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Interventions to Improve Communication

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SYNOPSIS

It is clear that children with autism benefit from intensive, early intervention that focuses on increasing the frequency, form, and function of communicative acts. Intervention methods that draw from a range of philosophies and make use of varying degrees of adult direction have been shown to be effective in increasing language and communicative behaviors, although direct comparisons among methods, controlled studies with random assignment to treatments, and long-term outcome studies are, as yet, lacking. Available evidence shows that highly structured behavioral methods have important positive consequences for these children, particularly in eliciting first words. However, the limitation of these methods in maintenance and generalization of skills suggests that many children with autism will need to have these methods supplemented with less adult-directed activities to increase communicative initiation and to carry over learned skills to new settings and communication partners. A review of programs aimed at language development in high functioning children with ASD points out the importance of thinking beyond words and sentences to the social functions of communication and language use when developing interventions. Although a range of adult-mediated programs are reviewed here, providing opportunities for mediated peer interactions with trained peers in natural settings appears to be especially important in maximizing the effects of this intervention.

Communication deficits are one of the core symptoms of Autism Spectrum Disorders (ASD). People with ASD can be slow to begin talking, or may not learn to talk at all; others may learn to produce words and sentences but have difficulty using them effectively to accomplish social interactive goals. Milestones in language and communication play major roles at almost every point in development for diagnosing and understanding autism. Most parents of autistic children first begin to be concerned about their child's development because of early delays or regressions in the development of speech [1]. Functional language use by school age has been shown to be related to better long-term outcomes in autism [2], [3]. Fluency and flexibility of expressive language are key components of the distinction between "high-functioning" and "low functioning" autism in school age or adolescence [4]. A history of language delay can be particularly crucial in differentiating autism from other psychiatric disorders in high-functioning adults[5].

Because of the centrality of communicative deficits in the expression of ASD, the amelioration of communication problems in children with this syndrome is one of the most important areas of educational service. The present discussion of intervention for communication disorders in ASD will be divided into two broad sections; one will discuss the development of early,

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prelinguistic communicative behaviors that lead to the emergence of language, the second will examine intervention for children who produce language, but have difficulty using it appropriately for social interaction. Communication Intervention for Children with Prelinguistic Communication and Emerging Language

Characteristics of Early Communication in ASD

A wide variety of studies have discussed the communicative characteristics of prelinguistic children with ASD. Chawarska and Volkmar [6,7] reviewed this literature, and identified several key characteristics of this group. These include:

- limited attention to speech, including failure to respond to name [8], [9].
- deficits in joint attention skills [10], [11], [12], [13], [14], including coordinating attention between people and objects, drawing others' attention to objects or events for the purpose of sharing experiences, following the gaze and point gestures of others, shifting gaze between people and objects for the purpose of directing another's attention, and directing affects to others through gaze.
- reduced rates of communication [14]
- limitation in range of communicative intentions to those whose function is to get others to do or not do things for them (requests and protests), [15], [14].
- Failure to compensate for lack of language with other forms of communication, particularly the more conventional forms, such as pointing or showing [16], [14], [17–19].
- deficits in symbolic behaviors apart from language [20], [21], [22], and in imitation of vocal and other behaviors [23], both of which are closely related to language development in typical children. Intervention for communication in young children.

Intervention for communication in young children with ASD, then attempts to address this range of difficulties.

Intervention Methods for Children with Prelinguistic Communication and Emerging Language

Goldstein [24], Paul & Sutherland [25], Rogers [26], and Wetherby and Woods [27] have reviewed interventions for early communication in autism, which are generally divided into three major categories. The first are often referred to as **didactic**. Didactic methods are based on behaviorist theory and take advantage of behavioral technologies such as massed trials, operant conditioning, shaping, prompting, and chaining. Reinforcement is used to increase the frequency of desired target behaviors. Teaching sessions using these approaches involve high levels of adult control, repetitive periods of drill and practice, precise antecedent and consequent sequences, and a passive responder role for the client. The adult directs and controls all aspects of the interaction.

A second category of approaches identified is frequently called **naturalistic**. These approaches attempt to incorporate behaviorist principles in more natural environments using functional, pragmatically appropriate social interactions, instead of stimulus-response-reinforcement sequences. Naturalistic approaches focus on the use of "intrinsic," rather than tangible or edible reinforcers. Intrinsic reinforcers include the satisfaction of achieving a desired goal through communication (the client says, "I want juice" and gets juice), rather than more contrived, extrinsic reinforcers such as getting a token or being told "good talking." Finally, and perhaps

most important, naturalistic approaches attempt to get clients to initiate communication, rather than casting them always in a responder role.

The final orientation in this classification scheme is called **developmental** or **pragmatic**. These approaches emphasize functional communication, rather than speech, as a goal. As such, they encourage the development of multiple aspects of communication, such as the use of gestures, gaze, affect, and vocalization, and hold these behaviors to be necessary precursors to speech production. Activities provide multiple opportunities and temptations to communicate; the adult responds to any child initiation by providing rewarding activities. Thus the child directs the interaction and chooses the topics and materials from among a range that the adult provides. Teachers strive to create an affectively positive environment by following the child's lead, and react supportively to any behavior that can be interpreted as communicative (even if it was not intended in that way).

In the following sections, examples of each of these three types of intervention approaches, as applied to the prelinguistic and early language stages of communication in ASD, will be presented.

Didactic Approaches

A large body of research has demonstrated that didactic approaches are an effective means of initially developing attention to and understanding of language, as well as initiating speech production in preverbal children with ASD. Discrete Trial Instruction (DTI) entails dividing the chosen skill into components and training each component individually, using highly structured, drill-like procedures. Intensive training utilizes shaping, prompting, prompt fading, and reinforcement strategies. Trials continue until the child produces the target response with minimal prompting; at which point the next step in the hierarchy of behaviors (such as correctly pointing to the named picture from among two pictures) is presented and trained.

Several group studies have shown that structured intervention based on behavioral principles is useful in improving expressive language in children with ASD [28–30]. A relatively large literature based on single case studies has also demonstrated the efficacy of these approaches in eliciting vocal imitation [31], and speech from nonverbal children [32], [33], [30]. However, these approaches rely heavily on teacher direction, prompted responses and contrived forms of reinforcement. An inherent weakness in didactic approaches lies in the fact that they often lead to a passive style of communication, in which children respond to prompts to communicate but do not initiate communication or transfer the behaviors acquired to situations outside the teaching context [34]. These difficulties in generalizing and maintaining behaviors taught through didactic approaches, along with changes in theoretical views of language learning that emphasized the central role of social exchanges in the acquisition of language, led to the introduction of more naturalistic methods of intervention.

Contemporary Applied Behavior Analysis (ABA)

A variety of practitioners of applied behavior analysis [35–37] have confronted the major shortcoming of classic behavioral approaches: the lack of generalization. Hart & Risley [38] were the first to attempt to apply operant principles to more functional communicative situations. Their major insight concerned the importance of making access to the object of the child's interest contingent on the child's initiating some communicative exchange about it. These contemporary ABA, or naturalistic methods share some aspects of the didactic approaches from which they are an outgrowth. They are moderately teacher-directed, address goals specified by the adult, and rely on reinforcement, although the reinforcement is more intrinsic (the attainment of the child's desire, or a social reinforcement) than the tangible rewards used in more traditional DTI methods. The effectiveness of these methods has been

amply documented in the literature, at least in single case studies, both for initiating speech in previously nonverbal children [39], as well as for increasing the complexity of spoken language [40]. Direct comparisons of TD and naturalistic approaches have shown some advantage for the more natural techniques, including maintenance and generalization of new behaviors [41], although not all investigators accept this [42].

Several techniques that fall within the category of contemporary ABA approaches to communication intervention include prompt-free training [43], incidental teaching [38,44], and mand-modeling in which the caregiver requests a response from the child [45]. *Milieu teaching* is an umbrella term that refers to this range of methods that are integrated into a child's natural environment [24]. The early language skills of children with a range of developmental disorders, including autism, have been shown to be enhanced through Milieu teaching methods [46], [35], [47,48]). Milieu teaching approaches include:

- Training in everyday environments
- Activities that take place throughout the day, rather than only at “therapy time.”
- Preferred toys and activities are included so that participation in activities is self-reinforcing.
- Encouragement of spontaneous communication by using “expectant waiting” and refraining from prompting.
- Waiting for the child to initiate teaching episodes by gesturing or indicating interest in a desired object or activity.
- Providing prompts and for expansion of the child's initiation.
- Rewarding child responses with access to a desired object or activity.

In general, the Milieu approaches like these have been shown to be associated with increased ability to initiate communication in children who did not show this ability previously [49], [50]. Nonverbal children have developed speech using these methods [51], and increases in the frequency, spontaneity and elaboration of language have also been documented [41], [24], [52]. Yoder and Stone [48] showed that children with autism who had some communicative behavior prior to intervention were more likely to develop speech in this program than were children with fewer communication behaviors at baseline.

In addition to the specific techniques described here, several comprehensive intervention programs have been designed within the contemporary ABA format. Some examples are listed in Table 1. A few studies [28,29] have shown these programs to be more effective in improving language and cognitive outcomes, both short-term and over the course of two years, than eclectic community interventions.

There is one significant problem with all the naturalistic ABA methods, however. Because of their reliance on allowing children to initiate, requiring interventionists to make more on-line decisions, they involve a significant level of training for interventionists, and rely to some degree on clinician sensitivity and skill. Although it has been demonstrated that both parents and peers can be taught to deliver naturalistic interventions successfully [32], [53], [54], these methods, nevertheless, require more moment-to-moment decision-making than didactic programs in which adult actions are clearly specified, unambiguous, and easily trained. Moreover, unlike didactic approaches, there are few materials available that outline comprehensive curricula; nor are there training opportunities that make it possible to master the approach from independent study of published manuals or through inservice training. Currently, then, it is difficult to disseminate these methods faithfully and efficiently to interventionists beyond those who created the approaches and their direct trainees.

Developmentally-Based, Social-Pragmatic Strategies

This approach is based on the assumption that children with autism develop language in the same way and following the same sequence as do typically speaking children. This means that children who do not speak will first be encouraged to use other means of communicating to get intentions across, in order to discover the value of communication in the ability to regulate others' behavior and control interactions. Proponents of this approach, then, advocate the use of a variety of nonverbal forms of communication being used as a "stepping stone" to speech. The central tenets of this group of approaches include:

- Following the child's attentional lead; allowing the child to choose the course of the interaction and use of materials;
- using the normal sequence of communicative development provides the best guidelines for determining intervention goals;
- providing intensified opportunities for children with ASD to engage in activities that are similar to those in which typically developing peers engage, in the belief that these are the most effective contexts for learning social and communication skills;
- learning opportunities ("teachable moments") that naturally arise in the course of interactions should be exploited, rather than relying on a predetermined curriculum. Intervention is carried out in the context of natural daily routines, such as bathing, dressing, and feeding.
- targeting *functional* goals for intervention; that is, targeted behaviors should be applicable to daily, meaningful activities in a variety of contexts apart from the one in which they were originally learned;
- assuming the "prerequisite" role of nonverbal communication, including gestures, gaze, vocalization, and other nonvocal means, in the development of language.

Floor Time—The developmental, individual-difference, relationship-based model (DIR; [55]), often referred to as "floor time" aims to develop symbolic, interactive communication through shared play and affect. Parents are trained to provide multiple, daily 'floor time' sessions in which the adult follows the child's lead, comments on the child's actions, providing many opportunities for reciprocal action as well as challenges and obstacles to 'stretch' the child's capacities. The method employs 'circles of communication' in which the adult follows the child lead in attending to objects the child shows interest in, then invites the child to interact in increasing complex and challenging ways with the chosen object. Few empirical reports of results of this intervention have appeared in the literature, although the authors give anecdotal reports of improvement [56,57].

Relationship Development Intervention—Gutstein and Sheeley [58] also present a program in which parents are trained to deliver intervention. In RDI, parents are taught a variety of strategies to use in providing scaffolded opportunities for their child to respond in more flexible ways to challenging and increasingly unpredictable activities throughout daily routines. The approach's authors, Gutstein, Burgess, and Montfort [59], reported reductions in autistic symptoms and increased mainstream school placements in an uncontrolled study of 16 children between 3 and 9 years who received this intervention and were followed for two years.

More Than Words—Another child-centered program was developed by Sussman [60]. It is derived from approaches developed by The Hanen Centre® for training parents and teachers to facilitate language development by providing enriched, contingent, and stimulating input to children with a range of disabilities. The focus of More Than Words, and the Hanen approach to autism in general, is on training the parents and teachers of pre-school children with ASD

to promote communication and social skills within ordinary interactions throughout the child's day.

Although there is a good deal of research to support the use of the Hanen approach in elaborating language for children with typical and delayed development (e.g., [61], [62,63]), there is as yet little empirical support for its use with children with ASDs. One case study [64] provides promising data showing increases in vocabulary and initiations in children whose mothers underwent responsiveness training.

Augmentative and Alternative Communication Strategies

For children with ASD with significantly delayed development of speech, alternative methods of communication are often introduced. Originally developed to assist individuals with severe sensory or motoric impediments to speech production, these strategies, commonly referred to as AAC, provide nonvocal options for communication. The main tenet of this approach is that all children have a need to communicate, and if speech is not present, communication need not wait for it to develop. Instead, the child is taught other ways to express his intentions. Below are some examples of AAC methods that have been used with children with ASD.

Sign Language—Manual signs have also been used frequently as a communication modality for children with ASDs who do not talk. Seal and Bonvillian [65] reported that the acquisition of signs is related to fine motor abilities, suggesting that children with low levels of fine motor development are less likely to benefit from this form of AAC. Goldstein [24] reviewed a range of studies employing manual signs combined with speech called Total Communication (TC), and concluded that TC can be effective for teaching early vocabulary both receptively and expressively. Lord and McGee [16] argue that, while signs may support children in making a transition to first words, they are not generally an entry into a fully functional language system. Use of signs has not been found to preclude the production of speech, but at least one study [33] suggests that teaching signs does not accelerate speech development, either.

Picture Exchange Communication System—PECS [66] begins with teaching single word requests by means of exchanging a picture for an object, then moves on to building sentence structure. Like Milieu teaching approaches, PECS incorporates child initiation of communicative acts, by requiring the child to initiate an exchange by handing a picture to an adult in order to obtain the desired object. Direct verbal prompts such as “what do you want?” are avoided to help increase the spontaneity of requests. Once a powerful reinforcer is identified, the child is required to exchange a picture card with the trainer for the desired item. It is recommended that two trainers be used, with one guiding the child through the picture exchange when s/he reaches towards the reinforcer. Spontaneity and generalization of the picture exchanges are addressed by:

- Gradually increasing the distance between the child and the pictures;
- Using the system in different environments;
- Involving a variety of people;
- Focusing on different reinforcers.

Charlop-Christy, Carpenter, Le Blanc and Kellet [67] conducted a study to examine the use of PECS with three preschool children with ASD and its effects on speech development. Results from this study indicated that all the children met the learning criteria for PECS and showed increases in use of speech. Tincani [68] compared instruction in Sign and PECS and found that both increased production of independent requesting, but sign language training produced a higher percentage of vocalizations. He suggested that the child's ability to produce motor imitations was also related to outcome. Howlin et al. [69] showed modest effectiveness, in

terms of increasing children's rates of initiations by training teachers to use PECS, although there was no evidence of improvement in the children's speech or general communication development.

Aided AAC—There is some limited evidence that nonspeaking individuals with autism can benefit from exposure to 'high tech' communication aids, as well. Two youths with autism were among the participants in a study by Ronski & Sevcik [70], who showed increased expression using both spoken language and a computerized voice output communication device (VOCA) over the course of a two year study, in which naturalistic teaching methods were employed to teach the use of the device. This approach also resulted in an increased use of communicative behaviours to request objects, respond to questions and make comments among the children with autism in another study. A case study of one child with autism by Light, Roberts, DiMarco & Greiner [71] also reported positive language outcomes when a VOCA was included as a component of a comprehensive communication system. Other components included gestures, natural speech and a communication book. Olive et al. [72] showed that three children with ASD learned to use a voice output communication device to request items during play when taught using a Milieu teaching approach. Bernard-Opitz, Srirani, & Sapuan [73] used feedback from an IBM Speech Viewer to increase vocal imitation in children with autism. Shane and Weiss-Kapp [74] have proposed a comprehensive visual language system to be taught to children with ASD that includes pictures, symbols, and video clips presented on electronic devices. The program is aimed at providing non-speech methods of expression, as well as supporting language comprehension and organizational skills. While these methods are appealing and a few initial reports are promising, additional larger-scale research is required to assess the efficacy of high-tech aids like these in this population.

Summary

Developmental-pragmatic approaches are widely used and advocated by many prominent communication specialists. One problem with these methods is that, to an even greater extent than naturalistic approaches, they require a high degree of sensitivity, creativity, and on-line decision-making on the part of interventionists. Programs like Hanen© have demonstrated that parents, teachers, paraprofessionals and others can learn these methods, but they require extensive training, practice, and ongoing support. Moreover, demonstration of child outcomes in response to adult training is weak. To some degree, then, the success of developmental-pragmatic programs may hinge on the careful training, follow-up, support, and talent of those who deliver the intervention.

At this time, developmental-pragmatic approaches have a narrower base in empirical research than the other two approaches to communication intervention in ASD. Some studies have shown them to be effective for eliciting speech in children with other developmental delays (e.g., [61], [75]). In addition, studies of child-centered methods have demonstrated their ability to increase imitation, gaze, turn-taking, and joint attention [76], [77] in preverbal children with autism. Kasari [78] and Whalen, Shreibman, & Ingersoll [79] report on small sample studies showing improvement in communication following training focused specifically on eliciting joint attention. Yoder and McDuffie [47] review research that suggests training children in play and nonverbal communication skills may improve the ability to acquire speech.

Conclusions: Early Communication Intervention

Programs to elicit initial communication behaviors and first words range from highly structured behaviorist to open-ended, child-directed methods, with a range of naturalistic approaches in between. Didactic and naturalistic ABA methods are aimed specifically at eliciting speech from preverbal children with ASDs and have established efficacy for doing so in single case studies, although controlled experiments with random assignment to treatments, the "gold standard"

of scientific evidence, are still relatively few as of this writing. Developmental-pragmatic approaches are aimed more broadly at the improvement of social communication and interaction, and have a less well-established, though emerging, empirical track record for eliciting first words in children with ASDs. They have been shown, in small sample and case studies, to increase preverbal behaviors such as imitation and joint attention. Developmental approaches that incorporate AAC methods such as Signs and pictures have been shown to be compatible with the development of speech, although again, their efficiency relative to straightforward speech treatment has not yet been established. Importantly, too, little research exists on the relationship between child characteristics and intervention efficacy, so that we do not know at this time which approach will be the ‘best match’ for a particular child. What does appear to be clear is that communicative deficits in preverbal children with autism are amenable to treatment, and that a range of treatments have been shown useful in enhancing communicative behavior. Core Communicative Deficits in Speakers with ASD

Once children with autism begin using words, the course of language development is similar to that seen in other children with disabilities [80]. Even, however, when children with ASD acquire basic language skills, significant challenges to the development of communicative competence remain. Tager-Flusberg, Paul, and Lord [81] point to two commonly observed characteristics of the communication of speakers with ASD:

- **Echolalia**, the imitation of what has been heard, either directly after it is spoken, or as a delayed echo at a later time.
- **pronoun reversal**, primarily the tendency to use ‘you’ instead of ‘I.’

Although this was at one time thought to reflect difficulties in ego formation, it is now seen as another instance of echolalia, in which the child refers to himself as ‘you,’ as he has heard others refer to him [82].

Both of these characteristics tend to decrease as language skill increases, and both are seen as transitional behaviors in typical development, as well [81]. Few programs have addressed pronoun reversal directly, since it tends to abate naturally, but a variety of case studies, have reported using behavioral methods successfully to reduce echolalia and replace it with simple request and labeling behaviors [83–85].

Deficits in **prosody** or musical aspect of speech, including its rate, loudness, pitch, voice quality, and use of stress are also frequently seen in speakers with ASD [86]. Sheinkopf, Mundy, Oller and Steffens [17], as well as Dawson, Osterling, Melzoff and Kuhl [87] showed that even prelinguistic vocalizations in young children with autism contained a significantly higher proportion of atypical vocal characteristics than did those of normal children. Paul, Shriberg, McSweeney, Klin, and Volkmar [88], found that approximately half of high functioning speakers with autism were rated as atypical in elements of prosodic production. When these differences are present they tend to be persistent and to show little change over time, even when other aspects of language improve [89], [90], [91]. Paul, et al. [88,92] showed that ratings of social and communicative competence were related to ratings of prosody in speakers with ASD, suggesting that difficulties in prosodic production affect listeners’ attributions of competence to these individuals.

To date, there has been little research on the treatment of prosodic deficits in autism. Several commercially available programs have been developed for addressing prosodic difficulties in non-autistic speakers (e.g., [93], [94]), but no research is available on their use with children with autism. Addressing prosodic deficits remains a largely unmet need in this population.

Pragmatics, or appropriate use of language in social situations, is, of course, the most prominent aspect of communicative deficit in this population [95]. Children with autism are

less likely than those with typical development to initiate communication, particularly with peers [96]. Overall rates of communication are very low, even in children who speak [97]. These children show reduced interest in language spoken to them; they are less likely to respond in a reciprocal fashion to the communicative bids of peers and more likely to produce self-directed, noncommunicative speech [95]. Paul et al. [98] reported that the following areas of pragmatics were most consistently impaired in speakers with ASD:

- use of irrelevant detail
- inappropriate topic shifts;
- topic preoccupation/perseveration;
- unresponsiveness to partner cues;
- lack of reciprocal exchange;
- Inadequate clarification;
- Vague references;
- Scripted, stereotyped discourse;
- Excessively formal style (for speakers with Asperger syndrome only)

Thus, for children with autism who develop speech, the conversational skills involved in managing turns and topics in discourse, flexibly adopting an appropriate style of speech keyed to the characteristics and setting and conversational partners, and inferring what information will be relevant and interesting to others constitute the greatest difficulties. Unfortunately, there are very few comprehensive, sequenced curricula designed to address these pragmatic deficits. The following discussion reviews a range of programs available for addressing language issues in speakers with ASD, using the same tripartite scheme as was used above.

Intervention Methods for Speakers with ASD

Didactic Approaches

ABA programs have been developed to address the expansion of early symbols into more elaborated forms of expression. They focus primarily on improvement of language form; i. e., vocabulary and sentence structures. One example is Teach Me Language [99], a comprehensive language program that provides a step-by-step guide with in-depth detail on intervention activities targeting language areas such as grammar, syntax, concepts and advanced narrative skills. Teach Me Language methodology is behavioral-based. Children are expected to follow a teacher's lead and regular repetition of drills is a key feature in the program.

The Verbal Behavior program takes a Skinnerian approach to language learning, based on the research of Michael, Sundberg, and Partington [100], [101]. The program, like Teach Me Language, provides a carefully sequenced curriculum for teaching language to children just emerging into symbolic communication, and carries the curriculum through to those learning more advanced language forms. It uses a highly structured behavioral approach, incorporating techniques such as errorless teaching, specific quick-transfer (prompting and fading) procedures, and the use of discrete trial training during both intensive teaching sessions and in more naturalistic contexts. Language goals are structured in terms of Skinnerian categories of verbal behaviors, which include (hierarchically ordered):

- Echoes: practice in imitating verbal behavior;
- Mands: verbal behaviors that produce an immediate benefit for the speaker (e.g., requests);

- Tacts: labels;
- Reception by Feature, Function, and Class (RFFC): responding to commonly used verbal stimuli (words);
- Intraverbals: verbal, nonechoic responses to the speech of others.

Just as in the case of the didactic approaches for children at prelinguistic communication levels, these highly behavioral language teaching programs also have the potential weakness of leading to passive styles of communication and limited levels of generalization. A search of reference databases found no reports of empirical evidence to support the specific use of the Teach Me Language program. However, Partington, Sundberg, and colleagues have published data indicating increases in verbal production using their method (e.g., Partington [101], [102], [103]. Still, little research is available on the functional effects of these programs on real-world communication, or on their consequences for adaptive communication and independence. While they may result in the achievement of target behaviors within the behavioral framework, as most ABA programs do, there are as yet few data on their general, long-term effects on the child's functioning or independence.

A slightly less traditionally behaviorist approach, the PECS program, also provides a curriculum for children who have acquired basic symbolic communication skills. Once single word exchanges have been mastered, sentence structure is targeted. The aim is for the child to combine an "I want" picture with a picture of a desired item or activity. A "sentence strip" is used to attach the pictures and this is passed to the communication partner. The sentences are further extended by the addition of other words such as adjectives, such as, "I want the **red** ball." Sentence strips are often color coded, so that, for example, there may be a green area for noun pictures that are framed in green, a blue area for verb pictures framed in blue, and a red area for adjective symbols framed in red, and so on. The next phase of the PECS moves from using the picture exchanges for requesting to encouraging commenting. This is done by introducing picture cards representing phrases such as, "I see", "I smell" and "I hear". Again, research on the efficacy of this stage of the program, or its generalization to functional communication, has not been reported.

Naturalistic Approaches

There is much less research in the effectiveness of naturalistic ABA programs in improving communication for speakers with ASD than there is for prelinguistic children. McClannahan and Kranz [104] provide an approach with empirical support that employs using scripts, either pictured or written, to guide children with autism on what to say in given social situations. The scripts are developed by teachers with the students to address particular social settings. As the children continue to rehearse the scripts with various adults and peers, pieces of script are removed, or faded, so the child is required to provide longer and longer portions of the language on his own. Krantz and McClannahan [105] have presented data suggesting this method leads to improvement in conversation for children with ASD.

Video modeling [106] is a similar procedure. Here, short videos are constructed that illustrate the language used in particular social situations, such as asking for a book from a librarian. The student watches the video with the instructor, discusses and verbally rehearses the scene, then practices it by role-playing with an instructor and eventually trying it in a real setting. Charlop-Christy et al. showed that this procedure is more effective than simply modeling the desired behaviors *in vivo* for children with ASD.

Brinton et al. [107] developed a method for improving conversational turn-taking and topic maintenance. In a case study, they reported on work, over a two-year period, with a boy with social disability who was taught a set of explicit rules for finding topics of common interest

with peers and engaging in conversation about them. Brinton et al. stress that change was slow, but did report improvement in social acceptance as conversational skills improved.

Focused stimulation is a naturalistic means of increasing receptive language skills in children with a variety of disabilities. This technique involves providing an interesting set of play materials, and using simple, repetitive language to talk about the ongoing action in concrete, here-and-now terms, using many examples of forms the child needs to acquire. One single case study [108] provides preliminary support for this strategy in children with ASD.

In addition, many of the comprehensive naturalistic ABA programs outlined in Table 1 provide examples of intervention methods for children who begin speaking.

Developmental-Pragmatic Approaches

There are few examples of detailed programs that take a child-centered approach to expanding basic language in speakers with autism. Prizant and Wetherby [109] advocate using the Social Communication Emotional Regulation Transactional Support (SCERTS) model, a comprehensive approach that allows the incorporation of an eclectic range of treatment methods and focuses on overarching goals that include improving social communication, encouraging behavioral self-regulation, and providing transactional supports to children with autism. This program has not yet been subjected to empirical study.

Quill [110] has presented another comprehensive curriculum for developing social and communicative skills in young children with autism at various levels of functioning. The curriculum is also eclectic and advocates the full range of highly structured, naturalistic approaches and child-centered methods. It suggests focusing on the child's responsiveness to typical peers, rather than promoting initiations (p. 89). Intervention guidelines include organization of the environment to facilitate participation and cooperation, careful selection of materials, and activities structured to foster the target child's participation. Again, empirical support has not appeared for this program.

Child-centered methods discussed at the prelinguistic level, including "Floor Time" [111] and RDI [58] also contain components that can be used at higher language levels. Sussman [60] has developed a companion volume to *More than Words*, called *Talkability* [112], which is aimed at children who speak. No empirical validation of these methods for improving language skills in children with ASD is available as of this writing.

Increasing social communication

However, as we have seen, a major difficulty for children with ASD who speak, and perhaps THE central problem for students with high-functioning autism and Asperger syndrome concerns not the forms of language, but its use in social contexts, particularly with peers. Apart from elaborating the form and increasing the frequency of language use, then, an additional important goal of communication intervention for children with ASD is to provide supports that allow these children to engage in peer interactions, including pretend play, games, and conversations. Some of the naturalistic approaches discussed already, such as script-fading and video-modeling, go some distance to addressing this issue. McClannanhan and Krantz [104] provide what comes closest to a comprehensive, sequential program for teaching conversational skills to this population.

Much of the literature addressing the more comprehensive problem of increasing social communication opportunities and skills in speakers with ASD is discussed under the rubric of "social skills training," a topic addressed in detail elsewhere in this issue. The main point to be stated here, however, is that for children with ASD who speak, speaking is not, in itself sufficient. These children will need supports aimed not only at increasing basic vocabulary and

sentence structure, but at the pragmatic aspects of language use in the context of social interactions, to address deficits like those identified by Paul et al. [98]. Studies of the effects of a variety of approaches to social skills intervention (See [113] for review) generally concur that trained peers are more effective agents of this intervention than are adults [114], and that the interventions are more effective when they take place in a child's natural environment, such as the classroom, than in a clinical setting [115].

Conclusions: Language Intervention—The most elaborated curricula for developing language at this level are highly behavioral. Although these have some demonstrated efficacy, behavioral programs maintain weaknesses in terms of the development of passive communication styles and failures of generalization. Naturalistic approaches have been developed to address aspects of social communication and have some demonstrated empirical support, but there are few comprehensive curricula. Developmental approaches for this stage of development have less fully elaborated curricula and limited empirical support.

Conclusions

Intervention for children with ASD at prelinguistic and early language stages has been shown to make a dramatic difference, at least in short-term outcome [12]. Intervention methods that draw from a range of philosophies and make use of varying degrees of adult direction have been shown to be effective in increasing language and communicative behaviors, although direct comparisons among methods, controlled studies with random assignment to treatments, and long-term outcome studies are, as yet, lacking. Despite the gaps in our current knowledge, it is clear that children with autism benefit from intensive, early intervention that focuses on increasing the frequency, form, and function of communication. Available evidence shows that highly structured behavioral methods have important positive consequences for these children, particularly in eliciting first words. However, the limitation of these methods in maintenance and generalization of skills suggests that many children with autism will need to have these methods supplemented with less adult-directed activities to increase communicative initiation and to carry over learned skills to new settings and communication partners.

A review of programs aimed at language development in speakers with ASD points out the importance of thinking beyond words and sentences to the social functions of communication and language use when developing interventions. Although a range of adult-mediated programs are reviewed here, providing opportunities for mediated peer interactions with trained peers in natural settings appears to be especially important in maximizing the effects of this intervention.

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Table 1

Examples of Comprehensive Programs

Program	Source	Description
Douglass Developmental Center	[117]	Developmentally sequenced program using behavioral approaches, beginning with discrete trials and moving toward more naturalistic methods
Learning Experiences and Alternative Program (LEAP)	[118]	Includes preschool program that blends behavioral and developmental approaches and incorporates peer-mediated social skills training and individualized curricula.
Denver Model	[119]	Developmental, relationship-based program with home program that incorporates natural contexts
Pivotal Response Training	[120]	Uses parent education, aims at providing skills that enable the child to function in inclusive settings. Aims at identifying pivotal skills such as initiation and self-management; employs naturalistic behavioral methods.
Treatment and Education of Autistic and Related Communication Handicapped Children (TEACCH)	[121]	Statewide program in NC. Regional centers provide consultation and training to parents and schools. Based on a structured teaching approach; includes parents as co-therapists. Communication curriculum makes use of behavioral and naturalistic approaches and alternative communication strategies for nonverbal children.
Walden Early Childhood Program	[35]	Comprehensive program for children toddler through kindergarten age; makes use of inclusive classrooms, incidental teaching approaches, with developmentally selected goals. Goals include functional language use, responsiveness, participation with peers and daily living skills.