Pivotal Response Intervention I: Overview of Approach

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The purpose of this article is to present an overview of several pivotal response interventions. Our research at the University of California, Santa Barbara, has been focused on developing interventions that, when changed, result in concomitant positive changes in other areas. Pivotal areas that are discussed include responsiveness to multiple cues, motivation to initiate and respond appropriately to social and environmental stimuli, and self-regulation of behavior, including self-management and self-initiations. The trend to streamline intervention by targeting behaviors that will have widespread effects on development, rather than targeting individual behaviors one at a time, is discussed.

DESCRIPTORS: pivotal response interventions, multiple cues, self-management, autism, early intervention

Recent epidemiologic estimates suggest a large increase in the incidence of autism (Bristol-Powers, 1999; Bryson & Smith, 1998; Bryson, Clark, & Smith, 1988; Fombonne, 1998; Gilberg, Steffenburg, & Schaumann, 1991). Whether this geometrically increasing rate is due to greater public awareness, increased sophistication among diagnosticians, or a true rise in the prevalence of the disability, the need for effective interventions that can be delivered in a time and cost efficient manner is crucial. This article is the first of two parts. The intent of this first article is to describe some of our research at the University of California, Santa Barbara (housed in the Graduate School of Education), which focuses on intervention for pivotal areas. Pivotal areas are defined as those that, when changed, generally produce large collateral improvements in other areas. The second article presents some preliminary outcome data, which suggest that teaching spontaneous initiations as a pivotal response may relate to especially favorable outcomes.

In addition to ongoing research projects at the University of California, Santa Barbara, information is disseminated and intervention services are provided, primarily through a parent education model, to individuals of a variety of ages. However, they focus primarily on early intervention. In addition, in order to expand the intensity and breadth of intervention, services are coordinated through consultation to the children’s schools and other community based programs. The focus of the approach is to provide intervention in pivotal areas that have widespread impacts on a large number of target behaviors (L. K. Koegel & Koegel, 1995; Matson, Benavidez, Compton, Paclawskyj, & Baglio, 1996; Mundy, Sigman, & Kasari, 1990; Schreibman, Stahmer, & Pierce, 1996). Specifically, by focusing intervention on a few core pivotal areas, such as increasing motivation to initiate and responding to complex social, linguistic, and academic interactions, peripheral features of the disability have been documented to improve in areas such as language, pragmatics, self-help, and in academic areas. Ultimately, the goals of providing intervention in pivotal areas are (1) to teach the child to be responsive to the many learning opportunities and social interactions that occur in the natural environment, (2) to decrease the need for constant vigilance by an intervention provider, and (3) to decrease the number of services that remove the child from the natural environment. This differs from a concept of generalization. For example, pivotal responses attempt to set a context for improved learning, such that responding is under the control of natural environmental stimuli. The individual demonstrates appropriately short response latencies, a high frequency of appropriate responding, and negligible avoidance of social learning opportunities.

The ultimate goal of our pivotal response model is to provide individuals with autism with the social and educational proficiency to participate in enriched and meaningful lives in inclusive settings. The model uses data-based applied behavior analysis (ABA) procedures that are positive, self-reinforcing, and family centered. General issues regarding intervention settings, amount of intervention, intervention agents, and target behaviors are described below.
1. Intervention settings: In addition to parent education outside of school, our program focuses on providing intervention in the most inclusive settings possible. This may include the children's homes, community preschools, regular education school programs, and after-school activities that typically developing children attend. Accumulating research suggests that children with developmental disabilities can efficiently learn age appropriate behaviors in an environment of similarly aged typically developing peers (Guralnick & Groom, 1988; Kennedy, Cushing, & Itkonen, 1997; Stainback, Stainback, & Forest, 1989). Effective techniques for teaching academics and socialization to children with autism in regular education classrooms and other community settings are now readily available (Harrower, 1999; L. K. Koegel, Koegel, Hurley, & Frea, 1992; R. L. Koegel, Frea, & Surratt, 1994; Nickels, 1996; Russo & Koegel, 1977; Strain & Odom, 1986). Ideally, we recommend that inclusion begin in the preschool years, well before the child enters elementary school. During these early years, fewer academic demands exist. Therefore, children with autism, who by the nature of the disability exhibit qualitative impairments in social interaction, can be prompted, motivated, and taught to engage in a variety of social interactions with typically developing peers.

2. Amount of intervention: Although the exact number of intervention hours varies across children, our goal is to provide the most effective intervention within a relatively small number of hours of direct contact from a highly skilled specialist. As such, the children are not removed from their natural environments, but are systematically taught the tools and behaviors that produce social and academic learning from the natural environment throughout the day, with support as required. Typically, support in natural environments is more intensive early on, but is gradually and systematically faded as the child improves. Although the children appear to need intensive intervention throughout the day (Lovaas, 1987; R. L. Koegel & Koegel, 1995), we believe that the quality of the intervention and the specific target behaviors that they are taught may be as important as the number of hours of direct contact from a specialist. The ultimate goal is to provide intervention in key pivotal areas that will lead to independence and self-education throughout the day, without the constant presence of an intervention provider.

3. Intervention agents: Since learning interactions can be designed to occur on an ongoing basis throughout the day, we advocate that the responsibility for intervention be spread across different intervention agencies. Interventionists may include the child's family members, school personnel, and consultants who have expertise in the area of autism and inclusion. For example, research suggests that it is helpful if the parents are actively involved in the intervention process. This will empower them to make appropriate and educated decisions about their child's needs and, ideally, to also participate as intervention agents (Fine, 1991; L. K. Koegel & Koegel, 1995; Singer & Powers, 1993). However, it is important to note that the effect of having a child with a disability typically causes specific areas of parental stress, often related to a lack of support, caregiving demands, disruption of social activities, lifespan care needs, and financial responsibilities (Moes, 1995; Moes, Koegel, Schreibman, & Loos, 1992). Therefore, it is important that interventions decrease a family's stress and provide "goodness of fit" with families' lifestyles and values so that they will more likely be implemented and maintained (Albin, Lucyshyn, Horner, & Flannery, 1996; Stiebel, 1999). Research demonstrates that incorporating interventions that are blended into daily routines and match family values actually reduce family stress, while greatly accelerating the acquisition of target behaviors for the child with autism (Moes, 1995; R. L. Koegel, Bimbela, & Schreibman, 1996). We recognize that families bring enormous strengths to their child's intervention, spend a number of hours with their child, and are usually with the child throughout numerous critical periods of the lifespan. Therefore, they are viewed as a valued and important driving force in the intervention process.

4. Target behaviors: Target behaviors are individualized according to each child's age, functioning level, and family circumstances. Therefore, these necessarily change across time and environments. When children with autism participate in inclusive school and community settings, goals are developed that consider the specific cultural and societal rules that apply to the particular provisions of that setting. Target behaviors are generally taught using toys or other age appropriate items that are found in the child's natural settings (R. Koegel, Camarata, Koegel, Ben-Tall, & Smith, 1998). We rarely use preprinted or manufactured flash cards in the context of analog, drill type activities. A primary area of focus is communication. Much of the intervention time in our program is spent developing communicative skills (which include both oral and nonverbal communicative systems) and appropriate social communicative interactions. Target behaviors are addressed through intervention in pivotal areas. These are defined as areas that are central to wide areas of functioning,
such that improvement will occur across a large number of behaviors (R. L. Koegel, Koegel, & Carter, in press). Pivotal areas that our research suggests may be particularly important will be discussed individually below. They include responding to multiple cues, child motivation, self-management, and child initiations. An important focus of future research will be the identification of additional important pivotal areas, so that time and cost efficient interventions will continue to be developed (R. L. Koegel & Frea, 1993; R. L. Koegel, Koegel, & Surratt, 1992; Mundy et al., 1990; Pierce & Schreibman, 1997).

**Background and Introduction to Pivotal Responses**

As noted, our underlying assumption is that teaching in pivotal areas constitutes an efficient and effective mode of intervention in overcoming the number of difficulties that exist for children with severe disabilities. Prior to the recent increasing trend in the literature focusing on areas that have numerous positive collateral effects, interventions were developed based on individual target behaviors that the children lacked (Matson et al., 1996). Although the children made gains and usually learned each individual target behavior, the intervention was extremely time consuming and costly (Lovaas, Koegel, Simmons, & Long, 1973). This led us to focus on teaching pivotal responses (also referred to in the literature as pivotal behaviors: Matson et al., 1996; or pivotal responding: Schreibman et al., 1996). Since pivotal responses appear to be central to wide areas of functioning, positive changes in these behaviors should result in widespread positive effects on many other behaviors. Therefore, a focus on pivotal responses constitutes an efficient intervention that produces generalized improvements in a variety of areas that did not directly receive intervention (Burke & Cerniglia, 1990; L. K. Koegel & Koegel, 1995; Pierce & Schreibman, 1997).

To date, a number of pivotal areas have been identified. For instance, early research determined that a lack of responding to multiple cues was a common learning characteristic displayed by children with autism. This characteristic, termed "stimulus overselectivity," has been further documented in a number of scientific studies (Allen & Fuqua, 1985; Bickel, Stella, & Etzel, 1984; Frankel, Simmons, Fichter, & Freeman, 1984; R. L. Koegel & Schreibman, 1977; Schreibman, Charlop, & Koegel, 1982; Schreibman, Kohlenberg, & Britten, 1986). Because an ability to respond to multiple cues significantly enhances learning and has general positive effects in a number of areas, we define responsivity to multiple cues as a pivotal response. A number of studies have developed interventions to teach children to respond to multiple cues. These will be described below.

A second important area that appears to be pivotal in producing widespread changes in children with autism is motivation. Motivational procedures, along with teaching children to respond to multiple cues, can be used to teach communication (expressive and receptive language), self-help (e.g., toilet training), academic (e.g., learning numbers, counting, printing, reading), social (e.g., decreasing disruptive behaviors, improving pragmatics), and recreational (e.g., attending summer camps, school field trips) skills.

A third important pivotal area is self-management. Typically developing children acquire increasing autonomy and self-regulation as they mature. This increasing autonomy and self-regulation allow them to exhibit a variety of appropriate behaviors in ever changing environments with minimal feedback from others. Self-management is defined as individuals discriminating and self-initiating their own appropriate behavior, and then self-reinforcing or self-recruiting reinforcement for their appropriate behaviors. 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.

Procedures for teaching self-management were initially developed for use with adults without disabilities (McFall, 1970; McFall & Hammen, 1971). These procedures quickly evolved into techniques that effectively could be applied to the behaviors of typically developing children (Broden, Hall, & Mitts, 1971; Drabman, Spitalnik, & O'Leary, 1973; Glynn, Thomas, & Shee, 1973). Subsequently, self-management programs have been shown to improve academics and reduce problem behavior among individuals with mild to moderate disabilities (Homer & Brigham, 1979; Knapczyk & Livingston, 1973; Sugai & Rowe, 1984) and autism (L. K. Koegel & Koegel, 1986; L. K. Koegel, Koegel, Hurley, & Frea, 1992; R. Koegel & Frea, 1993; Stahmer & Schreibman, 1992). Self-management is considered to be a pivotal area. Teaching a person to self-manage behavior allows that person to learn a skill that may facilitate the use of target behaviors across an infinite number of other behaviors, environments, and people, in the absence of an intervention provider.

A final area that appears to be pivotal during intervention for autism is self-initiations. The exact type and amount of self-initiated interactions necessary for optimal development still remain to be clearly defined. Generally, social self-initiations are notably lacking or absent in this population. For the purpose of our research, spontaneous initiations are defined as the individual beginning a new verbal or nonverbal social interaction, self-initiating a task that results in a social interaction, or changing the direction of an interaction. Initiations are discussed in detail in the following data-based article. It appears that individuals who do not demonstrate social initiations may not be judged as be-
self-learning, which increases the autonomy of the child by providing access to a knowledge base outside of any specific teaching context. For example, teaching a child with autism to initiate questions has been shown to improve vocabulary learning and to generalize to other settings (L. K. Koegel, Camarata, Valdez-Menchaca, & Koegel, 1998).

Multiple Cues

As mentioned, over the years, a substantial amount of research has identified a specific attentional characteristic displayed by many children with autism. This characteristic has been called “stimulus overselectivity” (Lovaas, Schreibman, Koegel, & Rehm, 1971). It refers to the tendency of certain children with autism to respond on the basis of a limited number of (frequently irrelevant) components in their environment (see Schreibman, 1997, for review). Although typically developing children often overgeneralize their first words (e.g., calling all animals with four legs “doggy”), they soon begin to distinguish among all of the relevant features in order to differentiate one object from another. Many children with autism, however, tend to respond to fewer and more irrelevant components (e.g., a bend in a picture card, as opposed to any relevant feature of the picture). Thus, children with autism may identify a stimulus by an irrelevant cue (Schreibman, 1997). This type of responding, if not effectively addressed, can lead to serious difficulties with social behavior, language acquisition, and the acquisition and generalization of new behaviors throughout the individual’s life (Rosenblatt, Bloom, & Koegel, 1995).

In order to reduce overselective responding, children displaying this characteristic can be taught to respond to multiple cues. Effective approaches for teaching children to respond to tasks with multiple cues have been identified in the research literature and can be divided into two general categories. One approach, called within-stimulus prompting (Schreibman, 1975), consists of exaggerating the relevant components of a stimulus item and then gradually fading the exaggerated component back to its original state (Dunlap, Koegel, & Burke, 1981; Rosenblatt et al., 1985). For instance, when teaching a child to discriminate the letters p and b, the orientation of the stem of the letters can be greatly lengthened to show a large difference in their orientation. By first attracting the child’s attention to the relevant cues, then the length of the exaggerated stem can be slowly reduced until the child is able to successfully discriminate the appropriate sized stems.

The second approach is to directly teach the child to respond to multiple cues by arranging the learning activity using conditional discriminations (R. L. Koegel & Schreibman, 1977; Schreibman, 1988; Schreibman et al., 1996). A conditional discrimination is one that requires the child to respond on the basis of multiple cues. For example, asking a child to get his or her green sweatshirt is requiring the child to make a conditional discrimination, when the child has another sweatshirt of a different color and other green articles of clothing. That is, the child must respond to both color (e.g., green sweatshirt as opposed to the red one) and object (e.g., green sweatshirt as opposed to the green shirt). Subsequently, after a child has mastered a given number of cues, the number required for a correct response can be gradually and systematically increased (e.g., green sweatshirt to new green sweatshirt). Research has shown that if a child is consistently exposed to this type of instruction, as opposed to single cue instruction (e.g., sweatshirt where any sweatshirt in the environment will do), the child will eventually learn to respond to an increased number of cues (Burke & Cerniglia, 1990; R. L. Koegel, Koegel, & O’Neill, 1989; Schreibman, 1997).

An example of this was provided by Burke and Cerniglia (1990). They conducted an investigation assessing and teaching responses to complex component stimuli to children with autism. Using a multiple baseline design across four behaviors (responses to one, two, three, and four component stimuli), the investigators found that the children participating did demonstrate increased difficulties in responding as the number of stimulus components was increased from one to four. Following this, they proceeded to teach each child to respond to verbal instructions containing one, two, three, and four components (e.g., a one component instruction would be “pick a book,” and a four component instruction would be “get a crayon and get a piece of paper and go sit down at the desk and write an ‘E’”). Results indicated that all children participating could be taught to respond to complex stimuli that contained up to four components within a relatively brief period. Additionally, some generalized increases in the child’s responses to complex structured and social stimuli were demonstrated following the teaching condition, as shown on standard assessments and an observational measure of social stimuli in naturalistic settings. These results are encouraging for targeting multiple cue responding as a viable pivotal area to increase responsivity and promote development in children with autism.

Teaching responsivity to multiple cues can be easily incorporated into a variety of activities in home, school, and community settings. The previous example provides an approach that parents can use to teach multiple cues in the home using articles of clothing. In classroom settings, teachers can provide a number of differently colored markers, pens, and pencils, from which the children could request a preferred writing/coloring utensil to use for a given activity. In the community, individuals with autism can be taught to correctly attend to traffic signal colors and locations, identify bus...
routes, and identify subtle social cues displayed by people with whom they interact.

Children typically encounter circumstances in which several cues appear concurrently in everyday teaching environments (Lovaas, Koegel, & Schreibman, 1979), teaching responsibility to multiple cues may have widespread effects on different types of learning. For example, typically developing children learn many appropriate social behaviors by observation. Children who do not respond to the full number of complex and subtle behaviors involved in social interactions are likely to show considerable social behavioral difficulties. Thus, teaching responsibility to multiple cues may provide children with autism a means to make improvements across various social behaviors by allowing them to attend to the totality of relevant stimuli involved in the modeling of behaviors by others in everyday social environments, as well as to the consequences of those behaviors.

Responding to multiple cues has implications for many characteristics of autism. For example, responding to multiple cues may also positively affect generalization of gains acquired in intervention settings to untaught situations, which otherwise might result in negligible learning improvements for children who respond to limited and irrelevant cues (Lovaas et al., 1979). That is, if a child attends to a limited number of cues in the original learning environment and/or to irrelevant cues in the teaching stimulus in that environment, generalization may be limited. Indeed, lack of generalization of intervention setting gains has been consistently reported to be an issue in children with autism (Lovaas et al., 1979). Further research is needed on the specific components, previously shown to improve the rate and accuracy of responding, was effective in producing generalized improvements multiple cue teaching may instigate. The identification and intervention of oversensitivity through teaching responsibility to multiple cues may hold promise to improve many social, emotional, and behavioral characteristics of children with autism by helping them to learn more as typically developing peers do (Lovaas et al., 1979).

Motivation

Another important pivotal area that often can be a difficulty in children with autism during everyday teaching and social interactions is motivation (L. K. Koegel & Koegel, 1995; R. L. Koegel, Koegel, Frea, & Smith, 1995; R. L. Koegel & Mentis, 1985; Schreibman, 1988). The term motivation, as used here, refers to observable characteristics of a child's responding. An improvement in motivation is broadly defined as an increase in responsiveness to social and environmental stimuli (R. L. Koegel, Carter, & Koegel, 1998). For example, characteristics reflective of motivation 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 et al., in press).

Traditionally, interventions for children with autism did not consider these characteristics and how they may have covaried with the actual intervention goal, thus limiting the effects of such approaches. Additionally, disruptive behaviors seemed to be at lower levels or absent and greater generalization occurred when motivational variables were incorporated (R. L. Koegel et al., 1992). In light of this, newer intervention approaches have increasingly moved toward procedures designed to enhance spontaneity and generalization (Wetherby, 1998). To this end, more than a decade of research has repeatedly documented certain variables to be important components in effectively addressing the lack of motivation apparent in children with autism. An early study by R. L. Koegel, O'Dell, and Koegel (1987) demonstrated that a group of individual components, previously shown to improve the rate and accuracy of responding, was effective in producing generalized and spontaneous verbal language acquisition in nonverbal children with autism within and outside of the clinical setting. In contrast, when language intervention sessions were conducted without the motivational variables incorporated, very little or very slow gains with little generalization or spontaneity were evidenced. These variables include the use of child choice, frequent task variation, interspersing previously learned tasks with new acquisition tasks, using less intrusive prompting, reinforcing the child's attempts, and incorporating turn taking within the interactions. This original study was described as the natural language paradigm because it closely approximated the manner in which typically developing children learn language. The authors compared the use of the above mentioned motivational components to an analog procedure. This procedure used a more traditional approach to language teaching including flash cards, lack of child choice, repetition of target until acquisition, and the use of arbitrary reinforcers. Incorporating motivational procedures was found to greatly accelerate language learning. Further research has demonstrated that the incorporation of such procedures also results in simultaneous decreases in problem behavior such as aggression and tantrums (R. L. Koegel et al., 1992). These variables, especially when used together, produce more rapid intervention gains and are discussed individually below.

Child choice. Child choice refers to using child preferred or child selected materials, topics, and toys, and following the child's lead (i.e., attention, interest) during interactions (Bambara, Koger, Katzer, & Davenport, 1995; Cole, Davenport, Bambara, & Ager, 1997; Cooper et al., 1992; Dunlap et al., 1994; Kern & Dunlap, 1998; Kern, Vorndran, Hilt, & Ringdahl, 1998; Moes, 1998; Sigafoos, 1998; Vaughn & Horner, 1997; Wacker, Berg, Asmus, Harding, & Cooper, 1998). For example, allowing the child to choose preferred stimulus items in language interventions has resulted in im-
provements in language targets. These include noun acquisition (Yoder, Kaiser, Alpert, & Fischer, 1993), morphologic and syntactic structures (Camarata & Nelson, 1992), and initial word acquisition (R. L. Koegel et al., 1987). Likewise, investigations using the provision of choice have shown gains in such areas as task engagement and productivity (Dunlap et al., 1994; Moes, 1998), increased interest and enthusiasm during a task (Moes, 1998), and increased participation in functional activities (Dunlap, Kern-Dunlap, Clarke, & Robbins, 1991). Additionally, most of these studies have demonstrated collateral reductions in challenging behaviors (Sigafos, 1998).

Opportunities for choice appear often throughout the day. Sigafos (1998) states that making use of the occasions that arise naturally within an individual’s daily routine may increase the functional benefits of choice. For example, mealtime sets the occasion for choices (what to eat), as does getting ready for school (what to wear), and doing homework (where to sit, which writing instrument to use; see Moes, 1998). Indeed, some degree of choice can be incorporated into almost all activities and topics. Incorporating child choice into an intervention procedure requires a variety of activities and items. It has been shown that children learn more rapidly if a pool of stimulus items is used and varied frequently according to the child’s interest (Dunlap, 1984; Koegel et al., 1998; Yoder et al., 1993). For instance, allowing the child to select colored candies to learn color concepts may prove far more effective than requiring the child to use an arbitrary set of stimuli items (e.g., colored construction paper selected entirely by the intervention provider).

Natural reinforcers. Several investigations have suggested that learning may be facilitated by considering the relationship between the behavior being taught and its reinforcer (R. L. Koegel & Williams, 1980; Saunders & Sailor, 1979; Williams, Koegel, & Egel, 1981). Specifically, the importance of using natural versus arbitrary reinforcers has been discussed. A natural reinforcer can be defined as one that is directly and functionally related to the task (i.e., one that is within the chain of behaviors required to produce the reinforcer), so that when children emit the target response, they will naturally obtain the reward. An arbitrary reinforcer can be defined as one that is not intrinsically related to the task (i.e., one that is not within the chain of behaviors required to produce the reinforcer), so that when they emit the target response, they will obtain an external reward. The use of natural and direct reinforcing consequences can be of benefit in various interactions throughout the day with children with autism (R. L. Koegel et al., in press). R. L. Koegel and Williams (1980) described a simple example of a direct response-reinforcer relationship for children with autism. They used tasks such as teaching a child to open the lid of a container to obtain a reward inside, as opposed to teaching the child to open the lid of an empty container, and then giving an indirect food reward. In this study, the children showed rapid acquisition only when the target behavior was a direct part of the chain leading to the reinforcer.

Past programs for children with autism often have relied primarily on arbitrary food reinforcers. Although provided contingently, they often have no direct relationship to the child’s behavior (e.g., clinician says “good talking” for labeling a picture of a cup and gives the child an M&M candy). In this response-reinforcer relationship, the response is not functionally related to the reward. In contrast, using an inherent reinforcer as a direct consequence related to the child’s own behavior on a task emphasizes that the consequence is functionally related to the behavior (e.g., clinician gives the child the cup to take a drink after the child labeled it, within the context of the child being thirsty).

Interspersing maintenance trials. Another motivational component discussed in the literature is to intersperse previously learned tasks (i.e., maintenance trials) with acquisition trials. This has been shown to improve correct responding and increase positive affect during teaching interactions (Dunlap, 1984; Dunlap & Koegel, 1980; L. K. Koegel & Koegel, 1986; R. L. Koegel & Johnson & Johnson, 1989). Interspersing maintenance trials frequently results in the child experiencing a high degree of success, which in turn, seems to result in an increased number of attempts to respond. Some researchers have described this phenomenon in terms of behavioral momentum and antecedents for improving responding (Kennedy, Itkonen, & Lindquist, 1995; Mace et al., 1988; Novin, 1996; Singer, Singer, & Horner, 1987). Behavioral momentum refers to the tendency for behavior to persist following a change in context. By preceding a difficult task with a series of short and easy tasks that have a high probability of being followed (Singer et al., 1987), a child will achieve repeated success and build momentum for improved responding through repeated reinforcements. This also can lead to decreased escape behavior and increased positive responsiveness to difficult tasks.

Reinforcing attempts. Reinforcing attempts have also been suggested to be an important motivational variable (R. L. Koegel & Johnson, 1989; R. L. Koegel & Mentis, 1985; R. L. Koegel, O’Dell, & Dunlap, 1988). By using a loose shaping criterion, reinforcing attempts when the child makes any clear, unambiguous, goal directed response, as opposed to using a more narrow shaping criterion, reinforcing only correct responses that are as good or better than the previous responses, children with autism show more responsiveness during teaching interactions. Reinforcing attempts may be especially important for children with autism, whose lack of motivation may stem from previous repeated failure. It is possible that children with autism and other severe disabilities who become accustomed to failure during
Thus, reinforcing any reasonable attempts may increase a child's likelihood of engaging in future interactions.

**Self-Management**

Self-management is an intervention procedure that has long been described as a viable technique for promoting independence because it shifts behavior management responsibility from the service provider to the individual with special needs (L. K. Dunlap, 1991; Koegel & Koegel, 1995; R. L. Koegel & Johnson, 1989). Generally, individuals should be involved in setting up the process of their own self-management program as much as possible. To increase motivation and self-reliance, it may be helpful if their reinforcers are self-selected and self-administered and if they participate in selecting their own learning goals.

The effectiveness of self-management procedures has been demonstrated with a broad population and a variety of target behaviors. For example, these procedures have been shown to be effective in improving social and play skills (Koegel et al., 1989; Koegel & Koegel, 1990; Sanato, Strain, Lefebvre, & Rapp, 1990; Shapiro, 1989). By teaching individuals to discriminate and choose their own target behaviors, to independently identify the occurrence or absence of that behavior (self-monitoring), and to self-recruit reinforcers, self-management allows individuals with disabilities to become actively involved in the intervention process and more involved in their home, classroom, and community environments. This more active involvement has the potential to improve autonomy by reducing dependence on outside intervention, giving the individual more opportunities to engage in desired activities and interact with others without the need for constant supervision. For example, children with severe disabilities have learned to independently use self-management strategies to reduce inappropriate vocalizations while participating in general classroom settings (Kern, Marder, Boyajian, Elliot, & McElhatten, 1997). Also, children with autism have learned to use self-management to reduce disruptive behavior and to self-administer rewards, further documenting that self-management techniques promote autonomy by decreasing reliance on intervention providers (Newman, Tuntigian, Ryan, & Reinecke, 1997). Additionally, an individual who uses a self-managed target behavior (e.g., appropriately self-recruiting attention) in the natural environment may encourage other individuals in those settings to deliver social reinforcers for the occurrence or improvement of that behavior outside of the intervention setting (Todd, Horner, & Sugai, 1999).

The positive effects of self-management procedures may also generalize to unsupervised settings (Stahmer & Schreibman, 1992) as well as across collateral behaviors (DiGangi, Maag, & Rutherford, 1991; Lam, Cole, Shapiro, & Bambara, 1994; McDougall & Brady, 1995; R. Koegel & Frey, 1993), leading many researchers to view self-management as a pivotal skill.

The general procedures for teaching self-management include (1) operationally defining the target behaviors, (2) identifying reinforcers for the individual to earn, (3) selecting a self-monitoring device, (4) teaching the individual to use the self-monitoring device, (5) fading the use of the self-monitoring device, and (6) validating whether the individual is using the self-monitoring device in natural environments (Koegel et al., 1992). Generally, individuals should be involved in the intervention setting whether the individual is using the self-monitoring device in inclusive environments (DeHaas-Warner, 1996) because it decreases the need for constant vigilance by teachers and other intervention providers. Furthermore, studies that have implemented self-management interventions in inclusive environments have consistently reported favorable results (DuPaul & Eckert, 1998). For example, self-management techniques have been successfully implemented within the constraints of inclusive academic environments (Harower, 1999; L. K. Koegel, Harrower, & Koegel, 1999), integrated job placements (Hughes & Scott, 1997), and other community settings (R. L. Koegel & Koegel, 1990). Therefore, these procedures may also be coordinated to occur in other environments such as home and community settings, resulting in a comprehensive program embedded throughout the individual's natural daily routine. Overall, the use of self-management as a technique for broad behavior change is being widely discussed in the literature and is being implemented with increasing frequency among children with autism.
Self-Initiations

The language characteristics of children with autism often include low levels of curiosity, and using language only to obtain desired items (Tager-Flusberg, 1996; Wetherby & Prutting, 1984), not to initiate conversation. In contrast, typically developing children frequently use a variety of these types of self-initiations to evoke language learning and social interaction. Therefore, a number of researchers have focused on developing procedures that result in self-initiations, such as question asking (Hung, 1977; L. K. Koegel et al., 1998; Taylor & Harris, 1995).

Self-initiations appear to be pivotal. They have the potential to provide for widespread spontaneous learning opportunities in natural environments throughout the child's day, without the need for adult initiated interventions. For example, L. K. Koegel and her colleagues (1998) investigated whether children with autism could learn and generalize an important and early developing type of child initiation, the child initiated use of a question. This study incorporated the motivational variables discussed above. It systematically assessed whether children with autism, who asked few or no questions, could learn to spontaneously initiate the question: “What’s that?” Furthermore, the authors assessed whether the spontaneous use of this question would generalize across stimuli, settings, and people not involved in the original teaching situations. Intervention consisted of placing child preferred items in an opaque bag and prompting the child to ask: “What’s that?” Following the prompted question, the child was shown what was inside the bag and was allowed to play or otherwise interact with the item. The prompt was then faded to the point where spontaneous question asking occurred. Next, child desired items were gradually replaced with neutral items that the child could not or otherwise interact with the item. The prompt was then faded to the point where spontaneous question asking occurred. Next, child desired items were gradually replaced with neutral items that the child could not label. Lastly, the use of the opaque bag was completely faded. After the intervention phase of this study, all of the children learned to use the question, “What’s that?” in relation to items they had previously been unable to label. Further, following the intervention, all of the children generalized the response and began to self-initiate with their mothers at home. They learned expressive vocabulary labels as a result of these self-initiations.

The benefits of teaching other types of self-initiated questions to children with autism have also been investigated. For example, Carter, L. K. Koegel, and Koegel (1996) discussed whether the use of the questions “What happened?” and “What’s happening?” could facilitate the acquisition and generalization of grammatical morphemes in children with autism. Through the use of pop-up books relating to the children's interests (e.g., the ocean, animals, trucks), children were taught to use one of the questions following manipulation of the pull-tabs. The interventionist then answered the child with the appropriate verb stem and targeted verb ending (-ed or -ing) and prompted the child to repeat the verb (e.g., “He's walking”). Preliminary data indicated that children learned the self-initiated strategy and acquired and generalized the target morpheme to verbs that were not specifically taught during the intervention sessions. Additionally, general language gains, such as increases in the children's mean length of utterance, appeared to occur concurrently. In addition to teaching the above types of self-initiations, other important types of self-initiations can also be taught, including (but not limited to) the use of other wh-questions, teaching assistance seeking initiations such as asking for help, and teaching information seeking questions such as questions about the name and location of items (Houghton, Bronicki, & Guess, 1987; R. L. Koegel et al., in press; Shukla, Surratt, Horner, & Albin, 1995).

In addition to the specific language gains noted above, preliminary research suggests that independent of how competent the children are academically, naive observers do not judge them as being pragmatically appropriate if they do not show initiations during unstructured interactions (L. K. Koegel, Koegel, Shoshan, & McNerney, 1999). Thus, not only are initiations important for improving the children’s language interactions, they may be a necessary pivotal response for social communicative competence.

Summary and Conclusions

To achieve widespread improvements across settings and behaviors, a number of researchers have focused on assessing whether children with autism could learn certain pivotal responses. In addition to specific studies discussed in this article, during the 1980s and 1990s, a large number of intervention strategies appeared in the literature demonstrating positive effects on collateral behaviors, such as antecedent physical exercise (Kern, R. L. Koegel, & Dunlap, 1984), academic and social priming (Kamps, Leonard, Vernon, Dugan, & Delquadri, 1992; Wilde, Koegel, & Koegel, 1992; Zanolli, Daggett, & Adams, 1996), curricular revisions (Dunlap, 1984; Dunlap, Dyer, & Koegel, 1983; Kern & Dunlap, 1998), and functional analysis (Carr, Carlson, Langdon, Magito-McLaughlin, & Yarbrough, 1998; Carr, Reece, & Magito-McLaughlin, 1996; Daly, Witt, Martens, & Dool, 1997; Durand & Crimmins, 1988; Ervin, DuPaul, Kern, & Friman, 1998; Kern, Childs, Dunlap, Clarke, & Falk, 1994; L. K. Koegel, Koegel, & Dunlap, 1996). By focusing on behaviors that have positive collateral effects, instead of exclusively upon individual target behaviors, the intervention can become less costly and time consuming.

Future research regarding pivotal responses may be useful in several areas. For example, providing a more
specific definition of motivation, defining the exact
types and amount of self-initiations that are necessary
for optimal development, defining the types of au-
tonomy and self-regulation that are important at differ-
ent ages, defining the types and numbers of multiple
cues that are optimal for specific types of development,
are all areas of research that are quite likely to be prof-
fable. Future research also may identify more effective
strategies for teaching pivotal responses and will un-
doubtedly reveal additional pivotal areas that have the
to produce positive changes across a wide va-
ty of behaviors for children with autism. In general,
the results to date have been quite promising. We ex-
pect this area of research to continue to lead to further
important developments for children with autism.

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