

Running Head: AUTISM INTERVENTIONS

Autism and Early Intensive Behavioral Interventions

Will Backner

University of Utah

Training School Psychologists to be Experts in Evidence Based Practices for Tertiary Students

with Serious Emotional Disturbance/Behavior Disorders

US Office of Education 84.325K

H325K080308

May 1, 2010

Abstract

Autism is characterized by severe impairment in reciprocal social interaction skills and communication skills and by the presence of stereotyped behavior, interests, and activities. It is a spectrum disorder so presentation is variable based on severity of symptoms. Autism awareness is increasing in the general public and with it there has been an increase in unproven treatments. Often these treatments are expensive and time consuming so it is essential that efforts be focused on treatments that have been researched and validated. This article discusses the diagnostic criteria, characteristics, prevalence, and evidence for behavioral interventions for autism.

Autism

Introduction

Autism is a low incidence disability affecting verbal and nonverbal communication and social interaction, which is generally evident before age 3 (Shriver, Allen, & Mathews, 1999). There is currently no cure but autism can be managed with a combination of behavioral, educational, and biological interventions (Gresham, Beebe-Frankenberger, & MacMillan, 1999). The goal of comprehensive treatments is to change the course of autism and reduce the level of the long-term disability associated with the disorder. Families are increasingly seeking out comprehensive programs to treat autism so they need information on the empirical basis of treatments in order to make informed decisions. There are many new ideas about potential cures and treatments for autism, and the majority do not have a well-established empirical basis (Rogers, 1998). Literature on autism has increased recently but it is a mix of science and unproven theories. Many of these reports are being made available through popular magazines, television shows, and the Internet. With so many choices available, it is difficult for parents to choose which interventions are proven and worth their time and money. An early start to intervention and individualization of services has been identified in many reports as key to successful interventions (Iovannone, Dunlap, Huber, & Kincaid, 2003). Additionally, a benign but ineffective treatment can be harmful if it takes the place of an effective treatment that could have been used (Gresham et al., 1999; Rogers, 1998). Some treatments such as Holding Therapy, Gentle Teaching, Options, Floor Time, and Sensory Integration lack scientific validation, a sound theoretical orientation, or have been shown to lack efficacy (Heflin & Simpson, 1998). Even empirically sound treatments such as Applied Behavior Analysis (ABA) are controversial

because of claims of autism recovery (Heflin & Simpson, 1998). Each person with autism is a unique individual so we need to beware of programs that ignore this (Freeman, 1997).

Effectively assessing autism requires that professionals are knowledgeable about the characteristics of autism (Shriver et al., 1999). Additionally, professionals need to be knowledgeable about the effectiveness of interventions in order to help parents distinguish between validated and unvalidated treatments (Rogers, 1998).

Definition and Classification

Autism is a biologically based neurodevelopmental disorder that is a lifelong impairment for most individuals (Erba, 2000; Freeman, 1997). It occurs in all parts of the world and in all types of families. No social or psychological characteristics have been found to be associated with autism (Freeman, 1997). There is no biological marker for autism that has currently been identified (Bryson & Smith, 1998). Therefore, it is a behavioral syndrome that is diagnosed by its symptoms (Shriver et al., 1999). Its cause is unknown but aspects of autism are heritable. It is known that it involves multiple genes and has a large phenotypic variation, which may be influenced by environmental factors (Johnson, Myers, & Council on Children with Disabilities, 2007). In fact, siblings of children with autism are 20 to 50 times more at risk for developing autism (Volkmar, Chawarska, & Klin, 2005).

Autistic disorder is one of the five subtypes of pervasive developmental disorders listed in the *Diagnostic and Statistical Manual of Mental Disorders (DSM-IV)*. The other four subtypes are Rett's Disorder, Childhood Disintegrative Disorder, Asperger's Disorder, and Pervasive Developmental Disorder Not Otherwise Specified (PDD-NOS). According to the DSM-IV, all subtypes of pervasive developmental disorders are characterized by severe impairment in

reciprocal social interaction skills and communication skills and by the presence of stereotyped behavior, interests, and activities (American Psychiatric Association, 1994). In order to meet a diagnosis of autism, children have to show abnormal development before age 3, and delays or abnormal functioning in social development, language, and restricted patterns of behaviors, interests, or activities (Freeman, 1997).

Characteristics

The clinical presentation of autism is variable. It is a spectrum disorder with a continuum of symptoms that vary widely (Freeman, 1997). Behavioral manifestations of autism vary with the severity of autism and the degree of mental retardation and there is a difference in the expression and severity of symptoms between children (Bryson & Smith, 1998). Characteristics often associated with autism include repetitive activities, stereotypical movements, resistance to environmental change, and unusual response to sensory experience (Shriver et al., 1999). Other symptoms are a lack of mutual gazing, reciprocal smiling, or pointing to share interest with others (Bryson & Smith, 1998). Children with autism often show deficits in joint attention and social relatedness to others. They do not seek connectedness and are content to be alone. Often they have deficits in eye contact and ignore bids for attention. They may have difficulty sharing the emotional states of others and show deficits in theory of mind. Young children with autism may not follow a point or eye gaze. To indicate an object that they desire, they may take a parent by the hand and lead them to it instead of pointing at it. They may not respond to their name, in the absence of a hearing deficit. Children with autism also may have delayed pretend play skills and restricted interests or obsession with certain things such as trains or dinosaurs and they may know far more details than typical children (Barbarese, Katusic, & Voigt, 2006; Johnson, Myers,

& Council on Children with Disabilities, 2007).

Associated Medical and Psychiatric Conditions

It has been reported that 25-30% of people with autism have other medical conditions (Bryson & Smith, 1998). The most common condition is mental retardation, which has reported rates of 50 to 75% of cases (Bryson & Smith, 1998; Freeman, 1997). However, when all pervasive developmental disorders are considered, the majority of children with an autism spectrum disorder do not have mental retardation since the rates drop to 26 to 29% (Bryson & Smith, 1998; Johnson et al., 2007). Other medical conditions common in autism are seizure disorders as reported in 30% of the population, fragile X syndrome as reported in 2 to 5% of the population, and tuberous sclerosis as reported in 1 to 3% of the population (Tsai, 1996). The mean rate of epilepsy in autistic populations is 16.8% (Volkmar, Lord, Bailey, Schultz, & Klin, 2004). Other common medical conditions in persons with autism include blindness, deafness, and neurofibromatosis (Bryson, 1998). Motor incoordination and severe allergies also affect many people with autism (Freeman, 1997).

There are many reported psychiatric symptoms associated with autism. These include hyperactivity, poor attention, anxiety, compulsive behaviors, obsessions, compulsions, and sleep problems. Psychiatric conditions common in autism are unipolar and bipolar affective disorders, obsessive-compulsive disorder, schizophrenia, Tourette syndrome, and attention deficit hyperactivity disorder (Tsai, 1996). It is not clear if these behavioral and psychiatric symptoms are developmentally related to autism. Usually only the higher functioning autistic patients receive the additional DSM-IV diagnoses. Clinicians are generally reluctant to give additional diagnoses to lower functioning people with autism because they are not able to provide

diagnostic information about their symptoms through interview or self-report scales (Tsai, 1996).

Prevalence

No association between autism and social class has been found in epidemiological studies (Volkmar et al., 2004). However, it has been found that the condition is more common in males. The ratio of autism reported in males as compared to females is 3 to 5:1 (Bryson & Smith, 1998; Fombonne, 2005). In recent years, there has been a dramatic increase in the number of children identified with autism worldwide. In the first survey of autism prevalence in 1966, the rate was 4.5/10,000 (Croen, Grether, Hoogstrate, & Selvin, 2002). In recent studies, the rate has been stated to be as high as 6/1,000 (Johnson et al., 2007). Prevalence estimates for all pervasive developmental disorders is 27.5/10,000 but there is a large variance in prevalence found between studies (Fombonne, 2003; Williams, Higgins, & Brayne, 2006). Surveys of prevalence of pervasive developmental disorders indicate that current prevalence estimates for individual disorders are 13/10,000 for autistic disorder, 21/10,000 for PDD-NOS, and 2.6/10,000 for Aspergers (Fombonne, 2005).

There is a controversy about whether increase in the prevalence of autism is due to increase in the incidence of the condition (Bryson & Smith, 1998). The appearance of an increase in autism is likely due to changes in the concepts, definitions, service availability, and awareness of autism spectrum disorders to the general public and professionals (Barbares et al., 1998; Fombonne, 2005). Direct analysis of data from the Office of Special Education shows that autism is increasing in prevalence over time, with a higher prevalence in younger birth cohorts (Newschaffer, Falb, & Gurney, 2005). However, this increase in IDEA autism classification is likely due to school personnel taking advantage of using the category as time goes on

(Gernsbacher, Dawson, & Goldsmith, 2005). An increase of 17.6% per year in California is also likely due to more children accessing services rather than increased awareness (Croen et al., 2002; Fombonne, 2005). Within the same birth cohort, prevalence rises as age of cohort increases, which suggests that there is an increase in identification rather than an increase in prevalence. The current data does not support an increase in the incidence of autism, but the power to detect time trends is limited in the current data sets (Fombonne, 2005).

Assessment and Diagnosis

Early identification of autism is important because early intervention may be more effective for children with autism than for children with other developmental disabilities (Barbaresi et al., 2006). Additionally, early identification can provide access to appropriate interventions, which lead to better prognosis (Freeman, 1997). Even with the importance of early identification, autism is often not diagnosed until children are 3-4 years old (Werner, Dawson, Osterling, & Dinno, 2000). Early markers in autism are evident on video prior to when parents started to suspect problems (Barenek, 1999; Volkmar, 2005). Deficits in joint attention and social difficulties are strong predictors of autism in 2-year-olds. Current diagnostic techniques can diagnose it as early as 2 years old, and most diagnoses are stable from this age on (Rogers, 1999; Volkmar, 2005).

Recent advances in diagnostic techniques have been able to detect differences between typical infants and those with early onset autism at 8-10 months. Autistic infants were much less likely to orient when their name was called and less likely to look at another person while smiling (Werner et al., 2000). Retrospective analysis of home movies has shown that children later diagnosed with autism show less visual attention to social stimuli, smile less frequently,

vocalize less, engage less in object exploration, and are less likely to respond to their own name as infants. At ages 1 to 3, difficulties in the area of social development, unusual gaze, abnormal play, and lack of responsiveness to speech are able to distinguish children with autism (Volkmar et al., 2005). Examining home videotapes found that measures of social responsiveness and measures of sensory-motor functioning were found to discriminate between 9- to 12-month-olds with autism and those without. Things that discriminated autistic children from others were mouthing, orientation to visual stimuli, social touch aversions, posturing, number of name prompts, and affect rating. These findings indicate that measures of sensory motor functioning can be used to augment measure of social responsiveness (Barenek, 1999).

Deficits in joint attention differentiated infants with autism from those with mental retardation and typical infants. Deficits in nonverbal communication and language delays distinguished autism from other developmental disorders. These nonverbal delays can include stereotypic speech, echolalia, and scripted speech. Repetitive behaviors are characteristic of autism but do not differentiate it from other disorders (Barbaresi et al., 2006; Johnson et al., 2007). After 24 months of age, children with autism can be differentiated on several factors: (a) they smile in response to a smile, (b) they respond to their own name, (c) they follow pointing, (d) they look to read faces for information when cheated, (e) they join functional play with miniature toys with an adult, and (f) they initiate requesting nonverbal and verbal behavior (Trillingsgaard, Sørensen, Nemeč, & Jørgensen, 2005).

Standardized measures can also be used to diagnose autism. The DSM-IV criteria work well for diagnosing children over age 3, while the Autism Diagnostic Interview-R (ADI-R) works well for diagnosing children over age 4. The Child Autism Rating Scale (CARS) is less accurate for children under 2. The M-CHAT has good sensitivity and specificity for a screener

and can be use with young children. Some researchers believe that the best method of diagnosing infants and young children is an experienced clinician (Volkmar et al., 2005). However, Werner et al. (2000) found that pediatricians were able to correctly classify infants 78% of the time at 1 years old but did not perform better than chance at 8-10 months. This suggests that specific diagnostic probes are necessary for very early identification rather than clinical judgment alone.

Controversy Over Treatment

Even with the increase in new information about autism, there is still controversy about which is the best treatment (Heflin & Simpson, 1998). There are several comprehensive treatment programs for autism that show positive outcome. These programs report significant acceleration of developmental rates, significant IQ gains, significant language gains, improved social behavior, and reduced symptoms of autism after 1 to 2 years in an intensive preschool setting (Rogers, 1996). The term intensive has been defined as one to one instruction for 30-40 hours a week for at least 2 years (Weiss, 1999). Some programs even report children being mainstreamed into general education following treatment. Common comprehensive programs used by community providers are the Lovaas method, ABA, Floor Time, and Treatment and Education of Autistic and Related Communication Handicapped Children (TEACCH) (Stahmer, Collings, & Palinkas, 2005).

Iovannone et al. (2003) found that components of successful interventions are “1. individualized supports and services for students and families, 2. systematic instruction, 3. comprehensible and/or structured environments, 4. specialized curriculum content, 5. a functional approach to problem behaviors, and 6. family involvement” (p. 153). An additional criterion for program evaluation provided by Freeman (1997) is that the only treatment that has

passed the test of time and effectiveness is “structured educational programs geared to the person's developmental level of functioning” (p. 646). Freeman states that each person with autism is a unique individual so we need to beware of programs that ignore this. Outcome of these treatment programs can be measured by quality of life indicators such as the ability to live, work, learn, be mobile, and have fun in a natural setting (p. 646). Even with these tools to evaluate program effectiveness, we need more data before we can conclude that any one program is effective for all children (Freeman).

Variables Affecting Outcome

The goal of comprehensive treatments is to change the course of autism and reduce the level of the long-term disability associated with autism (Rogers, 1998). In a review of the literature, Rogers (1998) found that every study in the literature that has shown significant changes in children with autism was conducted with children under age 5. Also, children appear to benefit most when treatment is begun between ages 2 and 4 (Rogers, 1996). Harris and Handleman (2000) found that children who entered intervention younger were more likely to be in regular education at follow-up than children who were older. In fact, all children who entered the program when they were 48 months or older were in special education at follow-up. Children who were younger than 48 months when they entered treatment had the most favorable outcome. Additionally, children who entered the program younger had higher IQs when they left the program. A higher IQ at discharge meant that the child was more likely to be in regular education. Harris and Handleman also found that children who had higher IQs at intake were more likely to be in a regular education setting after treatment. In a retrospective study, Gabriels, Hill, Pierce, Rogers, & Wehner (2001) also found that developmental IQ was predictive of

functioning at follow-up. Rogers (2008) also identifies pretreatment IQ as a predictor of treatment outcome.

In addition to age and IQ, Szatmari, Bryson, Boyle, Streiner, and Duku (2003) found that early language and nonverbal skills were predictors of adaptive behavior in communication and socialization. The predictive ability of these factors is stable through preadolescence. Other predictive skills include joint attention skills, functional play skills, cognitive abilities, and severity of symptoms. Johnson et al. (2007) state that poorer outcome is associated with lack of joint attention by 4 years of age and lack of functional speech by 5 years. The amount of treatment a child receives has also been studied as a moderator of outcome (Rogers & Vismara, 2008). The studies Rogers and Vismara reviewed did not find a difference between more or less hours of treatment using the Lovaas method. Months of treatment duration was the only significant variable found. However, Rogers and Vismara point out that these type of treatment intensity studies assume that children only learn during therapy, which may not represent their true learning opportunity. Family factors also have been proposed as moderator variables. Gabriels et al., (2001) found that children in families that had higher financial strain had worse outcomes, and children of parents that had worse coping skills had worse outcome. Weiss (1999) proposed learning rate as a moderator of treatment outcome. It was found that children who initially had a low rate of skill acquisition continued to struggle to acquire skills later in treatment. These contradicting reports of moderator variables indicate that the field is still in the process of definitively determining which variables moderate and mediate treatment outcome and the degree of short and long-term improvements that can be expected (Rogers & Vismara).

Review of Comprehensive Treatment Programs

There are several reviews of comprehensive early interventions for children with autism (Campbell, 2007; Corsello, 2005; Gresham et al., 1999; Heflin & Simpson, 1998; Reichow & Wolery, 2009; Rogers, 1999, 1996; Rogers & Vismara, 2008). Many researchers state that ABA is the most effective treatment for autism and reviews generally support this claim (Barbaresi et al., 2006; Bryson, 1998; Volkmar et al., 2004; Volkmar et al., 2005). However, the process of determining which treatments are the most efficacious for autism is still in the early stages (Rogers, & Vismara).

Rogers and Vismara (2008) review 22 comprehensive treatments for autism published between 1998 and 2006. They used the classification criteria of Chambless et al. (1996) and Nathan and Gordon (2002) to determine if studies are “well-established” or “probably efficacious.” Of the studies they reviewed, five were randomly controlled trials. However, these studies had small sample sizes and examined different treatments. Rogers and Vismara express concern over the low number of Nathan and Gordon’s Type 1 studies (studies with random assignment to a comparison group, blind assessments, clear inclusion criteria, adequate sample sizes, and clearly described statistical methods). It is possible to determine from these studies that children with autism experience developmental gains in response to daily interventions. A lack of comparative studies means that the question of which comprehensive treatment for autism is best cannot yet be answered. Rogers and Vismara state that large and well-powered studies are badly needed to determine the comparative effects of different treatments for autism. They found that across all studies that they reviewed, language, communication, and IQ improved. This indicates that symptoms of autism can be changed in early childhood. Lovaas’s

discreet trial training intervention approach has been previously shown to be “probably efficacious.” Rogers and Vismara’s review shows that, with recent replications of this study, the Lovaas method can now be considered “well established.” Replications of Lovaas’s study show that recovery, IQ in normal range and placement in a typical classroom without supports, can happen in a significant subgroup of children if the intervention is intensive enough and started early enough. Another type of study Pivotal Response Training (PRT) was also found to be “probably efficacious.” PRT is a treatment approach that use principles from applied behavior analysis but uses naturalistic interactions instead of adult-directed mass trial procedures to develop child motivation and initiative (Rogers & Vismara). Two other studies of comprehensive treatments, one developmentally based and the other language based, met the criteria for “possibly efficacious.” Replication is needed to further validate their efficacy. Other comprehensive treatments may be as or more effective than these treatments but other treatment methods either lack any peer-reviewed published data or their studies lack strong designs and independent replication.

Rogers and Vismara (2008) also reviewed the literature on medication interventions for autism. They found studies demonstrated that selective serotonin reuptake inhibitors (SSRI) had some positive effect in adolescents and adults with autism. Stimulant medication has also shown some promise in reducing inattention and hyperactivity although there is concern about increased irritability and stereotypic movements due to the medication. Antipsychotics have previously been shown to reduce aggression, social withdrawal, hyperactivity, and sleep disturbances. However, there is concern about tardive or withdrawal dyskinesia in children with autism. A concern about giving medication to children with autism is that there can be large placebo effects. Additionally, children with autism seem to have a lower response rate to medication than

typically developing children with similar symptoms.

Corsello (2005) reviewed several comprehensive early intervention programs for autism. Young children, family involvement, and intensive hours are identified as common elements of treatment programs. The TEACCH program emphasizes environmental organization and visual supports. Its goal is to teach independence and developmental skills. A strength of the program is that it focuses on teaching skills for the lifespan and is a community-based intervention. Its weakness is a lack of empirical support. There are two studies comparing TEACCH with intervention provided by public education. Both studies showed more improvements on outcome measures for the children in the TEACCH program, but the sample sizes were small and the groups were not randomized. Corsello (2005) also reviewed ABA programs. It is important to note that the UCL YAP model, which used DTT and was developed by Lovaas, is only one type of behavioral intervention for autism. There are other interventions based on ABA, but Lovaas's method is the most widely known. Newer ABA methods such as embedded trials, pivotal response training, and incidental teaching have not been studied as extensively but show promise in teaching language and functional communication. The UCLA YAP model uses one on one intervention with trained ABA therapists. This program model typically consists of 2 years of intervention for 40 hours a week. It focuses on imitation, interaction, and response to basic requests for the first year of treatment. During the second year, it focuses on language, descriptions of emotions, and preacademic skills. Replications of the UCLA model have shown promising gains in outcome, but gains were not as dramatic as the 47% recovery (defined as an IQ in the normal range and completion of first grade in the regular education classroom) claimed in the original study. Another ABA program is the Douglas Developmental Center at Rutgers in New Jersey. This program uses levels and starts with one on one training, then moves to a small

classroom format, and then to a classroom with typical peers. They found that 22% of children had IQ changes from the mental retardation range to the average range. The LEAP program includes typical peers in the intervention. Each classroom includes 10 typical children and 6 children with autism. The program uses a structured classroom with incidental teaching and other ABA methods. Peer-mediated techniques are used to increase interactions. The LEAP program has been shown to be effective in increasing social interactions. Corsello (2005) also reviewed developmental interventions. She states that they have limited empirical support, but some studies have shown positive outcomes in language and symbolic play. A limitation to developmental approaches is that they require children to exhibit behaviors to which the adults can respond since they are child directed. The Greenspan model, also known as Floor Time, is a relationship-based model. Its goal is to help children develop interpersonal connections, which will lead to the mastery of cognitive and developmental skills. The Greenspan model is based on following the child's lead and closing the "circle of communication" (Corsello, 2005, p. 82). It includes spontaneous play interactions with the parent and semistructured skill building activities. The success of the intervention is very dependent on the skill of the parent. There are no controlled studies of this intervention although there is one chart review study that shows positive outcomes (Greenspan & Wieder, 1997). The final comprehensive program reviewed is the Denver Model. This intervention is delivered in a 12-month classroom setting. It focuses on positive affect, pragmatic communication, and interpersonal interactions. Intervention is conducted within a play situation that uses positive affect to increase a child's motivation and interest in activities. Additionally, reactive language activities are used to facilitate communication. Outcome data, based on 31 children, shows developmental improvements, but there are no other studies of this program presented in the review. Corsello (2005) states that

even though most empirical studies have been conducted on ABA programs, there is not currently evidence that any program is better than any other.

Heflin and Simpson (1998) divide treatments for autism into four categories: relationship-based interventions, skill-based treatments, physiologically oriented interventions, and comprehensive educational programs that use a combination of the other three types of treatments. Relationship-based interventions seek to facilitate affect, attachment, bonding, and a sense of relatedness. Holding Therapy is based on a belief that autism results from a broken bond between mother and child. When the child refuses to make eye contact, he is signaling that the bond is broken and he is not attached to the adult. In response to this, the caregiver must force body contact and physical attachment. The caregiver holds the child closely while speaking in a comforting manner. The child often struggles and becomes aggressive, but the caregiver must hold him until the child surrenders and looks into the caregiver's eyes. Advocates say once the child makes eye contact and cuddles normally then they will begin to develop normally. One study showed that 30% of patients had a change of social relatedness, and 13 children were cured of autism. This therapy is used in Europe but lacks social sanction in the United States. Gentle Teaching is another relationship-based approach. It is based on the premise that adults need to be unconditionally accepting of children with autism and interact with warmth and caring so a bond develops between them. Inappropriate behavior is ignored and redirected, and the relationship is established using errorless learning, prompting, task analysis, and choice making in activities. In one study, self-injurious behavior was eliminated in 73 adults, but it has not been replicated. Some researchers state that Gentle Teaching is ineffective or harmful for children with autism, and it has not been proven effective in developing relationships or bonding. An intervention system called Options was developed by a family of a child with autism. In this method, parents

spend every waking hour with their child to develop a bond with them. They enter the child's world by imitating his actions. Parents build on what motivates the child to establish interpersonal relationships. A few testimonials and case studies support this as a cure, but the foundation that teaches it says that the goal is to connect with the child, not teach them skills to live in society. There is also no empirical evidence for this intervention.

Heflin and Simpson (1998) also include Greenspan and Wieder's (1997) Floor Time approach in the relationship-based category. Floor Time seeks to reestablish a child's developmental sequence of communicating and relating to others. Emphasis is on helping a child around processing difficulties in order to establish affective contact with the caregiver. The program starts with gestures and interacting with the child. The parent is encouraged to join the child in their activities. "Circles of communication" are the main component. The parent or therapist uses the child's natural motivations to encourage them to interact. Floor Time does not try to teach specific skills, and only tries to develop a sense of pleasure in relating to others. The only evidence supporting Floor Time is testimonials and a chart review study (Greenspan & Wieder, 1997).

Heflin and Simpson's (1998) skill-based treatments include ABA and DTT. In DTT, individual analyses of child functioning are used to determine skills they need to improve their functioning. Then a one on one method follows where the therapist gives a child a cue to respond and then provides reinforcement for the desired behavior. Even though it is the most efficacious method, there is controversy because of the outcome claims of autism recovery, requests of parents and professionals to exclusively use ABA and DTT, the fact that it is recommended to be used 40 hours a week for several years, and requests for schools to provide one on one DTT from many parents. Another skill-based treatment is cognitive behavioral strategies. These strategies

are used more with high functioning children with autism. They are based on assumption that autistic persons would prefer to monitor and manage their own behavior. Some techniques used are modeling, self-verbalizations (scripts), behavioral contracts, social stories, and social scripts. They teach children to monitor their own behavior and give self-reinforcement or consequences, but cognitive behavioral strategies require that the child have the skills necessary to apply self-reinforcement and monitor behavior. There is less research about cognitive behavioral strategies than other behavioral methods, and there is a lack of information about elements that are necessary for successfully using these strategies with autistic children. Another skill-based approach is the Picture Exchange Communication System (PECS). PECS uses pictures and symbols to develop functional communication. It teaches children with autism to exchange a picture of an object for the real item. Behavioral techniques are used to implement it such as shaping, physical prompts, chaining, and fading. Heflin and Simpson state that PECS is an empirically sound method that is useful for developing communication in nonverbal children with autism.

Other skill-based treatments reviewed by Heflin and Simpson (1998) have less empirical validity. Social Stories is a method for teaching social skills to children with autism. Some children with autism respond positively to this method, but research is needed to validate it. Facilitated communication uses a person trained as a facilitator to assist the child with autism in communicating. Scientific verification has determined that in most instances, the facilitator is the person providing information. Facilitated communication lacks a sound theoretical backing and empirical support. Other skill-based treatments such as visual schedules and FastForWord are methods that have successfully been used with children with other disabilities to help with schedule choices and to teach children to read.

The physiological oriented treatments reviewed by Heflin and Simpson (1998) generally lack empirical support. Sensory integration is based on the theory that the behaviors of autism are due to the person attempting to establish an internal state of equilibrium. This theory explains behaviors of autism as an attempt to seek preferred stimuli and avoid other sensations. Heflin and Simpson say that the theory has a scientific foundation but lacks scientific validation. Auditory integration training is supposed to reduce sound sensitivity and improve behavior, social, and cognitive functioning. The premise of treatment is that children with autism have a sensory dysfunction, which is a hypersensitivity to certain frequencies. Behaviors of children with autism are explained as negative reactions to painful stimuli. Therapy involves the child listening to sounds and music with certain frequencies filtered out. Scientific evidence consists of anecdotal evidence and a few published reports. One study cited by Heflin and Simpson found that auditory integration training had no effect on autistic symptoms. Other physiologically oriented treatments such as Rhythmic Entrainment Interventions, Irlen Lenses, and Vision Therapy purport to use hearing- or vision-based methods to reduce symptoms of autism. Heflin and Simpson found that none of these therapies had scientific validation, and they were unable to recommend their use.

Heflin and Simpson (1998) also group medication treatments with physiologically oriented treatments. They state that medication interventions are an important part of a treatment for autism. Medications can reduce many symptoms of children with autism. However, they state that drugs are not a cure for autism and they should only be used to support other treatments. Megavitamin therapy is a proposed treatment for autism. Large doses of vitamins supposedly improve behavior and cognition in autism, but scientific evidence for these claims is lacking.

The final category of interventions reviewed by Heflin and Simpson (1998) was

comprehensive educational interventions. Some of these programs are specific preschools or are limited in use such as the Baudhuin Preschool, Eden Program, Giant Steps, and the Higashi School. These programs incorporate components of skill-based, relationship-based, and physiologically oriented approaches. Some of these programs have positive results, but empirically sound studies are needed. One of the best known comprehensive educational approaches is TEACCH. TEACCH focuses on improving adaptive functioning of the individual while modifying the environment to accommodate the unique characteristics of the child with autism. The individual components of structured teaching have been validated through research and international survey research supports the TEACCH program.

A final review of comprehensive programs for autism was conducted by Gresham et al. (1999). They state that there is no cure but autism can be managed with a combination of behavioral, educational, and biological interventions. They evaluate the quality of evidence for the UCLA YAP, TEACCH, the LEAP Program, and ABA programs. A commonality of all programs is that they all report large developmental gains, less restrictive school placements, and large increases in IQ. Also, all studies report about half of the children being placed in regular education classrooms after treatment. Another common element across studies was curriculum that emphasized ability to selectively attend to stimuli, imitative ability, receptive and expressive language ability, appropriate toy play, and social interaction skills. At the time of this review there were no true experimental design studies of any of these interventions and, thus, the authors concluded that there is no scientifically validated treatment for autism. Since all treatment programs that they reviewed demonstrated similar IQ gains, Gresham et al. (1999) conclude that no program is more efficacious than another, and there is no basis for recommending which program is effective for different children with autism.

Reviews of the literature support the claim that comprehensive interventions based on ABA are the most well researched interventions (Barbaresi et al., 2006; Bryson, 1998; Campbell, 2007; Corsello, 2005; Heflin & Simpson, 1998; Reichow & Wolery, 2009; Rogers & Vismara, 2008; Volkmar, Chawarska, & Klin, 2005; Volkmar, Lord, Bailey, Schultz, & Klin, 2004). Rogers and Vismara even state that Lovaas's DTT program meets the criteria of "well established" and the behaviorally based PRT meets the criteria of "probably efficacious." Even though there is this large body of research supporting behavioral interventions for autism, previous reviews of the research express uncertainty about which intervention is most efficacious (Gresham et al., 1999), and there is no current research directly comparing different interventions (Rogers & Vismara, 2008). Additionally, other types of interventions, such as TEACCH and developmental, have reported positive results (Gresham et al., 1999; Heflin & Simpson, 1998). Even though those studies have methodological flaws, they still have to be considered. Therefore, we do not know which intervention is best for young children with autism. Future research should use well-controlled studies to compare different intervention models.

Programs in Use

The scientific literature may endorse one treatment for autism over another, but that does not necessarily mean that parents and community providers follow these recommendations. In a study of interventions used by parents, Hume, Bellini, and Pratt (2000) found that children were most likely to receive intervention services in a preschool setting (73.8%), followed by home programs (16.4%). The interventions parents reported using most were speech therapy (89.2%), followed by occupational therapy (83.1%), classroom aides (46.7%), consultation from

specialists (45.1%), augmentative communication (43.1%), sensory integration (40.0%), summer services (40.0%), behavior supports (30.8%), physical therapy (29.7%), medical treatment (27.7%), and discrete trial training (26.2%). Many parents report using multiple treatments for their children with autism. Parents using discrete trial training used intervention for the most hours per week (16.2 hours), followed by those using a classroom aide (15.4 hours). The mean number of hours of intervention was 25.5 hours a week. The majority of parents felt the intervention they used was effective and that their participation was encouraged. This report suggests that even though behavioral interventions have been shown to be efficacious, parents are still relying on relatively unproven methods.

Stahmer et al. (2005) surveyed community providers to find out which methods to treat autism were currently in use. They found six intervention types that were commonly used in more than one community setting. These types were ABA, Floor Time, occupational therapy (OT), picture exchange communication system (PECS), sign language, and Social Stories. Other commonly used interventions were DTT, music therapy, PRT, and TEACCH. PECS was the most widely used intervention system among community providers. Community providers tended to say that any intervention they were using was evidence based. They felt if they had attended a lecture or workshop on a method, then there was sufficient evidence to support it. However, of the interventions they reported using, only ABA, DTT, PECS, and PRT have a relatively strong evidence base. Floor Time, TEACCH, and sign language only have case reports and record review evidence contributing to improvements in children who have autism. OT, music therapy, and Social Stories lack a research-based evidence of success. Community providers stated they desired to use evidence-based methods but they did not check the research base for the programs that they used. Additionally, they highly modified and combined

techniques, which is a procedure that has not been studied in the literature.

Even though the literature indicates that behaviorally based programs are efficacious, this information is not being translated to parents and community providers. Interventions that lack a research base are still taking the place of well-researched theories. It is important for research based practices to be translated into community programs, and pragmatic issues with using the techniques in classrooms need to be addressed (Stahmer et al., 2005). The general community needs to be informed about the relative effectiveness of early intervention programs so that an ineffective intervention does not take the place of an effective one.

Meta-Analyses of Early Interventions for Autism

Meta-analyses have been conducted that investigated various aspects of autism. They have shown that meta-analysis is an effective technique for assessing the effectiveness of interventions for autism. Miller (2006) conducted a meta-analysis of single-subject design literature to determine which interventions were effective for increasing reciprocal social interaction in persons with autism. She found that the social skills interventions targeting reciprocal social interactions were effective. However, peer mediated interventions were more efficacious than child-specific interventions. Bellini, Peters, Benner, and Hopf (2007) conducted a meta-analysis on single-subject research of school-based social skills programs for children with autism. They found that school-based social skills programs were minimally effective for children with autism. Effects did not generalize well, but gains were maintained after the intervention was withdrawn. The authors state that the minimal effectiveness may have been due to the low number of hours children in the studies spent in intervention.

Other meta-analyses have targeted areas other than social skills. Bellini and Akullian

(2007) examined the effectiveness of video modeling and video self-modeling as an intervention for children and adolescents with autism. They found that both methods were effective for targeting social-communication skills, functional skills, and behavioral functioning. Video modeling and video self-modeling helped children acquire skills and maintain them across time and settings. A meta-analysis conducted by Christiansen (2005) investigated the effectiveness of using behavioral treatments to reduce self-injurious behavior in children with autism. In this meta-analysis, behavioral interventions were found to be an effective treatment for self-injurious behavior. Positive, aversive, and combined behavioral methods were all found to be equally effective using one statistical method, but with a different method, aversive techniques had a larger effect size. Steffey (2006) conducted a meta-analysis to determine the effectiveness of treatments for self-stimulatory behavior of children and adolescents with autism. Results indicated that interventions for self-stimulatory behavior (including aversive, nonaversive, and communication) are effective. A meta-analysis completed by Goldy (2008) examined the effectiveness of functional communication interventions for children and young adults with autism. She found that total communication (pairing sign language with verbal communication) interventions were the most effective. Additionally, persons who initially scored higher on adaptive measures benefitted most from functional communication interventions.

All of the above meta-analyses utilized single-subject design studies. They demonstrate that meta-analyses are a valid method for investigating the effectiveness of interventions for treating various symptoms of autism. The above meta-analyses also show that behavioral methods are effective in treating symptoms of autism. In addition to analyzing single-subject design studies, several meta-analyses have reviewed the literature to determine the effectiveness of behavioral interventions using between- and within-group designs.

A synthesis of the research on the University of California at Los Angeles Young Autism project (UCLA YAP) method of early behavioral intervention supported the claim that early behavioral interventions are an effective treatment for autism (Reichow & Wolery, 2009). As a part of their synthesis of the research, Reichow and Wolery conducted a meta-analysis of replications of the UCLA YAP. They found that in the studies that compared the UCLA YAP method to another method, little was known about the comparison studies and there was not uniformity across studies. Groups were not standardized, were poorly defined, and did not have measures of treatment fidelity. Therefore, even though effect sizes show that children receiving behavioral interventions made more gains than children receiving other interventions, the limitations of the treatment groups limits conclusions about the superiority of these behavioral interventions to other treatments. Other results of the meta-analysis show that postintervention performance was better than pre-intervention on multiple dimensions. The mean effect size across studies was 0.69, which suggests that behavioral interventions based on the UCLA YAP method are an effective method for increasing IQ in autism.

Cambell (2007) conducted a meta-analysis on the published literature on early behavioral interventions for autism to quantify the average outcome of children in these programs. He investigated effects on IQ, language, adaptive functioning, and autism symptoms. Additionally, potential moderator variables of IQ were examined. The meta-analysis found medium size effects on all outcome measures. Outcome was also correlated with pretreatment IQ. This study supports the conclusions in Reichow and Wolery (2009) that early behavioral interventions are an effective treatment for autism.

A recent meta-analysis was conducted by Eldevik et al. (2009) on early behavioral interventions for autism. They examined changes in full-scale intelligence and adaptive behavior.

Only nine studies were included since they had much stricter inclusion requirements than other meta-analyses on early behavioral interventions for autism. Only studies with comparison/control groups and a full-scale measure of intelligence were included. They also used a very precise definition of early intensive behavioral interventions and obtained data on individual children from the authors of each study that they included in the meta-analysis. Effect size was examined using Hedges g . The effect size for IQ change was $g = 1.10$, and for change in adaptive behavior, it was $g = 0.66$. These are large and medium effect sizes that provide additional evidence of the effectiveness of early intensive behavioral interventions for autism. However, due to its strict inclusion requirements, it excludes many of the studies conducted in this area.

A meta-analysis investigating the effectiveness of early comprehensive interventions in treating children with autism was conducted by Hourmanesh (2006) as a dissertation. Interventions based on the Lovaas method, ABA methods, and developmental interventions were included in the meta-analysis. The results of her meta-analysis show that all early comprehensive treatments were effective in improving the functioning of children with autism and have positive effects on cognitive skills ($ES = 0.64$), language skills ($ES = 0.61$), and adaptive skills ($ES = 0.68$). These effect sizes show moderate gains in all children after treatment. The relative effectiveness of individual treatment methods was also investigated. Hourmanesh found that ABA approaches produced greater gains in cognitive skills than the Lovaas method or developmental approaches. However, both ABA and the Lovaas method were effective in increasing language and adaptive skills. Developmental approaches were ineffective in increasing cognitive skills, but did have a positive effect on language development. Even though the developmental methods did not foster cognitive development, they were still included in the global effect sizes that summed up

treatment effectiveness.

Rogers and Vismara's (2008) review of interventions for autism found that the Lovaas method of intervention was the only one that met the criteria of "well-established," and Pivotal Response Training (PRT), another behavioral method, was found to be "probably efficacious." Reichow and Wolery's (2009) meta-analysis found that behavioral methods based on Lovaas' UCLA YAP significantly improved outcome of children with autism. These studies provide evidence for the effectiveness of behavioral interventions for autism.

REFERENCES

- American Psychiatric Association (2000). *Diagnostic and statistical manual of mental disorders* (4th ed. Text Revision). Washington, DC: Author.
- Anderson, S., Avery, D., DiPietro, E., Edwards, G., & Christian, W. (1987). Intensive home-based early intervention with autistic children. *Education and Treatment of Children, 10*(4), 352-366.
- Bangert-Drowns, R. (1986). Review of developments in meta-analytic method. *Psychological Bulletin, 99*, 388-399.
- Baranek, G. (1999). Autism during infancy: A retrospective video analysis of sensory-motor and social behaviors at 9-12 months of age. *Journal of Autism and Developmental Disorders, 29*, 213-224.
- Barbarese, W. J., Katusic, S. K., & Voigt, R. G. (2006). Autism: A review of the state of the science for pediatric primary health care clinicians. *Archives of Pediatrics and Adolescent Medicine, 160*, 1167-1175.
- Bellini, S., & Akullian, A. (2007). A meta-analysis of video modeling and video self-modeling for children and adolescents with autism spectrum disorders. *Exceptional Children, 73*, 264-287.
- Bellini, S., Peters, J., Benner, L., & Hopf, A. (2007). A meta-analysis of school-based social skills interventions for children with autism spectrum disorders. *Remedial and Special Education, 28* (3), 153-162.
- Bibby, P., Eikeseth, S., Martin, N., Mudford, O., & Reeves, D. (2002). Progress and outcomes for children with autism receiving parent-managed intensive interventions. *Research in Developmental Disabilities, 23*, 81-104.
- Birnbrauer J., & Leach D. (1993). The Murdoch Early Intervention Program after 2 years. *Behaviour Change, 10*(2), 63-74.
- Bryson, S. (1996). Brief report: Epidemiology of autism. *Journal of Autism and Developmental Disorders, 26*, 165-167.
- Bryson, S., & Smith, I. (1998). Epidemiology of autism: Prevalence, associated characteristics, and implications for research and service delivery. *Mental Retardation and Developmental Disabilities Research Reviews, 4*, 97-103.
- Campbell, J. (2007, May). *A preliminary quantitative review of ABA-based early intervention programs*. Poster presented at the 6th International Meeting for Autism Research, Seattle, WA.

- Cederlund, M., Hagberg, B., Billstedt, E., Gillberg, I., & Gillberg, C. (2008). Asperger syndrome and autism: A comparative longitudinal follow-up study more than 5 years after original diagnosis. *Journal of Autism Developmental Disorders, 38*, 72-85.
- Chambless, D. L., Sanderson, W. C., Shoham, V., Bennett Johnson, S., Pope, K. S., Crits-Christoph, P., et al. (1996). An update on empirically validated therapies. *The Clinical Psychologist, 49*, 5-18.
- Chasson, G., Harris, G., & Neely, W. (2007). Cost comparison of early intensive behavioral intervention and special education for children with autism. *Journal of Child and Family Studies, 16*, 401-413.
- Christiansen, E. (2005). *Effectiveness of behavioral treatments for the reduction of self-injury in autism: A meta-analysis*. Masters thesis, University of Utah, December 2005.
- Cohen, H., Amerine-Dickens, M., & Smith, T. (2006). Early intensive behavioral treatment: Replication of the UCLA model in a community setting. *Developmental and Behavioral Pediatrics, 27*(2), S145-S155.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Earlbaum Associates.
- Cook, T., & Leviton, L. (1980). Reviewing the literature: A comparison of traditional methods with meta-analysis. *Journal of Personality, 48*(4), 449-472.
- Corsello, C. (2005). Early intervention in autism. *Infants & Young Children, 18*, 74-85.
- Croen, L., Grether, J., Hoogstrate, J., & Selvin, S. (2002). The changing prevalence of autism in California. *Journal of Autism and Developmental Disorders, 32*, 207-215.
- Eikeseth, S., Smith, T., Jahr, E., & Eldevik, S. (2007). Outcome for children with autism who began intensive behavioral treatment between ages 4 and 7: A comparison controlled study. *Behavior Modification, 31*(3), 264-278.
- Eldevik, S., Hastings, P., Hughes, J., Jahr, E., Eikeseth, S., & Cross, S. (2009). Meta-analysis of early intensive behavioral intervention for children with autism. *Journal of Clinical Child & Adolescent Psychology, 38*(3), 439-450.
- Erba, H. (2000). Early intervention programs for children with autism: Conceptual frameworks for implementation. *American Journal of Orthopsychiatry, 70*, 82-94.
- Fombonne, E. (2003). Epidemiological surveys of autism and other pervasive developmental disorders: An update. *Journal of Autism and Developmental Disorders, 33*, 365-382.

- Fombonne, E. (2005). The changing epidemiology of autism. *Journal of Applied Research in Intellectual Disabilities, 18*, 281-294.
- Freeman, B. (1997). Guidelines for evaluating intervention programs for children with autism. *Journal of Autism and Developmental Disorders, 27*, 641-651.
- Gabriels, R., Hill, D., Pierce, R., Rogers, S., & Wehner, B. (2001). Predictors of treatment outcome in young children with autism: A retrospective study. *Autism, 5*, 407-429.
- Gernsbacher, M., Dawson, M., & Goldsmith, H. (2005). Three reasons not to believe in an autism epidemic. *Current Directions in Psychological Science, 14*, 55-58.
- Glass, G. (1976). Primary, secondary, and meta-analysis of research. *Educational Researcher, 5*(10), 3-8.
- Goldy, L. (2008). *Increasing functional communication skills in children with autism: A meta-analysis utilizing HLM*. Masters thesis, University of Utah, December 2008.
- Greenspan, S., & Wieder, S. (1997). Developmental patterns and outcomes in infants and children with disorders in relating and communicating: A chart review of 200 cases of children with autistic spectrum diagnoses. *The Journal of Developmental and Learning Disorders, 1*, 1-38.
- Gresham, F., Beebe-Frankenberger, M., & MacMillan, D. (1999). A selective review of treatments for autism: Description and methodological considerations. *School Psychology Review, 28*, 559-575.
- Hayward, D., Eikeseth, S., Gale, C., & Morgan, S. (In Press). Assessing progress during treatment for young children with autism receiving intensive behavioural interventions. *Autism, [In Press]*.
- Handleman, J., Harris, S., Celiberti, D., Lilleleht, E., & Tomchek, L. (1991). Developmental changes of preschool children with autism and normally developing peers. *Infant-Toddler Intervention, 1*(2), 137-143.
- Harris, S., & Handleman, J. (2000). Age and IQ at intake as predictors of placement for young children with autism: A four- to six-year follow-up. *Journal of Autism and Developmental Disorders, 30*, 137-142.
- Harris, S., Handleman, J., Gordon, R., Kristoff, B., & Fuentes, F. (1991). Changes in cognitive and language functioning of preschool children with autism. *Journal of Autism and Developmental Disorders, 21*(3), 281-290.
- Harris, S., Handleman, J., Kristoff, B., Bass, L., & Gordon, R. (1990). Changes in language development among autistic and peer children in segregated and integrated preschool setting. *Journal of Autism and Developmental Disorders, 20*(1), 23-31.

- Hedges, L. (1986). Issues in meta-analysis. *Review of Research in Education*, 13, 353-398.
- Hedges, L. (1992). Modeling publication selection effects in meta-analysis. *Statistical Science*, 7, 246-255.
- Hedges, L., & Olkin, I. (1985) *Statistical methods for meta-analysis*. Orlando, FL: Academic Press.
- Heflin, L., & Simpson, R. (1998). Interventions for children and youth with autism: Prudent choices in a world of exaggerated claims and empty promises. Part I: Intervention and treatment option review. *Focus on Autism and Other Developmental Disabilities*, 13, 194-211.
- Howard, J., Sparkman, C., Cohen, H., Green, G., & Stanislaw, H. (2005). A comparison of intensive behavior analytic and eclectic treatments for young children with autism. *Research in Developmental Disabilities*, 26, 359-383.
- Hourmanesh, N. (2006). *Early comprehensive interventions for children with autism: A Meta-analysis*. Doctoral dissertation, University of Utah, August 2006.
- Hume, K., Bellini, S., & Pratt, C. (2005). The usage and perceived outcomes of early intervention and early childhood programs for young children with autism spectrum disorder. *Topics in Early Childhood Special Education*, 25, 195-207.
- Iovannone, R., Dunlap, G., Huber, H., & Kincaid, D. (2003). Effective educational practices for students with autism spectrum disorders. *Focus on Autism and Other Developmental Disabilities*, 18, 150-165.
- Jenson, W.R., Clark, E., Kircher, J.C., & Kristjansson, S.D. (2007). Statistical reform: Evidence-based practice, meta-analyses, and single subject designs. *Psychology in the Schools*, 44(5), 483-493.
- Johnson, B. T. (1989). *DSTAT: Software for the meta-analytic review of the research literatures*. Hillsdale, NJ: Lawrence Erlbaum Associates.
- Johnson, C., Myers, S., & Council on Children with Disabilities (2007). Identification and evaluation of children with autism spectrum disorders. *Pediatrics*, 120, 1183-1215.
- Light, R., & Pillemer, D. (1984). *Summing up: The science of reviewing research*. Cambridge, MA: Harvard University Press.
- Lovaas, O. (1981). *Teaching developmentally disabled children. The "me" book*. Baltimore, MD: University Park Press.
- Lovaas, O. (1987). Behavioral treatment and normal educational and intellectual functioning in young autistic children. *Journal of Consulting and Clinical Psychology*, 55, 3-9.

- Luiselli, J., Cannon, B., Ellis, J., & Sisson, R. (2000). Home-based behavioral intervention for young children with autism/pervasive developmental disorder: A preliminary evaluation of outcome in relation to child age and intensity of service delivery. *Autism, 4*(4), 426-438.
- Magiati, I., Charman, T., & Howlin, P. (2007). A two-year prospective follow-up study of community-based early intensive behavioural intervention and specialist nursery provision for children with autism spectrum disorders. *Journal of Child Psychology and Psychiatry, 48*(8), 803-812.
- McConachie, H., & Diggle, T. (2007). Parent implemented early intervention for young children with autism spectrum disorder: A systematic review. *Journal of Evaluation in Clinical Practice, 13*, 120-129.
- Miller, L. (2006). *Interventions targeting reciprocal social interaction in children and young adults with autism spectrum disorders: A meta-analysis*. Doctoral dissertation, University of Utah, May 2006.
- Mullen, B., & Rosenthal, R. (1985). *BASIC meta-analysis: Procedures and programs*. Hillsdale, NJ; Lawrence Erlbaum Associates.
- Nathan, P., & Gorman, J. M. (2002). *A guide to treatments that work*. New York: Oxford University Press.
- Newschaffer, C., & Curran, L. (2003). Autism: An emerging public health problem. *Public Health Reports, 118*, 393-399.
- Newschaffer, C., Falb, M., & Gurney, J. (2005). National autism prevalence trends from United States special education data. *Pediatrics, 115*, 277-282.
- Orwin, R. (1983). A fail-safe N for effect size in meta-analysis. *Journal of Educational Statistics, 8*, 157-159.
- Ozonoff, S., & Cathcart, K. (1998). Effectiveness of a home program intervention for young children with autism. *Journal of Autism and Developmental Disorders, 28*, 25-32.
- Perry, A., Cummings, A., Geier, J., Freeman, N., Hughes, S., LaRose, L., Managhan, T., Reitzel, J., & Williams, J. (2008). Effectiveness of intensive behavioral intervention in a large, community-based program. *Research in Autism Spectrum Disorders, 2*, 621-642.
- Reed, P., Osborne, L., & Corness, M. (2007a). Brief report: Relative effectiveness of different home-based behavioral approaches to early teaching intervention. *Journal of Autism and Developmental Disorders, 37*, 1815-1821.

- Reed, P., Osborne, L., & Corness, M. (2007b). The real-world effectiveness of early teaching interventions for children with autism spectrum disorder. *Exceptional Children, 73*, 4, 1-18.
- Reichow, B., & Wolery, W. (2009). Comprehensive synthesis of early intensive behavioral interventions for young children with autism based on the UCLA young autism project model. *Journal of Autism and Developmental Disorders, 39*(1), 23-41.
- Remington, B., Hastings, R., Kovshoff, H., Espinosa, F., Jahr, E., Brown, T., Alsford, P., Lemaic, M., & Ward, N. (2007). Early intensive behavioral intervention: Outcomes for children with autism and their parents after two years. *American Journal on Mental Retardation, 112*(6), 418-438.
- Rogers, S. (1996). Brief report: Early intervention in autism. *Journal of Autism and Developmental Disorders, 26*, 243-246.
- Rogers, S. (1998). Empirically supported comprehensive treatments for young children with autism. *Journal of Clinical Child Psychology, 27*, 168-179.
- Rogers, S. (1999). Intervention for young children with autism: From research to practice. *Infants and Young Children, 12*, 1-16.
- Rogers, S., & Vismara, L. (2008). Evidence-based comprehensive treatments for early autism. *Journal of Clinical Child & Adolescent Psychology, 37*, 8-38.
- Rosenthal, R. (1979). The "file drawer problem" and tolerance for null results. *Psychological Bulletin, 86*, 638-641.
- Rosenthal, R., & Rubin, D. (1986). Meta-analytic procedures for combining studies with multiple effect sizes. *Psychological Bulletin, 99*, 400-406.
- Sallows, G., & Graupner, T. (2005). Intensive behavioral treatment for children with autism: Four-year outcome and predictors. *American Journal on Mental Retardation, 110*(6), 417-438.
- Sheinkopf, S., & Siegel, B. (1998). Home-based behavioral treatment of young children with autism. *Journal of Autism and Developmental Disorders, 28*, 15-23.
- Shriver, M., Allen, K., & Mathews, J. (1999). Effective assessment of the shared and unique characteristics of children with autism. *School Psychology Review, 28*, 538-558.
- Smith, T., Buch, G., & Gamby, T. (2000). Parent-directed, intensive early intervention for children with pervasive developmental disorder. *Research in Developmental Disabilities, 21*, 297-309.

- Smith, T., Eikeseth, S., Klevstrand, M., & Lovaas, O. (1997). Intensive behavioral treatment for preschoolers with severe mental retardation and pervasive developmental disorder. *American Journal on Mental Retardation, 102*(3), 238-249.
- Smith, T., Groen, A., & Wynn, J. (2000). Randomized trial of intensive early intervention for children with pervasive developmental disorder. *American Journal on Mental Retardation, 105*(4), 269-285.
- Smith, T., Klorman, R., & Mruzek, D. (2009, May). *Prediction of outcome after one year of early intensive behavioral intervention*. Poster session presented at the annual meeting of the International Meeting for Autism Research, Chicago, IL.
- Stahmer, A., Collings, N., & Palinkas, L. (2005). Early intervention practices for children with autism: Descriptions from community providers. *Focus on Autism and Other Developmental Disabilities, 20*, 66-79.
- Steffey, E. (2006). *Meta-analysis of single-subject research for self-stimulatory behavior reduction treatments in autism*. Masters thesis, University of Utah, May 2006.
- Strube, M., Gardner, W., & Hartman, D. (1985). Limitations, liabilities, and obstacles in reviews of the literature: The current status of meta-analysis. *Clinical Psychology Review, 5*, 63-78.
- Strube, M., & Hartman, D. (1983). Meta-analysis: Techniques, applications, and functions. *Journal of Consulting and Clinical Psychology, 51*, 14-27.
- Szatmari, P., Bryson, S., Boyle, M., Streiner, D., & Duku, E. (2003). Predictors of outcome among high functioning children with autism and Asperger syndrome. *Journal of Child Psychology and Psychiatry, 44*, 520-528.
- Trillingsgaard, A., Sørensen, E., Nemec, G., & Jørgensen, M. (2005). What distinguishes autism spectrum disorders from other developmental disorders before the age of four years? *European Child & Adolescent Psychiatry, 14*, 65-72.
- Tsai, L. (1996). Brief report: Comorbid psychiatric disorders of autistic disorder. *Journal of Autism and Developmental Disorders, 26*, 159-163.
- Volkmar, F., Lord, C., Bailey, A., Schultz, R., & Klin, A. (2004). Autism and pervasive developmental disorders. *Journal of Child Psychology and Psychiatry, 45*, 135-170.
- Volkmar, F., Chawarska, K., & Klin, A. (2005). Autism in infancy and early childhood. *Annual Review of Psychology, 56*, 315-336.
- Weiss, M. (1999). Differential rates of skill acquisition and outcomes of early intensive behavioral intervention for autism. *Behavioral Interventions, 14*, 3-22.

- Weisz, J., Southam-Gerow, M., Gordis, E., Connor-Smith, J., Chu, B., Langer, D., et al. (2009, June). Cognitive-behavioral therapy versus usual clinical care for youth depression: An initial test of transportability to community clinics and clinicians. *Journal of Consulting and Clinical Psychology, 77*(3), 383-396.
- Werner, E., Dawson, G., Osterling, J., & Dinno, N. (2000). Brief report: Recognition of autism spectrum disorder before one year of age: A retrospective study based on home videotapes. *Journal of Autism and Developmental Disorders, 30*, 157-162.
- White, K. (1982). The relation between socioeconomic status and academic achievement. *Psychological Bulletin, 91*, 461-481.
- Williams, J., Higgins, J., & Brayne, C. (2006). Systematic review of prevalence studies of autism spectrum disorders. *Archives of Disease in Childhood, 91*, 8-15.