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Back to Basics: Speech Audiometry

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BACK TO BASICS: SPEECH AUDIOMETRY

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SPEECH TESTING

- Historical Perspective
- Overview of Speech Threshold Testing
- Overview of Supra-threshold Speech Recognition Testing
- Most Comfortable Listening Level Testing
- Uncomfortable Listening Level Testing
- Other Tests and New Directions

SPEECH THRESHOLD TESTING

- Considerations in Testing Speech Thresholds
  - Purposes of Testing
  - Materials
  - Method

SPEECH THRESHOLD TESTING

- Purposes
  - In the past, speech thresholds were used to
    - Cross-check pure tone thresholds
      - Lacks validity since other physiologic and electrophysiologic procedures are now available for this purpose
    - Determine a level for supra-threshold speech recognition testing
      - Lacks validity since presentation level will vary depending on reason for supra-threshold testing

SPEECH THRESHOLDS

- Current purpose, aside from billing, is to provide diagnostic information about sensitivity for speech in pediatric and difficult-to-test patients, although also widely used with adult clients by many clinicians
  - Speech Recognition Threshold – Defines material (speech), task (recognition), and criterion (50%)
  - Speech Detection Threshold – Same as above, but task is detection

SPEECH THRESHOLDS

- Materials
  - Spondees (preferred stimuli for SRT and SDT)
  - Cold running speech (alternate stimulus for SDT)
- Methods
  - MLV vs. Recorded
  - Familiarization
  - ASHA-Recommended, Bracketing Techniques

SUPRA-THRESHOLD SPEECH TESTING

- Considerations in Testing SRS
  - Purposes of testing
  - Materials
  - MLV vs. Recorded
  - Level(s)
  - Full lists vs. Half-lists
  - Quiet vs. Noise

SUPRA-THRESHOLD SPEECH TESTING

- Purposes
  - Estimate of communicative ability at normal conversational levels
    - Test level: 50-60 dB HL
  - Diagnostic assessment
    - Psychometric or PI function
  - Hearing aid considerations
    - Words and sentences
  - Analysis of error patterns in speech recognition

SUPRA-THRESHOLD SPEECH TESTING

- Materials
  - Closed set vs. open set
    - Closed set – limited # of stimulus alternatives
      - useful for pediatrics (e.g., WIPI test) and has some use with adults for phoneme error analysis (e.g., California Consonant Test)
    - Open set – unlimited # of stimulus alternatives
  - NU No.6 vs. CID W-22
  - Other materials
    - Nonsense syllables (e.g., CUNY-NST)
    - Sentences (e.g., HINT or QuickSIN)

SUPRA-THRESHOLD SPEECH TESTING

- MLV vs. Recorded
  - Inter-speaker and intra-speaker variability makes using recorded materials the test method of choice in almost all cases
  - Carrier phrase is included on recordings, so issue of whether or not to use is resolved; however, if MLV must be used, then a carrier phrase should precede each test word

SUPRA-THRESHOLD SPEECH TESTING

- Level(s)
  - Psychometric or performance-intensity function
  - Comparative study of presentation levels to determine which would result in maximum supra-threshold recognition scores for individuals with different hearing loss configurations (Guthrie & Mackersie, 2009)
  - Reminder: Masking is needed when the presentation level in the test ear is 40 dB above the BC threshold in the non-test ear (with supra-aural phones)

SUPRA-THRESHOLD SPEECH TESTING

- Full lists vs. Half-lists
  - Binomial Distribution Model (Thornton & Raffin, 1978)
    - critical differences for scores vary as a function of number of test items
  - Abbreviated Protocol (Hurley & Sells, 2003)
    - The 4 NU-6 10-word and 25-word screening tests were found to differentiate listeners with impaired word recognition ability (needing a full 50-word list) from those with unimpaired word recognition ability

SUPRA-THRESHOLD SPEECH TESTING

- Quiet vs. Noise
  - Monosyllabic words in noise
  - Sentences in noise (commonly used for hearing aid evaluation purposes)
    - HINT
    - QuickSIN

SUPRATHRESHOLD SPEECH RECOGNITION SCORES

- Whole word scoring vs. phoneme scoring
- Patient responses must be EXACTLY correct
- Various categorizations have been proposed to define performance on SRS, including:
  - 90 – 100 % = excellent or within normal limits
  - 78 – 88% = good or slight difficulty
  - 66 – 76% = fair or moderate difficulty
  - 54 – 64 % = poor or great difficulty
  - < 52% is considered very poor

MOST COMFORTABLE LISTENING LEVEL

- When testing for the most comfortable level/range, “cold running speech” is typically used, and the level is gradually increased as the patient listens and makes judgments about the comfort of the levels.
- Several trials are generally completed .
- As mentioned earlier, MCL may not be equivalent to level at which maximum intelligibility is obtained.

UNCOMFORTABLE LISTENING LEVEL

- As with MCL, “cold running speech” is the stimulus of choice. Patients are asked to signal when the stimulus becomes “uncomfortably loud.”

ACCEPTABLE NOISE LEVEL

- Acceptable Noise Level (ANL) is the amount of background noise a listener is willing to accept while listening to speech, and is related to successful use of hearing aids (Nabelek et al., 1991; Nabelek et al., 2006).
- Uses MCL and BNL (acceptable background noise)
- ANL = MCL - BNL

OTHER SPEECH APPLICATIONS & FUTURE DIRECTIONS

- (Central) Auditory Testing
- "Real World" Approximations

REFERENCES

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