



## Speech Therapy for Sequelae of 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). Characteristics of VPD can also occur in children with no history of cleft palate for a variety of reasons.

Velopharyngeal dysfunction refers to a condition where the velopharyngeal valve does not close consistently and completely during the production of oral sounds. The term *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 velum, which is common in children with a repaired cleft palate or a submucous cleft. *Velopharyngeal incompetence (VPI)* refers to a neuromotor or physiological disorder that results in poor movement of the velopharyngeal structures, as might be seen with dysarthria or cranial nerve damage. Finally, *velopharyngeal mislearning* refers to inadequate velopharyngeal closure secondary to faulty development of appropriate articulation patterns. Differential diagnosis is very important in order to determine if appropriate treatment is surgery, speech therapy, or a combination.

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### Indications for Speech Therapy

Therapy is appropriate if the individual demonstrates the following:

- Compensatory articulation productions
- Misarticulations that cause phoneme-specific nasal air emission or phoneme-specific hypernasality
- Hypernasality or variable resonance due to oral-motor dysfunction (dysarthria or apraxia)
- Hypernasality or nasal emission following surgical correction

Therapy is NOT appropriate when there is velopharyngeal insufficiency (abnormal structure), even if the velopharyngeal opening is small. Therapy is *usually* not appropriate for hypernasality and nasal emission, since these characteristics are typically due to a large velopharyngeal opening. The exception is following surgical correction of the velopharyngeal mechanism, because changing structure does not change function. The child may need to correct compensatory articulation productions or develop oral airflow and resonance through auditory feedback. In addition, there are some techniques that may encourage oral resonance and improved pressure when the cause is neurological (i.e. dysarthria).

The following is a description of some specific therapy techniques that can be used with the common sequelae of velopharyngeal dysfunction. These techniques are offered as suggestions only. Further research is needed before the efficacy of specific techniques, particularly those designed to alter resonance or nasal emission, can be determined.

## Nasality (Hypernasality or Nasal Emission) and Weak Consonants

### Auditory Feedback

- Increase awareness of the nasality by presenting different samples of normal speech and speech with nasality on audio clips or by simulating nasal and oral speech.
- Use audio recordings (tape recorder, computer, or the Nasometer<sup>1</sup>) of the child's speech with abnormal productions, and then attempts for normal productions. Have the child self-evaluate.
- Using a straw or listening tube, have the child put one end at the entrance of a nostril and the other end near his/her ear. When nasality occurs, it is very audible and even loud. The child is then asked to try to make adjustments in articulation to reduce or eliminate the nasality on oral sounds.
  - Put the end of the listening tube in the front of the mouth and the other end at the child's ear. The child will be able to hear the air pressure during the production of oral sounds. Have the child try to increase the oral pressure.



**Listening Tube  
(Feedback for nasal emission)**



**Listening Tube  
(Feedback for oral pressure)**

- The Oral & Nasal Listener<sup>2</sup> (ONL)<sup>TM</sup> is preferable to use of a simple tube in therapy because it allows both the speech-language pathologist and the child to hear the nasal emission or hypernasality at the same time and at the same volume. This makes it much easier for the speech-language pathologist to give appropriate feedback to the child. The ONL can also be used by parents during home practice because it allows the parent and the child to easily distinguish normal from abnormal.
- The Oral & Nasal Listener (ONL) can be used to provide feedback about oral resonance and oral airflow. This is done by placing the funnel in front of the mouth, instead of in front of the nostrils. During speech, the ONL amplifies the sound and allows the child to easily hear the difference between weak consonants or hypernasal vowels, and those that are oral. This allows the child to be able to compare his or her own productions with the models provided by the clinician or the parent. This can also be used for articulation training.



**Oral & Nasal Listener**

**(Feedback for hypernasality/nasal emission)**

**Oral & Nasal Listener**

**(Feedback for oral pressure and articulation)**

**Visual Feedback**

- Place an air paddle<sup>3</sup> in front of the child's mouth during the production of pressure-sensitive phonemes. Have the child try to produce the sounds with enough pressure to force the air paddle to move.
- Using a See Scape<sup>4</sup>, put the nasal olive in one nostril and ask the individual to try to produce pressure consonants repetitively without allowing the foam stopper to rise in the tube. (Note that the foam stopper will rise during the production of nasal phonemes and with nasal breathing at the end of the utterance.)
- Using the See Scape, put the nasal olive at the front of the mouth and have the child produce pressure-sensitive sounds. The goal is to make the stopper rise in the tube.
- Place an air paddle in front of the child's mouth during the production of pressure-sensitive phonemes. Have the child try to produce the sounds with enough pressure to force the air paddle to move.



**Air Paddle**

- Using a See Scape put the nasal olive in one nostril and ask the individual to try to produce pressure consonants repetitively without allowing the foam stopper to rise in the tube. (Note that the foam stopper will rise during the production of nasal phonemes and with nasal breathing at the end of the utterance.)
- Using the See Scape, put the nasal olive at the front of the mouth and have the child produce pressure-sensitive sounds. The goal is to make the stopper rise in the tube.



**See Scape**  
**(Feedback for nasal emission)**



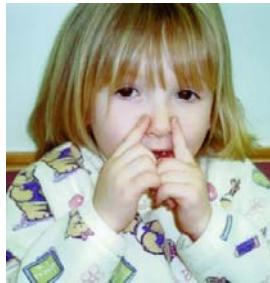
**See Scape**  
**(Feedback for oral pressure)**

### **Tactile-Kinesthetic Feedback**

- While the child is producing vowel sounds, preferably /ah/, raise the velum up and down with a tongue blade to produce oral-nasal contrasts. (Note: If there is a significant difference in resonance with elevation using the tongue blade, the individual may be a good candidate for a palatal lift.) Then have the child try to raise and lower the velum independently during the production of vowel sounds to produce nasal-oral contrasts.

### **Tactile Feedback**

- Have the child lightly touch the side of his/her nose to feel for vibration during the production of nasal phonemes versus oral phonemes. Ask the child to carefully produce oral sounds or sentences without the vibration.
- Have the child place his/her hand in front of your mouth as you produce plosives in a forceful manner to feel the air pressure. Then have the child place his/her hand in front of his/her own mouth to do the same.



**Tactile Feedback**

### **Lowering the Back of the Tongue**

An habitual high tongue position in the back of the mouth will increase the perception of hypernasality. To improve the resonance:

- Get the back of the tongue down and the velum up by having the child do a big yawn.
- Have the child co-articulate the yawn with vowels and anterior sounds, feeling the stretch in the back of the mouth.
- Have the child think of the yawn movements when articulating other sounds.

### **Increase Oral Activity and Volume**

Have the child increase volume, which will increase respiratory support, velopharyngeal effort, oral air pressure, and the force of articulation. The ultimate goal is a normal degree of volume, however.

- Have the child increasing anterior oral activity, which will increase posterior oral (thus velar) movement at the same time. Increasing mouth opening can also reduce oral resistance and increase oral resonance. The ultimate goal is a normal degree of oral activity, however.

### **Nose Pinch Technique**

- If the child has VPI, but surgical correction is being delayed due to airway concerns, work can still be done on articulation placement. This will be most effective if the nasal escape is eliminated so that there is adequate intra-oral pressure. This can be done easily by having the child pinch the nostrils closed. It is most effective however, if a nose clip can be used for therapy and practice at home.



**Nose Pinch Technique**

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## **Misarticulations (Compensatory Productions and Productions that Cause Nasality)**

Compensatory articulation productions are usually developed because there is inadequate oral pressure for production of normal oral consonants. These are very hard to correct prior to correction of the velopharyngeal opening. If surgical correction of velopharyngeal dysfunction is planned in the near future, it is often better to wait until after the surgery before initiating therapy. It will be much easier for the child, and the child will have success with therapy. If surgery is being delayed due to airway concerns, therapy can be done on placement, but the nose should be plugged to provide oral air pressure.

### **Glottal Stops**

Glottal stops are usually compensatory errors due to VPI. After surgical correction of the VPI, speech therapy is indicated to correct the glottal stops.

1. Have the child place feel his/her hand on his/her neck during the production of a glottal stop to feel the “jerk.” Then have the child feel his/her neck during a prolonged vowel or nasal consonant in order to feel the difference in voice onset. Tell the child that you are going to eliminate the “jerk” during speech.
2. Have the child produce voiceless plosives slowly without the vowel. (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/ (which keeps the vocal folds open and prevents the glottal stop) (i.e., “p...hhha” for

“pa,” and “p...hhhho” for “po”). Gradually decrease the transition time from the consonant to the vowel until the syllable is produced without the glottal stop.

4. Once voiceless consonants can be produced, move to voiced plosives. Have the child whisper the syllable slowly. Then gradually add “smooth” voicing and transition to the vowel with an inserted /h/. Have the child feel his/her neck for feedback.

### **Nasalized Plosives**

Nasalized plosives can persist after surgical correction of VPI and therefore, require therapy.

1. Work on the placement of bilabial and lingual-alveolar plosives first.
2. Ask the child to produce a big yawn, which pushes the back of the tongue down and the velum up.
3. Have the child be aware of the “stretch” in the back of the mouth.
4. Have the child coarticulate anterior articulation with a posterior yawn movement to produce the sounds. Once these are mastered, work on velar plosives.

### **Nasalized Vowels**

Nasalized vowels can be obligatory errors due to VPI. In this case, therapy is inappropriate. They can also be learned errors that cause phoneme-specific hypernasality. This typically occurs on high vowels, particularly /i/.

1. Ask the child to produce a big yawn, which pushes the back of the tongue down and the velum up.
2. Have the child be aware of the “stretch” in the back of the mouth.
3. Have the child coarticulate the vowel with the yawn.
4. At the same time, have the child use a listening tube for feedback; or have the child alternately pinch and open the nose. If he/she hears a difference in the two productions, there is still nasality.

### **Nasalized /r/ (ng/r substitution or incorrect /r/)**

The final /r/ sound 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 resonates. If the child raises the entire back of the tongue, the sound becomes an /ng/ sound, which results in nasal resonance.

1. Using your hand, show the child how the shape of the tongue forms a boat and that the back of the tongue has to touch 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 to put the two together.
3. Assist the child with posterior tongue elevation but pushing up against the base of the chin with the middle finger while squeezing the cheeks with the thumb and forefinger.
4. Once the final /r/ (which is a continuant) is established, then show the child how the tongue tip moves forward for the initial /r/.

Or

1. If the child continues to raise the entire back of the tongue for /r/, resulting in an /ng/, close the child’s nose during production of the sound. That will make the /ng/ sound impossible to produce.
2. If necessary, place a tube in the middle of the tongue so that sound goes through, but the middle of the tongue cannot go up to articulate against the velum.

### **Pharyngeal Plosives (substituted for the velar plosives)**

Pharyngeal plosives are usually compensatory productions as a result of VPI.

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 chin, which is under the base of the tongue. This promotes the velar production (and works in establishing /k/ and /g/ in other cases as well).
2. Starting with /ng/, have the child work on an up and down movement of the back of the tongue, rather than a back and forth movement which occurs with the pharyngeal plosive. This can be done silently.
3. Have the child take a breath, place his/her tongue in an /ng/ position, and then keeping the tongue position, release the air pressure slowly. This will result in a velar fricative (which is not a sound in English).
4. Once the child can produce the velar fricative, have the child start with the /ng/, build up air pressure, and then release it quickly with the downward movement to produce the velar plosive.

### **Pharyngeal Fricatives, Pharyngeal Affricates and Posterior Nasal Fricatives**

Pharyngeal fricatives, pharyngeal affricates and posterior nasal fricatives can be compensatory productions that require therapy after surgical correction of VPI, or they can be mislearned productions that cause phoneme-specific nasal air emission. Regardless of the original cause, the methods for correction are the same.

For /s/:

1. Have the child produce a loud /t/ sound repetitively.
2. Then have the child produce the /t/ with the teeth closed, which will result in /ts/.
3. Increase the duration of 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 /sh/, /ch/ and /j/:

1. Start with /ch/ because this sound contains a /t/. Follow the same procedures as noted above for /s/, but keep the lips rounded. Also, have the child try to produce this sound as a loud sneeze with the teeth closed.
2. Once the /ch/ sound is mastered, work on the /j/ in the same way, but start with a /d/ sound.
3. Once /ch/ is mastered, follow steps 4 and 5 of the /s/ sound to achieve an /sh/.

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 put the straw in front of his incisors and try to produce the sound until he/she can hear the airflow through the straw.

Or

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



### **ng/l Substitution**

The ng/l substitution can be a compensatory production or a learned misarticulation.

1. Have the child produce a big yawn to get the base of the tongue down and the velum up.
2. Have the child be aware of the “stretch” in the back of the mouth.
3. With the yawn, have the child coarticulate the /l/.
4. Gradually eliminate the use of the yawn movement but tell the child to think of the movement during production.

### **Mid-Dorsum Palatal Stops (Palatal-Dorsals)**

Mid-dorsum palatal stops are substituted for lingual-alveolars (/t/, /d/, /n/ or /l/) and velars (/k/, /g/ or /ng/). This placement is also used for sibilants (/s/, /z/, /sh/, /ch/ and /j/) and results in a lateral lisp. Mid-dorsum palatal stops often compensatory errors as a result of anterior crowding due to an anterior crossbite and 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 in order to prevent 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 prolong a nasal sound (/n/ or /ng/) to establish placement.
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, then achieve that placement and hold it.
4. Have the child release some of the pressure while holding the placement. This will result in a fricative type sound.
5. Then have the child repeat step 4, but drop the tongue to produce the plosive.

For sibilants:

1. Place a straw at the front of your own closed incisors and produce an /s/. Make sure that the air stream is heard through the straw.
  2. Place the 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/her closed incisors and produce a /t/ while keeping the teeth closed. Tell the child to push the air into the straw.
  5. Then have the child prolong the /t/ until it is a /tsssss/, while pushing the air through the straw. Because the /ch/ sound already contains the /t/ sound, in some cases it may be easier to work on /ch/ first using a /t/ and then prolonged /sh/.
  6. Have the child feel the air flow over the tongue and hear the air through the straw.
  7. Then have the child achieve that position without the initial /t/ and prolong the /s/.
  8. Once the /s/ is established, the same techniques can be used to achieve other sibilant sounds.
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## General Principles

- **DO NOT USE BLOWING OR SUCKING EXERCISES!** These exercises will only improve blowing and sucking (maybe), but not speech!
- Do not use velar “exercises” or oral-motor exercises. The problem is rarely muscle weakness.
- Use general articulation procedures to work on placement.
- Establish oral airflow through a change in articulation placement.
- Success depends on the frequency and intensity of practice (not just therapy).
- Discontinue therapy if abnormal resonance or nasal emission persists and progress is limited. Refer child to a craniofacial anomaly team (not an ENT who does not specialize in this area) for further evaluation of velopharyngeal function. Surgical intervention or revision may be necessary.

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## Timetable for Intervention

**Ages 0 – 3:** Concentrate on *Quantity*

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

**Ages 3 - 4:** Start working on *Quality*

- 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

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## Resources:

<sup>1</sup> The Nasometer (KayPENTAX, 2 Bridgewater Lane, Lincoln Park, NJ 07035-1488, (973) 628-6200).

<sup>2</sup> The Oral & Nasal Listener (ONL) is a product of Super Duper®, Inc. 5201 Pelham Road, P.O. Box 24997, Greenville, SC 29616, [www.superduperinc.com](http://www.superduperinc.com) or 1-800-277-8737.

<sup>3</sup> An air paddle is a paddle shape that is cut from a piece of paper.

<sup>4</sup> See Scape is a product of PRO-ED, 8700 Shoal Creek Boulevard, Austin, Texas 78757-6897.

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## For more information:

### Book:

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

### Self Study Video:

Kummer, A.W. (2007). Resonance Disorders and Velopharyngeal Dysfunction: Evaluation and Treatment. A *four hour self study course on DVD with manual*. Rockville, MD: American Speech-Language-Hearing Association.

### Handouts:

<http://www.cincinnatichildrens.org/svc/find-professional/k/ann-kummer.htm>.

Scroll down to Access Handouts.