Evidence-Based Interventions for Language Development in Young Children with Autism

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The abnormal development and use of spoken language is one of autism’s most unusual and striking features. Kanner’s (1943) first description of autism painted a very detailed picture of the two main subgroups of language symptoms in children with autism. One pattern involved children who did not develop spoken language, a group described in past years as including as many as 50% of persons with autism (Rutter 1978). Unlike other diagnostic groups of children who for one reason or another do not develop speech, these children did not develop an alternative communication system using distal signals, either, but instead moved people around physically, manipulating hands, pushing and pulling on others’ limbs and bodies when they needed adult help. These children appeared to understand little speech, and long-term follow-up revealed little change in their relatively non-communicative status over many years (Kanner 1971).

The second pattern involved children who produced speech that was markedly atypical. These children tended to mimic speech rather than generate their own sentences, with patterns of both immediate and delayed echolalia. Their ability to remember long strings of stories, songs, lists, and other memorized content was remarkable, and Kanner surmised that this was a sign of latent preserved intelligence. A second atypical feature was the lack of communicative content of their speech. These children did not use language to share their experiences with others or to gain information by asking questions. Other atypical features of the verbal children’s language included unusual prosody and intonation, unusually mature syntax patterns given the children’s ages, and the use of unusual words, or neologisms (Kanner, 1943).

Kanner described abnormal features in most areas of language use: semantics, or meanings; syntax, or grammatical form; and pragmatics, the social functions of language, as well as abnormalities of the supersegmental aspects of language—the additional information afforded by the rhythm, rate, intonation, and volume of speech. Only the phonology of language appeared spared, at least in the children who acquired speech. In the 40 years of published, empirically based intervention studies of autism, there is probably no aspect of autism that has received greater attention, and interventionists have attempted to treat every aspect of the atypical language development and usage patterns seen in autism.

The purpose of this chapter is to review the main types of empirically supported language interventions that have successfully taught preschool-age children with autism, age 5 or under, to use spoken language, and to consider the strengths and relative weaknesses of each approach. The distinction between the terms language and speech in this chapter defines language as an intentional communication system involving shared symbols, with speech as a specific type of symbol. The procedure for reviewing research studies involved a Web-based search in the PsycINFO data base, searching under the following key words: autism, intervention, treatment, and language. All studies that resulted from this search and that involved empirically based studies concerning teaching preschool-age children with autism to speak or to increase their speech that were published in peer-reviewed journals were examined. Studies involving older children were reviewed if a significant number of the participants were 5 years old or younger. References from those studies were also searched.
This chapter provides a comprehensive but not exhaustive review of the literature. It reviews the main findings from empirically based articles involving single-subject and group designs, both those that target improvement in spoken language as the primary outcome of the treatment and also those that involve many different goals of intervention, including spoken language gains. The chapter ends with some consideration of possible mechanisms that underlie the different language subgroups in autism and possible treatment implications.

THE DIDACTIC, OR MASSED-TRIAL, BEHAVIORAL APPROACH

History of This Approach

The first empirical reports of language interventions were published almost 40 years ago, by Wolf, Risley, and Mees (1964) and Risley and Wolf (1967), working at the University of Kansas, and Hewett (1965) and Lovaas, Berberich, Perloff, and Schaeffer (1966), working at the University of California, Los Angeles. At the time, there were two prevailing models of language development in the United States: the operant model of Skinner (1957) and the nativist model of Chomsky (1975). The first interventions, which specifically targeted development and remediation of spoken language, came from the operant tradition. Risley’s initial two studies and Lovaas’s first writing on language interventions provided the model of massed-trial, adult-directed teaching that continues today and that is often referred to as discrete trial teaching (DTT). This shorthand is inaccurate in that teaching episodes in many conditions contain planned antecedents, behaviors, and responses, and are, technically, discrete trials. For the purposes of this chapter, the term didactic teaching is borrowed from Warren and Kaiser (1988) to refer to this type of adult-directed teaching.

Characteristics of the Approach

The characteristics of didactic teaching are well known in the autism treatment world and represent applications of the laboratory studies of operant learning. All learning theory—based approaches rely on the teaching techniques involving shaping, prompting, and chaining to teach new behaviors and sequences of behaviors in response to specific antecedent events. Principles of reinforcement are used to increase the frequency and consistency of desired behaviors in response to antecedents, and principles of extinction and punishment (including time-Out from reinforcement) are used to decrease unwanted behaviors (Cipani & Spooner, 1994). The didactic method applies these principles in teaching sessions that are marked by high levels of adult control and direction, massed-practice periods of preselected tasks, and precise antecedent, teaching, and reinforcement practices. The learner is in a responder role, and the teacher has a directive role.

Studies Supporting the Approach

Many published studies involving both single-subject and group designs have demonstrated the efficacy of the didactic model for teaching speech to nonverbal children with autism and increasing the use and complexity of speech and vocabulary size in verbal children with autism. Children who, at the start of treatment, were completely nonverbal, lacking even consonant sounds, have been taught to speak and to use increasingly complex syntax and vocabulary, including response to questions. (In most studies, the measurement system has involved behavioral frequency counts of specific words or word combinations.) In addition to focusing on building semantic knowledge and syntactic structures, the didactic approach has taught use of gestures and supersegments, such as intonation and volume. Various pragmatic functions have been addressed, such as requesting, commenting, negation, and asking questions. For examples, see Krantz, Zalenski, Hall, Fenske, and McClannahan (1981; teaching complex sentences), Ross and Greer (2003; vocal imitation), Williams, Perez-Gonzalez, and Vogt (2003; use of questions),
Yoder & Layton (1988; development of first words), in addition to the early work of Hewett (1965) and Lovaas et al. (1966).

The early reports involved children in hospital settings, who received treatment all day long. When these children left the training setting, they lost many of their newly learned language skills. The fragility of their gains demonstrated the importance of ongoing environmental supports for speech (Lovaas, Koegel, Simmons, & Long, 1973). This finding led to a shift away from hospital-like treatment settings and toward explorations of treatment delivery in natural settings, where children’s new learning could be constantly supported in their natural environments by the people in those settings.

Several studies examined parents’ ability to master the didactic approach and deliver the treatment at home. Howlin and Rutter (1989) and Sandra Harris (Harris, Wolchik, & Weitz, 1981; Harris, Woichik, & Much, 1983) reported that a combination of weekly group parent-training classes combined with individual weekly or biweekly home visits resulted in child gains, with two important caveats. First, language gains were almost completely confined to children who already had some speech at the start of treatment. Nonverbal children made minimal gains, perhaps because the shaping of speech in non-speaking children requires more intensity, clinical training, or treatment precision than parents can easily implement. Second, most gains occurred in the first 6 months, during which time parents received both group and individual instruction, with little progress beyond this. Undergraduate college students have also been trained to carry out this type of teaching at high levels of fidelity, resulting in child improvement (Lovaas, 1987; Smith, Groen, & Wynn, 2000), as long as ongoing training and support are provided to the students. Thus the didactic approach can be used successfully to teach children with autism spoken language by people without advanced educational degrees, as long as ongoing monitoring, training, and oversight of nonprofessionals are provided by sophisticated therapists who are directing the individualized treatment of the child.

Most of the studies cited previously have involved single-subject designs, which tend to demonstrate short-term changes in very specific behaviors. However, group studies examine child progress over somewhat longer periods of time, use more general measures of progress, and use comparison groups to determine the effect of the treatment. Several group studies have also demonstrated the ability of the didactic method to increase language development. Lovaas (1987) reported significantly greater gains in expressive and receptive language by children with autism who had received his treatment model at a high level of intensity during the preschool period than by a comparison group who received the same model at a low level of intensity. Similarly, Eikeseth, Smith, Jahr, and Eldevik (2002) reported greater language progress in standardized tests by a group of somewhat older children receiving Lovaas’s treatment model than by children receiving an eclectic model involving the same intensity of treatment. Although Smith et al. (2000) originally reported greater gains made by children receiving Lovaas’s method than those in a randomly assigned parent treatment comparison group, they later indicated that the difference was not significant (Smith, Groen, & Wynn, 2001).

**Strengths and Weaknesses of the Approach**

The didactic behavioral approach has several strengths. First and foremost, it has demonstrated efficacy in many studies from a variety of independent researchers, using a variety of treatment settings and treatment deliverers, with both single-subject and group designs, including one randomly controlled trial. It has demonstrated efficacy in teaching a number of skills involving spoken language, including the development of speech in children who were completely mute, and the improvement in all three main aspects of speech: semantics, the meanings of words; syntax, the structuring of multiword utterances; and pragmatic, or social effects’ of an utterance. The teaching approach involves a general method for building and altering behavioral repertoires, and treatment givers who master the general principles of this approach generalize them to other teaching goals as well (Koegel, Russo, & Rincover, 1977; Koegel, Glahn, & Nieminen, 1978).
Second, it is accessible to a wide range of consumers. Its teaching method is highly specified and rule bound, and the behaviors associated with the teaching practices are relatively easily mastered. The method is readily available to the public through published instruction manuals that target teachers, therapists, and parents. Finally, the content of the teaching, or the specific teaching programs and curricula, has been published for the lay audience and is widely available (Maurice, Green, & Luce, 1996; Lovaas, Freitag, Gold, & Kassorla, 1965; Lovaas, 1981; Lovaas, 2002; Leaf & McEachin, 2001). This general manualization of both the process and the content of the teaching approach is a great strength.

Warren and Kaiser (1988) provided an excellent summary of this approach. There are many teaching situations in which bouts of drill and practice can be extremely useful in rapidly establishing a new behavior pattern or in developing speed or fluency, and massed-practice periods with tight instructional control accomplish this. Its strengths are in establishing initial skills—those with zero baseline—and for teaching imitation; initial sound label repertoire, articulation and phonology, as well as initial teaching of linguistic rules such as plurals and verb tense.

“However the advantages offered by didactic instruction for teaching basic discriminations may become liabilities to promoting functional generalized language” (Warren & Kaiser, 1988, p. 93). Limitations to this approach as a comprehensive language-training method were recognized from very early on. A core problem described by Lovaas and colleagues concerned the children’s lack of generalization. They did not use their trained language behaviors in other contexts or with other people, and they lacked communicative initiative (Lovaas et al., 1973). Several researchers described alterations of the basic techniques to deal with problems involving learning rates, maintenance and generalization, and behavior outbursts (Dunlap, 1984; Matson, Sevin, Box, Francis, & Sevine, 1993; Charlop, Schreibman, & Thiebodeau, 1985). These problems point to a fundamental limitation of this particular approach, and that is the very atypical communicative framework that surrounds the teaching situation. The teaching approach focuses on language as one of many learned behaviors, following the same learning rules as other operant behaviors. By targeting semantics, syntax, and pragmatics in adult-directed, rote-teaching drills, the main purpose of communication is bypassed, and the opportunity to associate new skills with functional, real-life settings and communicative experiences is lost. All communication, including speech, is a form of social interaction, with the main function of meeting social needs. This pragmatic understanding of communication has been most fully developed in the past 20—30 years, after the initial operant teaching approaches were first developed. The teaching approach and the teaching curriculum initially described in writings from the 1960s and the 1970s remain the core of didactic treatment as it is delivered today, even though the children who now receive the treatment vary considerably from the original group (in their younger age; in their multiple intervention experiences; in the wide; especially milder range of symptoms recognized to be part of autism; and in having the benefit of much more community know-how and expectations of response to intervention). The treatment settings differ greatly from the original settings, and the field of communication science has developed enormously in the past 30 years. The limitations of the didactic model are clearly recognized by experts in the operant approach. Both Smith (2001) and Sundberg and Partington (1999) caution users that didactic treatment approaches need to be combined with the naturalistic teaching in order to foster spontaneity and generalization.

**THE PRAGMATIC REVOLUTION IN UNDERSTANDING EARLY LANGUAGE**

The current scientific understanding of communication and language development stems from the pragmatics revolution of the 1970s and 1980s, in which infant language was demonstrated to develop from the preverbal social exchanges of infants involving facial expressions, gestures, and vocalizations with important others (Bates, 1976). Two types of interactions were described as particularly important for ushering in the use of spoken language: ritualized infant games involving movements, sounds, and shared pleasurable emotion (Ratner & Bruner, 1978); and
gestures that coordinated child and adult attention on objects, used by the infant to achieve goals concerning regulation of the adults behavior, joint attention (Bates, 1976), or social interaction and dyadic exchange.

These early communicative exchanges are marked reciprocity and emotion sharing between the partners and by the use of preverbal behaviors involving eye contact, gestures, vocalizations, and facial expressions to accomplish social coordination. As infant phonation and receptive word learning develop, infants add words to these already established communicative exchanges. Thus the typical preverbal infant who has mastered the use of gesture to share intention and attention is already an accomplished communicator who understands and uses the power of communication to share subjective experiences and to affect others’ behavior (Stern, 1985).

Current research has demonstrated that young children with autism lack these early building blocks of communication. The seminal work of Wetherby (Wetherby & Prutting, 1984), and Sigman and Mundy (Mundy, Sigman, & Kasari, 1990; Mundy, Sigman, Ungerer, & Sherman, 1986, 1987) demonstrated that young children with autism tend not to use nonverbal communication behaviors, nor do they seem aware of them, interested in them, or able to comprehend their meaning, compared with both typical and atypical groups well matched for cognitive development. These studies demonstrated that very young children with autism lacked social initiative, joint attention, social and emotional reciprocity, and the use of early gestures to coordinate social exchanges—behaviors now known to be essential features of language development.

This pattern of low social initiative and lack of shared control of interactions is continued and further reinforced in the didactic approach to communication training, with its emphasis on an atypical level of adult directiveness and control of the interaction, paired with a quiet, attending student who responds when requested and slowly builds up a semantic store of object labels and memorized responses to questions. Whereas later aspects of the didactic curriculum do focus on teaching communicative initiative and use of speech to accomplish various communicative functions, in normal development, communication and language are, from their beginning, focused on social exchanges with others and coordination of interactions with people and objects. The pragmatic use of language is not one aspect of language, like verb forms or pronoun use. It is the foundation of language. Difficulties of the didactic approach in achieving generalization and spontaneity are likely due to (1) its fundamental mismatch between the teaching approach and the nature of communication, (2) its reinforcement of atypical social patterns (didactic instruction and passive responding), especially in combination with the fundamentally deficient social repertoire seen in autism, and (3) the development of spoken language outside of a functional interactive social frame.

THE NATURALISTIC BEHAVIORAL LANGUAGE INTERVENTIONS

History of the Approach

In 1968, a landmark study by Hart and Risley (1968) was published that described the application of operant teaching principles to teaching language using a different paradigm from the didactic model described previously. This study experimentally demonstrated the relative inefficiency of teaching a language form didactically and then “relying on unsystematic events to make that skill functional” (p. 119). In this study, the authors analyzed a particular type of language (descriptive speech) by its function and then deliberately structured the children’s environments so that the function of that form was highlighted. They used children’s self-initiated behavior toward an object as the vehicle for the intervention, inserting the “instruction,” or prompt, after the child initiated a communication for the object but before giving them access to the object. Thus the children’s requested item was the reinforcer for the new behavior. Even though previous attempts were made to teach the same skill didactically in the classroom with very little gain, this change to
naturalistic teaching created rapid increases in spontaneous use of descriptive words in children’s language to gain access to preschool materials. Furthermore, when the reversal condition began, in which all requirements for use of descriptive language to access materials were removed, the children maintained a greatly increased rate of Language Development descriptive speech. Apparently, the natural environment contained sufficient reinforcers to maintain the new skill and even to support new learning. This study made two great contributions to behavioral language intervention approaches. First, it focused on the pragmatic functions of language, and it delivered the intervention within the social interactional frame in which the communication occurred. Second, by respecting the pragmatic goal of the communication, the intervention preserved the inherent reinforcement underlying a motivated interaction, in this case using children’s desired objects and events in the natural environment as the reinforcers for learning. The authors suggested that such “intrinsic” reinforcers might provide stronger reinforcement than “external” reinforcers selected by adults and might help to maintain the new behavior in the environment because they are the same class of reinforcers that maintain behavior in everyday situations.

Lart and Risley (1968) labeled the approach incidental teaching to draw the comparison with the didactic, or directive, style of teaching. Both the efficacy of the intervention and the unexpected maintenance and generalization effects that resulted stimulated a wave of research on new methods of stimulating language development, using typical environments and people in those environments: parents, teachers, and others (as reviewed by Warren, McQuarter, & Rogers-Warren, 1984). Whereas the initial incidental teaching intervention began from child initiations, Warren and colleagues (1984) demonstrated that similar effects could be gained by training teachers to initiate certain types of communication prompts using child-selected activity reinforcers (the “mand-model” approach). The first references to this type of teaching in the autism literature occurred in the mid-1980s in research by behaviorists who had already achieved recognition for their work using the didactic teaching approach and were now moving to new kinds of intervention models (Koegel, O’Dell, & Koegel, 1987; Carr & Kologinsky, 1983; McGee, Krantz, Mason, & McClannahan, 1983).

**Characteristics of the Approach**

Although the teaching method used in each of these studies varied somewhat (Hepting & Goldstein, 1996), the approaches shared a number of common elements, particularly the delivery of the intervention in natural environments, the use of intrinsic reinforcers, a focus on child initiation of communication, and pragmatically function social interactions. Warren and Kaiser (1988) classified these approaches as “naturalistic teaching” and suggested that the common elements included (1) teaching the form and content of language in naturally occurring exchanges, (2) using dispersed and intermittent trials; and (3) following the child’s lead, rather than directing the child to communicate. Warren and Kaiser (1988) attributed the rapid development of this approach to the convergence of behaviorists, who were following an inductive approach to achieving improved generalization and initiation of speech, and developmentalists, who followed a deductive approach, applying current theories and research regarding typical language development to children with atypical communication development.

McGee et al. (1983) defined the key differences that are core elements of naturalistic behavioral teaching and that do not characterize didactic teaching:

1. Teaching episodes are initiated by child behavior via requests or gestures for preferred items.

2 Teaching takes place in the context of ongoing activities, with items of child interest as part of the naturally occurring stimuli of the space.

3. The teaching stimuli are child selected, and contingent access to them is the reinforcement.
4. Prompt strategies for elaborated language vary according to the child’s initiating behavior.

**Studies Supporting the Approach**

Empirical support for this approach to language training in autism is substantial. A number of studies, virtually all using single-subject designs, have demonstrated the efficacy of this approach in teaching many linguistic responses to children with autism. Work by Koegel et al. (1987) demonstrated that completely nonverbal children could learn to speak using this approach. As described in excellent reviews by Delprato (2001), Lynn Koegel (2000), and Howard Goldstein (2000), children with autism have demonstrated increases in frequency, spontaneity, and syntactic sophistication of their language through naturalistic approaches (Laski, Charlop, & Schreibman, 1988). Examples of the use of naturalistic approaches to successfully teach various aspects of language include: teaching prepositions (McGee et al., 1983), using grammatical morphemes (Carter, 2001), improving articulation (Koegel, Camarata, Koegel, Ben-Tall, & Smith, 1998), teaching use of yes and no (Neef, Walters, & Egel, 1984), and using questions appropriately (Koegel, Camarata, Valdez-Menchaca, & Koegel, 1998). All aspects of language—pragmatics, semantics, syntax, and phonation—have been successfully treated using naturalistic approaches. Furthermore, direct comparisons between didactic and naturalistic approaches have demonstrated some advantages, including improved behavior (Koegel, Koegel, Hurley, & Frea, 1992; Koegel, Koegel, & Surratt, 1992) and greater progress (especially maintenance and generalization of newly learned skills) using naturalistic strategies than using didactic strategies (see Delprato, 2001, for a review of the comparative studies).

All the aforementioned studies involve individual treatment, but several studies have also demonstrated delivery of this approach in group treatment. Both Peck (1985) and McBride and Schwartz (2003) trained classroom teaching staff to use naturalistic teaching to increase the opportunities for child initiation and responding embedded inside ongoing classroom activities, with resulting increases in children’s communications, including speech. Similarly, McGee’s current use of incidental teaching is being delivered in the integrated, inclusive Walden Preschool at Emory University, though the outcome data have been provided in descriptive rather than empirical studies (McGee, Morrier, & Daly, 1999; Strain, McGee, & Kohler, 2001).

The effectiveness of this approach most likely results from four aspects of the technique. First, child language functions to achieve child-chosen goals and child-chosen reinforcers, which apparently strengthens the power of the reinforcers. (See Carter [2001], for a nicely designed experiment demonstrating that child choice, by itself, is reinforcing. Children showed more positive learning rates and behavior when they actively chose between two rewards than when they were given a reward by an adult, even though they had previously chosen the reward.) Second, the teaching style heavily emphasizes child initiation, either verbal or nonverbal, and the exchanges involve reciprocity of child and adult. Active child initiation is fostered and rewarded, and the interactions and the reinforcers that occur in the intervention approach are typical child—adult verbal exchanges in natural environments. Thus teaching focuses on child communication skills that are functional in all settings. Third, the social functions of language that lead to reinforcers are highlighted, so the core pragmatic aspects of language permeate the intervention. Finally, the emphasis on child motivation and natural reinforcers adds a positive affective element to the interactions, which may enhance memory for learning.

**Strengths and Weaknesses of the Approach**

The strengths of the naturalistic approach have been clearly demonstrated in maintenance, generalization, child gains, and child behavior. It has been demonstrated to develop useful, spontaneous speech in completely non-speaking children. It has been used successfully to teach semantics, syntax, and pragmatics of spoken language. However, there are also several weaknesses in the literature on naturalistic spoken teaching. First of all, most of the published empirical
studies involve one-to-one teaching using a highly trained therapist. Some of the promise of the naturalistic teaching approaches is in its application in typical environments, as described in the original Hart and Risley (1968) study. Although McGee and colleagues (1999) developed a method for applying naturalistic teaching for children with autism in an inclusive preschool classroom setting, empirical studies using comparative group designs are not yet available to demonstrate the amount of gain children make in group settings due to this technique. Second, because the teaching technique is (purposely) looser than the didactic method, it involves more degrees of freedom, and more adult choices, than does didactic instruction. Thus it may require more therapist training and sophistication than the didactic method. However, two studies demonstrate the ability of parents to learn naturalistic techniques (though in neither study were the children preschoolers; Laski et al., 1988; Charlop & Trasowech, 1991). McGee has described an effective procedure for teaching typical preschool peers to deliver incidental teaching (McGee, Almeida, Sulzer-Azaroff, & Feldman, 1992). Thus, although naturalistic teaching approaches may require more moment-to-moment decision making than didactic methods, it is clear that ordinary people, including children, can learn the techniques successfully.

Finally, unlike the available publications that describe the didactic behavioral approach, there are no treatment manuals in the public domain that lay out either the process of naturalistic teaching or the content (curriculum) of such teaching in such a way that others could independently learn from the materials. Without the ready availability of treatment manuals that allow others ready access to test this model, the approach currently remains in the hands of the few people who have developed the technique and are publishing work about it.

Whether naturalistic techniques are always preferred over didactic teaching is a matter of current debate. Whereas several literature reviews have maintained that naturalistic teaching is always advantageous (Koegel, 2000; Delprato, 2001), others have suggested that comparative data are insufficient to support this conclusion (Goldstein, 2000; Smith, 2001). Smith (2001) states that only didactic teaching approaches are able to develop a completely new behavior. However, this position does not seem tenable, given that naturalistic methods have demonstrated that children who lack all speech and imitative capacity have been shown to acquire speech in this method after failing to acquire speech through the didactic method (Koegel et al., 1987). Furthermore, the actual teaching techniques used in the two methods involve the same behavioral teaching repertoire: prompting, shaping, and chaining, as well as reliance on imitation, once it is learned, to shape new behaviors. As Goldstein (2000) points out, problems with generalization that occurred in the didactic teaching approach, described so carefully by Stokes and Baer (1977), stimulated behaviorists to incorporate the same teaching procedures used in didactic teaching in a novel way that maximized generalization, including embedding instruction in natural contexts and interspersing different types of trials, so as to apply discrete trial teaching in more natural contexts.

Schreibman’s current work involving learner profiles is applicable to the question of choice of one approach over another (Ingersoll, Schreibman, & Stahmer, 2001). In this study, Schriebman and colleagues demonstrated that pretreatment profiles involving characteristics such as motivation for objects and tolerance for social interaction predicted progress in their naturalistic treatment approach. Furthermore, the children who did not fit the profile and did not make progress in naturalistic instruction nevertheless benefited greatly when moved to didactic instruction. The didactic and naturalistic teaching approaches should probably not be considered as either—or, but rather as both—and. Every treatment technique with demonstrated utility represents an additional tool in the toolbox of interventionists. Teaching children with autism is a complex process, and the more tools available to an individual therapist, the more choices the therapist has in constructing an intervention approach that is effective for an individual child.

In summary, there is considerable promise in the naturalistic teaching approaches, and their efficacy has been demonstrated in individual treatment and in group interventions, using single-subject designs. The work in this area may be held back somewhat by the many different variations of these techniques that exist, with resultant lack of standardization of both the process
and the content of the teaching. Widespread public use will require widespread training availability and publication of treatment manuals that define both the content (curriculum) and the process (instructional techniques) of the approach. This area is in need of research that demonstrates broader applications of the method in order to test its full promise. Nevertheless, from the variety of publications already available, it is clear that naturalistic behavioral teaching, like didactic teaching, is a powerful and important treatment method with demonstrated efficacy for teaching many aspects of spoken language to children with autism.

DEVELOPMENTAL LANGUAGE APPROACHES

**History of the Approach**

As was stated at the beginning of this chapter, the behavioral approaches to teaching initially developed from the operant model of language development provided by Skinner (1957). However, that model of language development has been replaced by research findings in communication development over the past 30 years. As described earlier, children’s development of spoken language is now understood to follow earlier use of nonverbal communicative behaviors involving eye contact, voice, and gesture that support several communicative functions, especially behavior regulation, social interaction, and joint attention. Joint-attention behaviors and use of intentional communicative gestures have been found to predict development of spoken language use and understanding in typical development. Imitation of speech appears to be a necessary skill, but not sufficient, for development of typical spoken language. Detailed studies of early language learning in typically developing infants and toddlers in several different languages described the timing and pattern of developments in all these areas, and relations to cognitive accomplishments as well, across the toddler and preschool period (Bates, Bretherton, Snyder, Shore, & Volterra, 1980).

This social pragmatics revolution in understanding development of spoken language has parallels in autism research and treatment theory. The finding that nonverbal communication was a better predictor than was early speech for predicting later verbal ability (Mundy et al., 1990) led to the third main paradigm for language intervention discussed here: a model built directly from literature on normal language development, referred to here as the developmental pragmatics approach. The current understanding of the communicative deficits of children with autism from the developmental pragmatics viewpoint has been most clearly articulated by Amy Wetherby and Barry Prizant in a substantial body of theoretical writings over the past 20 years.

The developmental pragmatics approach to understanding the communication difficulties in autism represents the merging of the scientific study of normal language development with the most current findings concerning the social-communicative impairments seen in autism. Excellent recent descriptions of this line of thinking have been provided by Wetherby, Prizant, and Schuler (2000) and Peter Mundy (Mundy & Crowson, 1997; Mundy & Markus, 1997). This line of theorizing focuses on early autism-specific deficits in sharing affect and in social orienting as the initial social communicative deviations from the typical trajectory, deficits that interfere with the development of intersubjectivity as demonstrated by the presence of joint-attention behavior, intentional communication, and social referencing in the 9-12 month period. Delays in symbolic development in the second year of life further impede the process of acquiring a symbolic communication system. The patterns of communication that develop in preschoolers with autism—both the nonverbal child’s limited repertoire of direct actions on other people’s bodies and the young verbal child’s extensive use of immediate and delayed echolalia as a starting point for deconstructing speech—are understood as direct reflections of the barriers caused by lack of intersubjective understanding of others that is a core feature of autism.

**Characteristics of the Approach**
The most elaborated description of this kind of treatment has been provided by Prizant, Wetherby, and Rydell (2000) as the SCERTS model of intervention, with its focus on social-communication, emotional regulation, and transactional support as both the major components of the intervention and the treatment priorities. Principles of this approach include the following:

1. The focus is on enhancing spontaneous social communication within a flexible structure and varied and motivating activities.

2. Emphasis is placed on building multimodal communicative repertoires (including alternative communication systems) to give children a range of strategies for expressing intention.

3. Interactions are characterized by shared control, turn taking, and reciprocity.

4. Context involves meaningful activities or events chosen for their interest and motivation.

5. Child behavior, including unconventional behavior, is interpreted within the communicative framework.

6. A variety of social groupings and interactions are used.

7. Treatment goals and progress assessment are derived from the overall developmental profile of the individual child.

8. Rather than simplifying interactions to make them more understandable to the child, scaffolds and supports are added to provide meaning.

9. Conventional means of controlling others are provided to preclude behavioral problems.

10. Sharing affect is central to the learning process.

Thus this approach emphasizes the development of the full range of interpersonal communicative behaviors, including eye contact, shared affect, intentional vocalization, and manual gestures, as well as speech, to achieve reciprocal communicative exchanges regarding interactions involving objects and social games. Functional communication, rather than speech, is the primary goal. The adult seeds the environment with desired objects and activities that lend themselves to dyadic interactions, including objects that require adult assistance to reach or operate and objects that allow for the construction of joint activity routines. These activities provide multiple communicative opportunities and presses for the child. The adult responds to child behaviors that initiate or continue interactions, with the desired activity reinforcing the child’s communicative behavior. The affective quality of the exchanges, the amount of child control over the interaction, and the development of nonverbal gestures prior to speech are crucial aspects of the approach.

This approach bears many resemblances to the behavioral naturalistic teaching methods described earlier, as observed 20 years ago by Warren and Kaiser (1988) and recently reviewed by Prizant and Wetherby (1998), thus providing the potential for an unusual convergence between developmentalists and behaviorists. Kaiser and her colleagues continue to work in this kind of merged developmental-behavioral approach and have published two studies concerning the efficacy of their model, enhanced milieu teaching, for children with autism. Both studies used a single-subject design to test the effectiveness of this approach in increasing language use and social communication for 6 children in a parent-training model (Kaiser, Hancock, & Nietfeld, 2000) and for 4 children in a therapist-delivered model (Hancock & Kaiser, 2002). Developmental pragmatics work differs in several ways from the naturalistic teaching approaches described previously. First, the developmental approaches place more emphasis on developing prior to
verbal communication than do the behavioral approaches, because the developmentalists observe continuity between nonverbal and verbal communications both in typical development and in autism. Second, the developmental approach easily includes alternative and augmentative symbol systems as alternatives to speech for both expressive and receptive language development, because symbolic communication is the goal. Third, the goals of therapy are broader and more general than in the naturalistic behavioral approaches, including affect sharing and play development. Fourth, the treatment approach, in terms of the therapist’s behavior, is more loosely defined and would likely include a wider range of behaviors and interventions than the naturalistic behavioral approaches. In the developmental approach, symbolic communication in any form is the goal, with the assumption that children who are able to learn to speak will do so with appropriate treatment and that supporting nonverbal communication will always assist development of verbal communication. This approach to language development reflects the theory taught in the majority of university programs today. Communication scientists and practitioners, early educators, and special educators are trained in the pragmatics approach to communication development, and this is generally the disciplinary viewpoint of education and speech and language professionals who are new to autism. Although this knowledge is crucial for treating children with autism, professionals new to autism also need exposure to the language-teaching methods from the behavioral literatures, as reviewed in this chapter.

The line being drawn here between developmental and behavioral approaches regarding alternative/augmentative supports is not meant to be rigid, and there are points of crossover. Bondy and Frost’s (1994) Picture Exchange Communication System (PECS) is a well-known behavioral approach that focuses quite heavily on augmentative/alternative communication supports. The PECS approach uses careful shaping techniques to teach children to hand picture icons to adults to initiate requests. Adults verbalize the child’s request using simple, repetitive language, and a significant subgroup of children later begins to speak, apparently through imitating the adult responses. The approach known as verbal behavior (Sundberg & Michael, 2001), solidly based on Skinnerian theory of language acquisition (Skinner, 1957), focuses on the functionality of communication. It shapes children’s use of natural gestures, conventional gestures, and manual signs in functional, naturalistic, and reciprocal communicative exchanges for preverbal children, later shaping a verbal repertoire to accompany the nonverbal communicative behaviors. Both of these behavioral approaches also emphasize the function of communication for children in terms of requesting and supports for spontaneity of child communication. However, both approaches are solidly behavioral rather than developmental, and this difference permeates their approaches to teaching speech, the theoretical concepts underlying them, therapist behavior in the treatment, and the goals and objectives that are developed for the treatment.

Studies Supporting the Approach

Unlike the bodies of work already reviewed, empirical studies of the efficacy of interventions based on the developmental pragmatics approach are few in number and involve group studies rather than single-subject designs. This is likely because the single-subject model focuses on behavioral changes seen during brief periods of time, whereas the developmental pragmatics approach is more focused on multiple developmental changes that would involve longer periods of time. Kaiser and colleagues’ work (Hancock & Kaiser, 2002; Kaiser et al., 2000) is an empirically based developmental model. Rogers and colleagues published several studies describing the Denver model and its use of one version of the developmental pragmatics approach to treatment, known as the INREAL approach (Weiss, 1981), developed at the University of Colorado in the 1970s and 1980s. These studies involved relatively large groups of 30 or more preschoolers with autism in a pre–post design over a 6-month period. Pre–post standardized measures revealed a doubling of developmental rates and significant gains for a large group of children in expressive and receptive language beyond that which would have been expected from the children’s initial developmental rates, as well as increases in a variety of positive social interactions in dyadic exchanges with parents. Furthermore, of the completely nonverbal children, 50% acquired useful, multiword utterances, with the end result that 75% of children with autism had useful multiword
speech by age 5. These results were independently replicated in four different settings (Rogers, Herbison, Lewis, Pantone, & Reis, 1986; Rogers & Lewis, 1989; Rogers & DiLalla, 1991; Rogers, Lewis, & Reis, 1987). However, lack of comparison or control groups and lack of blind raters limit conclusions that can be drawn. Furthermore, the Denver model has since added behavioral components to the language intervention in order to improve success rate further for developing speech in completely nonverbal children (Rogers et al., in press).

Mahoney and Perales (2003, 2005) described a developmental intervention in a study that demonstrates the relationships between maternal sensitive and responsive interventions and child language development in both typically and atypically developing toddlers. Training mothers to use a sensitive, responsive interaction style with their toddlers with autism in one clinical session per week resulted in significant gains in child language development across a year of treatment. Furthermore, the amount of gain was directly linked to the level of maternal sensitivity measured in the mother’s communicative behavior, as reported in a pre—post study. A similar parent-training study using the developmental pragmatics approach was recently reported by Chandler, Christie, Newson, and Prevezer (2002). Parents of 10 toddlers with autism received home programs for their children, and a variety of teaching supports (booklets, a toy lending library, music therapy sessions). In 18 months, all the children were using communicative gestures and expressive speech according to parental report, though there was no control group and no independent assessment of the children. Greenspan and Weider (1997) described an intervention model that embraced the developmental pragmatics view and its strong affective base. A report of clinical outcomes of 200 children receiving this model described development of affectively rich, communicative behavior. A final model from the developmental pragmatics tradition is the Hanen Early Childhood Educators program. The Hanen approach is well known as a developmental language intervention method taught to parents and therapists. However, the only empirical study that was found had significant design problems and reported no positive effects of the method as applied by preschool teachers in generic preschool classrooms (Coulter & Gallagher, 2001).

**Strengths and Weaknesses of the Approach**

Even with the sparseness of supportive data, the developmental approach is a very popular treatment model with a strong basis in the science of communication development, which is its clear strength. A second strength of the model is similar to the naturalistic approaches in that the interactional exchanges are built on more typical models of communication, and thus teach communication in terms of its natural functions and social interactions, and are readily delivered in natural environments and by a variety of adults. However, the lack of controlled studies of the approach is a major weakness at this time. Furthermore, the treatment model is built from models of language development in typically developing toddlers and young children (though it accommodates to the different communicative trajectory that autism often creates in early childhood). Whether moving children with autism through a typical developmental sequence is the best approach is an open question. We have very little information concerning developmental patterns of language in autism. The only detailed language study done (Tager-Flusberg et al., 1990) compared 6 children with autism with those with Down syndrome, a group that also has difficulties developing expressive speech. It may be that the typical sequence of skills is the best sequence for teaching spoken language to children with autism, but it is not necessarily so. Another problem, similar to the naturalistic approaches, is the lack of treatment manuals in the public domain that lay out the process of intervention and the content or sequence of skills to be taught. The developmental pragmatics approach contains even more therapeutic techniques and approaches than the naturalistic model because of the many communicative behaviors that are treatment targets, and thus it represents an even more complex therapy to deliver. Furthermore, it requires a considerable body of knowledge on the part of the therapist. Nevertheless, parents and classroom staff members, including paraprofessionals, have been taught to carry out the method with high levels of treatment fidelity (Mahoney & Perales, 2003, 2005; Rogers et al., 1987) and thus the approach can be taught to a wide range of adults.
Finally, the extensive use of augmentative or alternative supports for communication has not been documented to assist acquisition of spoken language. Bondy and Frost’s (1994) data suggesting that children using PEGS spontaneously acquired some speech have been confirmed by a recent replication by Charlop-Christy, Carpenter, Le, LeBlanc, and Kellet (2002). However, there is no way to evaluate whether speech development was actually enhanced by the PEGS model in comparison with other models. The only experiment in the literature that examined that question is the elegant experimental design by Yoder and Layton (1988), who demonstrated no advantage to speech acquisition for children with autism when a visual system was included—in this case, sign language. Given the widespread use of PEGS and other visual systems in programs for young children with autism, this is a very important empirical question and needs scientific attention. While use of visual systems may not inhibit the learning of speech, they may not enhance the learning of speech, either, and enhancement of use of spoken language has to be a main goal of early intervention for autism, given its role in better outcomes.

The importance of the pragmatics of communication is unmistakable, and all the approaches described here have focused on teaching children with autism to use spoken language to accomplish a variety of interpersonal functions. What is not clear is whether nonverbal communication needs to be a precursor to other kinds of language teaching for nonverbal children with autism. It may be that simultaneous interventions in pragmatics of nonverbal communication, understanding of spoken language, and development and shaping of spoken language can be carried out and may result in more rapid acquisition of useful communicative speech. A summary of the main characteristics of these three approaches is provided in Table 6.1.

**CURRENT ISSUES**

Several issues that are currently points of conflict in the field appear to have considerable influence on decisions concerning language treatment for young children with autism. Some of these are as follows:

1. *Capacity for spoken language.* One continuing description of autism appears to need drastic revision, and that is the statement that 50% of persons with autism will not acquire useful speech. The lessons from the published studies across many designs and many approaches suggest that a more accurate statement is that 75-90% of young children with autism will acquire functional spoken language if they receive appropriate treatment during the preschool years (Smith et al., 2000; McGee et al., 1999). In contrast, no study of any alternative language system reveals improved general outcomes or even mastery of an alternative system at a more than rudimentary level. Because functional spoken language predicts better outcomes for preschoolers with autism, and because the large majority of young children with autism apparently can master speech, should teaching children to understand and use speech be a main priority of every early-intervention program for children with autism?

2. *Is there a preferred choice of treatments?* As reviewed by Goldstein (2000), the data does not support the conclusion that there is one best approach for all children, to teach all skills. There is a body of work demonstrating efficacy of both didactic and naturalistic behavioral models, with a few comparative studies. There is no comparable set of studies from the developmental pragmatics model. The published data from several of the group studies, and also from some single-subject designs, suggest that child characteristics interact with treatment outcomes. Those children with some speech appear to progress more rapidly than those without, and those with certain profile characteristics may respond better to one type of treatment.
<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Didactic behavioral approach</th>
<th>Naturalistic behavioral approaches</th>
<th>Developmental language approaches</th>
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<tbody>
<tr>
<td>Some well-known approaches that use the technique</td>
<td>Lovaas's approach; discrete trial teaching (DTT)</td>
<td>Incidental teaching; pivotal response training (PRT); milieu teaching</td>
<td>Prizant and Wetherby's SCERTS model; Denver model; Greenspan and Wieder's DIR model</td>
</tr>
<tr>
<td>Underlying theory</td>
<td>Skinner's operant learning model</td>
<td>Skinner's operant learning model</td>
<td>Current pragmatics-based language development theory</td>
</tr>
<tr>
<td>Setting</td>
<td>Specific teaching location. Limited stimuli available. Child and adult generally sitting and facing each other.</td>
<td>Natural or naturalistic settings with attractive materials to draw children's interest and motivate communication.</td>
<td>Natural or naturalistic settings involving meaningful activities or events chosen to elicit children's interest and motivate communication.</td>
</tr>
<tr>
<td>Style of teaching</td>
<td>Adult directed. Massed trials of preselected tasks with set rules for determining &quot;mastery.&quot;</td>
<td>Adult–child interactions are pragmatically functional. Trials are dispersed. Mastery trials interspersed with new skills. Child interest and engagement is a main target for adult.</td>
<td>Interactions involve shared control, turn taking, and reciprocity. Interactions are affectively rich and positive in nature. Shared affect is central to the teaching process. Nonverbal conventional communication is developed prior to or alongside of speech.</td>
</tr>
<tr>
<td>What initiates the teaching interaction</td>
<td>Adult directs and the child responds as directed. Child follows adult lead.</td>
<td>Adult creates a situation in which the child indicates desire for an object or activity. Adult then follows the child's lead with a prompt for a more mature communication.</td>
<td>Adult creates a situation in which the child indicates desire for an object or activity. Adult assures that the child's communication is successful by delivering desired object. Adult may prompt or model an additional communication before allowing access to desired activity.</td>
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<th>Naturalistic behavioral approaches</th>
<th>Developmental language approaches</th>
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<tr>
<td>Teaching techniques</td>
<td>Precise teaching with set ABC. Begins with vocal imitation and prompts, shapes, and chains desired speech behaviors in response to specific stimulus and language model.</td>
<td>Prompt, shape, and chaining procedures to shape or elaborate speech. Many different behaviors may be reinforced. Focus on form and content of language in typical communicative contexts.</td>
<td>A wide range of communicative behaviors, both verbal and nonverbal, and a wide range of pragmatic functions are targeted. Child behavior is interpreted within the communicative framework.</td>
</tr>
<tr>
<td>Therapeutic goal</td>
<td>Production of appropriate speech in response to multiple types of stimuli</td>
<td>Initiation of speech for communicative purposes</td>
<td>Effective communication for varied pragmatic functions</td>
</tr>
<tr>
<td>Choice and use of reinforcers</td>
<td>Extrinsic to the teaching task; chosen based on reinforcer strength; targeted behavior is reinforced by adult delivery of reinforcer.</td>
<td>Intrinsric to the teaching task; chosen based on child motivation for the activity/objects; child efforts and attempts, as well as mastered target behaviors, are reinforced with access to desired objects.</td>
<td>Intrinsic to the teaching task; chosen based on child motivation for the activity/objects; child efforts and attempts, as well as mastered target behaviors, are reinforced with access to desired objects.</td>
</tr>
<tr>
<td>Research base</td>
<td>Substantial base in single subjects and some group designs.</td>
<td>Substantial single-subject research base; some group designs.</td>
<td>Limited number of studies thus far; both single-subject and group designs.</td>
</tr>
<tr>
<td>Specificity of the targeted behavior</td>
<td>Extremely specific. There is one targeted behavior per trial.</td>
<td>Several different behaviors may be reinforced.</td>
<td>Wide range of nonverbal and verbal productions may be rewarded.</td>
</tr>
<tr>
<td>Knowledge needed to deliver the treatment</td>
<td>Precise nature of the teaching allows for a wide range of people to be trained but requires ongoing direction from master behavior therapist.</td>
<td>Requires greater therapist judgment than didactic teaching but can be learned by many different deliverers.</td>
<td>Because of the multiple targets for communication, requires considerable therapist decision making and judgment; typically delivered by developmentally trained therapists who train parents.</td>
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than another at a particular point in time. Additionally, specific skills may show different outcomes depending on treatment. For instance, increase in spontaneous communications will probably occur more rapidly when the teaching trial follows the child’s initial act rather than when it precedes it. In that case, the naturalistic approach may be the more powerful intervention. On the other hand, if one is trying to increase consistency of the use of the plural form of nouns, massed trials using a variety of material sets will likely result in faster increases initially than spaced, naturalistic teaching. As stated earlier, several authorities in the field are calling for blended approaches that offer the benefits of both didactic and naturalistic approaches, and McDonnell (1996) has demonstrated advantages of the combined approach over both of the single approaches.

For children who do not speak, naturalistic behavioral approaches may be the most powerful for teaching functional communication and shaping speech with spontaneity, generalization, and motivation to communicate. The few comparative studies that exist support this conclusion (see Delprato, 2001, for a review). In addition, many national leaders in communication and learning sciences, including those initially trained in the didactic models, have moved to naturalistic

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<tr>
<td></td>
<td>Teaching approach generalizes to other teaching targets easily.</td>
<td>Use of naturalistic teaching settings and interactional styles lead to maintenance and generalization of learned behaviors across natural settings.</td>
<td>Fits easily into natural routines and settings.</td>
</tr>
<tr>
<td></td>
<td>The precision of the instruction makes it deliverable by a wide range of people.</td>
<td>Use of highly motivating materials and activities promotes child positive behaviors; reduces unwanted behaviors.</td>
<td>Use of highly motivating materials and activities should promote child positive behaviors; reduces unwanted behaviors.</td>
</tr>
<tr>
<td></td>
<td>Teaching manuals and curricula are published. Drill and practice methods lead to rapid mastery of new skills and development of speed and fluency in responding.</td>
<td>Children initiate communication at high frequencies. Highlights the pragmatic functions of language and thus is in line with current communication science.</td>
<td>Highlights the pragmatic functions of language and thus is in line with current communication science.</td>
</tr>
<tr>
<td>Weaknesses of the approach</td>
<td>Artificial learning environment and interactional style limit generalization without additional teaching to transfer skills. Does not foster communicative initiative. Not based in current science of communicative development. Is not, by itself, a comprehensive language intervention approach.</td>
<td>More degrees of freedom in the approach make for a more difficult therapy to learn. No systematic treatment manuals available to the public. No published curriculum. Technique is not appropriate for teaching skills for which there is no intrinsic reinforcement.</td>
<td>Lacks a large body of effectiveness data. Model is based on normal development; may or may not be most effective route for autism. Lacks published treatment manuals and curricula. Most complex therapy to deliver because of the multiple communicative behaviors and functions that are targeted.</td>
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models. However as Ingersoll et al. (2001) have discussed, the didactic teaching method may be a more powerful initial teaching approach for some very avoidant children who initially lack much motivation for objects. Furthermore, didactic approaches may be usefully combined with naturalistic behavioral approaches for some specific reasons, such as teaching a particularly difficult syntactic form such as pronouns or other deictic constructions.

It is a truism that no single approach can best meet the needs of all children with autism and that individualization of approach to maximize progress will be necessary to attain the best outcome for an individual child. This means that interventionists need to monitor progress frequently and carefully and change intervention strategies when progress on specific objectives is poor. This also means that interventionists need to master several different intervention approaches, so that they are able to individualize for specific children, drawing from the approaches that have some empirical support. Speech and language pathologists are the communication experts on most children’s teams, but they may lack a breadth of expertise in the multiple, empirically supported approaches described here. Clinicians without special autism training need to seek out the approaches that have empirical support and learn them, rather than relying on general disciplinary therapeutic practices. This would be easier to do if treatment manuals and curricula were more readily available.

3. Should all nonverbal children with autism immediately have alternative communication systems taught to them? Although studies have demonstrated that some children will develop speech while using alternative systems (Charlop-Christy et al., 2002), there is currently no empirical evidence that the use of alternative systems will accelerate the development of spoken language with the published approaches that focus completely on developing spoken language. The few studies that demonstrate development of speech after visual systems show much-longer timelines-for-speech development than those intervention studies that teach speech directly to nonverbal children. Additionally, time spent on augmentative training is time not spent on learning to use and understand speech, and the alternative systems take considerable time to teach. Our knowledge is limited by the lack of studies targeting this question; only one true comparative study (Yoder & Layton, 1988) exists. We need empirical research that specifically examines the usefulness of alternative/augmentative systems in accelerating speech acquisition for children with autism. The existing research suggests that augmentative systems have a crucial role as a primary communication system for some children with autism, but they have not yet been demonstrated to be a necessary or even an important step in developing useful, communicative speech.

4. Parent training. Parent training is considered a necessary practice for intervention with young children with autism (National Research Council, 2001). Several studies have demonstrated that parents can learn all the major interventions described herein: didactic and naturalistic behavioral language therapy techniques and developmental pragmatic approaches. Parents can learn these techniques at high levels of fidelity, can deliver them at home, and can improve their children’s language abilities, even when parental interventions are the main interventions occurring. Furthermore, there is a plethora of evidence that certain parental styles encourage language and communication development in children with and without diagnoses, including those with autism (Siller & Sigman, 2002). These styles, considered to represent a style, resemble the naturalistic and developmental pragmatics approaches in that they follow children’s leads, are sensitive to children’s goals, use intrinsic reinforcers that are inherent to the situation, and use modeling and expansion. Parents trained in didactic teaching have also facilitated language gains in their children (Howlin & Rutter, 1989). However, the studies also make clear that parents have to receive ongoing individual training and frequent, regular support if child progress is to occur and continue. Parent-training groups are efficient and economical, but ongoing individual coaching sessions must be part of the package. Thus language treatment for children with autism should include enough parent training and support so that parents are delivering the method in the child’s home environment. Interventions that embed instruction in natural family routines and child-care practices may be especially effective.
5. Language subgroups in autism. The variety of language patterns seen in toddlers and preschoolers with autism who first come to treatment seems to fall into several clinical clusters. The first involves children who have die speech, however echolalic and unusual it seems. These children appear to have no difficulty with phonology or auditory memory. They can imitate speech (though they may not be able to imitate body movements or actions on objects), and there may be some pragmatic functions to their echolalic speech (Rydell & Mirenda, 1994), but they seem unable to deconstruct the language they hear and to infer the underlying meanings. A hypothesis is that, for this subgroup, the primary language problem is at the level of pragmatics. One of the core difficulties for those with autism is understanding others’ mental states: the intersubjectivity problem. “The child’s major task in learning language is to infer the relationships between language content, form, and use” (Warren & Kaiser, 1988, p. 91). Young children with autism lack the pragmatic and intersubjective tools needed to deconstruct others’ language and infer the relationships among language form, content and use that is the basic language learning challenge for toddlers.

Treatment for this group requires that the meanings underlying word use have to become very simple and clear for them Clinical experience has taught us that, as tempting as it is to use children’s auditory memory ability to prompt them to use correct phrase speech, going this route seems to reinforce echolalia. A better language treatment approach is to simplify the language environment for these children and make the relationships between forms, functions, and meanings very transparent by using and stimulating single-word utterances or very short phrases in functional communicative situations, so that these children can map out semantics and functions of single words. As they spontaneously begin to use single words appropriately for various functions, then the model increases to two-word and their longer utterances. For these children, many of the studies reviewed here describe approaches that expand their vocabularies, develop syntax, teach pragmatic use of language, and target spontaneity and initiative. The focus on pragmatics is crucial for this group, which probably has the potential for the very best outcomes (see Koegel, Camarata, et al., 1998; Williams, Donley, & Keller, 2000, for examples of teaching procedures that teach the pragmatic intent behind complex language structures). The naturalistic approaches seem a particularly good choice for these children because of better generalization and initiative that accompanies this approach to teaching.

The remaining children, those without speech or initiative vocalizations, are often seen as a homogeneous group—the nonverbal group—and the term oral dyspraxia is currently being used to characterize them. These children do not imitate adult behavior, whether movements or sounds. Research in our lab has demonstrated strong relationships between imitation of motor movements, facial movements, and simple sounds in preverbal toddlers with autism (Rogers, Hepburn, & Stackhouse, 2003). Many studies have demonstrated success at teaching this group to imitate actions and movements using a variety of methods (Kamps, Walke; Locke, Deiquadi, & Hall, 1990; Bernard-Opitz, Sriram, & Sapuan, 1999; Smith et al., 2000; Garfinkle & Schwartz, 2002; Lovaas et al., 1966; Lovaas, Freitas, Nelson, & Whalen, 1967, Metz, 1965), after which a subgroup of them proceed rapidly to imitation of facial movements and speech sounds. Once they are imitating speech sounds, they are on the road to learning spoken language. There are also alternative approaches to developing speech that do not rely on motor imitation but instead shape vocalizations into imitative responses (Ross & Greer, 2003; McGee et al., 1999; Koegel et al., 1987), and children have developed speech using these routes as well.

For the subgroup of initially nonverbal children who learn through treatment to imitate speech, the underlying mechanisms preventing language development may involve both (1) the intersubjective deficit described either, and (2) a second general deficit involving intentional imitation of motor movements, including oral movements and vocal imitation Although the underlying neurocognitive mechanisms for general imitation are not yet known, brain-imaging studies are converging to identify activation in the parietal and inferior frontal lobes, suggested to indicate the presence of “mirror neurons” that fire both when an individual movement is seen and when it is made, thus providing a neural representation of that movement to be acted on (for a
review, see Rizzolatti, Fadiga, Fogassi, & Gallese, 2003). This “resonance mechanism” may be at the source of imitation of motor movements. Current mirror neuron research suggests that certain of these neurons are specific for facial movements (see Bekkering, 2002). We conjecture that further work in humans may reveal mirror neurons that resonate specifically to the sound and sight of movements associated with speech. Although the concept of a generalized “dyspraxia” resulting in generalized motor planning and execution problems of all sorts is often applied to these children, initial findings from our lab suggest that this group’s difficulty appears to be specifically in making intentional, imitative body movements (Rogers et al., 2003). This group can learn to imitate body movements well through intensive and rigorous training. To develop meaningful speech, these children need to be taught to imitate speech, whether through didactic teaching approaches or through prompting and shaping techniques inside naturalistic approaches. Extrapolating from existing intervention studies, one could hypothesize that the imitation deficit is more remediable than the intersubjective deficit. (In fact, the two may be related [Rogers et al., 2003; Rogers & Pennington, 1991], and mirror neurons may underlie this relationship [Williams, Whiten, Suddendorf, & Perrett, 2001]). With appropriate treatment, these children can learn to imitate motor and vocal behavior and can learn functional spoken language. The two main foci of their language intervention, then, are (1) imitation, and (2) the pragmatics of social interactions and shared meanings of language.

However, there is a third subgroup, and these are the initially nonverbal children who do not progress into vocal imitation even after they have learned to understand some words and phrases, who have learned to imitate body movements, including novel acts (and thus have learned the underlying “do as I do” rule that defines imitation), and who may have developed impressive sight-word vocabularies and other nonverbal cognitive skills through intensive treatment. They have often learned to produce an intentional vocalization, but they cannot learn to imitate speech phonemes. For this group, a true underlying speech dyspraxia may prevent them from gaining intentional control of the speech—motor mechanisms for phoneme production. These children desperately need alternative communication systems to develop awareness of symbolic communication. Some of them will develop speech as they use signs, PECS, and other visual systems, according to existing research. Mastery of spoken language for this group may depend on adding to their general treatment a specific intervention that can develop intentional control of the speech—motor mechanisms. One approach that may hold promise for this group involves the PROMPT approach (Square-Storer & Hayden, 1989), a technique that provides manual facilitation of the speech—motor mechanisms during episodes of naturalistic communication therapy. An initial pilot study of the PROMPT approach has demonstrated considerable promise for rapid development of verbal imitation and spontaneous speech in nonverbal preschoolers with autism (Rogers et al., in press). Thus some or many children in this subgroup may also have the potential for spoken language given appropriate treatment for dyspraxia of speech. Interestingly, in Lovaas’s first study on teaching language, he refers to using motor prompts to shape oral—facial movements (Lovaas et al., 1966).

There is probably a fourth subgroup: those preschoolers who do not have the necessary cognitive maturity to support language development (those with nonverbal performance skills well below the 12 month level). This is likely a small number of children, and this group will need to be taught gestural and simple alternative communication systems initially.

6. The gap is immense between the language treatments most young children with autism receive and what connotes the state of the science in language intervention for children with autism. Speech—language pathologists represent the professional group with the greatest knowledge of ‘language development. However, most young children with autism have, at best, only a few hours of speech—language therapy per week and thus may not be receiving a rigorous enough intervention to make the most rapid gains possible. Furthermore, training in speech—language pathology alone may not equip a therapist with the special knowledge needed to optimally serve children with autism.
Many young children in the United States currently receive didactic behavioral teaching, both because of the empirical reports of outcomes from Lovaas’s method and because of the readiness of treatment manuals and relative ease of delivery. However, the well-documented difficulties of this approach in developing initiative, spontaneity, generativity, a wide range of communicative functions, and generalization to natural settings and interactions too often result in children whose speech consists primarily of echoic or rote trained phrases. Smith (2001) reminds users of the didactic intervention approaches to incorporate the use of naturalistic approaches and generalization techniques early rather than late in the speech acquisition process in order to achieve spontaneous, functional communicative speech.

The naturalistic behavioral approaches provide both a solid empirical base and bridges to current communication science, but the area is hampered by multiple similar approaches, and the most rigorous approaches have not been made easily available to the public. The plethora of models and terminology in various articles (Warren & Kaiser, 1988), combined with the lack of treatment manuals that clearly lay out either the process or the content of the treatment, make it hard to access by those outside of the circles in which it is taught. It would be of great benefit to the field for the leaders of the naturalistic approaches to foster a convergence, similar to the way that those working in the area of positive behavior supports have converged on terminology, process, and content, yielding treatment manuals, journals, and accessibility (Carr et al., 2002). It would be of even greater benefit if this convergence could create a true wedding of learning science and communication science, with professionals trained in current communication science, the science of human learning, and the use of single-subject designs to examine treatment efficacy.

It is clear that, whatever approach is used, involves ongoing individual interactions with a child using carefully planned and sequenced strategies and clear reinforcement practices in natural environments. Such interventions are being delivered effectively in many settings home, inclusive and specialized preschool group programs, therapy sessions. Is there a best setting? We know that teaching in natural settings fosters maintenance and generalization in those settings. Carrying out this kind of successful teaching in group classroom situations is nicely described by Peck, Killen, and Baumgart (1989) and McBride and Schwartz (2003). Whether or not initial teaching occurs in those settings, skills have to be practiced and reinforced in those settings if they are ever to become part of the child’s permanent repertoire. The behavioral model of collecting ongoing data and using it for decision making is crucial here. The bottom line is skill development and skill generalization. Whatever decisions are made regarding the style of language training, if children are not progressing and learned skills are not being used spontaneously in natural environments, the treatment is not succeeding, and changes need to be made. The intervention research is clear about this: Given appropriate treatment, children with autism progress. Lack of progress requires revision of the treatment.

7. Research needs. Given all that has been written about language intervention in autism, there are a relatively small number of empirical studies that describe well-controlled research involving young children with autism, and most of these are single-subject designs examining one specific language skill. We continue to need these studies to describe successful methods for teaching individual skills that have not yet been examined. Single-subject designs that document initial treatment failures and the alterations that were made to finally yield success provide strong models for clinicians.

The few comparative studies that exist have been quite helpful, but there are too few. There are big decisions to be made at the start of treatment. Will it help the child to use augmentative visual systems? Should we begin with a didactic or a naturalistic approach? Do we begin with one-to-one treatment sessions exclusively, or can excellent progress be accomplished by adding group treatment? If so, how? Parents and practitioners need answers to these questions from comparative group studies in which the children’s initial communication and imitation abilities are spelled out in detail and in which language progress is measured quite frequently. Measures that examine
pragmatics, semantics, and syntax independently will provide more information than standardized summary scores of receptive and expressive language.

Measurement systems for assessing language progress in the published research have been criticized as being too restricted. Prizant and colleagues have made important recommendations in this regard:

“In measuring efficacy of intervention, researchers need to go beyond traditional measures of communicative and language skills such as improvement on standardized tests and include broader characteristics, such as degree of success in communicative exchange, related dimensions of emotion expression and regulation, sociocommunicative motivation, social competence, peer relationships, and the child’s competence in natural environments” (Prizant et al., 2000, p. 218).

Finally, we need to understand more about the nature of language development in autism. Replication and extension of the work begun by Tager-Flusberg and colleagues in 1990 are needed to examine autism-specific differences in timing, sequencing, and learning strategies underlying specific aspects of language development so that we can construct intervention models that maximize the breadth, depth, and rate of language learning in children with autism.

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