
Behavioral Interventions to Promote Learning in Individuals with Autism

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INTRODUCTION

The application of behavioral techniques to autism, like the diagnosis itself, has a relatively short history. However the progress in the development and refinement of behavioral treatment has been swift and impressive. Prior to the mid 1960’s, psychodynamic therapy was standard in the treatment of children with autism, reflecting the now antiquated theory that the cause of autism was psychogenic. The monumental failure of the psychodynamic approach in the treatment of autism opened the door for the emerging field of applied behavior analysis. Applied behavior analysis grew out of the field of the experimental analysis of behavior, in which the general laws of learning derived from work with animal populations were applied to socially significant behaviors.

Behavioral procedures do not cure the disorder, but they have been shown to be extremely effective in substantially improving the lives of people with autism and those around them. The objectives of this chapter are: to describe current behavioral intervention techniques for the treatment of autism and to discuss recent trends and continued challenges for the future of this intervention model.

BEHAVIORAL INTERVENTION STRATEGIES

Current behavioral interventions can trace their roots to studies conducted in the early 1960’s. Prior to this time, it was commonly believed that children with autism could not learn. Ferster and DeMyer (1961; 1962) were among the first to demonstrate that children with autism could indeed learn and would do so if the systematic application of operant discrimination learning techniques was employed. They demonstrated that these children could learn new, albeit non-functional, behaviors under conditions where
correct answers were followed by contingent applications of reinforcement. Later, other behavioral researchers demonstrated the utility of the systematic application of reinforcement, prompting, fading, chaining, and other behavioral procedures (see Schreibman, 1988, for a review).

These early studies were mostly concerned with addressing isolated behaviors. Lovaas and his colleagues (e.g., Lovaas, 1977; Lovaas, Berberich, Perloff, & Schaeffer, 1966; Lovaas, Freitag, Gold, & Kassorla, 1965; Lovaas, Koegel, Simmons, & Long, 1973) were the first to develop a comprehensive, systematic package of behavioral interventions that addressed a wide range of behaviors in children with autism. Such interventions were associated with substantial decreases in inappropriate behaviors such as self-injury, self-stimulation, aggression, and tantrums as well as substantial increases in language, social, play, and academic skills. As the field of applied behavior analysis has evolved, so too have the intervention techniques designed for use with these children. Throughout this evolution, empirical validation and on-going monitoring of progress through systematic data collection have remained central.

Structured Behavioral Interventions

Comprehensive structured behavioral interventions, also known as discrete trial training, are widely used in early intervention programs for children with autism. These procedures, described by Lovaas (1987), are very similar to the original operant techniques described in the 1960’s. More recent elaborations have included increased focus on non-academic skills such as play and peer interaction, decreased use of aversives, and more varied delivery of reinforcement. Programs using this procedure share the following basic components: 1) the learning environment is highly structured;
2) target behaviors are broken down into a series of discrete sub-skills, and taught successively; 3) teaching episodes are initiated by the adult; 4) teaching materials are selected by the adult and rarely varied within a task; 5) the child’s production of the target response is explicitly prompted; 6) reinforcers, albeit functional, are usually unrelated to the target response; and 7) the child receives reinforcement only for correct responding or successive approximations (Delprato, 2001).

Discrete trial training has been credited with success in teaching children a variety of important behaviors (e.g., Baer, Peterson, & Sherman, 1967; Lovaas, Berberich, Perloff, & Schaeffer, 1966; Metz, 1965; Schroeder & Baer, 1972). In addition, this approach has been credited with impressive gains in children with otherwise poor prognoses (e.g., Lovaas, 1987) and in accelerated skill acquisition (Miranda-Linne & Melin, 1992). One oft cited study found that 47% of preschool-aged children with autism who had received intensive (40 hours per week) discrete trial intervention for two years achieved normal intellectual and educational functioning compared to 2% who received less intensive intervention (Lovaas, 1987). Although this study has been criticized for several methodological flaws (e.g., lack of random assignment, selecting only verbal subjects) (Mesibov, 1993), it demonstrates the tremendous benefit of structured behavioral techniques in the instruction of children with autism.

Despite these impressive findings, the highly structured behavioral approach has been criticized on a number of grounds. First, the adult-directed nature of the instruction and the fact that the target behavior is brought under tight stimulus control has been shown to compromise the spontaneous use of the behavior (Carr, 1981). Second, the highly structured teaching environment (Lovaas, 1977) and use of artificial reinforcers
Naturalistic Behavioral Interventions

Structured operant teaching techniques have been modified over the years to address some of the shortcomings noted above. The resulting behavioral interventions are more naturalistic and child-centered. The first naturalistic behavioral treatment was designed by Hart and Risley (1968) to teach the use of descriptive adjectives to disadvantaged preschoolers in a classroom setting. This study sought to increase generalization and spontaneous use of skills by teaching them in the context of ongoing classroom activities.

Since their original conception, naturalistic behavioral intervention techniques have undergone a variety of procedural elaborations, yielding a variety of similar intervention techniques, including incidental teaching (Hart & Risley, 1968; McGee, Krantz, Mason, & McClannahan, 1983), mand-model (Rogers-Warren & Warren, 1980), time delay (Halle, Marshall, & Spradlin, 1979), milieu teaching (Alpert & Kaiser, 1992), interrupted behavior chains (Hunt & Goetz, 1988), and the natural language paradigm/pivotal response training (PRT) (Koegel, O’Dell, & Koegel, 1987; Koegel, Schreibman, Good, Cerniglia, Murphy, & Koegel, 1989). Although the specific techniques were developed in different laboratories by researchers from different academic backgrounds, these approaches are similar in that they all share the following basic components: 1) the learning environment is loosely structured; 2) teaching occurs
within ongoing interactions between the child and the adult; 3) the child initiates the teaching episode by indicating interest in an item or activity; 4) teaching materials are selected by the child and varied often; 5) the child’s production of the target behavior is explicitly prompted; 6) a direct relationship exists between the child’s response and the reinforcer; 7) the child is reinforced for attempts to respond (Delprato, 2001; Kaiser, Yoder, & Keetz, 1992).

Despite their similarity, the techniques differ conceptually. Incidental teaching, mand-model, and time delay are all specific prompting procedures for increasing language that are implemented once the child has expressed interest in an item or activity (Miranda & Iacono, 1988). In the incidental teaching approach, the adult waits for the child to initiate a request for a desired item or activity. The adult then prompts an elaborated response. The mand-model approach was developed for children who do not readily initiate (Rogers-Warren & Warren, 1980). In this procedure, the adult waits for the child to indicate interest in an item and then places an instruction for a particular behavior. If the child does not respond, the adult models the correct response for the child to imitate. The time delay procedure was designed to transfer the child’s response from a verbal cue given by the adult to the environment (Halle et al., 1979). In this procedure, the adult waits for the child to indicate interest in an item and then approaches the child with an expectant look. If the child does not respond within 15 seconds, the adult uses a model or mand-model procedure. For all of these techniques, reinforcement is the delivery of the desired item or activity. Milieu teaching includes all three of these procedures as well as a direct model procedure in which the adult models language and
this child is expected to imitate the adult’s model to receive access to a desired item or activity (e.g., Kaiser, Ostrosky, & Alpert, 1993).

The interrupted behavior chain procedure uses naturally-occurring routines as the context for requesting items or assistance. This procedure is typically used with children who have very limited initiations and are minimally motivated to communicate (Hunt & Goetz, 1988). The child is allowed to begin an activity and then the adult prevents the child from completing the next step of the routine. The adult then uses mand-model or time delay to prompt the child to request the next step in the sequence. In this procedure, reinforcement is the ability to complete the next step in the behavior chain. This procedure differs from milieu teaching in that the instruction is presented after the child begins the activity rather than before (Miranda & Iacono, 1988).

PRT was designed based on a series of studies identifying important treatment components. It includes clear and appropriate prompts, child choice, turn-taking, maintenance tasks, reinforcing attempts, responding to multiple cues, and a direct response-reinforcer relationship. PRT does not define the specific types of prompts to use; however, implementation of the procedure usually involves the same prompting strategies as those used in milieu teaching and interrupted behavior chains. In contrast to the other procedures which have focused almost exclusively on increasing verbal and non-verbal communication, PRT has been adapted to teach a variety of skills including symbolic (Stahmer, 1995) and sociodramatic play (Thorpe, Stahmer, & Schreibman, 1995), and joint attention (Whalen & Schreibman, 2003).

Empirical studies comparing naturalistic to the more structured techniques have validated the position that naturalistic strategies lead to more generalized and
spontaneous use of skills (Charlop-Christy & Carpenter, 2000; Delprato, 2001; McGee, Krantz, & McClannahan, 1985; Miranda-Linne & Melin, 1992). In addition, studies have found that parents who have been trained to implement these techniques exhibit more positive affect while teaching their children (Schreibman et al., 1991) and both the parents and children exhibit more happiness and interest and less stress during family interactions (Koegel, Bimbela, & Schreibman, 1996) than families in which the parents have been trained to implement highly structured behavioral techniques. These findings suggest that the naturalistic approach is more enjoyable for parents and children and leads to a more positive family interaction style than the structured approach.

One question that has not yet been answered is whether intensive naturalistic interventions lead to similar or superior intellectual improvement as that which has been reported for intensive structured intervention (Lovaas, 1987). This comparison is difficult because intensive naturalistic intervention is typically conducted in classrooms, often inclusion-based, and targets functional behaviors (e.g., McGee, Daly, & Jacobs, 1994), whereas intensive structured intervention is typically conducted in the home and often targets more cognitive behaviors, thus confounding any sort of direct comparison.

**Augmentative and Alternative Communication Strategies**

One area of common difficulty in the treatment of children with autism is teaching communication strategies to non-verbal children. Throughout the years several types of augmentative/alternative communication strategies based on behavioral principles have been utilized with children with autism and other severe communication handicaps. These strategies include sign language (e.g., Carr, Binkoff, Kologinsky, &
Eddy, 1978), picture boards and picture point systems (Mirenda & Santogrossi, 1985; Reichle & Brown, 1986), and picture exchange systems (Bondy & Frost, 1994).

Sign language has historically been the preferred method of treatment for non-verbal children. However, sign language is symbolic and requires the ability to imitate; therefore, many non-verbal children fail to acquire it. In addition, as the majority of the population is unfamiliar with signs, children using this system are often unable to communicate in the community.

Picture or iconic systems have been used to teach functional communication to children with autism who fail to acquire verbal or signed language. These systems (e.g., picture boards, picture exchange) seem to be easier to acquire than sign language (Anderson, 2002) and are readily recognizable to individuals that have not been trained in the system, thus increasing the number of people with whom the children can communicate successfully. The Picture Exchange Communication System (PECS) is the most widely used iconic systems for non-verbal children (Bondy & Frost, 1994). This system requires that the child exchange a picture for a desired item or activity. Although the research on the effectiveness of PECS is limited, it has found wide acceptance in school-based intervention programs. Currently, more controlled research on this technique is being conducted and findings suggest it is efficacious and that acquisition of PECS leads to increases in vocal speech (Charlop-Christy, Carpenter, Le, LeBlanc, & Kellet, 2002).

One important question is which augmentative/alternative communication system is most effective for increasing communication skills in non-verbal children with autism. One study compared acquisition rates of modified signs and PECS pictures in non-verbal
preschoolers with autism. Six children were trained to request desired items via each system. Results indicated that all six participants acquired pictures more rapidly and demonstrated better generalization to novel stimuli with PECS than with sign. However, the children had more spontaneous initiations and were more likely to pair verbalizations with sign (Anderson, 2002). In addition, this study found that children indicated a clear preference for one system over another, suggesting the importance of individualizing augmentative/alternative communication systems to the child’s needs and preference.

Another important question is whether teaching pictures or sign to non-verbal toddlers and preschoolers is superior to a language only approach. Although, there is little controversy over using augmentative/alternative communication systems with non-verbal, school-age children who have already shown the inability to acquire spoken language, there is less consensus whether to begin with an augmentative/alternative communication system for non-verbal toddler and preschool-age children who are just beginning intervention (i.e., Bondy & Frost, 1994; McGee, Morrier, & Daly, 1999). These results suggest a continued need for research examine augmentative/alternative communication systems. We need to determine what child characteristics may be associated with success in verbal versus augmentative communication systems (e.g., PECS, sign). Also we need to examine which of these systems may promote vocal language in children with differing characteristics. Obviously there is much to do in this area of research.

Self-Management

Another struggle in the treatment of children with autism is independent learning. Although many behavioral treatment strategies are effective at teaching new skills, the
presence of a treatment provider is usually necessary to maintain these behavioral gains. Techniques that encourage learning and maintenance of behavior without increased reliance on teacher or parent monitoring are thus highly desirable.

Self-management has been shown to reduce reliance on a therapist in normally functioning individuals (Kopp, 1988). These procedures include self-evaluation of performance, self-monitoring, and self-delivery of reinforcement. Self-management procedures have been adapted for use with individuals with autism and developmental delay. They typically involve teaching the individual to identify appropriate and inappropriate behavior, record his or her own behavior using stickers or other material, and to reward him or herself after exhibiting the appropriate behavior or refraining from the inappropriate behavior. The presence of the therapist is gradually faded so that the individual is able to continue to display appropriate behaviors in an unsupervised setting. Eventually the self-management materials are also faded so that the individual is able to demonstrate self control completely independently (Koegel, Koegel, & Parks, 1990).

Self-management procedures have been used to address a variety of behaviors in individuals with autism. They have been used to decrease inappropriate behavior such as self-stimulation (e.g., Mancina, Tankersly, Kamps, Kravits, & Parrett, 2000; Koegel & Koegel, 1990) and perseverative play (Newman, Reinecke, & Meinberg, 2000) as well as to increase appropriate behavior such as toy play (Stahmer & Schreibman, 1992), social initiations (Koegel, Koegel, Hurley & Frea, 1992) and independent interactions with typical peers (Shearer, Kohler, Buchan & McCullough, 1996).

While self-management has been shown to be successful with higher-functioning individuals with well-established verbal language, lower-functioning individuals with
limited or no language are less likely to benefit from this approach. Accordingly, adaptations to the typical self-management procedure have been developed for use with these lower-functioning individuals. Pictorial self-management uses photographs of individual steps of a task in a book format. This procedure involves teaching the child to complete the step associated with each picture, turn the page to view the next picture, and reinforce him or herself after the task is complete. This strategy has been shown to increase lower-functioning children’s ability to perform self-help skills in the absence of adult supervision (Pierce & Schreibman, 1994).

**Video Instruction**

Recently, an interest in combining behavioral techniques with video for autistic individuals has emerged. Video technology has some intrinsic appeal as an instructional tool for this population. First, although not well documented in the literature, people have often suggested that children with autism are visual learners and typically excel in treatment modalities that rely on visual stimuli (e.g., Campbell, Lison, Borsook, Hoover, & Arnold, 1995; Charlop & Milstein, 1989; Schreibman, Whalen, & Stahmer, 2000; Pierce & Schreibman, 1994). Second, motivation may be enhanced because most children (including children with autism) typically enjoy watching videos. Third, videotapes can be replayed repeatedly without any variation, which might enhance learning in a population that benefits from predictability. Finally, the use of video does not typically require the direct intervention of an adult.

Video modeling has been the most well researched form of video instruction for children with autism. Modeling research has shown that these children can learn new behaviors through the observation of predictable and repeated sequences (Charlop,
Schreibman, & Tryon, 1983). Video modeling presents target behaviors in video format and has been shown to improve various skills in individuals with autism, including conversational speech (Charlop & Milstein, 1989, Sherer, et al., 2001), verbal responding (Buggey, Tombs, Gardener, & Cervetti, 1999), helping behaviors (Reeve, 2001), purchasing skills (Haring, Kennedy, Adams, & Pitts-Conway, 1987) and daily living skills (Shipley-Benamou, Lutzker, & Taubman, 2002). This medium has also been shown to increase vocabulary, emotional understanding, attribute acquisition, number of play actions, duration of play, and play-related statements (Schwandt, Pieropan, Glesne, Lundahl, Foley, & Larsson, 2002).

In addition to modeling, other forms of video technology have recently been used in combination with different behavioral techniques to promote appropriate behaviors. These include procedures such as priming (Schreibman, Whalen, & Stahmer, 2000), discrimination training (Matsuoka & Kobayashi, 2000), and self-management (Thiemann & Goldstein, 2001).

Research examining the effect of the type of model used in video based instruction has been equivocal. One study compared the effectiveness of using the target child as the videotaped model (self-as-a-model) to a similar-aged child model (other-as-model). This study found that although neither technique proved to be clearly superior, some individual children responded better to one or the other (Sherer et al., 2001). In contrast, a study comparing the use of video to in vivo instruction suggested that video modeling promotes faster acquisition and better generalization of new behaviors than in vivo modeling (Charlop-Christy, Le, & Freeman, 2000). In addition, these authors argued that video modeling is more cost effective because it does not require the use of a
live model (Charlop-Christy et al., 2000). Although this is only a preliminary study, it offers some interesting considerations. Research examining alternative behavioral applications of video and fine-tuning current video instruction techniques is certainly warranted.

One cautionary note related to the use of video instruction (and other similar technologies) is that it not be used to the exclusion of in vivo behavioral interventions. Just because a child may learn certain skills better with one type of intervention does not mean that the intervention is better overall. One reason that children with autism may learn well from video is because video instruction can eliminate the social demands that in vivo instruction requires. However, like all children, children with autism are required to function in a social world and must be able to learn from their social environment. Therefore, it is suggested that the use of video instruction be balanced with the use of in vivo instruction, regardless of the efficacy of video instruction.

FUTURE DIRECTIONS AND CONTINUED CHALLENGES IN BEHAVIORAL TREATMENTS

The past 15 to 20 years have brought a tremendous broadening and sophistication of behavioral technology as it is applied to people with autism. The earlier work in the area has laid the foundation for the current state-of-the-art and for what will follow. The fact that we now view some of our early efforts as relatively “simplistic” and are now much more effective and efficient in providing treatment should in no way be considered as criticism of these earlier efforts. Quite the contrary. We are not moving away from our early efforts; rather we are moving beyond them. Simply put, we would not be where
we are now, if we have not been there first. Our future directions and challenges are represented in the current research of our field.

**Generalization and Maintenance of Treatment Gains**

One of the continued challenges in the treatment of children with autism is the generalization of treatment gains across environments and over time (e.g., Lovaas et al., 1973). The use of naturalistic behavioral teaching techniques and training family members to be intervention providers has been shown to improve generalization (McGee et al., 1985; Koegel, Schreibman, Britten, Burke, & O’Neill, 1982). Despite these efforts, generalization remains an obstacle in the treatment of many children with autism. Future studies which focus on improving the generalization and maintenance of skills in children with autism are needed.

**Individualization of Treatment**

The importance of individualization of treatment has long been recognized and is reflected in the creation of a child’s IEP (individualized education plan). In this sense it is used to emphasize the need for individualized educational goals. However, the field is just beginning to recognize that there is no *one* treatment best suited to meet these goals. In fact, arguments relating to which behavioral treatment is superior are essentially meaningless because no treatment can boast substantial success in more than 50-70% of children. This variability in child response calls for the individualization of treatment strategies. Treatment variables and how they interact with child, family, and service provider characteristics are also crucial elements in the individualized treatment equation. The ultimate goal is to be in a position to determine a priori which treatment procedures
will be most effective and efficient with a particular child and a particular family situation, at a particular point in treatment.

Research on child characteristics that best predict treatment outcome for a particular intervention is just beginning (e.g., Anderson, 2002; Ingersoll, Schreibman, & Stahmer, 2001) but is hugely important. For example, one study has identified a behavioral profile of children who are likely to respond well to PRT and a separate profile of children who are likely to have a poor response to this treatment (Sherer & Schreibman, in press). These findings can help determine which children are appropriate candidates for PRT as well as provoke additional research to determine which alternative treatment options are most appropriate for children who meet the profile of a “non-responder” to PRT (Schreibman, Stahmer, & Cestone, 2001). Importantly, this subsequent study also found that the profile predicted outcome for PRT but not for another behavioral intervention, Discrete Trial Training, thus suggesting the profile is indeed predictive of a specific treatment and not just response to treatment in general. As a field it is important to continue to fine-tune this line of research, thus deriving the most benefit from early intervention.

In addition to child characteristics, it is also important to consider the individual characteristics of the child’s caregivers. The field is just beginning to examine how family variables interact with treatment effectiveness. The effects of ethnicity, culture, marital status, parental attitudes, parental age, level of education, socioeconomic status, and other factors all may affect how treatment is best delivered and the ultimate effectiveness of the treatment. For example, research has shown that children of more responsive and educated parents are more likely to benefit from prelinguistic milieu
teaching, while children of less responsive and educated mothers benefit more from responsive small group instruction (Yoder & Warren, 1998). Also, training in self-management may be more successfully implemented by parents for whom child independence is important (Schreibman & Koegel, 1996). However, certain cultures may not place a strong emphasis on child independence; thus, the parents may not choose to use self-management with their child or may use it ineffectively. Another example is the effect of stress. It has been shown that parents of children with autism report being under high levels of stress (e.g., Koegel, Schreibman, Loos, & Derlich-Wilhelm, 1992). Perhaps parents who are under a good deal of stress at a point in time would be poor candidates to implement training with their child; a clinician may then be the treatment provider of choice. At a later time, if the stress is reduced, these parents could perhaps very effectively implement the treatment.

It is also important to recognize teacher variables that predict the ability to learn and implement different intervention techniques. Given that the majority of intervention for children with autism is provided by teachers and paraprofessionals who may not have an extensive background in treatment techniques for this population, it is important to identify the best ways to teach them and discern which techniques they are likely to use. In response to increased attention on individualization of treatment, many researchers and service providers have come to recognize that multiple behavioral methodologies have a place within a comprehensive treatment program. Although there are still strong proponents of particular intervention philosophies, researchers and service providers must challenge themselves to explore multiple options for individual children. Most researchers and service providers have broadened their view of teaching methodology;
however, despite the incorporation of multiple behavioral methodologies, change is still slow. Ideally we will develop a set of formulas that will allow us to evaluate a child and based upon research results be able to prescribe the best treatment for this child at this time. Continued assessment would then allow us to alter the child’s treatment regimen in response to the child’s changing needs. We are still in the initial stages of being able to match treatment procedures with specific children but continued research in this area will no doubt be tremendously important in determining treatment decisions.

**Integration of Disciplines**

Although behavior modification provides a wealth of techniques to encourage learning and change behavior, the field has come to recognize that autism is a complex disorder, the cause of which cannot be explained by learning theory alone. To this end, the field has gravitated towards other disciplines to help in the development of more effective intervention targets and tools.

One such discipline is developmental psychology. Since their conception, naturalistic behavioral intervention strategies targeting communication have been heavily influenced by developmental research on language acquisition in typical children. More recently, some naturalistic behavioral interventions have added techniques traditionally limited to the developmental literature such as indirect language stimulation and contingent imitation to produce a combined approach such as Enhanced Milieu Teaching (Hemmeter & Kaiser, 1994), Prelinguistic Milieu Teaching (Warren, Yoder, Gazdag & Kim, 1993), and Reciprocal Imitation Training (Ingersoll, 2003).

Another recent trend has been the use of behavioral techniques to target deficits in autism identified in developmental literature, but previously ignored in the behavioral
literature. Many such autistic deficits, such as reciprocal imitation (Ingersoll & Schreibman, 2001; 2002), joint attention (Whalen & Schreibman, in press), symbolic play (Stahmer, 1995), and theory of mind (Garfinkle, 2000) which were originally identified in by developmental psychologists have been targeted using behavioral techniques in the past several years.

In addition, there has been an interest in whether targeting early social-communicative behaviors that are theoretically linked to later emerging behaviors in typical development, lead to increased development of these later emerging behaviors in autism. For example, Whalen (2001) used a behavioral methodology to teach young children with autism to make joint attention initiations and found increases in language despite the fact that it was not directly targeted. Similarly, Ingersoll (2003) found increases in language, play, and joint attention after targeting reciprocal imitation. Behavioral research that is focused on targeting behaviors within a developmental framework is exciting, and can only enhance the effectiveness of our interventions.

Future behavioral research will need to draw on the rapidly developing field of neuroscience. For example, more recent imaging techniques have confirmed the presence of attentional deficits (e.g., Courchesne et al., 1994), originally observed behaviorally (Lovaas, Schreibman, Koegel, & Rehm, 1971), which are likely involved in the development of a variety of autistic behaviors. In addition, recent work has suggested that face processing is impaired in autism and may lead to some of the abnormal social behavior observed in this population (Schultz et al., 2000). Newer behavioral research focused on targeting deficits identified by the field of neuroscience may lead to exciting new gains in child outcome. Additionally, imaging studies which examine functional
changes in neurological systems that are a result of behavioral therapy will help to identify whether our treatment contributes to brain reorganization. Such studies are currently underway.

As a field, we should also collaborate with treatment approaches that are not considered behavioral, but nonetheless, share some common elements with behavioral interventions. For example, the TEACCH model or structured teaching (Lord, Bristol, & Schopler, 1993) uses many forms of visual supports, such as picture schedules, to help individuals with autism navigate their world. Although the use of picture schedules is not inherently behavioral, many behavioral interventions have incorporated their use. For example, pictorial self-management combines the use of a picture schedule with self-reinforcement. Similarly, social stories (Gray & Garand, 1993), which provide a brief vignette of expected behavior in an upcoming social situation are in fact a form of priming, which has been shown to be an effective behavioral strategy with children with autism (Schreibman, Whalen, & Stahmer, 2000; Zanolli, Daggett, & Adams, 1996).

Another intervention approach commonly used with children with autism is the developmental approach. This approach, which includes floor time (Greenspan & Wieder, 1998), is focused on building emotional reciprocity. One key component to floor time, following the child’s lead, is also central to naturalistic behavioral strategies. Another central component, opening and closing circles of communication, shares many similarities with prompting and reinforcement strategies used in the naturalistic behavioral interventions. Although proponents of the developmental approach do not consider it behavioral, in many ways it is more similar to naturalistic behavioral interventions than naturalistic and structured behavioral interventions are to each other.
Similarly, sensory integrative therapy is also focused on following the child’s lead and gradually increasing the level of demands to help the child increase his or her fine motor, play, language, and sensory processing skills (e.g., Ayres, 1972).

One very obvious difference between behavioral and non-behavioral approaches is the focus on data collection and validation. Despite their common use and likely benefit, most non-behavioral interventions have not been empirically validated leading many behaviorists to doubt their efficacy. In recent years, the TEACCH model and social stories have undergone empirical study (e.g., Norris & Datillo, 1999; Ozonoff & Cathcart, 1998) while developmental and sensory integrative interventions have lagged behind. Future research which examines the efficacy of these types of interventions and their overlap with behaviorally-based interventions will undoubtedly improve both fields and result in better treatment options for children with autism.

A second difference between behavioral and non-behavioral approaches is the use of fidelity of implementation. Traditionally, behaviorists rigorously define their procedures and monitor their correct implementation. These definitions create a common language among intervention providers and assist in the consistent implementation of the intervention. Other disciplines are beginning to recognize the importance of fidelity of implementation. As we progress in our collaboration, it is hoped that we continue to challenge ourselves to define fidelity of implementation and manualize our interventions to insure consistency of treatment implementation.

One struggle in collaboration between disciplines is the confusion between specific behavioral techniques and general principles of applied behavior analysis among
professionals in other disciplines, as well as the public at large. In fact, some professionals have challenged the use of applied behavior analysis for children with autism because they are uncomfortable with the highly structured, adult-directed techniques used in discrete trial training, without recognizing that discrete trial training is only one of many behavioral techniques (e.g., Greenspan & Wieder, 1998). (In reality, the term “applied behavior analysis” refers to a specific research methodology – not a particular form of treatment.) As a field, we must clarify our principles to other disciplines in a clear manner that can highlight the similarities between disciplines and encourage collaboration.

Collaboration Among Service Providers

Behavioral interventionists have become less focused on treatment provided exclusively by specialists in clinic settings, recognizing that children need to learn within the context of their daily lives (e.g., as provided by naturalistic teaching strategies). Treatment is being delivered by individuals with a wide range of experience in a variety of settings. Behavioral interventionists and researchers have also recognized the importance of family participation in treatment. Research has shown that parents can be trained to implement behavioral procedures with their children with autism and that this training leads to increases in a variety of skills (e.g., Alpert & Kaiser, 1992; Hemmeter & Kaiser, 1994). In addition, research has shown that parent training leads to more durable improvement than clinic-based treatment (Koegel et al., 1982).

There has also been an increase in the use of siblings (Celiberti & Harris, 1993) and peers as intervention agents (e.g., McGee, Almeida, Sulzer-Azaroff, & Feldman, 1992; Pierce & Schreibman, 1995; 1997). Research suggests that typical children as
young as two years old can be trained to use behavioral strategies with peers with autism (Ingersoll & Stahmer, 2002). Sibling and peer-implemented behavioral interventions have been shown to increase children with autism’s social interaction (McGee et al., 1992), language (Pierce & Schreibman, 1997), and joint attention skills (Ingersoll & Stahmer, 2002; Pierce & Schreibman, 1997).

Given the variety of treatment providers and intervention settings in any one child’s intervention program, collaboration is indispensable. Most children with autism receive intervention in multiple settings throughout their lifetime. Parents and teachers may not be using the same techniques, which in some cases can lead to a breakdown in behavior. For example, many non-verbal children in are on PECS in their classrooms; however, many of their families are not familiar with the system, do not have the materials in the home, or do not know which pictures their child can use. In this situation, the lack of collaboration between the home and the school may lead to missed opportunities to build communication. Interventionists need to plan for collaboration between all environments to ensure consistency in program implementation. Future research on ways to facilitate collaboration between settings is certainly warranted.

Continuum of Services

Much of the early behavioral research was conducted with older children, adolescents, and adults with autism and other severe disabilities. With the recognition of the importance of early intervention, there has been a tremendous increase in research devoted to treatments for young children with autism. This focus is necessary and exciting has likely yielded better long-term outcomes for individuals with autism in general. However, despite better outcomes with the provision of early intervention
services, the prognosis for adults with autism is still very poor. Therefore, it is necessary that research on treatment options for older individuals with autism grow in step with the research on these options for young children.

**Dissemination**

Another extremely important issue is: How can behavioral researchers rapidly disseminate our findings so that they are widely applied. Like most scientific disciplines, behavioral interventions are developed and reported in professional journals. However, parents, teachers, and other frontline treatment providers are unlikely to be among the audience of the journals. We need to specifically target outlets that reach these personnel. Thus, publication of our work in media outlets and the popular press might be quite effective in making our treatments known.

Several behavioral methodologies have done this so far. Structured behavioral techniques have received widespread acceptance in both home-based and school programs, largely because they have been described in excellent detail in several commercially-available manuals (e.g., Leaf & McEachin, 1999; Maurice, Green, & Luce, 1996). Similarly, PECS, which also has a comprehensive training manual (Frost & Bondy, 2000), has received wide-acceptance in school programs across the country.

Discrete Trial Training has enjoyed a level of success and advocacy far beyond its objectively determined effectiveness (as mentioned earlier, no treatment is effective with all children with autism). Why is this the case? Probably because of the Lovaas (1987) study reporting that 47% of very young children provided with 40 hours a week of this treatment achieved “normal” functioning. Despite cautions about the methodology of the study and the fact that the study participants might not be representative of the wide
range of children with autism, parents understandably applauded the treatment as a potential “cure” and demanded the treatment for their children. (Interestingly, however, few people seem to notice that 53% did NOT achieve normal functioning.) The Internet, autism organizations, etc. all provided a ready vehicle for the dissemination of this very hopeful information from the Lovaas study to parents so eager for an answer to their child’s condition. This, in addition to widespread popular media coverage proved to make intensive Discrete Trial Training very popular indeed.

Conversely, some of the newer and more promising naturalistic behavioral interventions, self-management techniques, and the use of video technology have received less widespread acceptance, and remain primarily within an academic setting. Several possibilities for this difference in rate of dissemination arise. First, it is possible that there are less well-known, well-detailed manuals for these techniques. Second, it is possible that more naturalistic techniques, self-management, and video technology are more complex and less user-friendly for families and educators without a background in behavioral techniques. It is important for us to determine these barriers so that they can be overcome.

Another important goal of dissemination is to monitor the fidelity of implementation of behavioral treatments used in the community. Many of the teachers and therapists providing intervention to individuals with autism in the community do not have a firm background in behavioral principles. Given this reality, it is important to determine the quality of behavioral interventions being provided in the community as opposed to those provided in academic research settings and research training procedures to increase the effectiveness of intervention in the community.
CONCLUSIONS

As our knowledge of autism has increased, so too have the behavioral interventions designed to treat the disorder. One of the strengths of the field of behavior modification is the reliance on data collection to validate our procedures and monitor progress. As our own field has grown, we have become more open to differing treatment philosophies, more reliant on a variety of treatment providers, and more influenced by other fields. This expanding view of behavior analysis can only serve to improve interventions for individuals with autism. It is arguably the case that behavioral intervention is the most thoroughly studied treatment modality in the field. While one can cite some methodological shortcomings in some of the studies (e.g., small Ns, lack of random assignment) it is the case that these are endemic not only to research on behavioral interventions but of autism treatment in general. The necessity for continued research on effective treatments for this population is crucial and doubtless behavioral interventions will be in the forefront of this research for some time to come.
References


