

## Chapter 11

# AAC AND CHILDREN WITH DEVELOPMENTAL DISABILITIES

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Children with developmental language or speech disorders frequently benefit from augmentative and alternative communication (AAC) strategies. These children have severe expressive or receptive communication disorders or both which sometimes occur in isolation, or as part of a global developmental disability. Children with specific language impairment, pervasive developmental disorder, developmental apraxia of speech, autism, Down syndrome, or other types of developmental disabilities may need to use AAC strategies to supplement or enhance their language development. These children offer challenges to professionals, especially during the early years of language development. In the very young child, it is often difficult to determine the nature and degree of language impairment, to accurately diagnose the presence of other factors such as cognitive disabilities, and to predict the child's future prognosis for language or speech development.

In the past, young children diagnosed with severe language and speech disorders would have received years of traditional speech therapy focused on developing spo-

ken communication skills (Silverman, 1995). AAC would have been recommended only after traditional therapy techniques had failed. Today, professionals realize that AAC strategies can provide children who have developmental delays with an immediate means of communication; can facilitate expressive and receptive language development until other communication modalities improve (i.e., speech); and can serve as a bridge to future spoken language development (Kangas & Lloyd, 1988; Silverman 1995). AAC provides an expressive method of communication to facilitate language development in children who, in all likelihood, will eventually use speech to communicate. The focus of this chapter is on children with developmental disabilities who have the potential to use AAC strategies to develop receptive and expressive language skills, including speech. The chapter begins by presenting an overview of using AAC as a tool to enhance language and speech development. Specific AAC assessment and intervention issues are then presented in two separate sections for children with developmental apraxia of speech and for children with pervasive developmental disorders, including autism.

## **DEVELOPMENTAL COMMUNICATION DISORDERS**

Children with developmental language and speech disorders are often more dissimilar than similar. A simplistic method of categorizing these children is to look at development across the domains of nonverbal cognitive abilities, receptive language, expressive language, and speech. These four domains are interrelated, yet can develop at different rates in different children. Children can have delayed or disordered abilities in one, two, three, or all four domains. For example, some children have normal cognitive and receptive language abilities with impaired expressive communication and speech skills. Others have normal language and cognitive skills with severe oral motor speech difficulties. Still others may have receptive and expressive language abilities that are below other cognitive abilities, or might have speech articulation skills that are superior to receptive and expressive language levels.

Detailed language and speech characteristics cannot be easily listed for individuals who have developmental disabilities because of the numerous diagnoses that are included under this label. In addition, children with the same diagnosis can have dissimilar patterns of language development. Many parents will hear about other children with the same medical diagnosis as their child and make developmental comparisons. Although parent networks can be helpful sources of information, a medical diagnosis is not always a good predictor of future speech or language development (Ronski & Sevcik, 1988). For example, one of the authors is currently providing services to three 6-year-old children with Down syndrome. Their language abilities fall on a continuum. One child uses jargon, speaks in one to two word phrases using a telegraphic style, and has poor articulation, which results in unintelligible speech.

A second child uses three to four word incomplete sentences to describe concrete immediate events with 70% intelligibility in familiar listening contexts. The third child uses complete four to six word sentences, is able to discuss past and future events, and is 95% intelligible even in unfamiliar listening environments. In summary, each child presents with a unique set of communication characteristics. The decision to implement AAC strategies and the selection of appropriate interventions has to be determined individually by professionals and family members.

## **THE DECISION TO IMPLEMENT AAC**

The American Speech-Language-Hearing Association (ASHA, 1991) defined an AAC system as "an integrated group of components, including the symbols, aids, strategies, and techniques used by individuals to enhance communication. The system serves to supplement any gestural, spoken, and/or written communication abilities" (p. 10). Augmentative systems are not intended to be substitutes for, but are to be used in conjunction with, the residual abilities to speak and write (Silverman, 1995). AAC intervention commences at the individual's existing language level versus waiting for him or her to attain a certain skill; more of a "try and see" rather than a "wait and see" strategy (Goossens, 1989; McGregor, Young, Gerak, Thomas, & Vogelsberg 1992; Ronski & Sevcik, 1988).

The decision to implement AAC requires extensive speech and language evaluation, periods of trial therapy, and frequent reevaluations of progress to integrate AAC methods into an overall communication intervention plan. AAC can be combined with traditional speech and language training techniques or can be presented as an alternative to traditional therapy. The course of AAC intervention may be supplementary, short

term, or adopted as a long-term strategy to be used across the child's life span. Multiple AAC strategies can be sampled separately or concurrently. AAC can also be implemented in one or across all communication environments. The goal is to provide the child with communication skills that go beyond simple requests, rejections, and identification of wants and needs. It also involves developing the ability to share information, to achieve social closeness, and to learn social etiquette along with other higher level cultural and communication abilities (Beukelman & Mirenda, 1992).

### **Integrating AAC with Speech**

Parents of children with developmental disabilities often want speech to be the primary means of communication for their child. It is often the fear of both the older child and his or her parents that shifting the attention from the speech output mode to AAC systems will deemphasize the importance of developing and improving verbal output, reduce motivation for speech communication, and even cause the individual to stop talking. At this time, there is no documentation to support the notion that AAC reduces an individual's motivation to verbally communicate or the development of speech. On the contrary, Silverman (1995) reviewed more than 100 published and unpublished reports that indicated that at least 40% of AAC users increased their spoken output in conjunction with the use of AAC. Possible reasons for the increase in verbal output relate to the reduced pressure to perform verbally, the use of graphic symbols, and the development of alternate input and output channels, taking the pressure off of the traditional auditory-vocal channels (Kangas & Lloyd, 1988).

Jamie is an example of how communication skills can evolve over time. At age 3, Jamie exhibited generalized hypotonia and was nonverbal. He was introduced to a

Touch Talker, but it was not used often. At the age of 4, his family moved and he entered a school for children with developmental disabilities and also received private speech therapy. In private therapy, he worked jointly on vocal production and the use of the Touch Talker. In kindergarten, Jamie increased his verbal output, but was only intelligible 20% of the time. He used the Touch Talker in functional ways to make requests and communicate responses. He was motivated to not only model the speech of people with whom he interacted, but also to talk along with his device. During his first-grade year, he often initially produced his messages verbally and if they were not understood, he would then use the Touch Talker to repair the communication exchange. Once a printer was purchased, he also began to use the device more for written output than for verbal output. As his literacy and his understanding of letter-sound relationships improved, Jamie's articulation skills also improved. By the time Jamie entered the second grade, he would not use the Touch Talker as an expressive means of communication; instead he saw himself as a "speaker." The Touch Talker was housed in the closet most of his third-grade year and when he was in the fourth grade, the family donated the device to another child. His intelligibility continued to improve so that he was understood 75% to 85% of the time by his communication partners. In Jamie's case, speech training and AAC strategies were combined to support his ongoing communication development.

Children with developmental disabilities have a variety of spoken language skills, ranging from very delayed speech and language to mild degrees of speech unintelligibility. Nonetheless, it has been found that many of these children continue to think of themselves as functional "speakers." From their viewpoint, the fact that family members and consistent communication partners are able to understand

and translate their communication messages overrides the fact that the majority of people they come in contact with are unable to decipher their communication attempts. For example, Anne was a bright middle school student with a severe speech impairment. When confronted with the fact that listeners often did not understand her, she stated "If people are around me long enough, they begin to understand what I am saying ... if not, a friend can tell them what I said." Although this strategy satisfies her at this time, it will become less acceptable as she approaches her adult years and must address independence issues to meet vocational and recreational goals.

The type of situation and the communication partners tend to dictate the particular AAC modes or combinations of modes to be used during a communication interaction. Anne, the student previously discussed, was less than 30% to 40% intelligible in fluid, connected speech with unfamiliar communication partners. Her family understood her most of the time, so this allowed her to comfortably use verbal speech at home, as well as at school with familiar classmates and staff members. At school, Anne's primary mode of communication was speech, but her verbal responses were often misunderstood, much to the frustration of her teachers, classmates, and eventually, to herself. She reduced the length of her responses, and augmented the exchange with nonsymbolic expressions (e.g., eye gaze, gestures). Anne finally admitted that there were times when she knew the answer or had something to contribute and simply did not because of the effort involved. She occasionally used an alphabet board that gave the listener the option of seeing the first letter (and more, if necessary) of the word she was saying. When the context was known, seeing the first letter was often enough for the listener to figure out the word. However, when presented with

the task of participating in a speech contest, Anne wrote the speech and then programmed it into a voice output AAC device. Anne not only participated in the contest, but became one of the semifinalists (because of the content of her speech, not the mode of delivery). Anne was thrilled that the voice output AAC system had afforded her the opportunity to participate, something she could not have done using her natural speech.

Clearly, speech is looked upon as the preferred method of communication, even for speakers with limited speech. Articulation therapy is especially important in the early years of development when speech potential is difficult to predict. However, AAC can be used as a method to enhance speech, as well as a method of augmenting communication. AAC, as part of a multimodal communication system, may be a short-term strategy until speech reaches an acceptable level of intelligibility, or it may be a long-term strategy to build and maintain effective communication. AAC can also be a supplementary option for situations when it is imperative for a person with speech impairment to be understood. AAC does not impede the development of speech; in fact, AAC can serve as a form of scaffolding to support the use of speech in the early years of development.

### **Using AAC to Facilitate Language Development**

Over the past 20 years in the area of speech and language intervention the focus has shifted from "teaching people to speak, to giving students language, and now to helping students communicate" (Ferguson, 1994, p. 7). In many cases, a disorder in language may not be fixable, but possibly by "facilitating the attainment of socially effective communication, interactions can become more effective for an individual with developmental disabilities and associated communication impair

ments as they interact in their community" (National Joint Committee for the Communicative Needs of Persons with Severe Disabilities, 1992, p. 4). In the area of augmentative and alternative communication, the challenge is "to determine how nonspeaking individuals can best facilitate their daily interactions in educational, vocational, community, and home environments. The communication aids employed are the tools in the process; the central issue is the effectiveness of the interaction" (Light, 1988, p. 66).

Symbolic communication in any modality can be used to build receptive language, as well as to convey expressive messages. Symbolic communication can include verbal expressions, sign language, photographs, line drawings, objects, and graphic symbols. Again, the use of these systems goes beyond simply giving the individual a means to "talk." It must be remembered that symbol systems have unique properties and performance capabilities that will, in and of themselves, affect language development and conversational competence (Gerber & Kraat, 1992).

For the individual with severe communication impairments, augmentative communication strategies and systems can compliment the acquisition of functional communication and language skills. Some of the reasons for this relate to the systems themselves; augmentative communication strategies can act as a key to accessing the natural speech and language skills of an individual with developmental disabilities. Because individuals who are nonspeaking and limited speaking are in the process of acquiring linguistic abilities, AAC systems can help an individual structure the communication message (Nelson, 1992). This fact was evidenced in the expressive language development of Edward. Edward was a limited speaker with Down syndrome and mild mental retardation. Edward's academic environment was structured as a multimodal communication environment. His

spontaneous speech consisted of three to four word sentences. When using a picture communication display to augment his speech, his expressions consistently increased to five to six word sentences without outside prompting. His verbal expressions were clearer because his rate of speech was slower. Edward openly demonstrated that he was aware of his increased skills with the communication system. He would purposely search for specific communication displays to help him make particular requests or participate in particular activities. Edward seemed pleased with both his AAC system and the responses and reinforcement received from his communication partners when he used the picture displays.

AAC can also be used to enhance language comprehension. Many children with receptive language delays have difficulty following conversational communication exchanges or understanding directions or questions. Augmenting spoken messages with a visual representation can increase a child's ability to comprehend communication. Visual cues can be in the form of manual sign languages, natural gestures, facial expressions, and graphic picture communication symbols including photographs and line drawings. When teachers pair speech with manual signs or with visual symbols, it provides comprehension support, slows down the delivery of the message, and often results in favorable completion of the communication exchange. For example, a 5-year-old student was asked to sit down, a message the staff knew she understood. After several attempts to get her to comply, the direction was repeated and paired with signs. The student immediately imitated the signs and oral directions, as if solidifying her understanding of the message, and then followed the direction by sitting and staying in her seat. In another example, a student was given directions to get materials out of his mailbox and place them in his book bag, get his

coat and hat, and sit at his desk and wait for a snack. When only oral directions were given, the student required one-step directions and several repetitions, sometimes with physical prompting to complete the task. When directions were paired with an AAC picture communication board, the student was able to follow two to three step directions. It was also useful to have the student verbally repeat the directions using the picture board. Although both of these examples involved giving specific directions (not at a conversational level), the augmentation of a message with visual cues can assist language comprehension at any level. In the classroom, it is critical for the child to follow routines and directions; therefore, if tools exist that can add to a student's success, they should be explored and used.

For individuals with language disabilities and severe speech impairments, AAC systems and strategies can be used as a bridge to higher levels of communication interaction, enabling children with developmental disabilities to actively participate in home, school, and community environments. AAC is neither a crutch nor a single solution to speech and language impairments. To further illustrate this point, the next two sections of this chapter will focus on implementing AAC strategies with specific diagnostic categories of children. As stated previously, children with developmental disabilities are often more dissimilar than similar. The degree and nature of communication impairment varies widely from individual to individual. However, these two diagnostic populations have unique characteristics that can be used as a framework to discuss AAC assessment and intervention issues. The first section will focus on children with developmental apraxia of speech. Children with this disorder have severely impaired speech motor abilities with relatively intact receptive language skills. AAC is fre-

quently used to facilitate speech and expressive language development until speech intelligibility improves. In contrast, children with pervasive developmental disorders and autism have underlying global language difficulties with relatively normal speech motor skills. These children frequently require AAC strategies to enhance language understanding and expression.

## **DEVELOPMENTAL APRAXIA OF SPEECH**

### **Definition and Demographics**

Developmental apraxia of speech (DAS) has been given many labels, including developmental verbal dyspraxia, childhood verbal dyspraxia, apraxic dysarthria, and cortical dysarthria (Marquardt & Sussman, 1991). No matter what the label, the very existence of the disorder is often questioned in the literature (Blackstone 1989; Crary, 1993). A recent point-counterpoint by Robin (1992) and Hall (1992) indicated that researchers appear to be accepting its existence. Square (1994) indicated that clinical researchers were converging on a "consistent definition of the disorder as one in which the central control mechanism for the temporal sequencing of complex volitional speech movements is disrupted in the absence of other, observable muscular function abnormalities" (p. 151). She further stated that the basis for the disorder is an impairment of sensorimotor integration.

Professionals who work with individuals with DAS must be sensitive to the need for parents and other professionals to understand the terms that are used. A recent edition of *Communicating Together*, a parent newsletter, gave an excellent definition of DAS. It explained that some children have difficulty producing speech sounds due to strength or weakness of the mus-

cles used for articulation. It went on to note that for children with DAS, the strength or weakness of the speech musculature is not the issue. The problem lies in planning the motor movements for speech (Kumin, 1994).

## **Communication Characteristics in DAS Populations**

If DAS exists, then what are its characteristics? Many researchers have indicated that DAS is a complex of symptoms (Crary, 1993; Hall, 1992; Marquardt & Sussman, 1991). Individual children will display a different symptom complex, depending on individual differences. Cumley and Jones (1992) suggested the following commonly agreed upon characteristics:

1. Difficulty in imitating both nonspeech movements and speech sounds in the absence of abnormalities of the tongue, lips or palate.
2. Difficulty in initiating speech movements.
3. Unawareness of articulator positions, resulting in prominent phonemic errors.
4. Impairment in production of sound sequences.
5. Occasional telegraphic speech.
6. Disturbances in repetition of speech and in conversation, with frequent prosodic disturbances (e.g., slowed rate, uneven stress).
7. Inconsistency of articulator output and errors. (p. 230)

Another characteristic of DAS that is commonly noted is better proficiency in receptive language as compared to expressive language (Hall, 1992; Marquardt & Sussman, 1991; Robin, 1992; Rosenbek & Wertz, 1972). Rosenbek and Wertz suggested four characteristics to distinguish DAS from a functional articulation disorder. DAS includes vowel errors, oral nonverbal apraxia, groping trial and error be

havior, and increased errors on longer responses.

If it is accepted that DAS exists, how many children have this disorder? Shriberg (1994) has been working on a classification system for developmental phonological disorders based on the DSM model (*Diagnostic and Statistical Manual of Mental Disorders-IV*, American Psychiatric Association, 1994). He proposed five subgroups of children with developmental phonological disorders: (1) Speech Delay (SD) without associated involvement; (2) Speech Delay + Otitis Media with Effusion (SD+OME); (3) Speech Delay + Developmental Apraxia (SD+DAS); (4) Speech Delay + Developmental Psychosocial -Involvement (SD+DPI); and (5) Residual Errors (RE). Shriberg estimated the incidence of SD+DAS at 1 to 2 children per 1,000 and the gender ratio as 80% to 90% male. In addition, he felt there is a familial connection but that "limited subject descriptions . . . do not allow percentage estimates" (p. 28).

Hodge (1994) took exception with researchers' attempts to narrow the subject group to those with (1) normal hearing, cognition, and receptive language; (2) the absence of obvious sensorimotor or structural impairments; (3) moderate to severe speech intelligibility; and (4) speech characteristics of DAS. Hodge pointed out that speech characteristics of DAS can be present in a variety of other conditions, including mental retardation, developmental delay, and attention deficit disorder, among others.

In contrast, Hayden (1994) suggested that DAS should be diagnosed only after the exclusion of sensory, cognitive, and language components that could result in the disruption of speech movement sequencing. This limits the population she would recognize as having DAS to a very small number. She also stated that "DAS does not have the same root cause as autism" (p. 121) and that disorders that

are primarily of an emotional or pragmatic nature should be ruled out. Apraxic-like symptoms may be a result of one or more additional sensory or processing disruptions or the interactions among them. Overall, although there appears to be more agreement that DAS exists, there is not yet a consensus on the characteristics of the DAS population.

### **Intervention Strategies Specific to the Population**

Whether one accepts a broad or narrow definition of DAS and its population, training issues remain. Ferry, Hall, and Hicks (1975) stated that if intelligible speech has not developed by age 6 in a child with DAS it is "unlikely to develop" (p. 751). Hodge (1994) stated that for some children DAS was a chronic condition for whom "normal speech production is not a realistic expectation" (p. 99). Acquisition of intelligible speech is often a long process. The child with DAS needs practice in improving verbal skills as well as in some augmentative means of communicating until speech becomes the primary communication mode.

When planning an intervention program for the child with DAS, it is critical to offer multimodal communication from the onset. Crary (1993) stressed that in planning intervention the program must fit the child and not the reverse. When reviewing both speech training as well as AAC strategies, the speech-language pathologist must remember that each child presents unique challenges. One child may require an emphasis on strategies for building speech, another may require intensive AAC techniques, and others may require a program that equally emphasizes both strategies.

#### ***Speech Training Techniques***

Strategies for intervention naturally include those that stress intensive speech training,

Crary (1993) suggested that the failure for improvement in speech production after prolonged therapy, often cited as a characteristic of DAS, may be partially due to a "mismatch between the child's performance capabilities and the nature of the therapy program" (pp. 208-209). He emphasized that the treatment program must fit the child, rather than fitting the child into a program based on one theoretical construct of DAS. Crary pointed out the differences between "bottom up" and "top down" programs. Programs that build speech from the "bottom up" start with individual movements, sounds, coarticulatory sound sequences, and so forth. Programs that build speech from the "top down" focus on words, phrases, or sentence level productions. Crary emphasized the need for a multifocal intervention program, addressing motor speech (executive) issues, phonologic (planning) issues, as well as the syntactic deficits commonly seen in children with motor speech disorders. According to Crary, all three elements should be addressed in each session, rather than in a hierarchical structure.

Many speech treatment approaches have been described in the literature. The problem facing the clinician is choosing an approach that will work for each child and building an appropriate program for that individual. As the focus of this book is AAC strategies, specific speech training programs will not be reviewed in depth. The reader is referred to Cumley and Jones (1992) for a summary of natural speech intervention recommendations. Also, in a review of the literature, Pannbacker (1988) discusses selected therapy approaches to DAS and their general effectiveness. Readers interested in an updated discussion of therapy techniques should refer to Klick (1994) for the Adapted Cueing Technique, Hayden and Square (1994) for the PROMPT System, and Helfrich-Miller (1994) for Melodic Intonation Therapy. In addition, readers should investigate some of the



available commercial apraxia programs such as *Easy Does It for Apraxia and Motor Planning* (Strode & Chamberlain, 1993) and *Easy Does It for Apraxia-Preschool* (Strode & Chamberlain, 1994).

### **Augmentative and Alternative Communication (AAC) Strategies**

When suggesting AAC techniques to parents of a child with DAS, it is important for speech-language pathologists to remember the strong desire and expectation of parents that their children will speak. Family folklore often includes stories about a child's first words, and stories of the "darndest things" that the child said. In contrast, parents of children with DAS are hoping to hear their child's first word approximation or first intelligible word or sentence. When professionals first suggest using AAC methods, parents often feel that we have "given up" on speech or that by introducing AAC techniques their child will never speak (Blackstone, 1989).

Parent counseling is often an important first step to the introduction of AAC techniques. Blackstone (1989) presented nine steps for gaining family acceptance of

AAC in a therapy program for the child with DAS. Her suggestions emphasized both education about DAS and AAC, and the presentation of videotapes of successful AAC users. Table 11-1 summarizes her suggestions.

Parents sometimes seek confirmation that AAC is an accepted technique in the treatment of DAS. Researchers and experts such as Crary (1993), Hall, Jordan, and Robin (1993), Cumley and Jones (1992), Blackstone (1989), Hodge and Hancock (1994), and Miranda and Mathy-Laikko (1989) among others have suggested AAC techniques as part of an overall therapy plan for the child with DAS. However, there is a paucity of research studies on the efficacy of AAC techniques with this population. Culp (1989) presented a case example of the use of a multimodal communication system with an 8-year-old girl with DAS. Strategies included natural speech, gestures, sign language, and communication boards. An important component was training in the Partners in Augmentative Communication Training (PACT) program (Culp & Carlisle, 1988). This program attempts to develop functional and positive communicative interactions be

Table 11-1. Strategies for promoting family acceptance of AAC for the child with developmental apraxia of speech.

1. Provide discussion and demonstration of how speech is produced and clearly explain the child's speech problem.
2. Clearly explain the benefits of multiple communication systems, including speech, sign language, and aided AAC techniques.  
Have the child use a particular AAC technique in an activity to demonstrate what the child can do and the value of AAC.
4. Offer written information about DAS and AAC and follow up with a family discussion.
5. Have the family talk with other families whose children have been successful using AAC strategies.
6. Show videotapes of other children with similar problems communicating successfully with AAC.
7. Show videotapes demonstrating improvements in speech, language, and communication skills over time.
8. Begin AAC at school or in other environments if the family does not want to use AAC strategies at home.
9. If the family rejects implementation of AAC procedures, work on speech, gestures, conversational repair strategies, letter cueing, etc. Periodically reintroduce aided AAC approaches.

Source: From "Individuals with Developmental Apraxia of Speech" by S. Blackstone, 1989, *Augmentative Communication News*, 2(2), p. 2. Copyright 1989 by Sunset Enterprises. Adapted with permission.

tween children who are AAC users and their communication partners. Results indicated that there was a positive increase in communication from inclusion in the program. Culp suggested that work on speech alone may not ensure success for the DAS population and that further research is needed on the "role and timing of the introduction of AAC" ( p. 32).

There are several elements intrinsic to the nature of AAC techniques that make it a natural component of a therapy program for the child with developmental apraxia of speech. As noted previously, a common characteristic of DAS is a discrepancy between receptive and expressive language skills. AAC techniques allow children to continue to build receptive language skills while giving them access to an alternative expressive language modality. Expressive syntactic skills can be built through AAC, with the expectation that, when speech develops, carryover to the oral mode of communication will be easier. These authors' clinical experience has found that, for children who are just beginning to put oral words together into longer utterances, AAC techniques can be very powerful in organizing words into semantically and syntactically correct sentences. AAC systems also include a strong visual component. Visual cueing is a constituent of many of the speech training strategies mentioned previously, such as the Adapted Cueing Technique, which provides a visual cue for speech sounds. The picture overlays typical of AAC systems require pointing to picture cues to represent words or phrases. Pointing to picture symbols in conjunction with verbal output slows the rate of speech production. Slowing the rate is another technique for speech training that is included in the literature for DAS. Use of AAC systems also involves the use of a motor response, again a component of some speech training programs. Thus, it appears that AAC techniques inherently include many of the

components that have been found to be effective in speech training therapy for children with DAS.

**Characteristics of AAC Systems.** Available AAC techniques include both unaided and aided systems. Unaided techniques would include natural gestures and manual signs. Aided techniques would include the use of picture symbol communication boards in various formats as well as voice output devices. There are advantages and disadvantages to both systems and clinicians should remember the importance of finding a system that suits the unique needs of each child. Blackstone (1989) pointed out that use of unaided versus aided approaches is not an either/or question, but a matter of emphasis. She suggested that clinicians should consider the advantages of a multimodal approach. Sign language may work well in some contexts, whereas in other situations the use of voice output AAC devices or picture symbol boards may lead to more successful communication.

Before looking more closely at the important elements of unaided and aided AAC systems, it is important to consider several critical factors when evaluating any AAC system in relation to the DAS population. These include portability, vocabulary size, and costs. As Hall et al. (1993), Blackstone (1989), Cumley and Jones (1992), Culp (1989), and Miranda and Mathy-Laikko (1989) pointed out, the child with DAS is typically ambulatory and requires a system that is portable and accessible in all environments. Vocabulary selection is affected by the need to have sufficient vocabulary for the many different activities the child will participate in, hence, vocabulary size can be large and unpredictable. The issue of cost, critical in the selection of an AAC system for any individual, is particularly challenging with the DAS population. Many parents may view the AAC system as a bridge or transitional system until their

child develops functional oral speech. Because of that position, investment in an expensive system is often viewed as not cost effective. Clinicians and parents may need to do a very careful needs analysis of the child before settling on the communication system that will best serve the **child while still remaining** within the economic resources of the family.

**Unaided Gesture/Sign Systems.** Children with DAS frequently develop their own system of natural gestures that are understood by those who know the child (Hall et al., 1993). The use of gestures does not always mean that a child is a good candidate for using sign language. As Hall et al. stated, children with DAS may have overall fine or gross motor apraxia affecting their ability to produce signs as well. As a result, clinicians need to determine the presence and degree of hand and limb apraxia before introducing a manual sign language system. An evaluation by an occupational therapist may be a critical component of the decision-making process. If it is determined that sign language is an option for a child with DAS, parents often need reassurance that the use of signs will not impede the development of oral language. Hall et al. found that, as oral skills improved, sign language use spontaneously faded.

**Advantages of Unaided Systems.** One obvious advantage of sign language is its portability. Like natural speech, the child or parent can never leave the system at home or in the car. In the school environment, sign language is always available in the many different locations that a typical child might access, including the art and music rooms, assembly halls, and outdoor play areas. Vocabulary size is potentially unlimited with a manual signing system. New words can be added without regard to the size of a picture board or the memory limits of a voice output device. The cost is limited only to the number of sign lan-

guage classes and books the parents, school staff, and child may need to become proficient signers.

**Disadvantages of Unaided Systems.** Although sign language is readily available to the child in a variety of environments, imprecise signing is often an issue with the child with DAS. As mentioned previously, these children often exhibit some degree of fine and gross motor apraxia in addition to apraxia of speech. Parents often have to translate their children's sign as well as their speech, and children may develop a dependence on adult interaction and support for communication.

Although vocabulary size may be unlimited, Blackstone (1989) pointed out that most of the world does not understand or use sign language. Most children with DAS live in the hearing world. Reliance solely on sign language as an AAC system limits the child's communication partners to those family members and school personnel who have sign language knowledge and familiarity with the idiosyncrasy of that child's signing. Blackstone further cautioned that family and school staff need to have a strong commitment to total communication for it to work. Cumley and Jones (1992) pointed out that family, school, and friends often need considerable learning time to be fluent signers. This learning time limits the child's ability to immediately communicate in a variety of contexts. Blackstone also suggested that individuals and their communication partners often don't remember to use the signs they have been taught. Instead, a small number of easily recognizable signs should be taught and aided approaches should be stressed (Blackstone, 1989).

**Implementation of Unaided Systems.** The use of gesture and sign language as a component of an AAC system will only be effec-

\*AAC is dedicated to treating children with autism and other developmental disabilities through its pioneering LAMP (Language Acquisition through Motor Planning) method. Scientifically approached games. 100%. Children who played educational games via tablet improved their social communication by 100%. LAMP Programme. AAC. It has been observed that AAC training therapy increases children's potential and improves their behavior. Children with autism were taught 2 years intensive ABA therapy, 90% of them had important development to get accepted by public schools. LOVAAS, O. I. (1987). Behavioral treatment and normal educational and intellectual functioning in young autistic children. *Journal of Consulting and Clinical Psychology*, 55, 3-9. It is often introduced first to children or beginning AAC users because it is the easiest to understand. In "linear scanning", items are organized in rows and are scanned one at a time until a choice is made. Although more demanding than circular scanning, it is still easy to learn. Several reviews have found that the use of AAC does not impede the development of speech in individuals with autism or developmental disabilities, and in fact, may result in modest gains being observed.[91][92] A 2006 research review of 23 AAC intervention studies found gains in speech production in 89% of the cases studied, with the remainder showing no change.[