



Speech Therapy for Cleft Palate or Velopharyngeal Dysfunction (VPD)

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Children with a history of cleft palate or submucous cleft are at risk for resonance and speech problems due to velopharyngeal dysfunction (VPD). These problems include *hypernasality* (too much *sound* in the nasal cavity), *nasal air emission* (leakage of *air* during consonant production) and *compensatory articulation productions*. Some of these speech characteristics can also occur in children with no history of cleft palate for a variety of reasons.

Velopharyngeal dysfunction (VPD) refers to a condition where the velopharyngeal valve does not close consistently and completely during the production of oral sounds.

- *Velopharyngeal insufficiency (VPI)* is used to describe an anatomical or structural defect that prevents adequate velopharyngeal closure. Velopharyngeal insufficiency is the most common type of VPD because it includes a short or abnormal velum, which occurs in children with a history of cleft palate or submucous cleft.
- *Velopharyngeal incompetence (VPI)* refers to a neuromotor or physiological disorder which results in poor movement of the velopharyngeal structures. This is common in individuals with dysarthria due to cortical damage and velar paresis due to cranial nerve damage.
- *Velopharyngeal mislearning* refers to inadequate velopharyngeal closure on certain sounds due to learned misarticulations.

Differential diagnosis is very important in order to determine if appropriate treatment is surgery, speech therapy, or both.

Indications for Speech Therapy

Speech therapy CANNOT change hypernasality or nasal emission due to abnormal structure— even if there is only a small gap! Also, speech therapy is usually not effective in improving nasality due to abnormal physiology. When there is VPI, surgery (or a prosthetic device if surgery is not possible) is required for correction.

Therapy *is* effective and appropriate if the individual demonstrates the following:

- Compensatory articulation productions secondary to VPI that cause nasal emission
- Misarticulations that cause nasal air emission or hypernasality that is phoneme-specific
- Hypernasality or variable resonance due to apraxia
- Hypernasality or nasal emission following surgical correction. This is because changing structure does not change function. The child may need to learn to use the corrected velopharyngeal valve through auditory feedback.

The following are specific therapy techniques that have been effective at Cincinnati Children's. These techniques are offered as suggestions only. Research is needed before the efficacy of specific techniques, particularly those designed to alter resonance or nasal emission, can be determined.

Hypernasality and/or Nasal Air Emission (Nasality)

Auditory Feedback

Before attempting to decrease nasality, the child needs to be made aware of the difference between nasality and normal speech and resonance. This can be done as follows:

- Have the child listen to recordings of normal speech and nasal speech, and identify each.
- Simulate oral and nasal speech and have the child identify normal versus abnormal.
- Using a “listening tube” (any type of tubing will work), have the child put one end of the tube in the entrance of a nostril and the other end near his ear. When nasality occurs, it is very loud through the tube. Ask the child to try to reduce or eliminate sound coming through the tube as he produces oral sounds and words.
- Put the end of the listening tube in the front of the child’s mouth and the other end at the child’s ear. Have the child try to increase the oral pressure on oral sounds and hear it through the tube.



Listening Tube
(Feedback for nasal emission)



Listening Tube
(Feedback for oral pressure)

- The Oral & Nasal Listener¹ (ONL)TM is even more effective than a simple tube because it allows both the speech-language pathologist (SLP) and the child to hear the sound at the same time and at the same volume. This makes it much easier for the SLP to give appropriate feedback to the child. The ONL is also very effective for home practice because it allows the parent and the child to easily distinguish normal from abnormal productions.
- Put the funnel of the ONL in front of the child’s mouth to provide feedback about oral resonance, oral airflow, and oral pressure. This allows the child to be able to compare his own productions with the models provided by the clinician or the parent. The ONL can also be used to amplify the child’s articulation production for better feedback during therapy.



Oral & Nasal Listener
(Feedback for hypernasality/nasal emission)



Oral & Nasal Listener
(Feedback for oral pressure and articulation)

Nasometry

If available, the Nasometer² provides excellent visual feedback of hypernasality and nasal emission.

Misarticulations

Compensatory Productions: If VPI causes inadequate oral pressure for oral consonants, the child may develop compensatory articulation productions. These productions are typically made in the pharynx, where there is airflow. Compensatory productions are easiest to correct AFTER surgical correction. Once surgery is done to correct the abnormal structure, speech therapy is necessary to correct the abnormal function.

Misarticulations that Cause Nasality: Some children develop misarticulations for unknown reasons. Articulation errors due to mislearning can include the substitution of nasal, pharyngeal or glottal sounds for oral sounds. When these sounds are produced, there is hypernasality or nasal emission due to the place of production.

Abnormal Articulation with Uncorrected VPI

If the child has VPI but surgical correction is being delayed due to airway concerns, work can still be done on articulation placement.

- Articulation placement is very difficult to learn without adequate oral air pressure. Therefore, the nose should be closed during therapy. Although the child can pinch his nose, it is best to use a nose clip. The nose clip should also be worn whenever possible at home.

Glottal Stops

A glottal stop is like a grunt sound that is co-articulated with oral sounds, particularly plosives.

1. Make the child aware of the glottal stop. While in front of a mirror, have him watch the contraction in his neck when producing the sounds. Then have him place his hand on his neck during the productions to feel the “jerk.” Have him feel the lack of a jerk during a prolonged vowel or nasal consonant. Tell him the goal is to eliminate the jerk during speech.
2. Have the child produce isolated voiceless plosives while feeling his neck or watching in a mirror. (For voiceless sounds, the glottal stop does not occur until transition to the vowel.)
3. Have the child produce the voiceless plosive and then the vowel preceded by an /h/. For example, “p...ha” for “pa,” and “p...ho” for “po.” This keeps the vocal folds open and prevents the glottal stop. Gradually, decrease the transition time from the consonant to the vowel until the syllable is produced without the glottal stop.
4. Once voiceless consonants are produced, move to voiced plosives. Have the child produce the voiced sound slowly with a breathy voice. Gradually add “smooth” voicing and transition to the vowel with an inserted /h/. Have the child feel his neck for feedback.

Nasalized Plosives, Nasalized Vowels, or ng/l Substitution

Nasalized plosives or vowels can persist after surgical correction of VPI. Nasalized vowels can also occur in children with no history of VPI. This is usually due to an abnormally high posterior tongue position during production of high vowels, particularly /i/ (as in “feet”). This faulty articulation placement causes “phoneme-specific” hypernasality. In addition, some children have phoneme-specific hypernasality due to substitution of ng/l. The nasal for oral sound makes connected speech sound somewhat hypernasal.

1. Ask the child to produce a big yawn, which pushes the back of the tongue down and the velum up. Make him aware of the stretch in the back of his mouth.
2. Have the child coarticulate the nasalized sound (vowel, bilabial plosive or lingual-alveolar plosive, or /l/) with the yawn, while feeling the stretch in the back of the mouth.
3. For auditory feedback at the same time:
 - Have the child use a listening tube or the ONL.
 - Have the child alternately pinch and open the nose during production of the sound. If he hears a difference in the two productions, there is still hypernasality.

Nasalized /r/ (ng/r substitution)

The final /r/ sound is a continuant sound that is produced by articulating the sides of the tongue against the gum behind the molars. The mid portion of the tongue forms a boat-like shape through which sound enters and resonates. If the child raises the entire back of the tongue, the sound becomes an /ng/, which is a nasal sound.

1. Using your hand, show the child how the shape of the tongue forms a boat when producing final /r/. Note that the back of the tongue has to touch the gums behind the back teeth.
2. With a tongue blade, stimulate the both sides of the tongue towards the back. Then stimulate the upper gum ridge behind the molars. Tell the child that these come together for /r/.
3. Ask the child to make a wide smile while moving his tongue back to touch on each side.
4. Assist the child with posterior tongue elevation but pushing up against the base of the chin with your middle finger while squeezing his cheeks with your thumb and forefinger. If you feel his tongue push down under the chin, have him relax it so you can push it up.
5. If the child continues to raise the entire back of the tongue for /r/ resulting in an /ng/, have him close his nose during production. That will make the /ng/ sound impossible to produce.
6. Once final /r/ is established, show the child how the tongue tip moves forward for initial /r/.

Pharyngeal Plosives (substituted for the velar plosives k/g)

Pharyngeal plosives are usually substituted for k/g. They are produced with the back of the tongue against the pharynx.

1. Establish placement for velar plosives (/k/ and /g/) by starting with an /ng/. If the child can't produce an /ng/, use an upside down spoon (or tongue blade if necessary) to hold the tip of the tongue down. Then firmly press your thumb under the base of the child's chin to push up on the tongue. (This is effective in establishing /k/ and /g/ in other cases as well.)
2. Once /ng/ placement is established, have the child achieve the position and then drop the tongue. Work on the up and down movement of the back of the tongue to replace the back and forth movement which occurs with the pharyngeal plosive.
3. Have the child take a breath and place his tongue in an /ng/ position. Have him hold and then drop the tongue. This will produce a /k/ sound. (If necessary, pinch his nose closed and then have him drop the tongue.)
4. Once the child can produce the /k/, have him add voice for the /g/.

Pharyngeal Fricatives, Pharyngeal Affricates and Posterior Nasal Fricatives

Pharyngeal fricatives or affricates and posterior nasal fricatives can be compensatory productions due to VPI, or they can be misarticulations that cause phoneme-specific nasal air emission.

Regardless of the original cause, the methods for correction are the same.

Start with /s/:

1. Have the child produce a loud /t/ sound.
2. Then have the child produce the /t/ with the teeth closed. This will result in /ts/.
3. Have the child prolong the production until it becomes /tssss/.
4. Have the child note the position of the tongue and the air stream flowing over the tongue during production.
5. Finally, eliminate the tongue tip movement for the /t/ component.
 - For /ch/, following the above procedure, but make the lips round. You can also have the child try to produce this sound as a loud sneeze with the teeth closed.
 - For /j/, following the above procedure, but add voicing.
 - For /sh/, follow steps 1-4 with rounded lips.

Straw Technique:

1. Place a straw at the point of your own central incisors during production of a sibilant sound. Note the sound of the airflow through the straw.
2. Have the child put a straw in front of his incisors and try to push the air through the straw during production. If necessary, have him start with a /t/ sound.

Cul de Sac Technique:

- Have the child produce the sounds with the nostrils occluded and then open to get the feel for oral rather than pharyngeal airflow.

Palatal-Dorsal Productions (Mid-Dorsum Palatal Stops)

Palatal-dorsal productions can be substituted for lingual-alveolars (/t/, /d/, /n/, /l/) and velars (/k/, /g/, /ng/). This placement can also be used for sibilants (/s/, /z/, /sh/, /ch/ and /j/), resulting in a lateral lisp. Palatal-dorsal productions are often compensatory errors as a result of crowding of the tongue tip. This can occur due to an anterior crossbite or Class III malocclusion.

For lingual-alveolars or velars:

1. Have the individual bite on a tongue blade so that it is between the canine or molar teeth. Make sure it is back far enough to depress the middle part of the tongue, which prevents a dorsal production.
2. Have the child produce lingual-alveolar sounds (/t/, /d/, and /n/) in front of the tongue blade and velar sounds (/k/, /g/, and /ng/) behind the tongue blade.

Or

1. Have the child achieve placement and then prolong a nasal sound (/n/ or /ng/).
2. Have the child work on achieving that placement and then dropping the tongue. This can be done silently.
3. Have the child take a deep breath, achieve that placement, hold it, and then release to produce the plosive. Pinch the nose closed if necessary.

For sibilants:

1. Place a straw at the front of your own closed incisors and produce an /s/. Listen to the air stream as it goes through the straw.
2. Place a straw at the front of the child's closed incisors during production of the /s/ and note the lack of air stream through the straw.
3. Move the straw to the side of the child's dental arch during production of the /s/, and find the place where the air stream can be heard through the straw.

4. Have the child put the straw at the front of his closed incisors and produce a /t/ while keeping the teeth closed. Tell the child to push the air into the straw at the front of his teeth.
5. Have the child feel the air flow over the tongue tip and hear the air through the straw.
6. Then have the child achieve that position and prolong the /s/ without using the /t/.
7. Once the /s/ is established, the same techniques can be used to achieve other sibilant sounds.

General Principles

- **Do not use blowing exercises, sucking exercises, velar exercises or oral-motor exercises!** The problem is rarely muscle weakness and these exercises do not work!!!
- **Do not PINCH the nose to try to improve velopharyngeal function.** Closing the nose actually makes it impossible for the velum to go up.
- Use general articulation procedures to establish correct placement. In some cases, this may result in the establishment of oral airflow.
- Make sure the child practices frequently at home. Speech therapy is like taking piano lessons. The success depends on the frequency and consistency of practice between sessions!
- If progress is not being made, discontinue therapy and refer the child to a *craniofacial team* (not a general ENT) for further evaluation of velopharyngeal function. Surgical intervention or surgical revision may be necessary.

Timetable for Intervention

Ages 0 – 3: Concentrate on **Quantity (language)**

- Home program with emphasis on language
- Start **language therapy if indicated**

Ages 3 - 4: Begin evaluating **Quality (speech and resonance)**

- Evaluate speech and velopharyngeal function- Refer to a *craniofacial specialist* as needed.
- Start speech therapy or consider surgery as indicated

Goal of Treatment: Normal (not just “acceptable”) speech and resonance

Resources:

¹. The Oral & Nasal Listener (ONL) by Super Duper®, Inc. www.superduperinc.com

². The Nasometer by KayPENTAX. www.kayelemetrics.com

Book:

Kummer, A.W. (2008). *Cleft Palate and Craniofacial Anomalies: The Effects on Speech and Resonance*, 2nd Edition. New Albany, NY: Delmar Cengage Learning.