Evaluating and Treating Voice Disorders in the School-Based Setting

CSLD Team Day 12/7/18

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Normal voice production depends on power and airflow supplied by the respiratory system; laryngeal muscle strength, balance, coordination, and stamina; and coordination among these and the supraglottic resonatory structures (pharynx, oral cavity, nasal cavity).

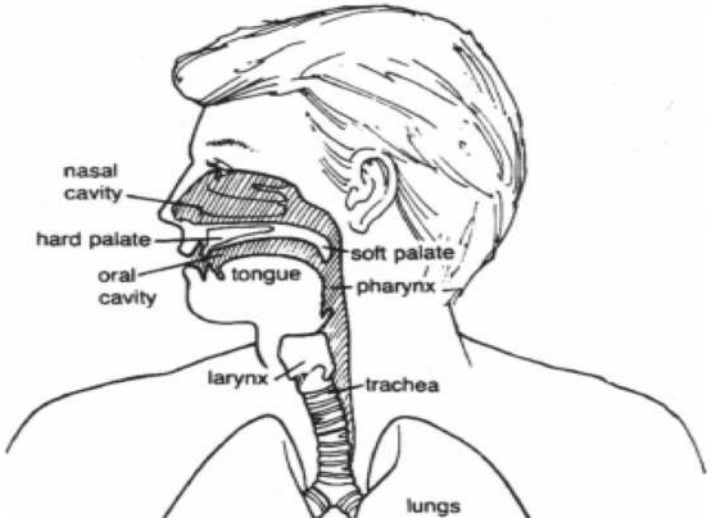
A **voice disorder** occurs when voice quality, pitch, and loudness differ or are inappropriate for an individual's age, gender, cultural background, or geographic location. A **voice disorder** occurs when voice quality, pitch, and loudness differ or are inappropriate for an individual's age, gender, cultural background, or geographic location

How Is Voice Produced?

Figure 1 contains the primary structures in the vocal tract. The larynx is a system of cartilages, muscles, and ligaments in the neck (pharynx). It sits on top of trachea, the passageway to the lungs. The passageway to the stomach is behind the larynx and trachea. The larynx is covered when we swallow, so food does not enter the trachea.

The larynx contains thin membranes, called vocal folds. The vocal folds sit in an open position during breathing. When a person wants to speak, muscles close the folds, and air from the lungs causes them to vibrate. The sound the vocal folds make then resonates through the mouth (or nose, for some sounds) and speech is created. The combination of breathing, vibrating the vocal folds, and shaping or resonating the vibration creates the distinct sound you recognize as your child's voice. A problem with any part of the voicing process may lead to a voice disorder.

Figure 1. The vocal tract.



Lee, L., Stemple, J. C., Glaze, L., & Kelchner, L. N. (2004)

Prevalence and Incidence

- Low prevalence (studies show range of 3-9%, but .98% in treatment seeking population)-- demonstrates that most people with voice disorders do not seek treatment
    - Specific prevalence of voice disorders in pediatric population is 1.4%-6.0%
- Child voice disorders are more prevalent in males than females
- Vocal fold nodules= most frequently diagnosed voice disorder in pediatric population, with prevalence of nodules twice as high in males than in females

Types of Voice Disorders

Organic

- Voice disorders that are physiological in nature that result from alterations in respiratory, laryngeal, or vocal tract mechanisms

1. Structural: result from physical changes in the voice mechanism (e.g., alterations in vocal fold tissues such as edema or vocal nodules; structural changes in the larynx due to aging)
2. Neurogenic: result from problems with the central or peripheral nervous system innervation to the larynx that affect functioning of the vocal mechanism (e.g., vocal tremor, spasmodic dysphonia, or paralysis of vocal folds)

Functional

- Voice disorders that result from the improper or inefficient use of the vocal mechanism when the physical structure is normal
- Examples
  - Phonotrauma (vocal abuse)
  - Vocal fatigue
  - Muscle tension dysphonia or aphonia
  - Diplophonia
  - Ventricular phonation

****Voice disorders are not mutually exclusive in their etiology-can consist of two or more types****

Other Disorders That Affect Voice

Psychogenic Voice Disorders: voice quality (pitch, loudness, roughness/hoarseness) affected when psychological stressors lead to habitual maladaptive aphonia or dysphonia. Referral to psychologist or psychiatrist for dx--would likely collaborate with treatment

Paradoxical Vocal Fold Movement (PVFM) or Vocal Cord Dysfunction: aerodygestive disorder where vocal folds *adduct* during inhalation Referral to pulmonary specialist for dx-would likely collaborate with treatment.

IDEA and Educational Implications

- Recall, US Dept of Education clarified the notion of providing services when the impairment ***"adversely affects educational performance"*** as defined by IDEA
  - "Educational performance' as used in the IDEA is not limited to academic performance. Whether a speech and language impairment adversely affects a child's educational performance must be determined on a case-by-case basis, depending on the unique needs of a particular child and not based only on discrepancies in age or grade performance in academic subject areas."
- **Students with voice disorders can face difficulties that have the potential to affect academic and social-emotional aspects of life.**
  - Ex: limit classroom participation (reading aloud, collaborating with peers), feel the need to "hide" voice due to embarrassment, school-career transition with older students, reluctance to participate in extra-curricular activities, negative attention from peers, teachers, and staff

School-Based Evaluation Components

- Case history
  - Medical History
  - Interviews: Vocal Handicap Index and informal vocal health questionnaire
- Oral mech exam: structural abnormalities that could affect resonance
- Phonotory measures= Maximum Phonation Time (MPT); S/Z Ratio
  - Informs endurance with voicing
- Perceptual measures: CAPE-V vs. GRBAS or BUFFALO VOICE PROFILE during various speech samples (single words-could be within formal artic or language assessments; written sentences, reading passage; informal conversation)
  - Informs voice quality, resonance, overall severity

Voice-Specific Case History

*If applicable, review any reports from outside medical provider that the school has obtained (may need to seek permission to contact if records known but not on file at school). Consult pervious IEPs/nurses reports for pertinent info re: medical history.

- Allergies: vocal fold irritation
- Medications
  - Antihistamines: cycle of mucus-throat clear-->no mucus=dry vocal folds
  - ADHD meds can dry out vocal folds which can lead to hoarseness, potentially organic changes
- Asthma: consider PVFM during exercise
- Gastrointestinal Reflux: may alter laryngeal/pharyngeal structure and function
- Family members who smoke

Voice-Specific Case History

1. **Voice Handicap Index (VHI)/VHI Pediatrics**
    a. Describes voice quality and effect of voice on person's life
    b. Adult version can be adapted to present questions about child--but some university clinics/clinical rearchers have compiled
2. **Pediatric Voice-Related Quality of Life Survey**
    a. Similar questions to VHI, shorter with 10 questions
3. **Questions Re: Vocal Hygiene:**
    a. How much water do you drink in a day?
    b. How much sleep do you get each night? Is this consistent?
    c. How many caffeinated beverages do you consume in a day?

Use measures separately for qualitative severity score and/or use combination of questionnaires elicited to parents and relevant educational staff to obtain best picture of student vocal behaviors and attitudes toward vocal function

Phonatory Measures

S/Z Ratio: Assesses laryngeal function with voiceless and voiced sounds

- Student takes natural breath then phonates on /s/ and then /z/ for as long as possible. Repeat x2
- GENERALLY: Students who have difficulty phonating will likely have an S/Z ratio of greater than 1.4. The higher the ratio, the more difficulty the client is experiencing when phonating.

Maximum Phonation Time:

- Student sustains /a/ at comfortable pitch and loudness on a deep breath.
- See appendix table from Lee (2004) for age norms. NOTE impacted by age and height and number of times trial is performed--take longest measure.

Also make note of **non-phonatory behaviors that involve respiration!

- Clavicular breathing (excess chest movement or shoulder movement)
- Stridor= noise heard on inhalation
- Throat clearing or coughing

Perceptual Measures

Roughness/Hoarseness: perceived as deviant from normal phonicity

Loudness/Intensity

Breathiness: vocal folds are not touching, “light, airy” sounds

Pitch: perceived as high/low relative to speaker’s age and sex.

Strain: tension or effort added to speak

Aphonia: absence of voicing, which may be intermittent or constant (voice may “cut out”); tension or strain may also be present.

Glottal fry: this is characterized by a series of rapid low-pitched ‘pops’ and a creaky quality.

Diplophonia: this is characterized by the perception of two simultaneous pitches in the voice

Phonation breaks: these are characterized by uncontrolled, short-duration cessations of vocal fold vibrations during speech, heard as short periods of no voice.

Fluctuations in quality: the quality of the voice (normal, breathy, hoarse, husky, whispered) may not be stable – there may be wide fluctuations from one quality to another and back again.

GRBAS Scale
(Hirano, 1981).

- Use with single word, sentences, and conversational speech tasks to rate perceptual qualities on a scale of 0-3
- No overall rating, but can informally summarize findings in evaluation report

G – *Grade*	Degree of vocal-changing global impression of the voice, the voice impact on the listener identifies the degree of voice disorder as a whole.
R – *Roughness*	Irregularity in the vibrations of the vocal folds, indicates the feeling of roughness in emissions.
B – *Breathiness*	Breathiness, audible turbulence as a hiss, air escape in the glottis, air feeling in his voice.
A – *Asteny*	Asthenia, poorly defined vocal weakness, loss of power, reduced vocal power, harmonics.
S – *Strain*	Tension, printing hyperfunctional state, acute frequency noise at high frequencies of the spectrum and treble harmonics marked.

0=WNL, 1= mild degree, 2=moderate degree, 3= high degree

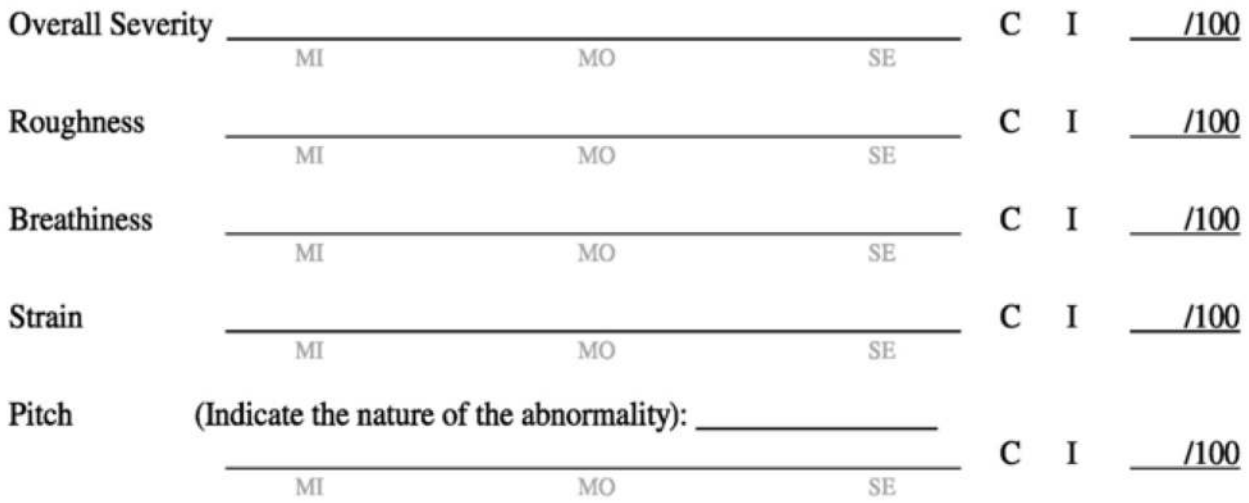
Buffalo III Voice Profile

- Could use in tandem with GRBAS scale, which is more specific

		BIIIVP Rating 2		
BUFFALO III VOICE PROFILE **Quality**	**Score 0** Quality is within normal limits **BIIIVP Rating 1**	**Score 1** Quality is noticeably different, but intermittent. Quality is not considered distracting or an interference to communication **BIIIVP Rating 2**	**Score 2** Quality is persistently hoarse, breathy, tense, strident or contains other abnormal attributes; inappropriate for age and gender; interferes with communication **BIIIVP Rating 3**	**Score 3** Quality is persistently hoarse, breathy, tense, strident, or contains other abnormal attributes; inappropriate for age and gender; greatly interferes with communication **BIIIVP Rating 4-5**

TEACHER INPUT FORM FOR VOICE Adverse Affect on Educational Performance Social -Emotional Academic -Vocational	**Score 0** No interference with student's participation in educational settings	**Score 2** Minimal impact on student's participation in educational settings	**Score 3** Interferes with student's participation in educational settings	**Score 4** Greatly interferes with student's participation in educational settings
TOTAL SCORE	**0 1 2 3 4**	**5 6 7 8**	**9 10 11 12**	**13 14 15 16**
TOTAL VOICE RATING	**Non-handicapping**	**Mild**	**Moderate**	**Severe**

CAPE-V
Concensus Auditory Perception Evaluation on Voice



- Sustained /a/, CAPE-V sentences, natural speech sample (see task instructions/script
- Measures roughness, breathiness, pitch, strain, loudness, overall severity across all three speaking activities; comments on if student shows these qualities "consistently" (C) or "intermittently" (I) as well as gradations from "mildly-severely deviant"
- Mark along line re: perception of each measure. Use ruler to measure distance from 0 or 100 in cm--gives more specific numeric value along qualitative WNL-Severe rating
- **CAPE-V showed greater rater reliability in judging perceptual voice qualities in comparison to the GRBAS scale, though both were reliable across raters and parameters** (Zraik et al 2011)
- For practice scoring CAPE-V, https://slpgames.csd.wisc.edu/capev_activities/capev1/index.html

Hearing Screening Date: _____ Passed Failed

If failed, describe hearing status:_____

Pertinent medical and social history: _____

_____

Directions: The Quick Screen for Voice should be conducted in a quiet area. Elicit verbal activities, such as spontaneous conversation, picture description, imitated sentences, recited passages, counting, and other natural samples of voice and speech, or perform the tasks requested. The screening test is failed if one or more disorders in production are found in any area, indicating that a more thorough evaluation is needed.

Mark all observations that apply, as the individual produces connected speech:

Respiration

_____ Inhalatory stridor or expiratory wheeze
_____ Infrequent breaths; talking too long on one breath
_____ Limited breath support for speech
_____ Reduced loudness or vocal weakness

_____ Normal respiration for speech

Phonation

_____ Rough or hoarse quality
_____ Vocal strain and effort
_____ Persistent glottal fry
_____ Conversational pitch is too high or too low
_____ Conversational voice is limited in pitch or loudness variability
_____ Breathy quality
_____ Aphonia
_____ Hard glottal attacks
_____ Conversational voice is too loud or too soft

_____ Normal voice quality

Resonance

_____ Hyponasality (observed during humming, nasal consonant contexts: Mommy makes me muffins; Man on the moon; Many men make money, etc.).
_____ Consistent mouth breathing
_____ Hypernasality (observed during vowel and oral consonants)
_____ Nasal turbulence or audible nasal emission (observed during pressure consonant contexts: Counting from 60 to 69; Popeye plays baseball; Give Kate the cake; Buy Bobby a puppy, Take a ticket to Daddy, etc.).
_____ Juvenile resonance characteristics

_____ Normal resonance

Post School-Based Evaluation

- When voice evaluation indicates a likely voice disorder, summary of clinical findings should specify phonatory and perceptual qualities as well as information gathered from questionnaires re: vocal behaviors and attitudes.
- When a voice disorder ***is*** indicated, SLP reports findings and explains how further evaluation conducted by an otolaryngologist (ENT) to inform and treat structural components of vocal mechanism and (ideally in combined clinic) medical SLP to inform and treat functional components
- Parents can bring IEP with speech report (containing voice eval) to primary care provider (PCP) who will then write a referral for an ENT for a full voice evaluation
    - In addition to voice quality, resonance, phonation, and rate measures, the ENT/SLP voice clinic will collect quantitative acoustic data (volume, pitch, etc.), aerodynamic measures (glottal airflow, subglottal pressure, etc.), and laryngeal imagery
- ENT/SLP interpret results and provide treatment recommendations--will ultimately inform school SLP re: goals to implement in child's IEP

Scenario	Action
Results from eval indicate “mild” voice disorder, not enough to qualify for services-will condition worsen over time?	Discuss all best-practice options with parents, including education re: behavior management/how to modify child’s environment; provide hospitals/clinics in area that specifically treat voice if desired
SLP learns student, who was referred to ENT was never evaluated due to noncompliance by parents or no financial support	*Free community based clinics:* school SLP gets ENT and medical SLP specializing in voice to volunteer their time and services to conduct voice evaluations pro bono. School SLP implements treatment plan
Student who received laryngeal evaluation from ENT that was negative for structural pathology, but was positive for functional dysphonia.	*Need to check district/state guidelines for initiating tx. If permitted, counsel professionals on reducing functional behavior, determine stimulability for normal voice and implement strategies.
Student received laryngeal evaluation from ENT with dx of organic pathology or structural abnormality that school SLP is unfamiliar with/uncomfortable treating	SLP consults other clinician in district/area who is deemed more of an expert in voice disorders to implement tx. Take CEUs, consult discussion boards, etc.

Treatment Components: SLP and Multi-Disciplinary Team

Behavioral Modifications Treatment:

- Hydration
- Sleep
- Reducing phonotraumatic behaviors in the classroom, on the playground, on the phone.
- Caffeine intake
- Excessive coughing or throat clearing
- Reduce whispering--encourage confidential voice

Work collaboratively with multidisciplinary team at school (classroom and sped teachers, related services, etc.) as well as parents to create visual aids, positive behavior reinforcement plans, etc. to generalize voice therapy into multiple communication environments.

Treatment Components: Voice Therapy

The goals of voice therapy (included in IEPs) should reflect the nature of the voice impairment. For example, if a child is diagnosed with vocal fold nodules, then the goals for therapy may include the following:

- building awareness of factors relating to this voice problem (i.e., vocal overuse, misuse or abuse)
- discriminating between healthy versus vocally abusive behaviors
- applying laryngeal relaxation strategies for optimal use of the vocal mechanism
- using appropriate pitch, loudness, and rate in spontaneous conversation
- using appropriate voice quality in everyday speaking/ spontaneous conversation

Vocal functioning exercises (pitch holds and glides)

Confidential voice

Negative practice

Relaxed muscles: upright posture, neck back,

Resonant voice exercises and

Resources on CSLD Drive

- Vocal Handicap Index (both adult version and an adaptive pediatric version
- Voice quality of life rater (pediatrics)
- CAPE-V: instructions and form
- Buffalo Voice Profile
- GRBAS Ratings
- Calculating and interpreting s/z ratio and MPT
- Vocal Health Tips document
- Pertinent research articles mentioned throughout/in references

Hospitals and Clinics With Multidisciplinary Teams For Pediatric Voice Evaluation and Treatment:

- Lurie Children's Hospital of Chicago
- https://www.luriechildrens.org/en/specialties-conditions/voice-therapy-program/. *Asks family for doctors order/referral before scheduling*

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