ARTICULATION AND PHONOLOGY RESOURCE GUIDE FOR SCHOOL-AGE CHILDREN AND ADULTS

Ann Bosma Smit, Ph. D.
Communication Sciences and Disorders
School of Family Studies and Human Services
Kansas State University
Manhattan, Kansas
The focus of this chapter is on how we might apply information about speech-sound disorders to speech-sound difficulties in particular populations. Specifically, this chapter concerns clients who have Developmental Verbal Dyspraxia, in which the speech-sound system is clearly disordered, clients who speak English as a Second Language (ESL) and are poorly intelligible, and clients who have developmental delays.

**DEVELOPMENTAL VERBAL DYSPRA\]XIA**

Developmental Verbal Dyspraxia (DVD) is a term used to designate children with a relatively severe impairment of speech-sound production (including prosody) that appears to have an important component of difficulty in planning and sequencing speech sounds. DVD is also called Developmental Apraxia of Speech (abbreviated DAS or DAOS) by some authors.

In order to understand dyspraxia, we need a clear understanding of praxis. Praxis is “the ability to select, plan, organize and initiate the motor pattern (for a particular action)” (Velleman & Strand, 1994). We become most aware of praxis when it “goes wrong.” For example, adults who have sustained neurological damage may exhibit apraxia. Consider this man who has had a stroke resulting in apraxia: When you hand him a comb, he may be unable to demonstrate its function even though he correctly combed his own hair in front of a mirror just an hour before. In adults, a discrepancy between ease of performing so-called automatic tasks and performing the same task volitionally is a hallmark of apraxia.

In adults, difficulties with praxis that affect speech manifest themselves as groping, inconsistency of production, and severe limitations on the length of an utterance. Again, there is often a discrepancy between the patient’s ready use of automatic or reflexive speech, such as swearing or saying the names of the days of the week, and the ability to say the same words volitionally. This disability is usually attributed to difficulty in sequencing movements to form words in a volitional way.

Most speech-language pathologists would agree on the existence of a group of children who have severe difficulty producing speech and whose disorder appears to have components of dyspraxia, that is, difficulty in planning and sequencing articulatory movements. They would agree that these children have more than just a severe phonological disorder. They would also agree that some of the signs of apraxia in adults would be missing because children have never been skilled users of speech and language. For example, in children there would not be a difference between automatic and volitional speech. And there the agreement would end.

The disagreements about Developmental Verbal Dyspraxia have been going on for many years. In the early years, the arguments concerned whether or not DVD existed as an entity separate from severe phonological disorder. At present, the arguments revolve around issues of definition—that is, how we determine which children belong in the group that has DVD. The issues are not trivial, because advances in our understanding of DVD may have been delayed due to lack of uniform definitions. At the same time, this is a rare disorder, and each researcher’s pool of potential participants in DVD research is typically small and therefore likely to be unrepresentative of the whole.

Another factor to consider is that Developmental Verbal Dyspraxia may not always be a difficulty that is confined to the oral mechanism. Our colleagues in occupational therapy have worked with children who have problems in developing motor coordination (dyspraxia) for many years (Ayres, 1972; Portwood, 2000). The DSM-IV-TR Manual (American Psychological Association, 2000) labels these types of motor difficulties as Developmental Coordination Disorder. The criteria for diagnosing Developmental Coordination Disorder include performance on activities requiring motor coordination that is below expectations for the child’s age.
and intelligence. This lack of coordination must be severe enough to “interfere with academic achievement or activities of daily living” (p. 56–57). In addition, there must not be any general medical condition such as cerebral palsy that could account for the difficulties, there must be no diagnosis of Pervasive Developmental Delay, and if mental retardation is present, it cannot be sufficient to account for the coordination difficulties.

We should note that there appears to be high co-morbidity (co-occurrence) between generalized dyspraxia and autistic-spectrum disorders. That is, many children with autism and similar disorders exhibit substantial generalized dyspraxia. However, dyspraxia can also exist by itself without being related to any kind of autistic-spectrum disorder.

Recognizing DVD

Developmental Verbal Dyspraxia is usually diagnosed in otherwise healthy and cognitively normal children, although in some cases there may be a more generalized dyspraxia as well. Table 8-1 shows characteristics of DVD that have been mentioned in the literature. The material in Table 8-1 is also available in checklist form as Reproducible Form 12 in Appendix A.

TABLE 8-1. Characteristics of Developmental Verbal Dyspraxia that have been mentioned in the literature. Characteristics which have widespread support, and which some authorities consider to be strong indicators of DVD if they are present, are indicated with an asterisk. (This book calls the asterisked indicators potential dyspraxic elements.) It is well to note that Marquardt and Sussman (1991) consider the severity of reported DVD behaviors to be as diagnostic as their presence. A checklist version of this table is available as Reproducible Form 12.

Speech and Oral Behaviors

1. Significant disturbances in intelligibility or naturalness* (Poor intelligibility is a common characteristic in young children who have DVD. Some older children who have undergone treatment have speech that is mostly intelligible, but slow and deliberate.)

2. Severely limited consonant repertory, with many omission errors*

3. Reduced syllable-shape inventory*

4. Assimilation and metathetic (transposition) errors*

5. Vowel errors*

6. Presence of an oral, non-verbal apraxia*

7. Groping for articulatory contacts*

8. Inconsistency in production, especially within the same word*

9. Increase in errors when word length increases or when word complexity increases*

10. Errors in prosody*

11. Increase in errors in connected speech compared to single words

12. Occasional well-articulated word that is not heard again*

(continues)
TABLE 8-1. (continued)

**History**

1. Poor feeding in infancy and/or persistent drooling after an age when most children reduce drooling
2. Sensory aversions such as tactile defensiveness in infancy and early childhood—that is, unwillingness to put certain textures or tastes in the mouth or to encounter certain textures on the skin
3. Relative silence during infancy
4. Generalized clumsiness
5. Slow progress in treatment*

**Non-Speech Indicators of Difficulty in Speaking**

1. Unwillingness or refusal to imitate modeled words
2. Well-developed gesture system to supplement speech*
3. Avoidance of speaking situations
4. Reliance on parent or older sibling as a translator

**Concomitant Characteristics**

1. Expressive language depressed in comparison to receptive language
2. Specific difficulty with vocabulary, especially word-finding
3. Signs typically associated with central neuromotor disorders: perseveration, difficulty inhibiting gestures or behaviors that interfere with production attempts, and evidence of fatigue relatively early in a task

It is no doubt obvious from the list in Table 8-1 that the “symptoms” of DVD are not always unique to DVD. For example, children who have severe phonological disorders often have very restricted consonant inventories, inconsistency in production, an increase in errors when word length increases or when word complexity increases, and an increase in errors in connected speech compared to single words. In addition, many children who have phonological disorders perform better in receptive language tasks than in expressive language tasks. Children with cerebral palsy or some other form of dysarthria may exhibit poor feeding in infancy, including persistent drooling after an age when most children reduce drooling, generalized clumsiness, and slow progress in treatment, as well as some of the central signs. Medically fragile children may experience sensory aversions, including tactile defensiveness, in infancy and early childhood.

We can raise other issues about some of the characteristics of DVD. For example, many writers consider inconsistency of production to be a hallmark of DVD. However, a young child with DVD who has very few speech sounds does not have much room to vary—that is, to demonstrate inconsistency. Consequently, inconsistency may be relevant only when the child has at least a small variety of consonants and vowels. Another example is the criterion of slow progress in treatment. We cannot always assume that the treatment offered to the child
Treatments for Developmental Verbal Dyspraxia

It should come as no surprise that there are numerous treatments for DVD. It should also come as no surprise, given the controversial nature of the area, that the various treatments for DVD tend to have strong advocates, that is, professionals who write about or give workshops on their preferred treatment. Further, despite the emphasis of some investigators on linguistic deficits being an inherent part of DVD, there are few interventions that are directed at the proposed linguistic components. Rather, almost all treatments are directed at the motor speech system. Finally, it is clear from reports after report that traditional treatment, with its emphasis on remediating one sound at a time, is not appropriate for children with DVD unless they are older and have only a few residual errors.

The various treatments for DVD are of several types: those that emphasize principles of motor programming, those that incorporate touching or manual molding of the child's articulators, those that impose speech on a suprasegmental pattern, those with a sensorimotor focus, those that are basically phonological interventions, those that are both motor and linguistic in orientation, and those that seek to increase strength and agility of the oral musculature. There is, of course, considerable overlap in emphases and techniques among all these approaches.

Treatments Based on Motor Programming Principles

Treatments for DVD that are based on motor programming have been carefully articulated by several authors (e.g., Hall, Jordan, & Robin, 1993; Strand & Skinder, 1999; Marquardt & Sussman, 1991; Velleman & Strand, 1994). Typically, these approaches resemble traditional intervention in their use of a bottom-up approach (syllables, then CV or CVC words, then more complex words, then phrases, and so on), and in their reliance on clinician models and client imitations. Some of the authors cited above rely on normal developmental sequences in choosing targets.
Where these motor programming approaches for DVD differ from traditional treatment is in their use of inputs from multiple modalities, in their emphasis on accurate vowels as well as accurate consonants, in their manipulation of prosody, and in their careful attention to principles of motor learning. For example, most of these authors emphasize the need for intensive drill distributed over many short treatment sessions.

Strand and Skinder (1999) have called these approaches “integral stimulation methods,” after Milisen (1954), and their terminology and emphases will be reported here. One area that Strand and Skinder discuss is the number of stimuli, such as syllables or words, to be trained at any one time. These authors use the severity of the child’s disorder as their guide. Thus the child with very severe DVD may work on only five or six different stimuli at one time, whereas a child with less involvement could deal with eight to ten stimuli. These authors also echo Velleman & Strand (1994) in their incorporation of functional vocabulary (e.g., no, mine) into the stimulus materials whenever it is feasible. Functional vocabulary is important because many children with DVD have speech so unintelligible that they are routinely frustrated in trying to communicate their wishes.

Finally, Strand and Skinder (1999) discuss the issues relating to keeping a young child motivated when massive amounts of drill are needed. They point out that careful planning to keep the child working at a high level of success is critical. They also report that making minor changes in the procedures every so often is helpful, even such minor alterations as shifting body position every 10 responses, or having the child do 10 responses with an altered hand position.

**Treatments that Incorporate Touching or Molding of Articulators**

There are several variations on treatment for DVD in which the clinician cues oral positioning by touching or molding the articulators, including Prompts for Restructuring Oral Muscular Phonetic Targets (PROMPT—Chumpelik, 1984; Square, 1999) and the Touch-Cue Method (Bashir, Grahamjones, & Bostwick, 1984). The PROMPT technique will be used as an exemplar of approaches that require touching or molding of articulators. In PROMPT treatment, the clinician cues a child about the articulatory placement of a speech sound using a well-defined system of cues that are implemented by touching the child’s face or neck while providing a model of the desired response. Sequences of sounds are similarly cued using sequences of touch cues. Specialized training is needed for speech-language pathologists who want to use PROMPT techniques.

**Treatments that Impose a Suprasegmental Pattern on Speech**

One treatment that has shown promise with children who have DVD is a variant of Melodic Intonation Therapy (MIT), which was originally developed for adults with aphasia. Helfrich-Miller (1984) modified MIT for use with children and has reported considerable success for two children with DVD. Thus the child is asked to produce speech with a particular intonation contour and rhythm, and this attention to prosody appears to facilitate phoneme production. It should be noted that the Helfrich-Miller adaptation also has an emphasis on the linguistic components of speech, in that the stimuli are chosen precisely because they represent syntactic forms and vocabulary needed for effective communication.

**Treatment with a Sensory-Motor Focus**

One of the earliest well-defined interventions for articulation disorders was that of McDonald (1964a). Although McDonald did not mention a condition like DVD or DAS, his approach has two areas of focus that are helpful for DVD. The first of these is the idea of starting every session with a kind of “babbling” practice, in which the child is encouraged to produce strings of
sylables containing phonemes that are already in his repertory. These syllable strings are pro-
duced with a variety of stress and intonation patterns, always with an emphasis on accuracy of
the speech-sound productions. The syllables might be CV or VC syllables, and they would typ-
ically be nonsense syllables. McDonald’s goal appears to be an increase in the child’s ability to
sequence the motor patterns of phonemes with normal timing and coarticulation. It is precisely
a deficit in this ability appears to be at the heart of Developmental Verbal Dyspraxia.

The second aspect of sensorimotor therapy that is helpful with children who have DVD
is its emphasis on facilitating contexts. It should be noted that the McDonald Deep Test
(1964b) was developed to aid in discovery of facilitating contexts for various phonemes; how-
ever, that test is probably far advanced for many children with DVD. (In any event, it is out
of print at this time.) Nevertheless, McDonald’s emphasis on moving from more facilitating
contexts to less facilitating contexts is very useful concept in the treatment of DVD.

**Phonological Treatments**

Preschool children who have DVD may have the same kinds of difficulties in figuring out the
phonological system of the ambient language that other children of similar ages exhibit. In
such cases their poor intelligibility may stem from a general phonological disorder and from
a specific difficulty in sequencing commands to produce speech. That said, we should remem-
ber that these two sources may produce similar effects. In other words, most of the standard
phonological processes appear to simplify the child speaker’s task, but so do many of the
errors attributed to children who have DVD.

In any event, aspects of phonological treatments that help the child to learn the patterns
of the language should be helpful to preschoolers and early school-age children with DVD.
These include auditory bombardment (Hodson & Paden, 1991), simultaneous work on multi-
ple exemplars of the same phonological process (a feature of several phonological
approaches), use of minimal pairs to demonstrate phonemic contrasts, and work with mean-
ingful words and phrases as much as possible.

**Treatments Based on Both Motoric and Linguistic Considerations**

Crary (1993) and his co-authors have articulated the importance of including a linguistic planning
component in treatment programs. By this they mean that not only does the child prac-
tice sounds in isolation, words, and phrases, but she also has experience in slotting
appropriate word forms into sentences and experience in formulating narratives using newly
learned sounds and words. Crary regards a motor planning component as intrinsic to lin-
guistic aspects of communication.

The Pressure Points intervention (Smit, 2000), as described in Section 6, is another
approach that combines motor and linguistic aspects of intervention for preschoolers with
severe phonological delays (some of whom undoubtedly have DVD). The stimuli for this
approach are chosen so that when the child produces a sound in a word correctly, the word
will be completely correct and intelligible to others and can be used immediately in commu-
ication. Although this early intervention has not been expanded to further stages of inter-
vention, a logical expansion of this concept is that the child would be expected to produce
appropriate syntactic forms, such as plurals, in naturalistic drills and in conversation.

**Oral-Motor Exercises**

Oral-motor treatments constitute yet another possible route for intervention for Developmental Verbal Dyspraxia. There is no uniform definition of what constitutes an oral-
motor treatment; however, for purposes of this discussion, oral-motor treatments include all
interventions intended to increase strength and agility of the structures of articulation and respiration. These exercises are often presented not only as ways to increase strength and agility, but also to promote normal oral-facial tactile sensation, increase functional differentiation of the head and face from the rest of the body, build muscle tone, and heighten proprioception (e.g., Boshart, 1998). Many of the concepts and techniques used in oral-motor therapy have been borrowed from the field of occupational therapy.

Oral-motor treatments have been promoted for both phonological disorders and for DVD. They have a certain intuitive appeal, because it seems obvious that the muscles must be strong enough to be used for the complexities of speech, and the articulators must be agile enough to reach specified positions quickly. There are a number of assumptions that follow from this intuitive position, as Forrest (2002) has noted. One assumption is that a complex behavior can be broken down into its parts and that practice on the parts will improve learning of the whole pattern. Another assumption is that speech activities emerge from the structures used for vegetative functions such as swallowing; consequently, oral-motor exercises may improve the basis or substrate for speech.

Unfortunately, there is little evidence that oral-motor exercises do what they are intended to do—namely, improve speech production. Furthermore, there is evidence from the few studies that have incorporated controls that these exercises do not, in fact, improve speech. Forrest (2002) has recently undertaken a review of the role of oral-motor exercises with children who have phonological disorders and has also related this work to the motor learning literature. She notes a much-replicated finding in the rather large literature on acquisition of complex behaviors, namely that training on constituent parts of such behaviors actually reduces the learning of these behaviors.

When it comes to strength training of the speech musculature, there is a definitional hurdle to overcome, namely that if the child has demonstrated weakness of the muscles, that child is by definition dysarthric rather than having a phonological disorder or a dyspraxic disorder (Forrest, 2002). Strength training may indeed be warranted in cases of dysarthria, but there is no reason to undertake strength training for children who have a phonological disorder or DVD without a demonstrated loss of strength.

The findings to date seem counterintuitive until we consider one of the key facts about speech: Speech rides very lightly on the vegetative capabilities of the oral, laryngeal, and respiratory systems. In other words, speech uses little of the capacity of the speech musculature. For example, in respiration, the part of the lung volume used for speech is usually only a small portion of the very large Vital Capacity (although singers and actors can train themselves to use more of that capacity). Similarly, phonation requires very little subglottal pressure compared to the very large pressures that the system is capable of generating. Similarly, the tongue-tip-alveolar pressures used in speaking represent only a fraction of the pressures that can be generated and that might be available for chewing, feeding, and swallowing. Consequently, if the child with a phonological or dyspraxic disorder can handle feeding well, eats typical foods, and is well-nourished, it is highly likely that the oral mechanism has more than enough strength for the production of speech.

With respect to agility, it is difficult to know what is meant by the term when it is applied to structures of the head and neck. Agility generally means the ability to move and respond quickly and efficiently when necessary. Presumably, oral agility means that the oral, pharyngeal, laryngeal, and respiratory structures can respond easily when asked to produce normal speech. Agility must in large part be related to strength, if only because a weak muscle will move an articulator sluggishly, if at all. It appears therefore that if strength is adequate for speech, then agility is also likely to be adequate for speech. Clinical Note 8-1 relates some personal experiences with oral-motor tasks.