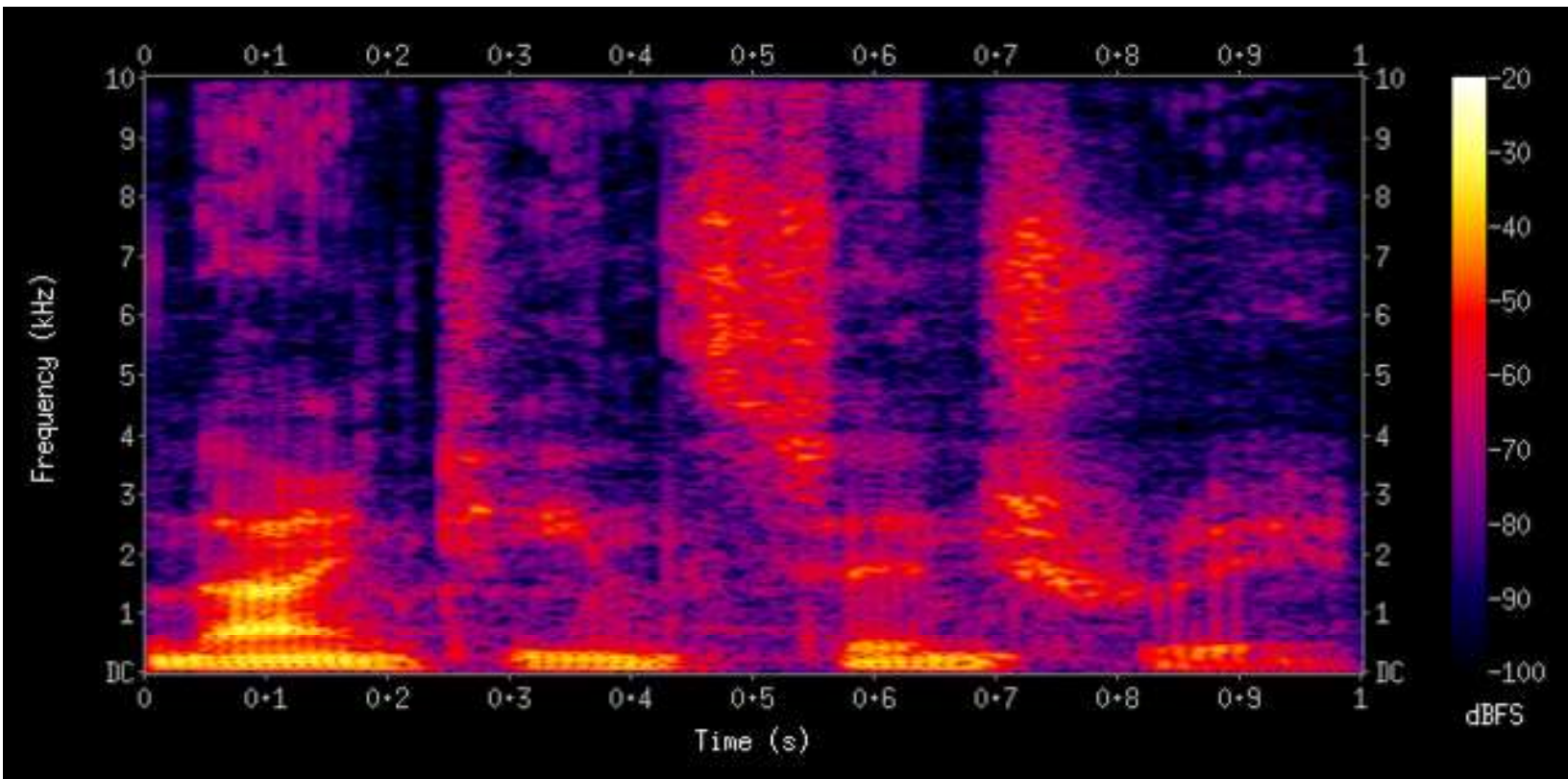


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Perceptual and Acoustic Voice Evaluation

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PERCEPTUAL EVALUATION

Introduction

Perceptual rating scales are clinical tools used to assess the severity of vocal quality impairments. They have been developed to minimize errors in determining vocal quality characteristics when listening to the patient's voice.

GRBAS VS CAPE-V

There are two types of perceptual evaluations: GRBAS and CAPE-V. The GRBAS is a widely used method for the perceptual assessment of voice quality on a 4-point grading scale (0 = normal; 1 = slight; 2 = moderate; 3 = severe) observing the roughness, breathiness, asthenia, and straining of the voice being evaluated (Sáenz-Lechón et al., 2006). According to ASHA, the CAPE-V describes the severity of auditory perceptual attributes of a voice problem through the different parameters of severity, roughness, breathiness, strain, pitch, loudness, and resonance on a 100-point grading scale (2024).

Strengths of **GRBAS**:

- Brief evaluation
- Short 4-point Likert scale
- More utilized and more familiar to SLPs
- Patients are more cooperative, and there is no discomfort throughout the evaluation.

Weaknesses of **GRBAS**:

- The evaluation is harder to study to study statistically and compare reliability.
- Limited ratings given the short 4-point Likert scale.

Strengths of **CAPE-V**:

- More freedom to choose your own stimuli for the evaluations as long as it sticks to the same concepts for each speech sample.
- More space on the evaluation allows more note-taking and highlighting of the most impactful portions of the evaluations.
- Wide range of gross descriptions of voice levels.
- Better rating reliability than the GRBAS.

Weaknesses of **CAPE-V**:

- Causes disagreements between professionals.
- This causes potential risks of incorrect protocol for speech samples and the inability to provide reliable results.

SLP TRAINING AND VOICE ANALYSIS

Training for SLPs for voice analysis includes many online training sessions. Clinicians can earn CEUs online through courses at the ASHA store. For example, an intermediate course on voice perception costs \$39, and clinicians can earn 0.1 ASHA CEU). SLPs can get auditory training for perceptual voice evaluations to learn the different types of voice descriptions to determine normal and abnormal voices: hoarse, breathy, strained, high/low, rough, and loud.

PATIENT EXPERIENCE/SATISFACTION

The Voice Handicap Index (VHI) measures how a voice problem influences a patient's quality of life. It includes physical subscale, functional subscale, and social subscale. The goal of the VHI is for the

patient to pick out ten categories to hone in on specific areas of their life they wish to improve. The VHI can be used to treat adult and pediatric populations. The VHI is preferred by clinicians as it allows them to connect with their patients and work on the areas their patients desire to improve.

ACOUSTIC VOICE EVALUATION

Introduction

The purpose of acoustic voice evaluation is to analyze the acoustic signal and determine the average speaking pitch, vocal range, and how the mechanics of voice production affect the overall sound quality.

Types of Evaluations and Procedure

There are multiple acoustic voice evaluation tools currently available. Three common platforms are Praat, Dr. Speech, and the Multidimensional Voice Program. Each of these tests involve a similar procedure, where the patient must complete a series of voice tasks while speaking into a microphone. Praat provides data regarding fundamental frequency, jitter, intensity, shimmer, spectral measures, harmonics, and vocal tremor. In addition to providing these measurements, Dr. Speech analyzes glottal closure time, vocal cord vibration regularity, noise energy, and signal-to-noise ratio. Likewise, the Multidimensional Voice Program quantifies vocal attributes similar to Praat, in addition to providing additional measures of vocal turbulence and amplitude tremor intensity.

Strengths

There are several advantages of acoustic voice evaluation. First, it is a non-invasive procedure that is easily replicable throughout the patient's therapeutic intervention. Second, it is user-friendly, readily

accessible, and relatively low-cost, making it an efficient and practical option for clinicians. Lastly, it provides evidence-based, objective results that can directly inform intervention. The breadth of research surrounding acoustic evaluations can assist clinicians when interpreting results, making predictions regarding underlying phonatory physiology, and providing a link between voice diagnosis and subsequent treatment.

Weaknesses

As with any type of evaluation, there is always a risk of the external factors interfering with the test results. With acoustic voice evaluation in particular, the speech sample may be skewed because of variables like environmental noise, distance from the microphone, and experience of the administrator, to name a few. There is also a risk that the recording software will not accurately capture the speech signal. Specifically, “peak-clipping” occurs when the software is unable to accommodate extremely high volumes so the signal must be cut-off, resulting in an inaccurate representation of the intensity. An error can also occur when the recording fails to use the available quantization levels adequately.

SLP Training and Acoustic Voice Evaluation

A strength that was previously mentioned is the “user-friendly” nature of acoustic voice evaluation. It is a fairly intuitive procedure and requires minimal training and equipment (limited to a laptop/desktop, microphone, and amplifier) to implement clinically. Finally, the software independently provides an objective analysis of the voice, so it does not require a highly tuned ear for assessing vocal quality that may take years of clinical experience to develop like perceptual analysis does.

Patient Experience/Satisfaction

Since acoustic voice evaluation is a non-invasive procedure, the patient is not at risk of being harmed or uncomfortable. In addition, acoustic analysis tends to corroborate the patient's analysis of their voice, which can help to achieve a true understanding of the pathology and the impact it is having on quality of life. With this highly-individualized approach to patient care that is supported by acoustic voice evaluation, patient satisfaction is likely to be high.

DISCUSSION

Based on our discoveries of acoustic and perceptual voice analysis, it has become abundantly clear that both are needed to obtain the best results. Using both perceptual and acoustic measures will allow the clinician to use evidence from one analysis to reinforce the other. The use of both perceptual and acoustic measures can also help to solidify findings and maximize results. Any deficits found in either acoustic or perceptual analysis can be mitigated by the use of the other. For example, perceptual analysis is important to implement because voice quality is perceptual in nature; however, including an acoustic analysis can detect abnormalities that might not be noticeable by ear. Perceptual analysis can also provide an immediate measure of voice severity, and acoustic analysis can build upon that to provide a specific baseline for treatment and follow-up care.

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