Assessment of Voice and Resonance

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WISCONSIN DEPARTMENT OF Public Instruction
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Housekeeping – Meeting Resources

- In the Participant Folder you will find the google slide deck as well as other relevant resources for the meeting.
- Once finalized, the recorded meeting and resources will be all be available to view on the Wisconsin DPI Speech-Language Website.

New Rule Effective August 1, 2021

Individualized Education Program (IEP) teams must use the new criteria to identify a speech or language impairment for referrals for special education dated on or after August 01, 2021.

- Summary of Changes for SLI Rule
- Revisions to SLI Identification
- Videos of SLI Criteria Overview
- SLI Criteria: Digging Deeper Webinar Videos
- WI DPI Speech or Language Impairment Assessment Tools page

Today's Learning Objectives

1. Participants will review the administrative rule for voice disorders
2. Participants will define voice and resonance disorders
3. Participants will become familiar with different causes of voice and resonance disorders in school-aged students.
4. Participants will identify evaluation procedures to identify and characterize voice and resonance disorders that can be used by school-based SLPs

What is a voice disorder?

American Speech-Language Hearing Association:

A **voice disorder** occurs when voice quality, pitch, and loudness differ or are inappropriate for an individual's age, gender, cultural background, or geographic location. A voice disorder is present when an individual expresses concern about having an abnormal voice that does not meet daily needs—even if others do not perceive it as different or deviant.

https://www.asha.org/practice-portal/clinical-topics/voice-disorders/

What is a resonance disorder?

American Speech Language and Hearing Association:

Resonance disorders result from too much or too little nasal and oral sound energy in the speech signal. They can result from structural or functional (e.g., neurogenic) causes and occasionally are due to mislearning (e.g., articulation errors that can lead to the perception of a resonance disorder)

https://www.asha.org/practice-portal/clinical-topics/resonance-disorders/

What is a voice disorder?

Wisconsin Administrative rule:
The child's voice is impaired in the absence of an acute, respiratory virus or infection and not due to temporary physical factors such as allergies, short term vocal abuse, or puberty.

Following consideration of the child's age, culture, language background, or dialect, the child demonstrates characteristics of a voice impairment, which include any of the following:

a. The child's vocal volume, including loudness.
b. The child's vocal pitch, including range, inflection, or appropriateness.
c. The child's vocal quality, including breathiness, hoarseness, or harshness.
d. The child's vocal resonance, including hypernasality.

How many students have voice disorders?

Prevalence 1.4%-23.9% (Bhattacharyya, 2014; Powell, Filter, & Williams, 1989)

- 3.9% of preschoolers (Duff et a., 2004)
- 94% of children born extremely preterm
  - 58% of these moderately-severe (French et al., 2013)
- 76-100% of children post laryngotracheal reconstruction (Clary et al., 1996, Smith et al., 1993, Zalzal et al., 1991)

How many students have resonance disorders?

- Overall prevalence is unknown
- Cleft palate with or without cleft lip 1 in 1000 births
  - Up to 30% have residual resonance disorder even after repair
- Submucous cleft palate is about 1 in 1200 births
- Resonance disorders high in children with
  - Dysarthria
  - Apraxia
  - Syndromes including 22q11.2 deletion, Prader-Willi, Opitz G/BBB

Relatively Few SLPs in Schools Support Voice

Voice 4% of caseload in pediatric medical settings. (ASHA 2019).

In schools, 15.1% serve students with voice or resonance disorders (ASHA 2020)

Social-Emotional Impact of Voice Disorders

- Teachers, other adults, and peers rate children and adolescents with voice disorders more negatively
- Children as young as 4 aware of and affected by their voice problem (Connor et al. 2008)
  - Social development
  - Extracurricular choices
  - Personality development

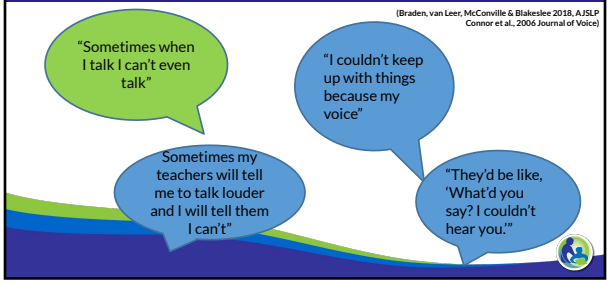
Teacher and Peer Impressions

Based on voice alone, students with voice disorders perceived more negatively by peers, teachers, and other adults than those without voice disorders

(Lass et al., 1991; Ruscello et al., 1988, Zacharias et al., 2013)

In their own words

(Braden, van Leer, McConville & Blakeslee 2018, AJSLP
Connor et al., 2006 Journal of Voice)



Planning your Comprehensive Evaluation

Consider:

- Purpose
- Background information and history
- Presenting concerns
- Age and developmental level
- Available resources
- Need for multiple assessment tools

Medical Considerations

Anyone with a voice or resonance disorder of unknown etiology SHOULD get a medical evaluation

Voice - "Clinicians should perform laryngoscopy, or refer to a clinician who can perform laryngoscopy, when dysphonia fails to resolve or improve within 4 weeks or irrespective of duration if a serious underlying cause is suspected." (AAO Clinical Practice Guidelines, Stachler et al 2018)

Medical Considerations

"All patients/clients with voice disorders are examined by a physician, preferably in a discipline appropriate to the presenting complaint. The physician's examination may occur before or after the voice evaluation by the speech-language pathologist." (ASHA Preferred Practice Patterns https://www.asha.org/policy/pp2004-00191/#sec1.3.34)

Medical Considerations

Resonance-Cleft Palate

Resonance and nasal airflow assessments are conducted by appropriately credentialed and trained speech-language pathologists.

Speech-language pathologists may perform these assessments individually or as members of collaborative teams that may include the individual, family or caregivers, and other relevant persons (e.g., educators, medical personnel). (ASHA Preferred Practice Patterns for the Profession of Speech-Language Pathology)

Cleft palate or craniofacial team https://acpa-cpf.org/team-care/

Medical Considerations

- COVID-19 has led to delays and barriers to specialty care
- Some aspects of voice and resonance can be evaluated in the school setting
- Anyone with stridor, choking, breathing problems should be medically evaluated *ASAP*

Purpose of Evaluation?

- Determine etiology?
- Determine functional impact?
- Characterize differences and needs?
- Determine potential for change?
- Determine eligibility for services?

Comprehensive Voice Evaluation (ASHA)

- Case History
- Patient's self assessment of quality of life
- Oral peripheral evaluation
- Assessment of respiration
- Perceptual evaluation of voice quality and resonance
- Phonation (onset, offset, ability to sustain voice, vocal diadokokinesis)
- Rate
- Laryngeal imaging
- Acoustic assessment
  - Vocal amplitude
  - Vocal frequency
  - Vocal signal quality
- Aerodynamic assessment
  - Glottal airflow
  - Subglottal air pressure
  - Mean SPL and F0

https://www.asha.org/practice-portal/clinical-topics/voice-disorders/#collapse_5

Comprehensive Evaluation Cleft Lip and Palate (ASHA)

- **History**
- **Audiologic evaluation**
- **Feeding and Swallowing**
- **Oral mechanism examination**
- **Perceptual evaluation of speech**
  - Speech sound production
  - Resonance
  - Nasal airflow
  - Low-tech procedures
- **Instrumental evaluation of VP function**
- **Voice**
- **Language**
- **Other**
  - Communication participation and activity
  - Facilitators
  - Barriers

https://www.asha.org/practice-portal/clinical-topics/cleft-lip-and-palate/comprehensive-assessment-for-cleft-lip-and-palate/

Comprehensive Assessment Model

4 Part Model for Comprehensive Assessment	
Academic Activities: • Artifact analysis • Curriculum-based assessment • Observations in school (natural) settings • Educational records	**Speech-Language Probes:** • Case history • Interviews • Language/Narrative samples • Stimulability • Dynamic assessment • Play-based assessment
Contextualized Tests: • Norm-referenced measures of academic achievement • Curriculum benchmarks	**Decontextualized Tests:** • Norm-referenced speech-language tests (parsed skills: articulation, semantics, syntax, morphology, fluency, etc.)

Ireland, Marie. "The Real Requirements Behind Eligibility Decision Making in Schools". Lecture. ASHA Connect, Chicago, IL. July 19, 2019.

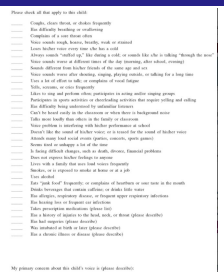
Academic Activities

Classroom observation	Participation in discussions
	Ability to be heard and understood by peers and teachers
	Participation in individual spoken activities
Educational records	Loss of participation credit?
	Teacher reports of reduced participation
	Teacher checklists

Example Teacher or Parent Checklist

Quick Screen for Voice – Functional Indicators of Voice Disorders in Children and Adolescents (Lee et al., 2004)

https://pubs.asha.org/doi/10.1044/0161-1461%282004/030

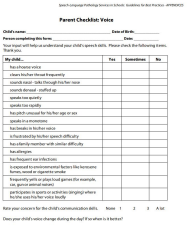


Please check all that apply to this child.

_____ Coughs, clears throat, or shakes frequently
_____ Has difficulty breathing or swallowing
_____ Complains of a sore throat often
_____ Voice sounds rough, hoarse, breathy, weak or strained
_____ Loses his/her voice every time s/he has a cold
_____ Always sounds "stuffed up," like during a cold, or sounds like s/he is talking "through the nose"
_____ Voice sounds worse at different times of the day (morning, after school, evening)
_____ Sounds different from his/her friends of the same age and sex
_____ Voice sounds worse after shouting, singing, playing outside, or talking for a long time
_____ Uses a lot of effort to speak or complains of vocal fatigue
_____ Avoids talking or voice disorder
_____ Likes to sing and performs when participates in acting and/or singing groups
_____ Participates in sports activities or cheerleading activities that require yelling and talking
_____ Has difficulty being understood by unfamiliar listeners
_____ Can't be heard easily in the classroom or when there is background noise
_____ Talks more loudly than others in the family or classroom
_____ Voice problem is interfering with his/her performance at school
_____ Doesn't like the sound of his/her voice, or is teased for the sound of his/her voice
_____ Attends many loud social events (parties, concerts, sports games)
_____ Seems tired or unhappy a lot of the time
_____ Is having difficult changes, such as death, divorce, financial problems
_____ Is teased or bullied by other children
_____ Lives with a family that uses loud voices frequently
_____ Smokes, or is exposed to smoke at home or at a job
_____ Uses alcohol
_____ Eats "junk food" frequently; or complains of heartburn or sour taste in the mouth
_____ Drinks beverages that contain caffeine, or drinks little water
_____ Has allergies, respiratory disease, or frequent upper respiratory infections
_____ Has hearing loss or frequent ear infections
_____ Takes prescription medications (please list):
_____ Has a history of injuries to the head, neck, or throat (please describe)
_____ Has had surgeries (please describe)
_____ Was intubated at birth or later (please describe)
_____ Has a chronic illness or disease (please describe)

My primary concern about this child's voice is (please describe):

Example Parent Checklist, VDOE



Speech-Language Pathology Services in Schools: Guidelines for Best Practices - APPENDICES

Parent Checklist: Voice

Child's name: _____ **Date of Birth:** _____

Person completing this form: _____ **Date:** _____

Your input will help us understand your child's speech skills. Please check the following items. Thank you.

My child...	Yes	Sometimes	No
has a hoarse voice			
clears his/her throat frequently			
sounds raspy - talks through his/her nose			
sounds denasal - stuffed up			
speaks too quietly			
speaks too rapidly			
has a pitch unusual for his/her age or sex			
speaks in a monotone			
has breaks in his/her voice			
is frustrated by his/her speech difficulty			
has a family member with similar difficulty			
has allergies			
has frequent ear infections			
is exposed to environmental factors like kerosene fumes, wood or cigarette smoke			
frequently yells or plays loud games (for example, car, guinea animal noises)			
participates in sports or activities (singing) where he/she uses his/her voice loudly			

Rate your concern for the child's communication skills. None 1 2 3 A lot

Does your child's voice change during the day? If so when is it best to?

Student or Parent Report Measures

- Pediatric Voice Outcome Survey *(PVOS)* (Hartnick 2002) https://jamanetwork.com/journals/jamaotolaryngology/fullarticle/482997
  - 4 item questionnaire
  - Completed by parents
- Pediatric Voice Related Quality of Life *(PVRQOL)* (Boseley, Cunningham & Volk, 2006) https://jamanetwork.com/journals/jamaotolaryngology/fullarticle/484211
  - 10 item questionnaire
  - Completed by parents, but adapted to be completed by children too
- Pediatric Voice Handicap Index *(pVHI)* (Zur et al., 2007) https://www.sciencedirect.com/science/article/abs/pii/S0165587606003727?via%3Dihub
  - 21-item questionnaire with 3 subsections
  - Completed by parents
- VPI Effects on Life Outcomes *(VELO)* (Skirko et al., 2013) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4074517/
- Institution specific checklists

Speech-Language Probes

- **Case history –** parent report, medical history
  History of surgeries, intubations, vocal injuries, heavy voice use?
- **Interviews –** parents, teachers, student
- **Narrative samples** (assess voice and resonance in multiple contexts)
- **Stimulability**
- **Dynamic assessment**
- **Play-based assessment**

Speech-Language Probes

- **For both voice and resonance, record and listen to speech samples in multiple contexts**
  - Classroom
  - Playground
  - Noisy and quiet environments
  - Higher and lower stress situations

Dynamic Assessment (Stimulability)

Voice

Do any voice strategies change vocal production?
- Lip trills
- straw phonation; bubbles
- humming
- being louder or softer
- Airflow
- Resonant voice

Would any assistive technology (e.g., amplifier) improve classroom function?

Dynamic Assessment (Stimulability)

Resonance
- Phoneme specific errors – can these be corrected?
- What changes with nasal occlusion?
- Does student alter resonance with models and cues?

Compensatory Errors

- Using compensations to approximate normal sound in the presence of abnormal structure
  - Glottal stop substitutions
  - Pharyngeal fricatives
  - Nasal fricatives

If structure has been repaired, therapy can help

If surgery has to be delayed, therapy can help with placement

Velopharyngeal Mislearning

- Velopharyngeal errors with intact structure
  - Phoneme specific nasal emissions or substitutions
  - Hypernasality after structure is fixed
  - Functional resonance disorder

THERAPY CAN HELP

Contextualized Tests (Academic Activities)

Formal ratings of voice and resonance across contexts (using scales)

Assessment of speech sound errors and nasalizations across contexts

Auditory Perceptual Evaluation

Dysphonia and resonance disorders are identified with the ear

Various ways of quantifying or describing

There are consistent scales for this

Perceptual Characteristics of Voice

- **Pitch** - perceptual correlate of frequency
- **Loudness** - perceptual correlate of intensity
- **Breathiness** – perception of excess air escape
- **Roughness** – perceived irregularity in the voicing source
- **Strain** – perceived excessive vocal effort

GRBAS

- Grade
- Roughness
- Breathiness
- Asthenia
- Strain
- 0-3, 0=normal, 1=mild, 2= moderate, 3=severe
- G2R2B2A0S1 = a moderately dysphonic voice characterized by moderate roughness, moderate breathiness, no asthenia and mild strain

(Hirano, 1979 *Clinical Measurement of Voice)*

CAPE-V

Consensus Auditory Perceptual Evaluation of Voice
100 mm visual analog scale 0=normal, 100=profound
Available on www.asha.org for download for non-commercial purposes
Rater makes a mark on the 100 mm visual analog scale that corresponds with their perception

- Overall severity
- Roughness
- Breathiness
- Strain
- Pitch
- Loudness

(Kempster GB, Gerratt BR, Verdolini Abbott K, Barkmeier-Kraemer J, Hillman RE, 2009.)

Resource for Ear Training

Patrick Walden, PhD developed a database of 296 audio files, with CAPE-V ratings by 2 or 3 voice specialized SLPs

Walden, Patrick R (2020), "Perceptual Voice Qualities Database (PVQD)", Mendeley Data, v2, Perceptual Voice Qualities Database (PVQD) - Mendeley Data

CAPE-V Stimuli

- Sustained vowels /a/ and /i/ for 3-5 seconds each
- Sentences
  - The blue spot is on the key again
  - How hard did he hit him?
  - We were away a year ago?
  - We eat eggs every Easter
  - My mama made lemon muffins
  - Peter will keep at the peak
- Connected speech

Resonance Rating

Cleft Audit Protocol for Speech-Augmented (John et al., 2006)
Perceptual rating tool with guidelines and operational definitions
- Intelligibility
- Voice
- Resonance
- Nasal airflow
- Grimace
- Consonant production

https://journals.sagepub.com/doi/10.1597/04-141.1?url_ver=Z39.88-2003&rfr_id=ori%3Arid%3Acrossref.org&rfr_dat=cr_pub++0pubmed&

Resonance

RESONANCE exists on vowels and voiced consonants, NOT voiceless

Hypernasality - too much nasal energy

Hyponasality - too little nasal energy

Cul-de-sac resonance - often sounds muffled, blocked

Mixed resonance - might be hypernasal on some sounds, hypo on others

Rating scale of 0-3 (none, minimal, mild, moderate, severe)

Resonance Ratings

Hypernasality
- 0= no hypernasality
- 1= minimal - detectable to trained ear, not impacting intelligibility
- 2-mild - detectable on high vowels
- 3- moderate- detectable on high and low vowels
- 4 - severe - noticeable on all vowels and voiced consonants

Resonance Ratings

Hyponasality
- 0= no hyponasality
- 1= minimal- slight denasalization of nasal consonants
- 2-mild - slight denasalization of nasal consonants and adjacent vowels
- 3- moderate- noticeable on nasal consonants and vowels
- 4 - severe - total denasalization of nasal consonants and noticeable on vowels

Nasal Airflow

Audible nasal airflow occurs mostly on consonants - stops, fricatives, affricates

Nasal turbulence is heard as a rustle or frication in the nasal cavity or nasopharynx
Audible nasal emission is nasal airflow, usually without the rustle
Passive = air escape while sound is being produced
Active = redirection of airflow through nose

ACTIVE nasal airflow is often mislearning

Resources for Ear Training

ACPA-CPF speech samples
https://acpa-cpf.org/speech-samples/

Rochester Institute of Technology
https://www.rit.edu/ntid/slpros/assessment/speechvoice/training/9

The Leaders Project
https://www.leadersproject.org/category/all-menus/cleft-palate/cleft-palate-videos/cleft-palate-thph/

Perceptual Ratings of Voice or Resonance

- Assess in multiple contexts
  - In quiet area
  - In competing noise
  - Higher cognitive load
  - More and less stressful
  - Different times of day?

Decontextualized Tests

Oral mechanism exam
Evaluation of respiration outside of connected speech
Acoustic or instrumental assessments
Low-tech assessment of resonance
Formal articulation tests

Oral Peripheral Examination

Should include at minimum:

- Lips, tongue, jaw appearance, strength, symmetry and ROM
- Velar elevation and appearance
- Diadokokinetic movements
- Vocal diadokokinesis (/uu?ii/x5, /papapa/x5)

https://www.youtube.com/watch?v=iCZZpNVvgn4&t=14s
from The Leaders Project

Assessment of Respiration

- **s/z ratio**
- **Maximum phonation time**
- **Observe respiratory patterns**
  - Breath holding
  - Shallow, clavicular breathing
  - Stridor

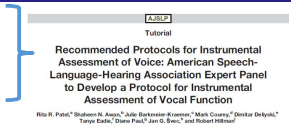
Respiration Norms

Age	Gender	MPT	s/z ratio
4;0-6;11	F	6.22 +/- 1.99	0.96 +/- 0.15
4;0-6;11	M	6.02 +/- 1.77	0.97 +/- 0.17
7;0-9;11	F	7.90 +/- 1.98	0.99 +/-0.27
7;0-9;11	M	8.05 +/- 1.98	0.95 +/- 0.15
10;0-12;0	F	9.05 +/- 2.02	1.01 +/- 0.17
10;0-12;0	M	9.22 +/- 2.33	0.99 +/- 0.15

Mendes Tavares et al., 2012

Acoustic Assessment

- Vocal intensity dB SPL
- Vocal frequency (f0)
- Vocal signal quality (Cepstral Peak Prominence)


AJSLP

Tutorial

Recommended Protocols for Instrumental Assessment of Voice: American Speech-Language-Hearing Association Expert Panel to Develop a Protocol for Instrumental Assessment of Vocal Function

Rita R. Patel,[a] Shaheen N. Awan,[b] Julie Barkmeier-Kraemer,[c] Mark Courey,[d] Dimitar Deliyski,[e] Tanya Eadie,[f] Diane Paul,[g] Jan G. Svec,[h] and Robert Hillman[i]

- Other measures
  - Jitter
  - Shimmer
  - Noise to harmonic ratio

https://pubs.asha.org/doi/10.1044/2018_AJSLP-17-0009

Low-cost or Free Acoustic Tools

- Praat: doing phonetics by computer – F0, CPP, dB, jitter, shimmer Praat: doing Phonetics by Computer
- Physics toolbox sensor suite – app for iOS and Android – measures pitch and loudness
- Sensors Toolbox app for iOS

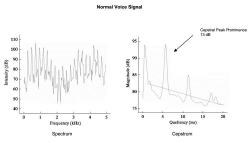
F0 and F0 Range

Can be obtained with relatively low-tech measures, and apps

F0 changes quite a bit with male puberty, less with female puberty

Cepstral Peak Prominence

- Spectral measure
- Measures the amplitude of dominant cepstral peak relative to the other noise in voice
- **HIGHER CPP associated with BETTER voice quality**



From Heman-Akah et al., 2002

Acoustic Norms for Students-F0

	Age	4;0-6;11	7;0-9;11	10;0-12;11	13;0-15;11	16;0-19;11
F0	Female	257.0 (SD 15.0)	244.8 (SD 22.9)	253.9 (SD 24.8)	219.2 (SD 32.2)	214.5 (SD 27.7)
	Male	245.2 (SD 25.48	241.6 (SD 31.08)	239.4 (SD 29.33)	151.4 (SD 43.33)	107.3 (SD 20.33)

Kent, Eichorn, & Vorperian 2021

Acoustic norms for students

		4;0-6;11	7;0-9;11	10;0-12;11	13;0-15;11	16;0-19;11
Jitter %	Female	2.53 (SD 3.72)	2.35 (SD 1.69)	1.84 (SD 0.91)	1.54 (SD 0.91)	1.38 (SD 0.86)
	Male	2.17 (SD 1.36)	1.14 (SD 0.48)	1.89 (SD 0.78)	1.20 (SD 0.72)	0.90 (SD 0.94)

Kent, Eichorn, & Vorperian 2021

Acoustic norms for students

		4;0-6;11	7;0-9;11	10;0-12;11	13;0-15;11	16;0-19;11
Shimmer %	Female	6.67 (SD 2.58)	6.81 (SD 2.46)	5.58 (SD 2.11)	4.92 (SD 1.84)	4.39 (SD 0.98)
	Male	6.86 (SD 3.12)	4.48 (SD 1.43)	5.00 (SD 1.58)	4.78 (SD 1.84)	6.05 (SD 2.43)

Kent, Eichorn, & Vorperian 2021

CPP in Students

- Norms exist, but differ depending on software used
- For free software (Praat), no pediatric normative data yet
- For adults, CPP<14.55 dB on sustained vowel, and <9.33 in the Rainbow passage indicated presence of a voice disorder (Murton et al., 2020)
- CPP increases with age (younger kids have lower CPP)

Putting the Pieces Together

- Etiology
  Do you know? Does it need further medical evaluation?
- Academic impact (including social-emotional)
- Characterize and describe functionally across contexts
- Potential for change

Summarize Data

- Consider information from a variety of sources
- Team should not rely on a single data point
- Assessments should include sufficient information for IEP team to consider student's previous rate of academic growth
- Barriers, facilitators, and parent/ student input should be considered

Causes of Voice Disorders

Benign lesions
- Nodules
- Cyst
- Polyps

Mobility impairment
Papilloma
Congenital anomalies (cleft, web)
Scar or sulcus
Posterior glottic insufficiency post intubation
Dysphonia after laryngotracheal reconstruction

Vocal Fold Nodules

Vocal Fold Nodules

- Most common cause of voice disorder in children (von Leden 1985; Gramuglia 2014)
- Bilateral lesions at point of most contact on vocal folds
- Assumed to be caused by repeated impact forces
- Usually improve or resolve with therapy
- Often have difficulty getting soft AND getting loud
- Rough, breathy, lower pitch, more effort, harder to get quiet voice or high voice

Case Example

- 8 year old boy
- 2nd grader
- Diagnosed with nodules at ENT after pediatrician notices hoarseness

Comprehensive Assessment Model

4 Part Model for Comprehensive Assessment	
Academic Activities: • Artifact analysis • Curriculum-based assessment • Observations in school (natural) settings • Educational records	**Speech-Language Probes:** • Case history • Interviews • Language/Narrative samples • Stimulability • Dynamic assessment • Play-based assessment
Contextualized Tests: • Norm-referenced measures of academic achievement • Curriculum benchmarks	**Decontextualized Tests:** • Norm-referenced speech-language tests (parsed skills: articulation, semantics, syntax, morphology, fluency, etc.)

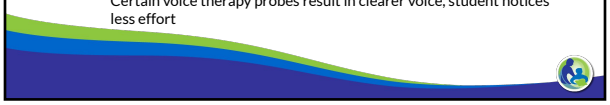
Ireland, Marie. "The Real Requirements Behind Eligibility Decision Making in Schools". Lecture. ASHA Connect, Chicago, IL. July 19, 2019.

Academic Activities

- **Educational records**
  - Academic performance at grade level
- **Observe in class**
  - Noticed voice breaks when answering a question
  - Difficulty projecting voice during small group activity when classroom was loud
- **Observe on playground/ lunch**
  - Yelling on playground, notice more hoarseness after
- **Teacher checklist**
- **Parent checklist**

Speech-Language Probes

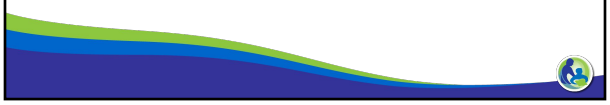
- **Case history?**
  - Parent provides ENT evaluation information
- **Interview student**
  - Student is aware of voice difference
  - Notices vocal fatigue, loses voice by end of day, embarrassed
- **Interview parent**
  - Parent reports hoarseness has been worsening, heavy voice user
- **Communication sample - perceptual ratings**
- **Stimulability**
  - Certain voice therapy probes result in clearer voice, student notices less effort



- Perceptual rating of voice - CAPE-V rating
- Overall rating-54/100 moderate, roughness, 57/100, breathiness 42/100, strain 63/100, loudness 0, pitch 23/100 lower pitch

Decontextualized Tests

- Oral mechanism exam - normal
- Assessment of respiration - MPT 4 seconds, shallow, clavicular breathing noticed
- Acoustic measures
  - CPP in speech 5.2 (low)
  - F0 low for age or gender

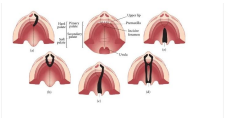


Resonance Disorders in Students 3-21

- Cleft palate
- Submucous cleft palate
- Non-cleft structural velopharyngeal insufficiency
- Neurologic
- Velopharyngeal mislearning

Cleft Palate

- Congenital opening in the palate
- Can be unilateral or bilateral
- Can involve lip or not
- Occurs early in gestation



Cleft Palate

- Rare to not be identified prenatally or at birth
- Usually followed by a cleft palate or craniofacial team
- Lip typically repaired at 3-8 months
- Palate typically repaired around 1 year
- Students may continue to have speech or resonance disorders after repair
  - Some of these respond to therapy
  - Some of these require surgical treatment

Case Example

6 year-old girl
History of overseas adoption
Palate repaired overseas at age 2
Secondary surgery due to continued hypernasality 4 months ago with local cleft or craniofacial team
Presents with moderate hypernasality and cleft type speech errors

Academic Activities

- **Educational records**
  Meeting expectations for grade level
- **Observe in class**
  Reserved in interactions with other students
- **Observe on playground or lunch**
  Plays with other students
- **Teacher checklist**
  Teacher has difficulty understanding her
- **Parent checklist**
  Parent is concerned with her intelligibility

Speech-Language Probes

- **Case history?**
  - Palate repaired overseas
  - Evaluation with craniofacial team - secondary surgery due to persistent hypernasality, cleared to begin therapy -
  - surgeon believes the palate is now functional
  - History of frequent ear infections, has tubes
- **Interview student**
  - Student knows her speech sounds "different,"
  - Some sounds are hard for her

Speech Language Probes

- **Interview parent**
  - Parent has concerns for intelligibility and for academic and literacy skills
- **Communication sample - perceptual ratings, speech sound errors**
- **Stimulability**
  - Nasal occlusion
  - stimulability for consonants in error

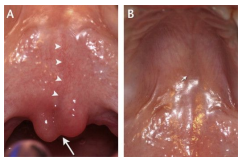
- Perceptual rating of resonance in speech
  - Moderately hypernasal
  - Audible nasal emissions on /s/ and /f/
- Speech sounds in context
- Glottal stop substitutions for /k/ and /g/
  - nasal substitutions for /ʃ, ʧ, ʤ/
  - audible nasal emissions on /s/ and /f/
  - accurate productions of /p/, /b/, /t/, /d/, /m/, /n/

Decontextualized Tests

- Oral mechanism exam - scar from palate repair visible, dental crowding
- Articulation test
  - glottal stop substitutions for /k/ and /g/
  - nasal substitutions for /ʃ, ʧ, ʤ/
  - audible nasal emissions on /s/ and /f/
  - accurate productions of /p/, /b/, /t/, /d/, /m/, /n/

Submucous Cleft Palate

- Defect of the soft palate hidden by intact mucosa – i.e., the skin is together but the muscle is not
- Classic appearance includes
  - Bifid uvula
  - Zona pellucida
  - Notching of the hard palate
- Can also be "occult" – meaning none of these are seen, but the muscle is still incomplete



Hasan et al., 2014

Submucous cleft palate

- **Variable presentation**
- **If difficulties are present, they are:**
  - Early difficulties with bottle and breastfeeding
  - Frequent ear infections
  - Hypernasality or difficulty producing high pressure consonant sounds

Velopharyngeal Mislearning

- **Structurally and neurologically, all is typical**
- **Atypical articulation errors**
- **Generally, present on some sounds and not others**
  - Phoneme specific nasal substitutions
  - Phoneme specific nasal emissions
  - Phoneme specific hypernasality

Case example

7 year-old boy
No significant medical history
Speech sounds "different"
Hard to understand, getting some negative attention

Speech-Language Probes

- **Case history?**
  - No relevant history
- **Interview student**
- **Interview parent**
- **Communication sample - perceptual ratings, speech sound errors**
- **Stimulability**

- Perceptual rating of resonance in speech
  - Normal resonance EXCEPT
    - words containing /s/ and /ʃ/ sound hypernasal
- Speech sounds in context
  - Nasal production of /s/ and /ʃ/ - like a backward snort

Decontextualized Tests

- Oral mechanism exam - normal
- Articulation test
  only errors are /s/ and /ʃ/

Non-cleft Velopharyngeal Insufficiency

Occurring due to other structural anomalies, not a cleft of the palate

Short velum or deep pharynx

Occurs disproportionately in 22q11.2 deletion syndrome and some other genetic syndromes

Post-adenoidectomy

Usually transient (2-3 months)

If it doesn't resolve independently, may resolve with therapy

If it does not, there may be a structural reason

Neurogenic Velopharyngeal Dysfunction

- Apraxia
- Dysarthria
- Nerve injury

Hyponasality

Nasal obstruction	Nasopharyngeal obstruction
• Allergies • Upper respiratory infection • Narrow nasal passages	• Adenoid or tonsils

Resources for Continued Learning

No cost

UW Voice and Swallow Clinics Lecture Series

- Voice Thera-palooza: voice therapy exercises evidence and theory-based practice
- Speech Therapy for Cleft Palate and Velopharyngeal Dysfunction
- Adapting voice therapy techniques to children

LEADERSproject

ASHA Practice Portal https://www.asha.org/practice-portal/

Resources for Continued Learning

For a fee

https://learning.acpa-cpf.org/store/provider/provider09.php

ASHA Learning Pass

Medbridge

Thank you!

Online survey:
bit.ly/widpisurvey

Your Universal Survey Passcode is:

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