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Normalizing Oral-Tactile Sensitivity

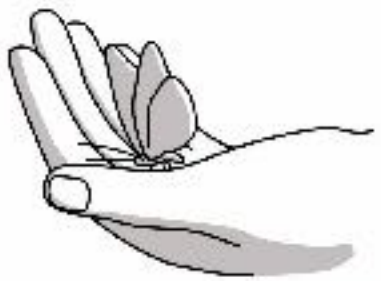
Enhancing light touch awareness and discrimination for phoneme learning

"Only by an integration of finely discriminated auditory, proprioceptive, and tactile stimuli can the precise ballistic, overlapping movements of mature, normal articulation be developed from the gross motor behavior of an infant."

– Eugene T. McDonald, 1964

The role of the tactile system in the training of speech movements can be ignored no longer. The skin with its embedded nerve endings is the organ responsible for feeling the light-as-a-butterfly touch experiences of voice, resonance, place, and manner of articulation. The concept that speech training should include methods to enhance oral tactile sensitivity began with a few articles published in the 1940s, and practicing speech-language pathologists have been developing clinical methods to assist oral-tactile perception ever since. The relationship between oral tactile sensitivity and articulation even has received a fair amount of attention among speech researchers throughout the past sixty years, but for some reason this area continues to be a controversial one. Not everyone accepts the view that some speech clients might have difficulty with oral-tactile sensitivity despite significant evidence to the contrary.

The present chapter takes the perspective that some clients, especially those with motor speech disorders, do have difficulty with oral-tactile sensitivity and that this deficit may be contributing directly to their troubles in speech movement learning. This chapter reviews aspects of normal and abnormal oral-tactile sensitivity, it explains simple procedures for clinical evaluation, and it presents practical methods to calm and/or excite oral-tactile responses. This chapter ends with two case samples that demonstrate how one might alter an articulation or motor speech program to encompass organized tactile input for improved speech movement learning.



The touch experiences of articulation are as light as a butterfly and require a heightened sense of oral-tactile sensitivity.

BACKGROUND

Fairbanks (1954) was one of the first to propose that humans use three mechanisms to perceive and monitor their speech productions: the auditory system, the tactile system, and the proprioceptive system. He said that the auditory system was the most important sensor but he advised that the tactile and proprioceptive systems had their roles too. Fairbanks proposed a closed-loop theory that suggested all three sensory systems work together in the perception and self-monitoring of speech.

Fairbanks' and other similar theories have been questioned as they apply to adult speech production (e.g., Kelso & Tuller, 1983). However, many authors have suggested that the role of proprioceptive feedback may be very different for an adult who already produces all his phonemes correctly than for a very young child who is just learning to produce phonemes in the first place. It has been suggested that the tactile system may play a more significant role in

protectively.

PROBLEMS IN SENSITIVITY

Research projects on oral-tactile sensitivity and speech impairment generally have hypothesized that under-sensitivity is the principle issue at work, but working therapists see a different picture. Clinicians report that, while some of their clients are under-sensitive, others are over-sensitive, inattentive, confused, or cannot seem to remember what they feel. In addition there are clients who avoid oral tactile experiences and, therefore, do not allow themselves enough opportunities to process what they feel.

Speech and motor therapists began to categorize clients by these sensitivity differences nearly four decades ago beginning at least with Morris (1977a, 1977b). Clinicians began to classify these problems as hyposensitivity, hypersensitivity, mixed sensitivity, fluctuating sensitivity, and defensiveness.

Hyposensitivity (Under-Responsiveness)

The client who is hyposensitive has a very high threshold of response to tactile input. He responds slowly or not at all. The client's gag, therefore, may be completely absent or may be tardy in its response, meaning that it takes repeated or powerful stimuli to elicit. A client who is hyposensitive has difficulty feeling place, manner, and voicing changes. He also may have trouble managing food in his mouth. This client needs a program to awaken his tactile system and to help him pay attention to oral-tactile stimuli. Clinicians and researchers have begun to use the term "under-response" for hyposensitivity. The new term takes the focus off the tactile system and places it on the client's reaction.

Hypersensitivity (Over-Responsiveness)

The client who is hypersensitive has a very low threshold of response to tactile input. He responds quickly to very little oral stimulation and, therefore, gags easily. The client even may respond negatively when he simply thinks about oral stimulation. This client usually avoids oral tactile experiences. He may be very picky about the types of foods he eats and he may avoid certain articulatory contacts. He

Some clients withdraw, hide, or protect the mouth to avoid oral-tactile stimulation.

even may respond to tactile input with a tonic bite reflex. A hypersensitive client needs a program to calm his fight-or-flight protective responses so that the higher-order skills of tactile localization and discrimination can develop.

Mixed Sensitivity

The client with mixed sensitivity responds to touch stimuli differently depending upon where it occurs on the body map. For example a client can be over-sensitive to stimuli on the face yet under-sensitive to stimuli inside the mouth. This client needs a program to normalize his tactile responses.

Fluctuating Sensitivity

Some clients show fluctuations in their reactions to tactile input, and these changes can range from complete unresponsiveness to over reactions. Such swings can be seen in any type of client, but are more common in clients on the autism spectrum and those with dementia.

Defensiveness

The client with tactile defensiveness reacts negatively and emotionally to tactile input and he avoids tactile experiences as a result. Tactile defensiveness can occur at any sensitivity level. This client needs a program to calm his defensive fight or flight tactile system so that he can begin to process higher-order skills like localization and discrimination. Ayres seems to have been the first to use the term *tactile defensiveness*. "Tactile defensiveness is the tendency to react negatively and emotionally to touch sensations" (Ayres, 1979, p. 107).

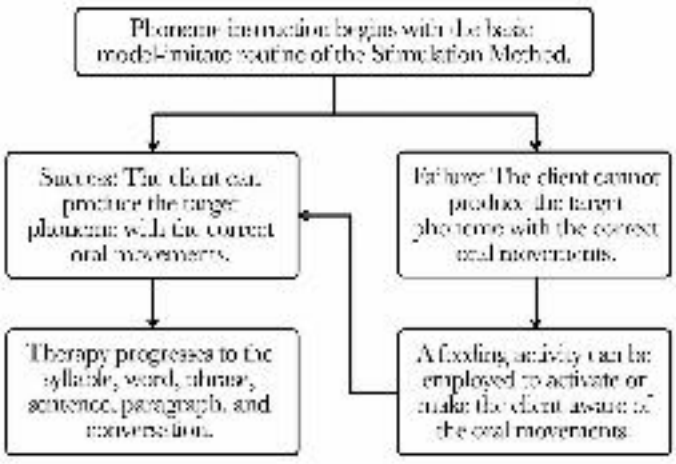
Tactile defensiveness is a behavioral response that ranges from mild to severe,

Hyposensitivity	Normal Sensitivity	Hypersensitivity
← Tactile defensive behavior →		
← Poor awareness, localization, or discrimination →		

Tactile problems can occur at any sensitivity level.

summaries of this and earlier history are referred to Hanson and Mason (2008) and Mills (2011).

- *1968:* Fledging articles on the speech and swallowing relationship began to appear in speech journals in the 1960s.
- *1970:* Gellis published an early teaching manual entitled *Training Therapies for Tongue Thrust Cases* (1970).
- *1972:* An interest group called the American Association of Oral Myo Therapists was formed in 1972, and this group eventually evolved into the International Association of Orofacial Myology (IAOM). Today the IAOM functions as the international professional organization that provides continuing education on the assessment and treatment of swallowing problems and oral habits, as well as information and resources for patients and their families.
- *1974:* *The Journal of Speech and Hearing Disorders* carried an article on the tongue thrust controversy written by Mason and Proffit. This article became the standard around which everything written since has surrounded in the fields of orofacial myology, speech, and dentistry.
- *1976:* Garliner published *Myofunctional Therapy* (1976). Garliner eventually was discredited for unethical practices, but his work stands as an historic contribution.
- *1978:* Hanson and Barrett published *Assessment of Orofacial Myology* (1978). This textbook became the first worldwide standard.
- *1991:* ASHA published a statement on the role of the SLP in the management of oral myofunctional disorders (American Speech-Language-Hearing Association, 1991).
- *1993:* ASHA published a new knowledge and skills supplement on orofacial myology (American Speech-Language-Hearing Association, 1993).
- *2003:* Hanson and Mason set a new textbook standard with *Orofacial Myology: International Perspectives* (2003). They defined orofacial myology as "the study of normal and abnormal patterns of use of the mouth and face and their relationships with dentition, speech, and vegetative functions" (p. 3).



Van Riper's basic plan for incorporating feeding activities into articulation therapy.

THE MATURE SWALLOW

Therapists who want to integrate eating and swallowing activities into articulation or motor speech therapy need to understand the mature swallow. *Swallowing* has been defined as "the entire act of deglutition from placement of food in the mouth through the oral and pharyngeal stages of the swallow until the material enters the esophagus through the cricopharyngeal juncture" (Logemann, 1983, p. 1). The mature swallow has been divided into three or four phases depending upon the source cited. Therapists who use this information in articulation therapy are concerned only with the first two phases in which the tongue, jaw, and lips are active. The following represents a idealized yet foundational ideas using the four-phase model.

Phase 1: Oral Preparatory Phase

The first stage of the mature swallow has been called the *oral preparatory phase*. This is a voluntary stage that begins when food is taken into the mouth (Logemann, 1983). It includes the process of preparing and sampling food within the mouth and the act of biting. Once food enters the mouth, the tongue carries the responsibility of transferring the incoming food to the molar areas for chewing and the cheeks press in to keep food out of the sulci and over the molars. Mature chewing occurs when the jaw moves up-and-down, left-and-right, forward-and-back, and diagonally in rotary patterns that are larger than those used during the process of speech. The tongue translates food side-to-side during chewing so that the food becomes well masticated and mixed with saliva. Once the food has entered the mouth, the lips close, and they remain closed to prevent food from exiting the mouth throughout the entire chewing and swallowing process. The lips also remain closed to create a socially polite eating experience.

Once adequately crushed, mixed with saliva, and softened, food particles are gathered together into a bolus (ball, rounded mass) as a result of several coordinated and simultaneous actions. The cheeks push the particles medially, the tongue gathers the food particles together,

> *against the alveolar ridge, but with the tongue adjusted in such a manner that its margins do not touch the teeth and gums at the sides"* (Carroll & Tiffany, 1965, p. 257). However, modern day electropalatometry has revealed that some articulation also may occur at the tongue's shoulders, although this may be the result of coarticulation (McLeod & Singh, 2009).

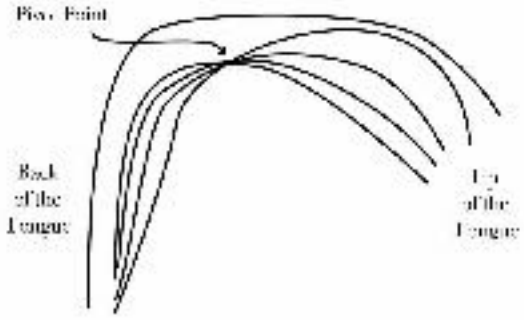
Since movements develop from proximal-to-distal, a tongue that is functioning with full tip extension and elevation is functioning with full maturity. A tongue that cannot extend and elevate its very tip is showing motor immaturity.

Tongue-Tip Curling

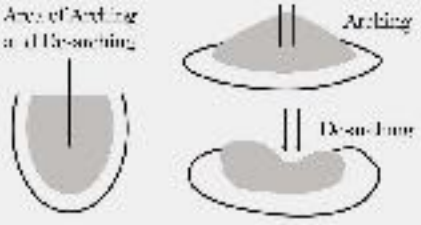
The tongue-tip lifts and curls up-and-back so that the tongue forms into an exaggerated bowl-shape that faces the oropharynx. This pattern is used during production of the retroflex /r/: "For the retroflex /r/ the[] apical tongue tip is curled upward toward the middle of the hard palate" (Bosley, 1961, p. 81). Retroflex /r/ is the only phoneme that requires this advanced movement pattern.

Protruding

The entire tongue shifts forward slightly so that the tip emerges between the teeth for /θ/ and /ð/. The jaw



Maxillar arching, de-arching, and pivot point as seen from the side of the tongue (adapted from Iskarous, 2005).



The middle of the tongue arches and de-arches as seen from the top (left) and the front (right).

simultaneously shifts downward slightly to accommodate this forward tongue position. Shifting the whole tongue forward is a primitive movement pattern that requires only simple maxillar control. Therefore, it is a movement often used in defective articulation. The amount of forward shifting in normal mature speech varies from one person to another:

> *"If a tongue-protruded /θ/ is made, the apical tongue tip begins to protrude between the teeth at approximately the cuspid or perhaps first premolar area. However, it is not necessary to protrude the tongue for a normal /θ/"* (Bosley, 1961, p. 53).

Arching, De-Arching, & Pivot Point

Iskarous (2005) found that the midline of the tongue undergoes bulges (arches) and de-arches (valleys) downward from a pivot point on the tongue's midline during production of phonemes. Height of the arch contributes to vowel formation. This means that the vowels are formed when the tongue braces at its lateral margins against the sides of the palate while the middle of the tongue arches and de-arches:

> *"The tongue is an elastic continuum with a very large number of degrees of freedom along its midsagittal edge.... Pivoting and arching, therefore, indicate a principle of tongue movement"* (Iskarous, 2005, p. 575, 580).

The tongue de-arches to keep its middle down and away from the palate throughout speech (Fletcher, 1989). This does several things: it helps create the hourglass shape for /ʃ/, /ʒ/, and /ɹ/, it allows the tip to elevate independently for /l/, it allows the palatines to curl up and back in an exaggerated cup-shape for the retroflex /ɹ/, it allows the sibilants to be produced with a central groove (depressed middle is part of the basic tongue bowl that lends itself to the grooved quality of the vowels).

A careful study of the palatography images of all consonant and vowel productions reveals that the very middle of the tongue never makes contact with the roof of the mouth in normal mature speech (McLeod & Singh, 2009). A middle that is held low is part of oral stability and tongue maturity. Since movements develop from medial-to-lateral, a tongue that is over-using or arching in its middle section is a tongue that is functioning with motor immaturity. The elocutionists' term *thickening* described speech that was produced with the tongue arching upward too much in its middle zone.

Lateral Elevation

The lateral margins of the tongue must be able to elevate independently of the rest of the tongue to form the central groove and the horseshoe shape. The lateral margins elevate in the back for /ɹ/ and the vowels. They elevate from the back to about half-way forward for production of the palatal sounds, and they elevate all the way to the

(1925) that Van Riper called "curious wire contrivances" (Van Riper, 1947, p. 186).

European Origins

The tradition of using objects in articulation therapy came to the U.S. from Europe at the turn of the last century. Alexander Graham Bell's family of elocutionists moved to the US from Scotland, and they used what they called a "manipulator" (Bell, 1906). Bell's father said that his manipulator was a letter opener but that any similar object could be used.

Two texts from the early 20th century were ones that Van Riper recommended: *Stuttering and Lisping* by Scripture (1912) and *Speech Correction* by Borden and Busse (1925). Scripture was an American professor who had traveled to Berlin to study the most modern speech methods being used there at the time. Borden and Busse were professors in New York City who worked with a huge European immigrant community. These books describe how they used tools with a diverse population of children and adults with acquired, habitual, second language, and medical speech problems.

In the 1960s Borel-Maisonny described a set of tools being used to teach speech movements in France (Borel-Maisonny, 1965). The set consisted of 21 probes made of metal and later plastic. Each probe was comprised of a long thin handle with a shape on the end. The shapes were of balls and paddles of various sizes, forms, and textures. These tools were still being used in the 1980s as described by Bosley: "Speech pathologists in France, called orthophonists, carry around with them a tool kit with all sorts and shapes of oral probes for pushing the tongue around and for increasing awareness of tactile sensation in the mouth" (Bosley, 1981, p. 57).

United States

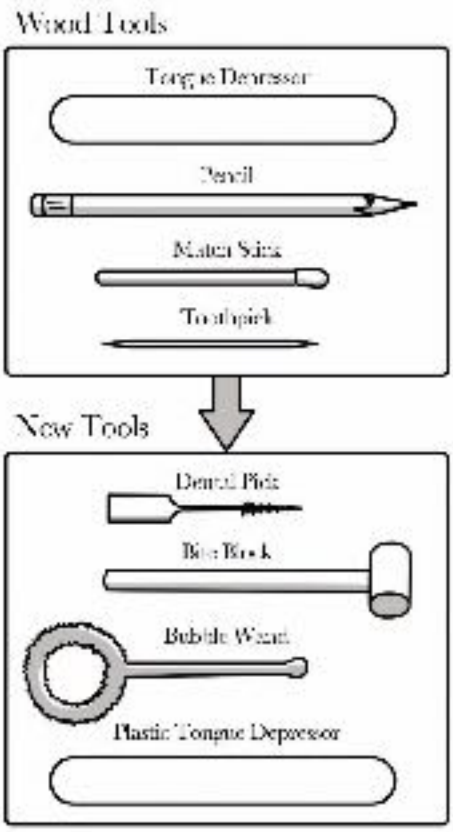
By the 1930s the use of tools to teach oral movement for clients with articulation and motor speech disorders was being discussed along with many other methods for speech and feeding therapy under the broad heading of *oral-motor techniques* (e.g., Marshalla, 1992a, 1992b, 1992c; Rosenfeld-Johnson, 1992; Bosl art, 1997). Since then these tools have been tossed into the basket called *non-speech oral-motor exercises* (e.g., Powell, 2008a, 2008b) and this is where the trouble began. These ideas had been eliminated from modern textbooks in articulation and phonology for so long that newer generations of clinicians and researchers were no longer familiar with them. Speech researchers began to scorn these ideas because it was assumed they were new and they were not being researched in the modern sense. There also were indications of misuse (Lof, 2008; Lof & Watson, 2008). But textbooks from the traditional era are filled with these ideas.

Many of today's "how to" articulation manuals published in America continued to recommend them as well. For example, Secord et al. (2007) and Bleile (2006) are modern therapy manuals that contain scattered examples of how to use tools in the process of phonetic placement. These books are quite popular among professional SLPs in the US, and they also are used as supplemental texts in the training of university students. Two examples from each manual are offered below. These represent classic old-time phonetic placement methods that can be traced back to some of the 20th century's earliest publications.

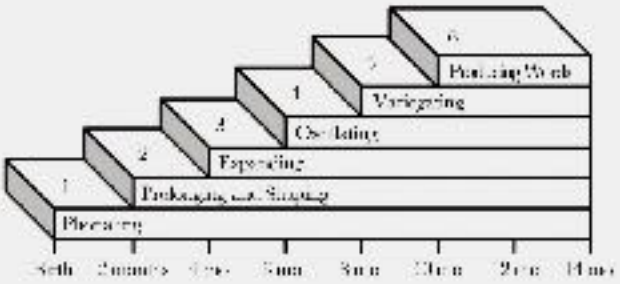
- *Bleile on teaching /l/*: "Touch the student's alveolar ridge with a tongue depressor, peanut butter, or lollipop to indicate place of production for [l]" (Bleile, 2006, p. 146).

- *Bleile on teaching /w/*: "Use a strip of paper, a feather, or the hand held in front of the student's mouth while you produce several glides or liquids to draw attention to the 'flowing' quality and continuous nature of the sounds. Alternately, tape a small paper flower on the end of a pencil and encourage the student to move the flower in the wind" (Bleile, 2006, p. 213).

- *Secord et al. on teaching /k/*: "Use a tongue depressor to guide the tongue toward a backward movement. [Also] rub a moist cotton swab on a flavored food, such as a Life Saver®.... Then touch the soft



Original phonetic placement tools made of wood have been replaced by sanitizable modern ones.



Platforms of speech movement learning govern the acquisition of pre-speech vocalizations.

sounds seems to train the auditory and speech movement systems simultaneously and in fundamental ways that enhance later articulation and phonological development. The idea that producing sound and hearing sound develops in tandem in early infancy is an idea that modern research is beginning to support (e.g., Kuhl et al, 2014).

Platform 1: Phonating

Expressive speech begins with exhalation and voice. Newborns produce one speech-like sound known as the *quasi-resonant nuclei* (QRN) during this time. "The QRN ranges from a syllabic nasal consonant to a high, mid, unrounded, nasalized vowel" (Oller, 1978, p. 526). The QRN dominates expression because of the newborn's governing flexor tone. High flexor tone keeps the baby curled up, and this posture restricts lung volume and oral position. Newborns also produce non-speech, vegetative, or reflexive sounds during this period including burping, sneezing, coughing, and clicking. They also produce sounds of displeasure including crying, whimpering, and fussing.

Application to Therapy

Clients with the most severe forms of expressive speech impairment produce no voice at all or they produce a weak QRN. These clients need assistance with breath support and voice. They need to learn to produce the QRN.

The production of voice is stimulated in many ways depending upon etiology and therapy setting. The following main ideas are in common use today and are part of the present author's clinical routine. Methods provide stimulation that sets the vocal mechanism into action:

- Alerting activities designed to arouse clients who are sluggish and generally unresponsive. Stimulation might come in the form of gross motor activity (jumping, bouncing, etc.) or specific vestibular stimulation (swinging, prescribed spinning, etc.). Therapists also use feeding activities for the taste and scent stimulation they contribute to arousal.

- Activities to stimulate inhalation and exhalation for speech. (For ideas, see Chapter 7 on breath support.)

- Activities to stimulate basic auditory attention to sound and speech. (For ideas, see Chapter 4 on classic auditory training.)

- Neuromuscular inhabitation and facilitation techniques when muscle tone perpetuates the excessive flexor tone that interferes with the production of voice. SLPs work with motor specialists to design these prescribed therapy activities so that the trunk supports the best possible inhalation, exhalation, and voice patterns.

- Deep pressure and/or vibration: "The most effective way that we know of facilitating voice for a [child with cerebral palsy] is through the use of vibration. As the child exhales, the therapist uses her spread hand to vibrate as rapidly as she can the patient's diaphragm, chest, spine, larynx, or the infrahyoid area, that is, underneath the lower jaw, depending upon whichever part the best and quickest results" (Crickmay, 1966, p. 19).

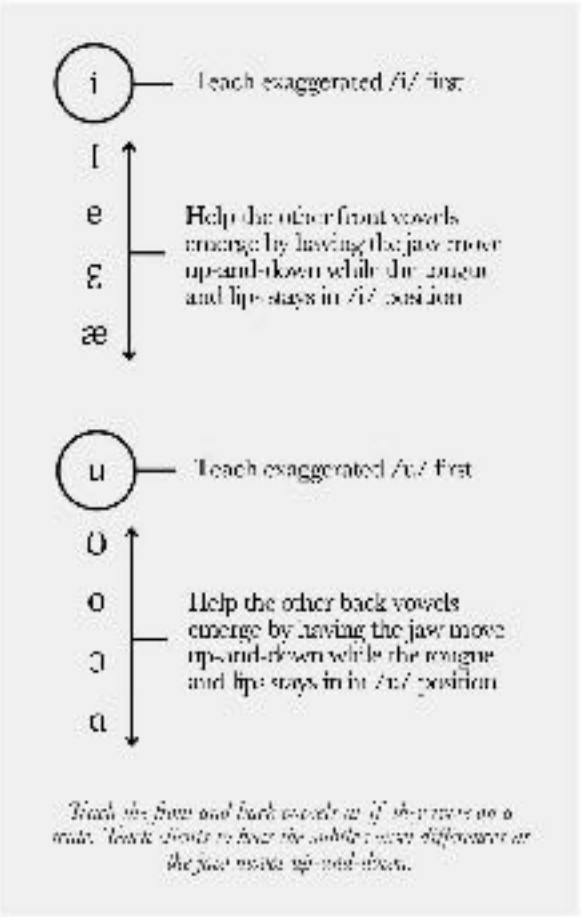
- Laughing, giggling, singing, and other gross pre-speech stimulation activities.

- Procedures in which communication partners respond to any and all sounds the client makes spontaneously. The general idea is to reward the client for producing any and all of the sounds he can say. The goal is to get the client to produce more sounds more often, and to produce them under a greater number of circumstances and for a greater variety of communicative purposes. Partners assign communicative intent to sounds these clients make spontaneously.

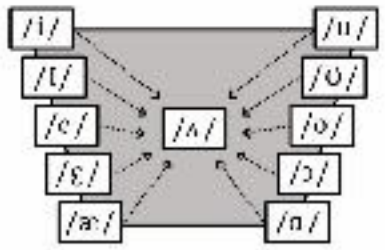
Newborns: Flexor tone, flexion and the QRN go hand-in-hand.

Platform 2: Prolonging & Shaping

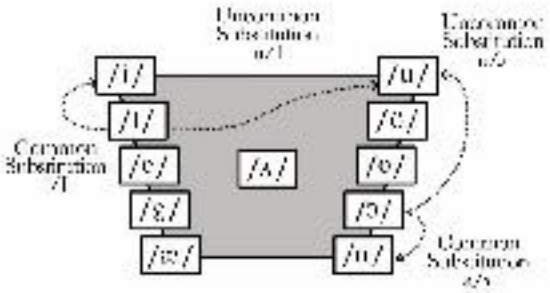
A new platform of skill emerges by 2–3 months of age because of changes in postural support and oral movement. The development of trunk extension opens the chest cavity and allows a child to inhale and exhale a greater volume of air. More air allows a child to prolong sound, a process called *cooing*, and this ability to prolong voice creates a new platform for speech development. Playing with



Teach the front and back vowels as if they were on a train. Teach clients to hear the subtle vowel differences as the jaw moves up-and-down.



Vowels tend to collapse into the schwa because it requires less oral movement.



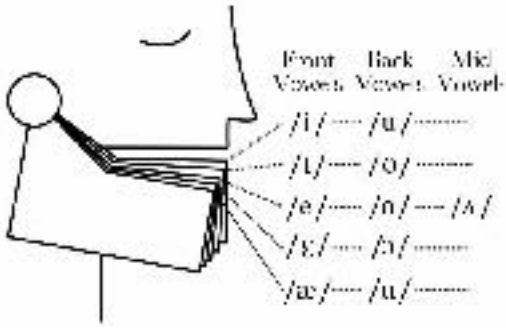
Vowels tend to be substituted for by other nearby vowels.

Mobilize the Jaw

An old traditional method for teaching the vowels is the present author's favorite because it is so easy to do and because there is research to support it. The method involves manipulating jaw height. It is the present author's opinion that infants learn vowels in the first place by moving the jaw up-and-down. Remember, the vowel quadrilateral is acquired by five months of age and the jaw is the principle mover at that time. It seems clear from this that jaw elevation and depression is the main factor that causes early vowels to emerge, and that the tongue and lips take over vowel formation much later as the jaw begins to stabilize during early word productions.

Further, Lindblom and Sundberg (1969) and Fletcher (1992) reported that different vowels may be produced solely by manipulation of jaw position. This means that up and down jaw mobility should be our primary concern when stimulating the vowel quadrilateral. One teaches the client to position his jaw from high-to-low while he holds lip and tongue positions steady. "Vowels are most easily taught through an understanding of their relationship to each other in terms of mandible depression and tongue arching" (Bosley, 1981, p. 36).

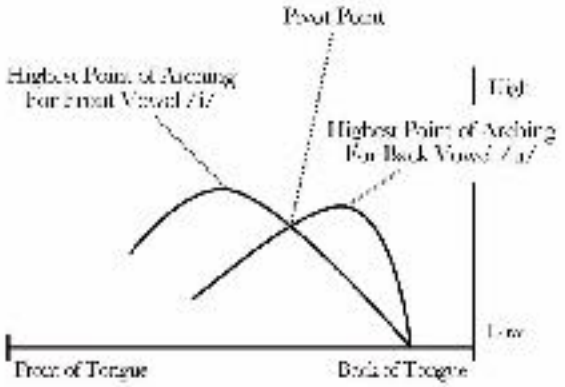
For the front vowels we start at the top with /i/ because research shows that this vowel usually is the earliest pronounced and that all front vowels are formed off of /i/.



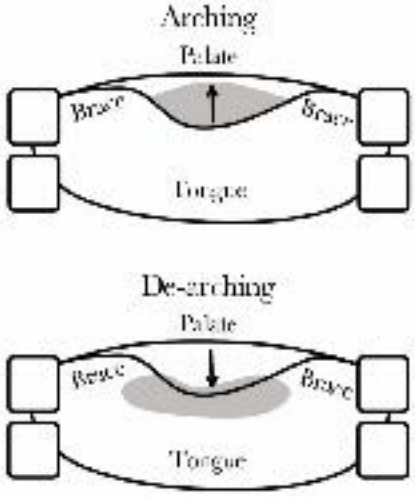
Exaggerated jaw positions during production of the vowels.

Vowel	i	u	a
Jaw Height	High	High	Low
Lip Position	Retracted	Rounded	Neutral
Tongue Height	High Front	High Back	Low Back

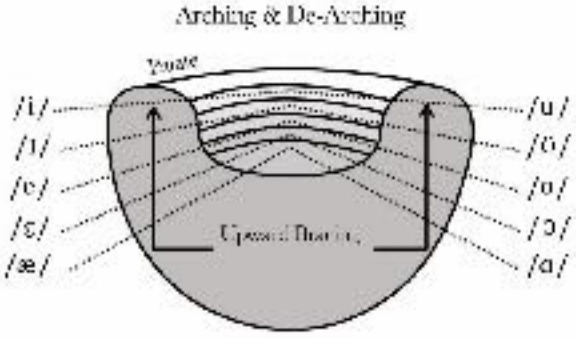
Jaw, lip, and tongue features represented in the three basic vowels.



Here the side arching of the middle of the tongue varies and features of the front form for the front and back vowels.



From the front lateral tongue bowing, arching, and de-arching together create the vowel sounds.



From the front schematic illustration representing a cross section of the tongue during bowing, arching, and de-arching for production of each front and back vowel.

gestures. They represent the top, bottom front, and back of midline tongue elevation, they represent the lips rounded, retracted, and neutral, and they represent the highest and lowest positions of the jaw. Each vowel that is added to a language employs vowels that are made within the movements required for these items.

Newest View of Tongue Movement

The classic vowel quadrilateral is two-dimensional and only represents a side view of midline tongue elevations during vowel productions. This model has led most therapists to think that teaching the vowels is a matter of teaching the tongue to lift and lower while teaching the lips to round or retract. This is an incorrect perspective.

Modern equipment has helped us understand more about three-dimensional tongue movement, and we now know that to produce vowels the tongue actually engages in two different movements patterns. First the back-lateral margins are lifted and braced against the palate and side teeth to create a stable base. Second, from these points of stability, the middle portion of the tongue arches or de-arches to create the quadrilateral. The first movement

lateral elevation of the sides of the tongue — is very important in the tongue's bowl shape and subsequent oro-aural quality of vowels. Arching in the middle is that which creates each distinct vowel sound while the outer sides hold the tongue in place relative to the palate. Teaching the vowels, therefore, requires instruction on two different movements: upward lateral elevation and midline arching and de-arching. The subject of how to teach the tongue to elevate and brace on the sides is discussed in Chapter 15 on tongue movement and Chapter 14 on oral stability.

Diphthongs

"Diphthongs are characterized by movement [and] like vowels, diphthongs serve as the nucleus of syllables" (Garn-Nunn & Lynn, 2004, p. 48-49). Diphthongs are produced by making two vowels in sequence. For example, "I" in the word *hi* actually consists of two basic sounds /ɑ/ and /i/. A diphthong is different than a steady state vowel but it functions like a vowel. Traditionally five diphthongs have been identified in Standard North American English — /eɪ/, /aʊ/, /ɔɪ/, /oʊ/, and /aɪ/ (Garn-Nunn & Lynn, 2004). Many more diphthongs and triphthongs are used in English across the North America and the rest of the world as regional influence dictates.

Coarticulation of Cs & Vs

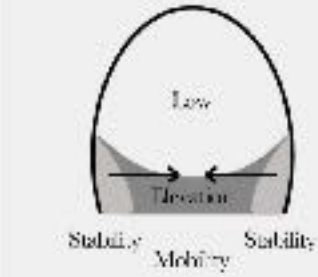
The movements of consonants and the embouchures of vowels overlap in syllables. "The great principle to be kept in mind, is that positions do not merely succeed one another like letters on a printed page, but overlap" (Bell, 1908, p. 112). When one utters the word *two*, for example, the oral position for /t/ overlaps with the oral position for /u/. This process was recognized a century ago by Bell (1908), the overlap was called *coalescing* by Miller

the newborn's first consonant sounds. It begins to occur in simple CV syllables as the baby learns with /ŋ/ and then pulls the back of the tongue down and away from the palate to create a vowel. Babbling with /ŋ/ emerges as a baby learns to move the back of the tongue down-and-up in sequences with alternating with /ŋ/.

Motions /ŋ/

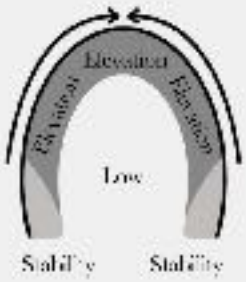
A different oral motor pattern emerges as /ŋ/ matures.

- *Starting position:* First the jaw and tongue stabilize to set the mouth in starting position. (See Chapter 14 on oral stability.)
- *On glide:* While the tongue maintains its stable position at the back lateral margins, the middle back of the tongue presses upward from sides to middline against the velum.
- *Target position:* The entire back of the tongue forms a seal against the velum. This position is held while the voiced airstream resonates in the nasal cavities and exits through the nose.
- *Off glide:* The off glide begins as the tongue's middle-back lowers away from the velum from middline-to-sides. The jaw and back-lateral margins of the tongue remain stable throughout.



Tongue elevation is from sides-to-middline across the back

Motions /ŋ/ is produced with the same tongue movements as motions /k/ and /g/.



Elevation is from back-to-front along the sides

Tongue movement and positioning during production of motions /n/ are the same as for motions /t/ and /d/.

TREATMENT STRATEGIES

The nasals emerge early in infancy and the relative ease of their production means that they tend to be in error only in our most severe clients. Therapists tend to teach /m/ and /n/ early in a program for clients with many phonemic errors but, as discussed above, /ŋ/ actually is the earliest of these sounds to emerge in our speech vocalizations and is very important as a means for an infant to learn how to make sound oral and nasal. The phoneme also is important as the English present progressive morpheme -ing. Therefore, all three nasal sounds should be addressed. The following advice for stimulating early nasals is offered.

- If the full set of nasals is completely absent, consider stimulating for general knowledge about oral and nasal airflow by using tubes and other tools.
- If a client has no nasals at all, consider addressing all three of them simultaneously and teaching the nasal features before teaching the nasal consonants. In other words teach the client to make any "nose sound" before targeting any one specific nasal consonant.
- If no nasal sound exists, consider stimulating from while the client is eating to teach the infantile eating-humming pattern. It sometimes is the earliest way children acquire the nasal feature.
- If the set of nasals is completely absent, consider beginning with /m/ because it is the most visible. However, many clients find others in this set easier to produce. For example, clients who keep the back of the tongue high in the "high guard position" probably will learn /ŋ/ first.
- Most therapists tend to teach these phonemes in the prevocalic position first. However, the final position in which the client can close a syllable by closing the mouth can be easier for many clients. Remember that each child takes his own path of phonemic acquisition so be flexible in your ordering of treatment targets.

/m/

Multisensory Stimulation Techniques

- *Auditory stimulation to converge /m/:* Model, amplify, repeat, prolong, and bombard with the phoneme.

26

Low Cognition & Intelligibility

Guidance from studies of emerging language and phonology

"The most elementary requisite of good speech from a [illegible] and there is little disagreement about this [illegible] is intelligibility."

Carrell & Tiffany, 1960

This final chapter discusses clients with motor speech disorders who cannot attain a mature phonological system in their lifetimes because, they also have significant cognitive impairment. Clients with low cognitive skills often have poor auditory processing and they may do little self monitoring and self correcting. They have limitations in their comprehension of language and therefore, they may have difficulty understanding concepts that could help their speech change, concepts like same/different, better/worse, or right/wrong. They also may have difficulty understanding simple directions such as "Put your lips together" or "Make it with two syllables" or "Remember not to lift up the back of your tongue." Factors such as these can cause significant restrictions in the ability to improve phonemes and phonological processes. These clients often get stuck at speech production plateaus that can last years and this can give the impression that the client is not changing. But changes can be made and improvements can occur if the cognitive deficit is taken into account and problems of intelligibility are addressed in unique ways.

The present author has worked with clients with low intellectual functioning for four decades and has found that although change is slow there is purpose to the work and changes can be made. This chapter presents her perspective on developing better expressive speech in this population. The ideas are rooted in research spanning three areas: cognitive development, early patterns of phonological development, and the development of imitation skills. No proof that these methods are effective can be offered other than the present author's clinical experiences, therefore, it is suggested that the reader view this chapter simply as anecdotal advice passed from one therapist to another. The effectiveness of this approach comes down to the individual client. The question each therapist must ask regarding the client is: Are these ideas helping my client become more intelligible to an increasingly wider audience?

Clients with cognitive impairments bring unique challenges to the work of speech remediation.

BACKGROUND

Children with cognitive deficit often respond differently than children whose cognition is in the normal range. These clients often have difficulty learning, generalizing, and retaining new speech skills within the language context. As an example, the average child usually learns to produce /b/ quickly and easily during the babbling stage, he generalizes this sound to his first words almost immediately, and he seldom "unlearns" his production of /b/ as vocabulary and grammatical skills expand. Some children with cognitive deficit perform in the opposite way. The emergence of any one phoneme can be very slow,