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Evaluation of Speech/Resonance Disorders Secondary to Velopharyngeal Dysfunction

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Financial Disclosures

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• *Oral and Nasal Listener* (ONL) from Super Duper Publications, Inc.
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Non Financial Disclosures

• None

Objectives

As a result of this course, participants will be able to:

• Describe the types of speech samples that should be included in the perceptual evaluation.

• Explain how to use low-tech methods, that can be used in any setting, to make an accurate differential diagnosis of resonance and velopharyngeal dysfunction.

• Describe the best way to obtain an intraoral examination and what is important to observe.
Course Outline

• VPI and Its Effect on Speech and Resonance
• Perceptual Evaluation
• Instrumental Evaluation
• Intraoral Evaluation
• Recommendations

VPI AND ITS EFFECT ON SPEECH AND RESONANCE

continued
Resonance & Airflow for Speech

- Lungs
  - VC Vibration
  - Open Glottis
    - Sound
      - Resonance
        - Vowels and Voiced Consonants
        - Voiceless Consonants
      - VP Valve directs sound and airflow
    - Airflow
      - Air Pressure

Velum: During Speech

- Velum (soft palate)
Velopharyngeal Insufficiency/Incompetence

Can cause the following:
- Hypernasality (resonance disorder)
- Nasal air emission (speech disorder)
- Dysphonia (voice disorder)
Hypernasality

- Too much *sound* in the nasal cavity
- Most perceptible on vowels
- Consonants often substituted by nasal sounds

Hypernasality

- Voiced plosives sound like their nasal cognates (e.g., m/b, n/d, ñ/g).
- Other consonants may be substituted by a nasal phoneme (i.e., n/s).
Video 1: Hypernasality

Video 2: Hypernasality

Video 3: Hyponasality

Nasal (Air) Emission

- Leak of air through the VP valve
- Occurs on high pressure consonants
- Heard best on voiceless consonants
- Occurs with or without hypernasality
Nasal Emission: Small Opening

- Air forced through the small opening
- Causes friction and bubbling of secretions
- Bubbling causes a **nasal rustle**
  - AKA nasal turbulence (misnomer)

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Nasal Emission: Small Opening

- Occurs inconsistently
  - Worse with increase in utterance length, phonemic complexity, fatigue, congestion
- Distortion is loud and distracting
- Has no effect on consonants or utterance length
- Still requires surgical correction
Video 4: Nasal Emission/Rustle

Small opening

Nasal Emission: Large Opening

- No impedance to airflow
- Soft, low intensity sound
Nasal Emission: Large Opening

Will cause:

- Low volume
- Weak or omitted consonants
- Short utterance length
- Nasal grimace

Video 5: Nasal Emission

Note the nasal grimace
Video 6: Nasal Emission

Large opening causing low volume, weak consonants, short utterance length, and nasal grimace

Compensatory Productions for VPI

- Manner of production is usually maintained
- Placement is changed to the pharynx where there is airflow
Compensatory Productions for VPI

Plosives (Stops)
- Glottal stop
- Pharyngeal plosive

Fricatives
- Glottal fricative (/h/)
- Pharyngeal fricative
- Posterior nasal fricative

Video 7: Compensatory Productions
Video 8: Dysphonia
Perceptual Evaluation

• When
• What
• How
• Why
When to Evaluate VP Function

- Child needs to have...
  - connected speech
  - ability to cooperate for stimulability testing and instrumental assessment
  - adequate airway with no recent airway concerns
  - Usually around the age of 3

Caveat: Don’t wait too long!

- Critical period of brain development and speech/language learning
- Consequences of waiting too long
  - Correction will take longer
  - Prognosis is negatively affected
  - Can affect social and emotional development
What to Assess

- Speech sound production
- Airflow/air pressure and nasal emission
- Resonance
- Voice (phonation)
Speech Sound Production

- Placement errors
- Phonological (pattern) errors
- Developmental errors
- Compensatory errors or obligatory distortions

Nasal Emission (NE)

- Inaudible, audible, nasal rustle (AKA nasal turbulence)
- Consistent, inconsistent or phoneme-specific
- Effect on pressure-sensitive consonants and utterance length
### Causes of a Nasal Rustle

**Due to Structural Defect**
- Inconsistent
- Occurs on all pressure phonemes
- Occurs on voiceless plosives (p, t, k)
- Increases with utterance length or fatigue

**Due to Misarticulation**
- Consistent
- Is phoneme-specific
- Occurs only on certain sibilants primarily
- Does not vary with utterance length or fatigue

### Resonance

Need to determine the type:
- Normal resonance (normal balance of oral and nasal resonance)
- Hypernasality
- Hyponasality
- Cul-de-sac resonance
- Mixed resonance
Resonance Severity

Types of rating scales:
- Seven point scale
- Normal, mild, moderate, severe
- Present or absent

Phonation

Evaluate for signs of dysphonia:
- Hoarseness
- Breathiness
- Low or high pitch
- Low intensity
How? What are the tools?

How: Speech Samples

- Single word articulation test... is not sufficient.
Speech Samples

- Prolongation of sounds
- Repetition of syllables
- Counting
- Repetition of sentences
- Connected speech

Production of Single Sounds

- Oral sound to test hypernasality:
  - High and low vowels, /ɑ/ and /i/
- Oral sounds to test nasal emission:
  - Prolonged /s/
- Nasal sound to test hyponasality:
  - Prolonged /m/
Repetition of Syllables

To test hypernasality or nasal emission, use oral consonants with high and low vowels:

- pa, pa, pa, pa... pi, pi, pi, pi...
- ba, ba, ba, ba... bi, bi, bi, bi...
- ta, ta, ta, ta... ti, ti, ti, ti...
- ka, ka, ka, ka... ki, ki, ki, ki...
- sa, sa, sa, sa... si, si, si, si...
- ja, ja, ja, ja... ji, ji, ji, ji...

To test hyponasality, use nasal sounds with high and low vowels:

- ma, ma, ma, ma... mi, mi, mi, mi...
- na, na, na, na... ni, ni, ni, ni...
Counting

To test nasal emission:

- Count from 60 to 70
- Repeat 60 or 66 over and over

66 = SIKSTY SIKS

- Good combination of plosives and fricatives in blends

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Counting

To test hyponasality:

- Count from 90 to 99
- Repeat 99 over and over

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Repetition of Sentences

- t/d: Take Teddy to town. Do it for Daddy.
- k/g: Give Kate the cake. Go get the wagon.
- f/v: Fred has five fish. Drive the van.
- s/z: I see the sun in the sky.
- f: She went shopping.
- tf: I ride a choo choo train.
- dʒ: John told a joke to Jim.
- l: Look at the lady.
- r: Run down the road. I have a red fire truck.
- th: Thank you for the toothbrush.
- Blends: splash, sprinkle, street

Stimulability

- Stimulability is a good prognostic indicator for correction with therapy
For non-compliant children...

Ask Either/Or Questions

What do you like best?
• Puppy dogs or kitty cats?
• Baby dolls or teddy bears?
• Cup cakes or cookies?
• Baseball or basketball?
• Dancing or singing?
Key to Perceptual Assessment

Listen very carefully!!!

Low-Tech & “No-Tech” Procedures

Use same type of speech samples to:

• See it
• Feel it
• Hear it
See: Mirror Test

See: Air Paddle
See: See-Scape

Feel: Sides of Nose
Hear: Nose Plugging

- Listen to oral sounds with nose open and closed
- If there is a difference, there VPI
- If there is no difference, the test is inconclusive

*How can we hear it the best?*
Hear: Stethoscope

- Put the tip of the tube at the entrance of a nostril
- Listen for air or sound through the scope

Hear: Straw

- Same as stethoscope
- Straw is always available and it’s disposable!
Hear: Straw

- To rule out a lateral lisp versus nasal emission.

Hear: Listening Tube
Prediction of Gap Size

- Hypernasality, *inaudible* nasal emission, weak consonants, short utterance length, low volume compensatory errors
- Hypernasality, *audible* nasal emission, weak consonants, may have compensatory errors
- Audible nasal emission and possibly mild hypernasality
- Normal resonance, but inconsistent nasal rustle (AKA nasal turbulence)

Prediction of Size of Gap based on perceptual features

<table>
<thead>
<tr>
<th>Severity Level</th>
<th>Velopharyngeal Gap Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Large</td>
</tr>
<tr>
<td>2</td>
<td>Medium</td>
</tr>
<tr>
<td>4</td>
<td>Small</td>
</tr>
</tbody>
</table>

- Hypermnasality
- Audible NE
Intraoral Evaluation

- Can evaluate oral structures and oral function
- Cannot evaluate velopharyngeal structure or VP function
- View is well below area of closure
Normal Velum

• Color is pinkish and consistent
• White line (median raphe) down the middle
• Normal uvula

Intraoral Evaluation

Rule out the following:
• Dental malocclusion
• Abnormal position of tongue tip relative to alveolar ridge
• An oronasal fistula if patient has CLP
• Enlarged tonsils
Intraoral Evaluation

- Rule out evidence of a submucous cleft:
  - Bifid or hypoplastic uvula
  - Zona pellucida (bluish area)
  - Notch in the posterior border of the hard palate
  - Abnormal insertion of muscles, causing an upside-down V-shape with phonation

Top point is anterior, pointing toward the incisive foramen

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Cleft and Muscles

A  B
Submucous Cleft

Video 9: Submucous Cleft

Note the inverted “v” shape
Submucous Clefts

Submucous Clefts
Submucous Clefts

Oronasal Fistula

- Will it affect speech?
Oronasal Fistula vs. VPI

Hard way:
• Occlude the fistula with gum or fruit roll up

Easy way:
• Compare the degree of nasal emission on anterior sounds (/p/, /t/) with posterior sound (/k/)
Intraoral Evaluation

Rule out the following:

• Evidence of surgery for VPI, if appropriate

Observations of Possible Airway Obstruction

• Audible breathing
• Mouth breathing
• An open-mouth posture
• Anterior tongue position
• Puffy eyes
• Appearance of pinched nostrils
• Symptoms of OSA
Techniques

Intraoral Evaluation

• To see the roof of the mouth...use a dental mirror and light
Intraoral Evaluation

- To see the back of the mouth and uvula... have the child say /æ/ (as in “bat”) and protrude the tongue

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INSTRUMENTAL EVALUATION

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continued™
Instrumental Evaluation

Nasometry

- Measures acoustic correlates of resonance and VP function through a computer-based instrument
- Provides objective data that can be compared to standardized norms
Nasometer Equipment

• Placement of the headset

Display of the Speech Signal

• **Nasogram**—a contour display of individual data points in sequence as they are collected in real time during production of a passage
McKay-Kummer Simplified Nasometric Assessment Procedures- Revised (SNAP-R)

- Syllable Repetition/Prolonged Sounds Subtest
- Picture-Cued Subtest
- Reading Subtest

Picture-Cued Subtest- Oral Phonemes

- Pick up the .....  
- Take a ..... 
- Go get a ..... 
- Suzy sees the .....
Nasogram – Bilabials from SNAP

Pick up a

normal

abnormal

SNAP TEST: Nasal Rustle
Videofluoroscopy: Lateral View

Nasopharyngoscopy
Why? Purpose of the Evaluation

• The results of the speech evaluation determine the appropriate treatment
• The surgeon cannot make this determination
Treatment of VPI

- Surgery - Refer to a cleft/craniofacial team, not an ENT
- Prosthetic device - If surgery is not an option
- Speech therapy - For correction of compensatory articulation errors postoperatively

Treatment of VP Mislearning

- Speech therapy only
Speech Therapy

- Speech therapy is appropriate for:
  - Compensatory errors (after correction of the structure)
  - Misarticulations that cause PSNE or PS hypernasality
- Speech therapy is NOT appropriate for:
  - Hypernasality and/or nasal emission due to VPI

Speech Therapy

For specific speech therapy techniques for this population and others, see the following speechpathology.com course:

**Sound Judgment**: Using effective speech therapy techniques and motor learning principles for speech sound disorders, with or without related structural anomalies

by Ann W. Kummer, PhD, CCC-SLP, ASHA Fellow
Expand your Expertise with “Speech Tools”

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QUESTIONS?
Thanks for your interest!