Chapter 1 Introduction and Neurology

WHAT IS DYSARTHRIA?

There have been many approaches to describing and defining dysarthria. When we explain dysarthria to patients or their families, we may say that dysarthria is speech that is slurred or hard to understand and is caused by damage to the control center in the brain. However, we know that this is a simplistic explanation that focuses too much on the articulation aspects and not on the other components.

According to Darley, Aronson, and Brown (1975), dysarthria is a speech disorder resulting from a weakness, paralysis, or incoordination of the speech musculature that is of neurological etiology. Rosenbek and LaPointe (1985) describe the dysarthrias as "a group of related motor speech disorders resulting from disturbed muscular control over the speech mechanism" (p. 99).

Van der Merwe (2009) and others describe speech as a sensorimotor skill. That is, the act is not motor alone; therefore, dysarthria should be considered a disorder not only of motor speech, but also one of sensorimotor speech. The sensory feedback (auditory, tactile, and proprioceptive) is an important part of speech production. "Today it is generally accepted that sensorimotor interaction is integral to movement control and that the brain uses feed-forward and feedback information in a plastic and generative manner depending on the task demands or context of motor performance" (p. 5).

We must keep in mind that the dysarthrias affect more than the ability to produce consonants and vowels (i.e., articulation). The disturbed muscular control can result in difficulties in respiration, phonation, resonance, articulation, and prosody.

Which systems are affected by dysarthria?

- respiration
- phonation
- resonance
- articulation
- prosody

There are also different problems with muscular control that result in these difficulties. The muscles can be paralyzed or weak, they can have too much or too little tone (spastic or flaccid), and muscle movements may be slow and reduced in range (rigid) or uncoordinated.

What can be wrong with the muscles?

- paralyzed (can't move at all)
- weak (can't move well)
- spastic (too much tone, tight)
- flaccid (not enough tone, flabby)
- rigid (movements slow and reduced in range)
- uncoordinated

Clark (2003) provides information on two types of neuromuscular impairments and their treatment with non-speech oral-motor exercises. (See Chapter 7 for information on treatment.)

- Weakness is the decreased ability to produce force. Fatigue is described as weakness noted during "sustained force production or over-repeated trials" (p. 400). Complete weakness could be described as paralysis.
- Disrupted muscle tone is the tendency of a muscle to resist passive stretch. Muscle tone may be hypertonic. One type of hypertonia is spasticity and another is rigidity. Rigidity is usually associated with hypokinetic dysarthria. Tone may also be hypotonic or variable (typically associated with damage to the basal ganglia control circuit).

Clark (2003) points out that it is more difficult to recognize disrupted tone in speech musculature than when it occurs in limb muscles. For example, it is difficult, if not impossible, to put the tongue or lips through passive stretch. Speech musculature also typically lacks agonist/antagonist relationships, making it "difficult to judge the amount of resistance offered by a single muscle group when the perceived resistance may include the tonic response of another, overlapping muscle group" (p. 401).

Spastic dysarthria

Possible medical diagnoses	• anything that damages the direct and indirect pathways bilaterally • degenerative disease (primary lateral sclerosis, pseudobulbar palsy, progressive supranuclear palsy [PSP]) • toxic/metabolic • inflammatory disease (leukoencephalitis) • CVA (bilateral lesions to internal carotid, middle and posterior cerebral arteries, multiple lacunar strokes or single brain stem stroke) • trauma (neurosurgical) • TBI • cerebral palsy
Neurological system affected	• pyramidal and extrapyramidal systems: bilateral UMN lesions
Associated symptoms	• damage to the extrapyramidal tracts causes excessive muscle tone (spasticity) • damage to the pyramidal tracts causes weakness of distal muscles • loss of fine, skilled movement • hypotonia
Patient complaints	• slow speech rate • increased effort to speak • gets tired when speaking • poor control of emotions (pseudobulbar affect) • drooling • difficulty swallowing
Reflexes	• positive Babinski • snout reflex present • positive jaw jerk • positive suck • hyperactive gag
Tasks most helpful to make diagnosis	• conversational speech and reading (hypernasality, slow speech rate, and imprecise articulation) • speech AMRs (slow but regular) • vowel prolongation (strained, strangled, or harsh voice; low pitch)

List of Perceptual Symptoms

Physiologic	Typical Characteristics	Treatment Objectives
Respiration	• may have reduced vital capacity • difficult to separate from what is caused by poor laryngeal valving	RSP 1, 13-20, 25-28
Phonation	• strained, strangled • low pitch • some pitch breaks • little loudness variation • monopitch	PH 16-20, 17-21, 27-32
Resonance	• hypernasality but not usually nasal emission	RSN 1-8, 14
Articulation	• imprecise consonants • distorted vowels	AR 1-12, 29-43, 44-46, 47-50
Prosody	• reduced stress • may have excess and equal stress • slow rate • short phrases related to phonation	PR 12-17, 34-38 or 18-23 (excess and equal)

Chapter 7 Articulation

When treating articulation deficits due to dysarthria, it is important to consider the relationship of the articulation disorder to deficits in the other physiologic systems. The following are some helpful tips:

- If respiratory support is decreased, it may be easier for the patient to work on stops and nasals.
- If the patient has better respiratory support, he can try fricatives and affricates.
- If the patient has velopharyngeal incompetence (VPI), he may be better able to produce nasals, vowels, and glides.
- If movement of the velopharyngeal mechanism has improved, the patient may work on nasal/oral contrasts, such as *may/pay* or *my/pie*, for carryover to speech.
- If the patient is working on lingua-alveolar sounds, high front vowels /i, ɪ/ may be the easiest context.

The following two seminal articles are recommended:

1. "Neuromuscular Treatments for Speech and Swallowing: A Tutorial" by Clark (2003)
2. "Evidence-Based Systematic Review: Effects of Non-speech Oral-Motor Exercises on Speech" by McCauley, Strand, Lof, Schooling, and Frymark (2009)

Clark's tutorial provides an in-depth description of the way NS-OMEs have been used. Chapter 1, Introduction and Neurology, describes the types of neuromuscular impairments. According to Clark, understanding the principles of exercise, based mostly in physical and occupational therapy literature, helps us make informed decisions about the treatment of speech disorders. Clark categorizes these exercises as follows:

► Active Exercises

- designed to improve strength, endurance, and power
- stretching and range of motion

► Passive Exercises

- passive range of motion
- passive slow stretch
- passive quick stretch
- massage

► Physical Modalities

These specific physical modalities provide another methodology for passive treatment:

- heat
- cold
- electrical stimulation
- vibration

Clark's conclusions are based on principles of strength training (e.g., overload, specificity of training, frequency) and knowledge of motor units.

"Clearly the current state of literature is inadequate for establishing that strength training is of benefit for improving speech and/or swallowing function in individuals with neuromuscular impairments" (p. 411).

". . .it is impossible to conclude from the available literature that these treatments (active stretching, vibration, massage) are appropriate for treating dysarthria" (p. 411).

As Yorkston et al. (2010) point out, the goal for a child is improved, functional speech with improved intelligibility rather than adult-like, accurate production. Specifically, when working on articulation, the goal for a child is productions that are more intelligible rather than perfectly produced sounds. This would be a goal for a child with a simple articulation disorder.

AUGMENTATIVE AND ALTERNATIVE COMMUNICATION (AAC)

A mistake too often made with preschool children with dysarthria is that of failing to include augmentative and alternative communication (AAC) in the treatment plan. Understandably, parents hope their child will be able to communicate intelligibly through speech, and they may think that using AAC will impede that development (Cress & Marvin, 2003; Miller, Light, & Schlosser, 2006).

Discuss information about the effectiveness of AAC systems with parents. Research demonstrates that AAC may actually enhance the development of natural speech (Cress & Marvin, 2003; Miller et al., 2006). Share that information with parents to help them understand that AAC and the development of speech are complementary strategies that can occur simultaneously (Yorkston et al., 2010).

Romski and Sevcik (2005) stress introducing a child to AAC interventions before he experiences failure with communication attempts. Use AAC for a preschool child who is nonverbal or who has a severe delay in the development of verbal communication. Introduce the use of AAC as the following:

- a foundation for language development (Romski & Sevcik, 2005)
- a way to increase social participation (Light, Parsons, & Drager, 2002)
- a way to facilitate development of natural speech in children for whom that is a viable goal (Hustad, Morehouse, & Gutman, 2002; Hustad & Shapley, 2003)

CONCLUSION

If you are treating a child with a dysarthria, use the information from all of the chapters in this book, adapting and changing some of the techniques to be age-appropriate. You will also want to seek additional information from some of the excellent texts listed in the references for this chapter (pages 167-168).