or combination thereof to supplement, enhance, or increase a person's communication abilities.

Sign language refers to use of signs alone or paired with speech.

Picture Exchange Communication System (PECS) involves using picture symbols to communicate wants and needs, as well as to label items. The child goes through a learning process that teaches initiation of communication and then expands to the use of sentences. Many children who use PECS develop some verbal skills and may graduate to speech as the primary form of communication.

Communication boards can be made with pictures or objects that the child points to or removes from the board to communicate wants and needs.

Other communication devices include a wide range of devices designed to enable the user to create longer messages. These devices can also act as a universal remote, allowing the user to operate electronic devices in the environment such as the TV, lights, and so on. The speech-language therapist can assess the child's abilities to use high-tech devices and make recommendations about the type of device that is best suited for the child's individual needs.

Total communication refers to a communication system that pairs simultaneous production of speech with manual signs or another augmentative devices or symbol systems. The child is encouraged to use the words/phrases that he is capable of producing and supplementing communication with signs and symbols for those thoughts he cannot communicate verbally.

Enhanced Milieu Teaching (EMT) is a naturalistic teaching strategy that incorporates both the principles of incidental teaching (Hart & Risely, 1968) and systematic principles for responsive conversational style (Kaiser & Grim, 2006). EMT is used by caregivers and professionals to teach communication skills in the context of daily routines and activities. Adults arrange the environment with materials of interest to the child and follow the child's lead. EMT consists of a set of prompting techniques which support turn taking and the child's use of language. EMT is especially useful with individuals on the autism spectrum because it focuses on the development of functional communication skills in the context of typical social interaction and utilizes behavioral techniques that are effective in teaching new skills to students with autism (Kaiser & Grim, 2006).

Physical Therapy

Physical therapists (PT) are specialists in sensorimotor development, muscle and joint function, posture, balance and coordination, as well as gait and functional mobility. They are knowledgeable about orthotic and prosthetic devices and assistive technology. Physical therapists identify movement problems and determine what issues may be interfering with a child's ability to develop age-appropriate gross-motor skills.

Physical therapists help young children with autism learn to walk, run, jump, ride a tricycle, and catch a ball. They assist preschoolers and school-aged children in becoming safe in their environments, walking up and down stairs and climbing. They help children acquire the gross-motor skills necessary to play on the playground or participate in physical education classes with their peers.

Physical therapy may work closely with occupational therapy, sensory integration and/or speech therapy to help maximize the effects of each therapy.

Occupational Therapy

Occupational therapy (OT) is concerned with an individual's ability to participate in desired daily life tasks, or "occupations," that give life meaning. If a person's ability to perform life tasks is impacted by an illness, disease, and/or disability, occupational therapy can be important.

Performance areas include:

- Activities of daily living such as grooming, oral hygiene, toilet hygiene, dressing, feeding and eating, socialization, functional communication, and functional mobility
- Work and productive activities (educational and vocational activities) and home management such as meal preparation, shopping, or clothing care;
- Play or leisure activities (play or leisure exploration and play or leisure performance).

Following an evaluation of the child's functioning, OT intervention is focused on those areas that are interfering with the child's ability to function. Tasks that may be targeted include writing, improving hand-eye coordination, buttoning a shirt, tying one's shoes, getting dressed, and feeding oneself. OT intervention with persons with autism often includes a sensory-integrative approach which focuses on providing controlled sensory input during specific activities (see next section on Sensory Integration). School-based occupational therapy is focused on educationally relevant goals and is tied to curriculum standards. For school-based therapy to be effective, a consultative approach is necessary. Therapy may encompass the more traditional "pull-out", direct service approach. This approach is comprised of working with the student within the classroom, consulting with the parent, student and educational team to ensure that interventions and accommodations (in the home as well as in the classroom) are effective.

Areas addressed by occupational therapy may include the following:

- **Fine-motor control/written output** The OT may implement a fine-motor strengthening and coordination program, and recommend adaptations (i.e., use of pencil grips, specially lined paper, use of keyboard, extended time, shortened work load, use of note-taker or adapted software programs).
- **Visual-motor and visual-perceptual skills** Occupational therapists may also address the student's ability to control eye movements to smoothly shift visual focus, track objects across midline, and perform the visual motor control needed to read and write text . Accommodations may include slant boards, copy of all work on chalkboard available at desk, paper window guided work, and colored transparencies.
- **Postural stability and control** Occupational therapists may address difficulties students may have in maintaining efficient seating postures. Recommendations may include dynamic seating using a partially inflated beach ball or camping pillow or a Move n' Sit Cushion.

Sensory Processing

A. Jean Ayres, Ph.D., an occupational therapist, first researched and described the theories and frame of reference that we now call sensory integration. Briefly, sensory integration is a process used by the brain to locate, sort, and make sense out of incoming sensory information. This process is important to the successful accomplishment of life tasks.

Ayres described sensory integrative dysfunction as a sort of "traffic jam" in the brain. Some bits of sensory information get "tied up in traffic" and certain parts of the brain do not get the sensory information they need to do their jobs. Children who have ASD may experience this.

For example, a child may scream when wearing certain clothing because her sensory system is hypersensitive to the sense of touch. This same child may crave bear hugs (deep touch) because her proprioceptive system is hyposensitive. (See "Proprioception" below.) These hypersensitive and hyposensitive sensations impact the child's independent functioning in many facets of life, including peer interaction, attention at school, and activities of daily living at home.

Proprioception (sensation from joints, muscles and tissues that lead to body awareness) is obtained by lifting, pushing and pulling heavy objects as well as by engaging in activities that compress (push together) or distract (pull apart) the joints. It is the sense that allows a person to guide his arm or leg movements without having to observe the movement to make sure it is happening.

Vestibular (the sense of movement, centered in the inner ear) is obtained by spinning and swinging and, to a lesser extent, any type of body movement or change in head position. It coordinates the movement of one's eyes, head, and body and tells the body where it is in space. The vestibular sense is central in maintaining muscle tone, coordinating two sides of the body, and holding the head upright against gravity.

Tactile (sense of touch) is obtained by providing a variety of input from textures, temperature, and pressure.

Auditory (what we hear and closely connected with the vestibular sense) is obtained by listening to various types of music or natural sounds. Some auditory input can have an organizing and calming effect. Music containing 60 beats per minute can be particularly organizing, whereas irregular beats and contrasts in volume may be energizing.

Visual (what we see), can be used to calm or alert the system. Care must be taken that the child's environment is not too visually stimulating or distracting.

Olfactory (smell) input can stimulate, calm, or send a child into sensory overload.

Taste, obtained by the use of sweet, salty, crunchy, or chewy foods, can help calm, alert, or organize the system.

Sensory Diet Once the child's sensory processing abilities and needs have been evaluated, the therapist may work with the educational team as well as the family to develop a *sensory diet*, a term coined by Patricia Wilbarger, OT. The sensory diet is a carefully designed personalized activity schedule that provides the sensory input a person's nervous system needs to stay focused and organized throughout the day. Because sensory needs vary from individual to individual and from day to day, careful monitoring and collaboration is crucial. Components of a sensory diet might include brushing, swinging, heavy work (lifting, carrying), swimming, wearing weighted vests, wrist or ankle weights, wearing earphones, tactile play, trampoline jumping, chewing hard or crunchy objects, among many others. Occupational therapists may also elect to use a system of tactile and proprioceptive input called the Wilbarger Protocol. This is a system using a soft bristle brush to provide carefully controlled sensory input, always followed by a deep pressure/joint compression system. While this protocol has been anecdotally reported to be effective in regulating sensory processing for some individuals, if done incorrectly, it can have harmful or dangerous results. Therefore, this procedure should only be used by trained personnel, and under the supervision of a trained occupational therapist.

Recreational Therapies

Recreational therapy is a general term used to describe the practice of using leisure activities as therapeutic interventions. Such therapies provide opportunities for supporting and enhancing communication and social and motor activities, and may include, but are not limited to, the following.

Additional research is needed to determine the efficacy of recreational therapies

Aquatic Therapy refers to the use of water and specifically designed activities to help restore, maintain, and increase function. Aquatic/swimming therapy focuses on therapeutic play activities that improve range of motion and increase balance, endurance, and body awareness. Swimming provides movement that can help enhance motor planning. Water pressure can be soothing and calming for individuals with ASD.

Art Therapy is an established profession that uses the creative process of art to improve and enhance the physical, mental, and emotional well-being of individuals of all ages. It can increase fine-motor, visual motor, visual perception skills, organization, planning, and artistic expression.

Music Therapy is the prescribed use of music and musical interventions to work toward specific therapeutic goals and objectives. Goal areas include communication, academic, motor, emotional, and social skills. Music therapy can also have a positive effect on self-esteem and reduce anxiety while developing appropriate expression of emotions. Music is a nonverbal form of communication. It is a natural reinforcer – it is immediate in time and provides motivation for practicing nonmusical skills. Parallel music activities are designed to support the objectives of the child as observed by the therapist or as indicated by a parent, teacher, or other professional. A music therapist might observe the child's need to socially interact with others. Musical games like passing a ball back and forth to music or playing sticks and cymbals with another person might be used to foster such interaction. Eye contact might be encouraged with imitating clapping games near the eyes. Preferred music may be used contingently for a wide variety of cooperative social behaviors like staying in a chair or remaining with a group of children in a circle.

Therapeutic Horseback Riding Hippotherapy, or therapeutic horseback riding, uses horses as a source of treatment to improve balance, posture, and mobility. It can also improve the cognitive, behavioral, and communication functions of individuals of all ages. Riding enables an individual to participate in an enjoyable activity while increasing attention span, independence, and self-esteem. While learning from the horse, riders often bond with the horse as well as the other riders, thus providing a good foundation on which to build relationships with others.

Other possibilities for recreational therapies include tumbling/dance, camping, 4H, animal therapy, peer playgroups, community sports activities, swimming/aquatics, yoga, martial arts, and tae kwon do.

When deciding on recreational therapies, the child's needs and interests must be considered

Biomedical Interventions

Policy Statement from the* AMERICAN ACADEMY OF PEDIATRICS: *Counseling Families Who Choose Complementary and Alternative Medicine for Their Child with Chronic Illness or Disability

Committee on Children with Disabilities

PEDIATRICS VOL. 107 NO. 3 MARCH 2001, PP. 598-601

A statement of reaffirmation for this policy was published on May 1, 2005.

The use of complementary and alternative medicine (CAM) to treat chronic illness or disability is increasing in the United States. This is especially evident among children with autism and related disorders. It may be challenging to the practicing pediatrician to distinguish among accepted biomedical treatments, unproven therapies, and alternative therapies. Moreover, there are no published guidelines regarding the use of CAM in the care of children with chronic illness or disability. To best serve the interests of children, it is important to maintain a scientific perspective, to provide balanced advice about therapeutic options, to guard against bias, and to establish and maintain a trusting relationship with families.

Medications

A variety of medications have been prescribed for individuals with ASD, and several have been researched. However, no one medication works for every person with ASD. Hyperactivity, sleep problems, obsessive tendencies, anxiety, aggression, and self-injury are some of the symptoms that may be targeted with specific medications. When medication is being discussed or prescribed, it is important to ask:

- What is the safety of its use in children with autism?
- What is the appropriate dosage?
- How is it administered (pills, liquid)?
- What are the long-term consequences?
- Are there possible side effects?
- How will my child be monitored and by whom?
- What laboratory tests are required before starting the drug and during treatment?
- Are there possible interactions with other drugs, vitamins, or foods?

Given the complexity of medications, drug interactions, and the unpredictability of how each patient may react to a particular drug, parents should seek out and work with a medical doctor with expertise in the area of medication management. Medications should be given on a trial basis with close monitoring of positive and negative effects. Since there are few objective measures of a person's response to a medication,

reliance on subjective information (parent, teacher, and caregiver reports) is common. This is particularly important for children with ASD, who have difficulty understanding and expressing feedback from their bodies and their emotions. The observations of parents and caregivers should be systematically collected by logs, charts, scales, or other accepted behavioral documentation. Occasionally, a trial of medication tapering and discontinuation is a way to determine its efficacy and/or whether it is still needed. Like any medical treatments, medications should be reviewed at every follow-up visit.

Nutritional and Dietary Interventions

Individuals with autism may exhibit low tolerance or allergies to certain foods or chemicals. While not a specific cause of autism, food intolerances or allergies may contribute to behavioral issues. Nutritional therapies may be used for a variety of reasons. Some parents and professionals have reported changes when specific substances are eliminated from the child's diet.

Parents wishing to pursue dietary interventions should consult a gastroenterologist or nutritionist who can help ensure proper nutrition. Be sure to consult with a doctor, nutritionist, or dietician before beginning any dietary or nutritional supplement interventions

The Gluten-Free/Casein-Free Diet (GFCF) According to theory, some individuals are unable to completely digest the protein in cereals (gluten) or in dairy products (casein). The molecular structure of the partially undigested proteins, known as peptides, resembles opiates. Such peptides are thought to have an effect much like opiates on the brain and nervous system. From this premise it follows that long-term exposure to these peptides can have damaging effects on the developing brain and can also affect behavior, just as any narcotic would.
Beginning a GFCF diet can be difficult but not impossible. Gluten is most commonly found in wheat, rye, and barley, and sometimes contaminates oats grown nearby or processed on the same equipment as gluten-containing cereals. Casein is found in dairy products. Wheat and dairy make up a large proportion of the Western diet. One of the biggest obstacles parents face is that children needing GFCF diets often crave these foods. In fact, parents often report withdrawal symptoms when gluten and casein are eliminated from their child's diet.

Although there are reports of immediate improvement, it may take as long as six months for gluten and one month for casein to clear out of the system. Advocates of the diet recommend trying it for at least a year as it can take that long for some children to show improvement. The diet affects changes in the body at a cellular level and promotes healing of the stomach and intestinal lining, both of which can take time. Calcium is very important in bone development and maintenance. Most people get their calcium from dairy sources. If your child is on a dairy- or casein-free diet, a calcium supplement may be necessary.

Specific Carbohydrate Diet (SCD) refers to a strict grain-free, lactose-free, and sucrose-free dietary regimen. Initially developed for individuals with celiac disease and other intestinal disorders, the diet may help individuals with ASD who experience gastrointestinal problems. The theory behind this diet is that carbohydrates, being forms of sugar, promote and fuel the growth of bacteria and yeast in the intestines, causing an imbalance of and eventual overgrowth of bacteria and yeast. Bacterial overgrowth can prevent the digestion and absorption of carbohydrates. This causes the carbohydrates to remain undigested in the intestines, providing even more fuel for bacteria and yeast. Toxins and acids can be formed by the bacteria and yeast and injure the small intestine lining. Excessive mucus may be produced as a defense mechanism against the irritation caused by toxins, acids, and undigested carbohydrates.

Anti-Yeast Diet This diet was developed to address the overproduction of or allergies to Candida albicans, a single-celled yeast that is impossible to keep out of the body. Normally, it does no harm, because it is kept in check by beneficial bacteria, but if there is an imbalance in the beneficial bacteria, Candida can grow uncontrolled, releasing extremely acidic toxins into the bloodstream. These chemicals slow the brain down so that it no longer works correctly. The chemicals should be cleared by the liver so that they never reach the brain. However, in some, they are apparently not cleared, causing problems. The anti-yeast diet consists of removing fermented foods from the diet. T he worst offenders are alcoholic beverages and non-alcoholic beer, vinegar, barley malt, chocolate, pickles, soy sauce, and aged cheese. Some believe that individuals with ASD are likely to have an allergy to or overproduce Candida albicans.

Supplements Over the past 10 years or more, claims have been made that vitamin and mineral supplements may improve the symptoms of autism in a natural way. If you are considering adding vitamins or minerals to your child's diet, a laboratory and clinical assessment of her nutritional status is highly recommended. The most accurate method for measuring vitamin and mineral levels is a blood test. It is also important to work with someone knowledgeable about nutritional therapy. While large doses of some vitamins and minerals may not be harmful, others can be toxic. Once supplements are chosen, they should be phased in slowly (over several weeks), and the effects should be observed for one to two months. The reported benefits of supplements range from behavioral changes, to improved language. Supplements can include the following:

- **B6 and Magnesium**
  B6, often combined with magnesium, is reported to help improve language, eye contact, brain electrical activity, behaviors, and immune system function. Magnesium is needed with high doses of B6 because, when taken alone, B6 may cause a deficiency in magnesium and other B vitamins. Also, magnesium may decrease some possible side effects, such as irritability, bed-wetting, and sensitivity to sound.

- **Vitamin B12**
  Vitamin B12 deficiency is characterized by the inability to absorb food. Vitamin B12 is essential for metabolism of fats and carbohydrates and the synthesis of proteins. Vitamin B12 is involved in the manufacture of the myelin sheath, a fatty layer that insulates nerves in the brain.

- **DMG/TMG**
  Dimethylglycine (commonly known as DMG) is classified as a food substance rather than a vitamin. It is found in very small amounts in brown rice and liver. Parents have reported positive results with a similar product, tri-methyl-glycine (TMG). TMG breaks down into DMG and SAMe in the body. SAMe is a nutritional supplement and is sometimes used to treat mood disorders such as depression. There are, as yet, no published reports on the efficacy of DMG or TMG for individuals with ASD.

- **Melatonin**
  Melatonin is a hormone made by a part of the brain called the pineal gland. Melatonin may help our bodies know when it is time to go to sleep and when it is time to wake up. Melatonin supplements come in two pill forms, natural and synthetic (man-made). Natural melatonin is made from the pineal gland of animals. Children with ASD often have sleep disturbances, which suggests that there may be some problem associated with the body's production and use of melatonin. Children receiving melatonin regularly exhibit benefits that cannot be explained in simple terms, like better sleep. It may be a combination of better sleep and better control of biological rhythms. Especially in children, melatonin should be given only under the supervision of the regular physician.

- **Vitamin A**
  For years, high doses of this vitamin have been used successfully to treat the measles virus. Using cod liver oil, Megson (2004) began vitamin A therapy with some of her patients and observed some positive results. Some patients spoke more frequently and clearly; others made gains in eye contact. Megson has reported that vitamin A in the natural form, such as cod liver oil, helps to rebuild areas in the brain, called receptors which are dramatically affected by ASD. The natural form of vitamin A is claimed to also improve cell growth, repair of epithelial cells found in the gut wall, immune system function, and gene expression and transcription. Consult your doctor if you are considering a Vitamin A supplement as too much vitamin A or D, which is also found in cod liver oil, can be toxic.

- **Vitamin C**
  The benefits of vitamin C are widely known in the general public, and it may be of help for children with autism as well. Vitamin C is an antioxidant that helps the brain utilize oxygen. Without this vitamin, confusion and depression can develop. Vitamin C can also help support the immune system, aid in detoxification, and fight viruses and bacteria. Vitamin C is nontoxic, even in high doses.

- **Folic Acid**
  Folic acid is a nontoxic B vitamin, and a nutrient essential to the brain's health. It has been reported as helpful in treating autism. It is widely recommended that pregnant women take extra folic acid during their pregnancy to help prevent some birth defects. It is most effective when taken with vitamins B12 and C. Other supplements can include essential fatty acids, zinc, probiotics, and cod liver oil, but should be carefully researched and taken only under the supervision of a physician.

Defeat Autism Now! Protocol (DAN)

The Defeat Autism Now!, or DAN, protocol is a guide for clinical assessment of individuals with autism developed by participants in the DAN conferences organized originally by the Autism Research Institute. ARI is the Autism Research Institute, a non-profit organization, founded in 1967 by Dr. Bernard Rimland. ARI is focused on conducting research and providing information on ASD to both parents and professionals. Some practitioners who know the DAN! protocol regularly use the medical tests to assess a child's health. There are also practitioners who will be willing to read the DAN! protocol and implement it. The basic premise of the DAN! protocol is that heavy metal toxicity in the form of thimerosal in vaccines, amalgams, or some other source, is the cause of the symptoms of autism. Most also recommend the use of the GFCF diet.