

## Pivotal Areas in Intervention for Autism

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*Discusses several core pivotal areas that appear to be influential in intervention for autism. Literature and outcome data are reviewed with respect to several core areas that appear to be particularly helpful in intervention for autism, including improving motivation, responsivity to multiple cues, self-management, and self-initiation of social interactions. A conceptual framework is described, and outcome data are reviewed suggesting that when children with autism are motivated to initiate complex social interactions, it may reverse a cycle of impairment, resulting in exceptionally favorable intervention outcomes for many children. Because the peripheral features of autism can be numerous and extensive, the concept of intervention for pivotal areas of functioning may be critical if children are to be habilitated in a time- and cost-efficient manner.*

Autism was first described as a distinct disorder in 1943 (Kanner, 1943). Although descriptions of the disorder have varied slightly over the years, children with autism appear to exhibit impairments in a multitude of behaviors in three general areas: impairments in social interaction; impairments in verbal and nonverbal communication; and restricted, repetitive, and stereotyped patterns of behavior, interests, and activities (American Psychiatric Association, 1994). Because of the numerous areas affected by the disability, intervention has focused on attempting to identify core (see Rapport, this issue) pivotal areas that would produce widespread effects on the children's symptomatology.

Early theories of etiology originally centered on a psychodynamic perspective, viewing children with autism as coming from environments lacking in warmth and enjoyment. In the 1940s and 1950s, autism was explained as a withdrawal from cold, mechanistic environments; individuals were thought to be seeking solace in solitude (Kanner, 1949). Intervention focused on psychoanalytic procedures to attempt to reduce the core hypothesized inner conflict the children were thought to be exhibiting (Bettelheim, 1974; Gerard & Overstreet, 1953; Herskovitz, 1954; Pavenstedt, & Andersen, 1952). Because these theories of parental causation were largely dismissed as lacking data, and empirical studies demonstrated that parents of children with autism do not differ from parents of typically developing children (cf. R. L. Koegel, Schreibman,

O'Neill, & Burke, 1983), a search for other core pivotal areas for intervention continued.

Beginning in the 1960s, intervention procedures for children with autism began to focus on social learning theory, and behavioral intervention techniques were developed based on principles of learning (cf. Bandura, 1969; Ferster, 1961; Risley & Wolf, 1967).

Early behavioral attempts focused on the core pivotal areas of generalized imitation and social behavior. Initial studies focused on rewarding the children for imitation in a controlled laboratory setting (Hewett, 1965), unlike later interventions that were designed to be applied in other settings such as the home (Sheinkopf & Siegel, 1998); classroom, community, or vocational settings (Schopler, Mesibov, & Hearsey, 1995); or with intervention providers other than the clinician (R. L. Koegel, Koegel, Kellebrew, & Mullen, 1996). In addition, for a brief period of time, especially in the 1960s, attempts to create responsivity to social consequences focused on increasing the strength of the reinforcers such as using food deprivation and escape from aversives paired with social stimuli (Lovaas, Schaeffer, & Simmons, 1965).

Potential pivotal responses, such as generalized imitation and social behavior, that were hoped for, were only acquired by very few children (e.g., Risley & Wolf, 1967). Thus, these core pivotal areas, which seem to be central to development in typical children, proved to be elusive for the vast number of children diagnosed as having autism (cf. Lovaas, 1977; Lovaas, Koegel, Simmons, & Long, 1973). This may have been because of the way intervention was implemented. Providing very salient extrinsic punishers and reinforcers in an isolated environment may have led to excessively restricted stimulus control, which (for many children) subsequently did not result in enough generalized imi-

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tation or social behavior in a broad enough context to be clinically meaningful (Rosenblatt, Bloom, & Koegel, 1995). Thus, the original efforts to identify pivotal areas proved to be difficult, and it was not until the 1980s and 1990s that the complex relations among areas of symptomatology began to be understood, such that core, pivotal areas for intervention began to be identified.

Results from research in the interim, using behavioral interventions to treat individual target behaviors, demonstrated that the children's positive and negative behavioral symptoms could be modified using principles such as reinforcement, extinction, and punishment. These behavioral interventions relied on principles of operant conditioning, involving the presentation of a stimulus (e.g., a question or command) to evoke a specific response. Following the correct response (physically prompted if necessary), the reinforcer (usually tangible items such as edibles, tokens, or other desired items) was provided (Ferster & DeMyer, 1962; Wolf, Risley, & Mees, 1964). Incorrect responses or inappropriate behaviors were followed by punishers or some form of aversive stimulation (Lovaas et al., 1965; Lovaas & Simmons, 1969; Tanner & Zeiler, 1975).

Examples of effective intervention procedures include the reduction of a number of behaviors such as self-injury (Lovaas & Simmons, 1969), aggressive behavior (Woods, 1982), stereotypic behavior (Foxy & Azrin, 1973; Haring & Kennedy, 1990; Mulhern & Bauermeister, 1969), and echolalia (Lovaas et al., 1973; Risley & Wolf, 1967). In addition, improvements were documented in a variety of deficit areas including increases in eye contact (Matson et al., 1988; McConnell, 1967), vocalizations (Lovaas, Berberich, Perloff, & Schaeffer, 1966), and toileting skills (Matson, 1977). Although most children made documented gains with these behavioral interventions, the process of targeting individual behaviors one at a time was lengthy and laborious (Lovaas, 1977).

In the 1980s and 1990s, researchers once again began to hypothesize (and provide data suggesting) that intervention targeting certain core areas of the disorder may have more widespread effects across nontargeted behaviors than intervention that focused on modifying a single targeted symptom (R. L. Koegel, Camarata, & Koegel 1994). For example, one area that emphasized the complex interrelations among areas of symptomatology focused on the functional analysis of target behaviors (Carr & Durand, 1985; Iwata, Dorsey, Slifer, Bauman, & Richman, 1982; L. K. Koegel, Stiebel, Koegel, 1998; Sasso et al., 1992; Sigafos & Meikle, 1996). These studies and others suggested that autism may involve primary and secondary factors, such that intervention for the primary (core) behavior produced subsequent changes in proxy behaviors. For example, research has repeatedly shown that there is a strong re-

lation between early communication deficits and the development of subsequent severe behavior problems, and intervention that targets improving language skills is likely to result in improved behavior (Bird, Dores, Moniz, & Robinson, 1989; Carr & Durand, 1985; Dattilo & Camarata, 1991; L. K. Koegel, Koegel, Hurley, & Frea, 1992). This research is consistent with previous literature addressing the concept of response covariation in which several behaviors tend to be correlated to form groups of responses. Intervention targeting one response in a particular cluster is thus likely to affect other related responses, resulting in either positive or negative sequelae, depending on the behaviors that typically covary with the specific target behavior (Kazdin, 1982; Parrish, Cataldo, Kolko, Neef, & Egel, 1986).

### Theoretical and Conceptual Underpinnings

Before we discuss specific concepts relating to core or pivotal areas for intervention, it is valuable to consider some general variables relevant to development for children both with and without disabilities and that appear to be especially important for the habilitation process for children with autism. For example, development appears to be enhanced when responsiveness to stimulation occurs under typical conditions for extended periods of time; and it appears as though environmental stimulation needs to emphasize the relation in response-reinforcer contingencies. These areas are discussed later and relate directly to the development of current pivotal response interventions.



#### Responsiveness to Typical and Frequent Stimulation

A number of studies demonstrate that for normalized behavioral and neurological development to take place, there must be regular and ongoing specific types of environmental stimulation. Early environments affect neurological, social, and cognitive development in developing individuals, as brain structures and nervous system tissues must be provided with sufficient stimulation. If an infant or child experiences insufficient stimulation, atrophy may develop, which can result in behavior such as social withdrawal, pathological shyness, explosive and inappropriate emotionality, and an inability to form normal emotional attachments (Joseph, 1999). Specific types of stimulation also seem to be important. For example, verbal stimulation by caregivers has been shown to predict children's later cognitive competence (Hart & Risley, 1995; Olson, Bates, & Kaskie, 1992). Furthermore, children's active exploration of sensory

stimulation appears to play an integral role in their development (Berlyne, 1978; Gibson, 1988; Lewis, 1978; Ruff & Saltarelli, 1993). Although there exists some plasticity in individual development, for children with autism who lack social initiations and often avoid contact with others, it does not appear to be enough to provide intense stimulation for relatively short periods of time, such as might occur in brief intervention sessions (cf. R. L. Koegel & Johnson, 1989; R. L. Koegel, Koegel, & O'Neill, 1989; Neville, 1988). Stimulation (specialized if necessary for children with disabilities) in typical environments for extended periods of time can maximize the likelihood of normalized environmental stimulation and provide opportunities for the children to learn the nuances of how to use new behaviors under complex social requirements of a given setting (MacDonald, 1986). Typical children are so responsive to the numerous stimuli in their environments that their parents often need to limit their child's very active explorations of stimuli. In contrast, children with autism typically interact with a very restricted number of stimuli, often in a repetitive or stereotypic manner (cf. R. L. Koegel et al., 1989). Thus, pivotal response interventions, implemented throughout the day in natural settings, that increase children with autism's responsiveness to their environment have the potential to have widespread impacts because they can favorably increase the amount and type of environmental and social stimulation and learning interactions that have the social consequences that occur for typical development (R. L. Koegel & Johnson, 1989; R. L. Koegel & Koegel, 1988; R. L. Koegel, Koegel, & O'Neill, 1989).

### Response-Reinforcer Relations

From a theoretical point of view, the behaviors of children diagnosed as having autism appear to be similar to those discussed in the literature on learned helplessness (Seligman, personal communication, 1979). Children with autism appear to be especially unmotivated to respond to complex social and task stimuli (cf. Clark & Rutter, 1979; R. L. Koegel & Egel, 1979; R. L. Koegel & Mentis, 1985; MacMillan, 1971; Rodda, 1977). It may be that for many children with autism, a motivational problem, resulting in reduced social responding, begins very early in life when the children experience failure due to central nervous system dysfunction. A cycle can begin wherein efforts to "help" the children by doing things for them can create conditions for learning that responding and reinforcement are independent (cf. Chan & Keogh, 1974; Gruen, Ottinger, & Ollendick, 1974; R. L. Koegel & Egel, 1979; R. L. Koegel & Koegel, 1988; Lewinsohn, Larson, & Munoz, 1982; MacMillan, 1971; Seligman, Klein, & Miller,

1976; Zigler & Butterfield, 1968). That is, individuals can learn that the consequences for their responding are noncontingent, thus depressing social initiations and lowering motivation (L. K. Koegel & Koegel, 1995). In addition, because social and communication interactions may be difficult for the children, they may revert to early forms of effective communication such as crying and tantruming to get their needs met, and they may avoid interactions that are purely social. In contrast, teaching the children to initiate responding that is likely to have a low demand and high reinforcement probability, even if it is necessary to initially reinforce small attempts, may promote the learning that responding and reinforcement are related, and may reduce avoidance behavior. Thus, pivotal response interventions that emphasize relations between social communicative responses and their positive consequences appears to increase motivation to respond, thereby improving responsiveness and increasing favorable environmental and social stimulation and interaction.

### Conceptual Introduction to Pivotal Responding

In relation to the earlier discussion, the core area of motivation to respond to social and environmental stimuli appears to be a key pivotal area. That is, from a conceptual perspective, an important goal of intervention is to focus on increasing motivation to respond, so that the children self-initiate social, linguistic, and academic interactions, thereby providing complex stimulus input and learning opportunities throughout the day. Although motivation in itself is difficult to observe behaviorally, the effects of this process can be observed. That is, the effects of *improved motivation*, as the term is used in this article, refers to observable characteristics of a child's responding, such that an improvement in motivation is broadly defined as an increase in responsiveness to social and environmental stimuli. Some motivational characteristics that have been measured include increases in the number of responses a child makes to teaching stimuli, decreases in response latency, and changes in affect (e.g., interest, enthusiasm, happiness; R. L. Koegel, Carter, & Koegel, 1998). Motivation to respond to multiple cues and to self-regulate and self-initiate behavior also appear to be especially helpful in producing widespread improvements (R. L. Koegel, Koegel, & Carter, 1999). It should be noted that these areas are extensions of effective applied behavior analysis procedures. In the past, applied behavior analysis procedures repeatedly have been reported to improve the behaviors of children with autism, however, as science advances, refinements of the general behavioral procedures are now

being documented to increase responsivity, learning, and generalization.

### Motivation

Procedures that increase motivation, as defined earlier, have now been reported extensively in the literature. In particular, several antecedent variables have been identified that increase children with autism's responsiveness to social and academic stimuli, while simultaneously decreasing the amount of disruptive behaviors exhibited during interactions (Kern & Dunlap, 1998; R. L. Koegel et al., 1998; Schreibman, Stahmer, & Pierce, 1996). These variables include child choice, task variation and interspersal of maintenance tasks, reinforcement of response attempts, and the use of natural and direct reinforcers.

Child choice is defined as the incorporation of child-preferred or child-chosen materials, activities, topics, and toys into learning opportunities. Although the clinician follows the child's lead, the environment remains structured such that desired target behaviors are incorporated into the activities, while maintaining the child's attention, and decreasing the likelihood that the child will avoid the interactions and engage in disruptive behaviors (cf. Dyer, Dunlap, & Winterling, 1990; Kern et al., 1998; R. L. Koegel et al., 1998; Moes, 1998; Sigafos, 1998). Motivation can also be improved by varying the task sequencing and interspersing previously mastered tasks with new acquisition tasks during a learning activity (Carr, Newsom, & Binkoff, 1980; Davis, Brady, Williams, & Hamilton, 1992; Dunlap, 1984; Winterling, Dunlap, & O'Neill, 1987). The child thus experiences a higher rate of success, a greater likelihood of reinforcement, and consequently, increased responsivity (R. L. Koegel, Carter, et al., 1998).

Broadening shaping criteria to reinforce the children's appropriate attempts to make social and communicative responses, as compared to a stricter shaping criterion wherein only responses that are as good or better than previous responses are reinforced, has been shown to increase the children's acquisition of language and academic tasks (R. L. Koegel, Carter, et al., 1998; R. L. Koegel & Egel, 1979; R. L. Koegel, O'Dell, & Dunlap, 1988). This may be especially important for acquisition of first words in nonverbal children (R. L. Koegel et al., 1988), particularly because related areas such as phonology, pragmatics, and semantics may not yet be strongly established due to lack of practice of these complex multiple components that comprise appropriate social interactions (cf. Camarata, 1996; Camarata & Leonard, 1986).

Research has shown that incorporating natural reinforcers that are directly and inherently related to the child's response leads to increased motivation, enhanced learning, and more rapid acquisition of the tar-

get behaviors (L. K. Koegel & Koegel, 1995; R. L. Koegel, Carter, et al., 1998; McEvoy & Brady, 1988). Use of natural, direct reinforcers can teach the children that there is a direct relation between their response and reinforcement (L. K. Koegel & Koegel, 1995) and may shorten the delay between a response and reinforcement, resulting in the stimuli and reinforcer becoming more salient (Kazdin, 1977; Skinner, 1979).

Incorporating the motivational variables described earlier, as a group, into an intervention approach can significantly improve language, academic, and social functioning, while simultaneously decreasing disruptive behavior in children with autism as well as other populations (Dunlap, Kern-Dunlap, Clarke, & Robbins, 1991; Kern & Dunlap, 1998; L. K. Koegel, Koegel, & Carter, 1998; R. L. Koegel, Dyer, & Bell, 1987; R. L. Koegel, Koegel, & Schreibman, 1991; Moes, 1998; Schreibman et al., 1996).

### Multiple Cues

Responsivity to multiple cues is another pivotal area that when changed appears to produce widespread improvements in children with autism. Research has indicated a lack of response to multiple cues, or stimulus overselectivity, in children with autism (Allen & Fuqua, 1985; Bickel, Stella, & Etzel, 1984; Fein, Tindler, & Waterhouse, 1979; Frankel, Simmons, Fitcher, & Freeman, 1984; R. L. Koegel & Schreibman, 1977; Lovaas, Koegel, & Schreibman, 1979; Pierce, Glad, & Schreibman, 1997; Reynolds, Newsom, & Lovaas, 1974; Schreibman, Charlop, & Koegel, 1982; Schreibman, Kohlenberg, & Britten, 1986), which occurs when a child responds to an overlimited portion of cues in the environment or responds on the basis of an irrelevant component of a complex stimulus. Lack of responding to multiple cues can lead to negative sequelae such as learning problems in the areas of language acquisition, social behavior, observational learning, and generalization (Burke, 1991; Dunlap, Koegel, & Burke, 1981; Lovaas et al., 1979; Schreibman et al., 1996). Intervention that teaches children with autism to respond to multiple cues in the environment has been shown to enhance attention to social cues and increase learning and generalization (Burke & Cerniglia, 1990).

### Self-Management

Another area that appears to be pivotal for widespread intervention gains is self-management or self-regulation of behavior. Typically developing children acquire increasing autonomy and self-regulation as they mature. In addition, children without disabilities demonstrate widespread generalized use of newly learned behaviors through self-management of re-

sponding. However, children with autism often do not appear to develop the necessary self-regulatory behaviors needed to be responsive to the environmental social cues that lead to independence.

Individuals who are not showing widespread generalization of newly learned skills or autonomy of responding can be taught to self-manage behavior. The general procedure involves teaching individuals to discriminate between appropriate and inappropriate behaviors, then to actively record correct responses, and in some cases to administer self-rewards. This procedure can foster generalization of appropriate behaviors across settings and interactions with others while decreasing the need for constant and long-term vigilance by a clinician (Jones, Nelson, & Kazdin, 1977; Kazdin, 1974; Kern, Marder, Boyajian, Elliot, & McElhatten, 1997; R. L. Koegel, Koegel, & Parks, 1995; Pierce & Schreibman, 1994; Stahmer & Schreibman, 1992). Interventions using self-management have been shown to result in increases in personal competence, problem solving, and independence (L. K. Koegel & Koegel, 1995) and have been successful in targeting a variety of behaviors such as stereotypy (R. L. Koegel & Koegel, 1990), social skills (L. K. Koegel et al., 1992; R. L. Koegel & Frea, 1993; Reese, Sherman, & Sheldon, 1984), disruptive behavior (Newman, Tuntigian, Ryan, & Reinecke, 1997), appropriate play (Stahmer & Schreibman, 1992), and academic skills (Harris, 1986). In addition, implementing a self-management program can promote a cycle of increasing positive interactions, as the children learn to self-recruit reinforcement for appropriate behaviors in the natural environment, thus increasing the likelihood of obtaining reinforcement from individuals outside the intervention setting (Baer, Fowler, & Carden-Smith, 1984; Todd, Horner, & Sugai, 1999).

### Self-Initiations

Self-initiations are an additional pivotal area that when targeted can lead to improvements in social and pragmatic development. Although typically developing children demonstrate a variety of initiations (such as asking questions) in social and learning contexts, children with autism and similar communicative disorders often do not use initiations that lead to such interactions (cf. Hung, 1977; L. K. Koegel, 1995; Paul & Shiffer, 1991; Tager-Flusberg, 1994; Taylor & Harris, 1995; Wetherby & Prutting, 1984). Strategies that teach children with autism to self-initiate social and teaching interactions may promote learning in language, social skills, and pragmatics (L. K. Koegel, Camarata, Valdez-Menchaca, & Koegel, 1998; L. K. Koegel, Koegel, Shoshan, & McNerney, 1999; Krantz & McClannahan, 1993; Yoder, Warren, & Hull, 1995)

and concomitantly lead to decreases in untreated disruptive behavior (Oke & Schreibman, 1990).

### Summary of Conceptual Framework

In summary, we have hypothesized that a qualitative impairment in social communicative interaction plays a major role in autism spectrum disorder (L. K. Koegel, Valdez-Menchaca, Koegel, & Harrower, in press). Behaviors in this category that may be evidenced early on, prior to the onset of intentional communication (10–18 months), include lack of eye contact, lack of anticipatory movements, lack of head positioning, stereotypic movements, and unusual facial expressions. From an intervention perspective, the disability may be long and well-established when intervention commences. By this time, the aforementioned learned helplessness, or lack of motivation to engage in complex social and academic tasks, may permeate the child's behavior and exhibit itself as a marked lack of motivation. Specifically, the children often do not respond at all to complex social stimuli or exhibit extreme latencies in responding. When pushed, they may engage in disruptive behavior including tantrums, aggression, and self-injury.

Addressing core behaviors during intervention is an emerging strategy in reducing proxy behaviors or symptoms that show an indirect relation with core symptomatology of children with autism. As can be noted in Figure 1, the major core area in this conceptual framework relates to increasing the child's motivation to engage in social communicative interactions. This involves motivating the child to initiate social interactions, to self-regulate behavior, and to respond to complex interactions involving multiple cues. Thus, specific procedures designed to increase motivation are incorporated into all teaching and learning interactions. Research has shown that addressing this core area may result in large improvements not only in the core areas of social communication, initiations, and self-management but also in many proxy behaviors including reductions in disruptive and stereotypic behavior and improvements in vocabulary and language, speech intelligibility, and play interactions with peers.

### Brief Review of Recent Outcome Studies

In addition to the large number of studies over the past 3 decades showing that children with autism can learn numerous individual target behaviors, there now is a growing body of literature demonstrating concomitant changes in untreated behaviors following intervention for certain core behaviors as the focus of intervention. Matson, Benavidez, Compton, Paclawskyj, & Baglio (1996) reviewed 251 studies from 1980 to 1996 that uti-

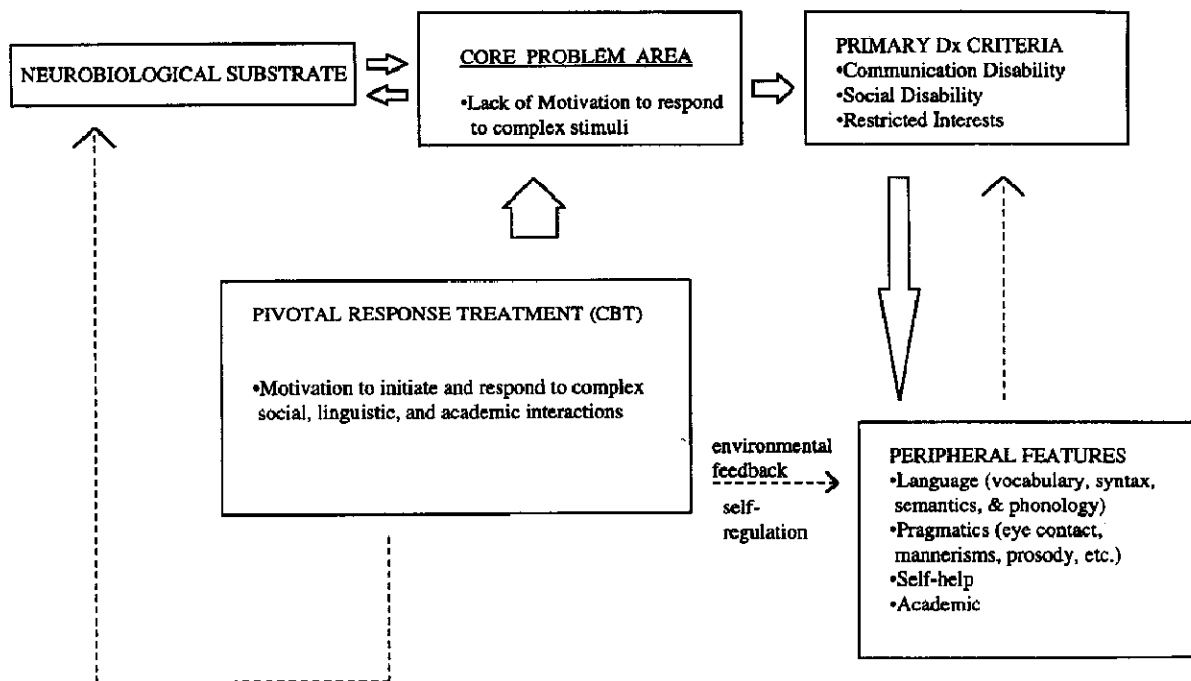


Figure 1. A model of pivotal response intervention.

lized behavioral interventions for children with autism. These authors discussed the concept of pivotal behaviors as a growing trend that may decrease the amount of time, effort, and number of behaviors requiring direct intervention while simultaneously increasing the effectiveness of intervention.

The following brief review of outcome studies is divided into (a) examples of studies reporting data on collateral and generalized improvements in multiple observable behavioral symptoms that are characteristic of children with autism and (b) examples of global long-term outcome studies.

#### Examples of Studies Reporting Generalized and Collateral Improvements

Because behavioral interventions consistently have been shown to be effective in teaching individual target behaviors but have required often prohibitive numbers of hours and years of intervention, researchers have focused on trying to improve the efficiency of such techniques. For example, incorporating motivational procedures into traditional discrete trial language teaching procedures has been shown to greatly improve acquisition and generalization of verbal expressive language and social skills in children with autism and other related communicative disabilities (cf. Camarata & Nelson, 1992; Charlop, Schreibman, & Thibodeau, 1985; Halle, Marshall, & Spradlin, 1979; Laski, Charlop & Schreibman, 1988; Warren, McQuarter, &

Rogers-Warren, 1984; Yoder, Kaiser, Alpert, & Fischer, 1993). For example, R. L. Koegel, O'Dell, & Koegel (1987) showed substantial increases in rate of acquisition and generalization of imitative and spontaneous speech in nonverbal children with autism. In this study, data were collected in a multiple baseline design. One condition, a traditional analogue teaching paradigm, wherein the clinician presented instructions, prompts, and reinforcers for correct responses in a repetitive discrete trial format, was compared to another condition that consisted of modifying the variables of the analogue condition to incorporate the motivational procedures described earlier. Results indicated that the children showed more imitative verbalizations in the latter condition as well as demonstrating generalization to spontaneous verbalizations inside and outside of the clinic setting.

Related to the aforementioned finding of improved speech production in nonverbal children, research also has shown that a motivational condition in which the shaping criteria were broadened to reinforce all goal-directed speech attempts resulted in not only improvements in speech production but also in greater interest, enthusiasm, happiness, and improved general behavior during intervention (R. L. Koegel et al., 1988). Specifically, a within-subject repeated reversal design was employed to compare two conditions. In the more narrow motor shaping speech condition, successive improvements in motor speech were reinforced and systematically shaped based on a specified phonetic criterion, wherein the children needed to produce responses that were at least as good as their previous re-

sponses to be reinforced. In contrast, in the verbal attempts condition, the shaping criterion was broadened so that observable attempts to verbalize in a purposeful manner also were reinforced. The results showed that although both conditions resulted in some improvement in the children's speech, when the children were reinforced for their attempts instead of merely on the basis of correct speech production, they made more rapid and consistent progress. Further, only the children in the verbal attempts condition showed socially significant long-term verbal gains over time. These findings are concordant with research indicating that parents of children without disabilities often reinforce their children's efforts to imitate speech (Hovell, Schumaker, & Sherman, 1978), resulting in high rates of imitative behavior, which may then promote acquisition of language (Moerk, 1972). In addition, literature suggests that frequent exposure to positive response-reinforcer contingencies may increase children's number of successes, and in turn, favorably influence children's motivation to interact with others (Goetz, Schuler, & Sailor, 1983) and concomitantly decreasing the likelihood of repeated failures, which can lead to task and social avoidance (MacMillan, 1971).

Likewise, even verbal children with autism who exhibit poor speech intelligibility show greater acquisition and functional use of target sounds in generalization settings when motivational procedures were incorporated into an otherwise effective discrete trial intervention (R. L. Koegel, Camarata, Koegel, Ben-Tall, & Smith, 1998). Although children improved in speech intelligibility in teaching settings using both traditional discrete trial teaching procedures (focusing on shaping motor production) and using discrete trial procedures that incorporated motivational procedures, functional generalization only occurred in the latter condition.

Concomitant improvements in disruptive behavior were demonstrated by R. L. Koegel, Koegel, & Surratt (1992) when motivational procedures were incorporated into traditional discrete trial teaching interactions focusing on verbal communication. Specifically, preschool children with autism who demonstrated disruptive behavior including crying, yelling, echolalia, loud stereotypic verbal behavior, leaving the intervention area, slapping and grabbing the interventionist, and knocking stimulus materials off the table were selected to participate in the study. Data were collected in the context of a repeated reversal design with number and order of sessions varied both across and within children to control for order effects. One condition did not include motivational procedures but attempted to evoke responses through the use of successive discrete trials with each item presented serially using flash cards until the child reached criterion. Arbitrary reinforcers (usually small edible candies paired with praise) were provided contingent on correct responses. The other

condition also used discrete trials but incorporated motivational variables described earlier including child choice, task variation, reinforcing attempts, and natural reinforcers. Results showed that greater improvements in verbal responses and considerably less (often negligible) disruptive behavior occurred when motivational procedures were incorporated. The aforementioned results are consistent with those reported in related literature. For example, similar procedures have also been effective in reducing problem behaviors and concomitantly increasing academic learning and communication in children and adults with other developmental disabilities (Dunlap & Kern, 1993; Dunlap et al., 1991; Horner & Budd, 1985).

In addition to improvements in generalized language use and disruptive behavior, improvements in social areas also have been shown when treating core motivational behaviors. For example, Baker, Koegel and Koegel (1998) and Baker (2000) incorporated ritualistic themes, or topics, on which children with autism perseverated into socially appropriate playground games. These children, who had very low levels or a complete absence of social play during baseline, demonstrated large increases in levels of social play, with concomitant increases in social interaction during other play activities with peers at school and with siblings at home. These increases resulted not only in improved social behavior but also in a reduction in ritualistic behavior. Further, improvements in positive affect occurred for all of the children. These generalized gains in social interaction and positive affect also maintained during follow-up measures. It is interesting to note that the results of these studies suggest that teaching the children appropriate ways of obtaining stimulation produces concomitant decreases in their abnormal ritualistic behaviors. This is consistent with an analogous approach for intervention for stereotypic behavior by Kern, Koegel, Dyer, Blew, and Fenton (1982) and Kern, Koegel, and Dunlap (1984), where children decreased stereotypic behavior and increased appropriate academic and play behaviors during time periods after they had engaged in vigorous physical exercise. Other researchers also have incorporated stereotypic or ritualistic behaviors into intervention by using them as reinforcers, resulting in increases in appropriate behaviors (Charlop, Kurtz, & Casey, 1990; Hung, 1978; Wolery, 1978; Wolery, Kirk, & Gast, 1985), and decreases in aggressive, tantrum, off-task, and stereotypical behaviors (Charlop-Christy & Haymes, 1996, 1998).

The positive effects of incorporating motivational procedures into social communication intervention also has been demonstrated. Gaylord-Ross, Haring, Breen, and Pitts-Conway (1984) conducted a study in which preferred objects were used to promote initiation of social interactions by adolescents with autism to peers without disabilities. The authors of this study

found increased frequency and duration of initiations and generalization across peers. Similarly, R. L. Koegel, Dyer, and Bell (1987) showed that when children with autism were taught to direct conversational and play interactions toward their preferred areas of interest (in generalization settings without an intervention provider), improvements in social behavior occurred. In a repeated reversal design, 10 children with autism who exhibited social avoidance behaviors participated in sessions in which the activities and conversational topics were arbitrarily chosen, and sessions in which the activities and conversational topics were child preferred. The results showed an inverse relation between the number of social avoidance behaviors and the opportunity for child-preferred activities. In addition, the study reported results showing that social avoidance behaviors can further decrease when the children are prompted to initiate child-preferred activities, and that new, appropriate behaviors can generalize to community settings.

Several investigators have taught children with developmental disabilities verbal initiations such as question asking (Guess, Sailor, & Baer, 1978; Hung, 1977; Taylor & Harris, 1995). One study demonstrating generalized improvements in social communication, taught children with autism to initiate social communicative interactions (i.e., asking questions) using a variety of motivational procedures (L. K. Koegel, Camarata et al., 1998). These children, who demonstrated deficits in spontaneous language and exhibited disruptive behaviors such as tantrums and aggression at baseline, were systematically prompted to ask the question "What's that?" To improve the children's motivation, child-preferred items were incorporated into the procedure, and natural reinforcers were provided subsequent to the children's use of the question. Generalization of spontaneous question asking occurred across settings and individuals without the use of additional intervention, prompts, or extrinsic rewards. Furthermore, the increases in spontaneous language were associated with increases in expressive vocabulary levels. A number of other studies also have focused on increasing social reciprocity to develop appropriate pragmatic social interactions. Haring and Lovinger (1989) and Oke and Schreibman (1990), for example, taught children with autism to initiate social interactions with peers.

Another core area with implications for widespread improvements in children with autism is overselective responding to restricted portions of the environment (cf. Lovaas et al., 1979). This restricted responding can be so severe that children may respond to stimulus material such as irrelevant lip movements (Lovaas, Schreibman, Koegel, & Rehm, 1971) or even to irrelevant articles of clothing (Schreibman & Lovaas, 1973). Studies demonstrating effective teaching of responding to multiple cues have been shown to produce generalized improvements in untreated areas. For example,

Burke and Cerniglia (1990) tested the hypothesis that the children with autism's number of correct responses would decrease as the number of stimulus components increased. Intervention focused on teaching conditional discriminations that required the children to respond to verbal instructions containing up to four components. The results showed that the children learned the conditional discrimination taught during intervention. More important, the results showed generalized improvements in the children's responses on standardized language tests and to complex stimuli during social interactions.

For children with autism who are older (e.g., over 5 years) and demonstrate excessive levels of proxy behaviors such as self-stimulatory behavior, avoidance behavior, and a lack of responsivity, implementation of self-management procedures to reduce these proxy behaviors can be effective in producing positive changes in what are considered to be the core symptoms of autism. For example, L. K. Koegel et al. (1992) taught verbal children with autism who were unresponsive to verbal initiations from others to self-manage responsivity to others in multiple community settings. Following intervention for self-management, the children, who at baseline infrequently responded appropriately to others' verbal initiations and exhibited disruptive and self-injurious behaviors (e.g., head banging, tantrums, screaming, and running away from the communicative partner), showed improvements in their levels of appropriate responding. Further, the children were able to use the self-management procedures in other targeted settings such as in the home and community and were able to accurately self-record their responses, maintaining higher levels of appropriate responding than at baseline. In addition, subsequent to the self-management intervention, disruptive behaviors in the community decreased for all children. These findings support the literature suggesting that disruptive behavior declines as more effective communication skills are acquired (Carr & Durand, 1985; Newman et al., 1997) as well as improving social skills and increasing task engagement, while simultaneously reducing aggression (Dunlap, Clarke, Jackson, & Wright, 1995).

Another study, focusing on pragmatics, examined acquisition of individual social communicative behaviors and generalization across other social behaviors in children with autism (R. L. Koegel & Frea, 1993). Self-management intervention for an individual pragmatic behavior such as eye gaze or nonverbal mannerisms generalized to other pragmatic behaviors, suggesting that a variety of pragmatic behaviors may function as a response class. An advantage of implementing self-management procedures is that children manage their own behavior in a variety of settings in the absence of an interventionist. Self-management procedures also have been used to improve appropriate behavior in less



restrictive community settings such as regular education classrooms (cf. Gregory, Kehle, McLoughlin, 1997; Harrower, 1999; Kern et al., 1997; R. L. Koegel & Koegel, 1990; D. J. Smith, Young, Nelson, & West, 1997), to increase social behavior in individuals with autism while interacting with cashiers and other employees in stores during purchases, at home with family members (L. K. Koegel et al., 1992), and during peer and sibling interactions at school and home (Strain, Kohler, Storey, & Danko, 1994).

### **Brief Examples of Global Outcome Studies**

Although considerable data exist regarding intervention for multiple observable behaviors, only a few global, long-term outcome studies for children with autism are reported in the literature (e.g., Lovaas, 1987; Ozonoff & Cathcart, 1998; Sheinkopf & Siegel, 1998).

For example, in 1987, Lovaas reported follow-up outcome data from an intensive, long-term intervention for children with autism. His data suggested that a higher percentage of children could obtain very favorable outcomes (based on educational placement and IQ score) than had previously been indicated. Although the results are being viewed cautiously by some, the data provide evidence to suggest that at least some children with autism can make very large global improvements if they are provided with intensive intervention. A follow-up was conducted by McEachin, Smith, and Lovaas in 1993, and the authors reported that the children (at mean age 13 years) maintained their gains in educational placement and intelligence scores, and eight of the nine children who had achieved the most favorable gains were reported to be indistinguishable from typical children on measures of adaptive behavior and intelligence tests.

In another study, assessing outcomes of 21 pre-school-age children with mental retardation and features of autism (19 boys and 2 girls), T. Smith, Eikeseth, Klevstrand, and Lovaas (1997) reported that the children in the intensive behavioral treatment group (compared to those in minimal treatment) achieved clinically significant gains. Specifically, they state that at follow-up, the children (ages 5-7) who received intensive behavioral intervention exhibited more expressive speech and obtained higher means on intelligence tests. Children in both conditions, however, showed reduced behavior problems. The authors reported that although the children in the intensive behavioral intervention group showed gains compared to the minimal intervention group, the children remained significantly delayed.

These studies suggest that early intensive intervention may result in favorable outcomes for children with autism; however, further information regarding social

functioning and quality of life are additional areas worthy of investigation.

### **New Exploratory Studies Related to Differential Long-Term Outcomes**

Because self-initiations seemed to have a positive effect on children with autism's linguistic and pragmatic behavior (L. K. Koegel, Camarata, et al., 1998), we recently assessed whether teaching a series of initiations as a core or pivotal behavior would have a widespread effect on proxy behaviors. L. K. Koegel, Koegel, et al. (1999) conducted a preliminary investigation to assess whether spontaneous self-initiations might be associated with favorable outcomes for children with autism. In a two-part study, the authors first conducted an archival analysis of data for six children who initially had favorable prognoses according to traditional variables (e.g., presence of functional speech before 5 years of age) but who had either very favorable or very poor outcomes after years of intensive intervention. The children with favorable outcomes were academically at grade level in regular education classrooms, had typically developing friends, participated in sports and extracurricular activities, and scored close to or above their age level in adaptive behavior functioning. Children with poor outcomes resided in institutions and were placed in (or moved from regular education classes to) more restrictive special education classrooms; had no typically developing friends; participated in no community extracurricular activities; exhibited aggressive, stereotypic, or disruptive behaviors; and scored far below their age levels in adaptive behavior functioning.

One consistent characteristic across all of the children who had exceptionally favorable outcomes was the number of self-initiations prior to intervention. That is, the children who had favorable outcomes frequently began new interactions or changed the direction of an interaction at a very young age, during parent-child interactions.

Based on the findings of this archival analysis, the purpose of a second phase of that exploratory study was to assess whether children with few or no self-initiations could be taught a series of self-initiations and whether those children would then achieve similarly favorable outcomes. Four children, who exhibited preintervention characteristics similar to the children who obtained poor outcomes in Phase 1, were taught a variety of child initiations and were then later assessed for changes in academic, social, community, and adaptive behavior functioning.

The children were taught a series of initiations, consisting of verbal utterances (such as question asking) that were likely to evoke an adult response that would result in social-communicative development. The series of initiations was taught in increasing developmen-

tal complexity, beginning with the early developmental question, "What's that?" and followed by such questions as "Where is it?" "Whose is it?" and "What's happening?" In addition, the children were taught other types of initiations, such as appropriate ways of seeking help and attention.

Results from the second phase of that study suggested that those children also achieved highly favorable intervention outcomes, consistent with those of the children in the favorable outcome group from the archival phase of the study. The children exhibited a large variety and number of social self-initiations following intervention, attended regular education classes, participated in a variety of extracurricular activities and sports, and obtained ratings of normalcy by naive observers (who did not have backgrounds in the area of disabilities), suggesting that the children appeared very appropriate in relation to what one would expect from a typically developing child. This preliminary research suggests that self-initiations may be a pivotal area associated with highly favorable outcomes for children with autism and that children who exhibit few or no self-initiations prior to intervention can successfully be taught this pivotal behavior.

### Summary

Although the exact physiological cause of autism is not yet known, it appears as if behavioral interventions that focus on core pivotal areas of the disorder may favorably influence the children's habilitation. It is hypothesized that when the children are motivated to initiate large numbers of social interactions that provide naturally occurring learning opportunities, it may reverse a cycle of impairment, resulting in exceptionally favorable intervention outcomes for many children. This motivation appears to be essential to reduce the core and peripheral features associated with autism. Because the peripheral features can be numerous and extensive, the concept of intervention for pivotal areas of functioning may be critical if children are to be habilitated in a time and cost-efficient manner. Although we have described a few core pivotal areas that appear to be especially important, the field as a whole appears to be moving in a direction that is likely to produce continued and numerous advances within this framework in the future.

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