SPEECH AUDIOMETRY
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In general, pure tone audiometry is performed in tandem with speech audiometry. Please refer to the previous section pertaining to the pure tone audiogram and pure tone audiometry for background information which will be helpful when considering speech audiometry.

Speech audiometry entails measurement of an individual’s ability to hear and understand speech. It has been well documented that speech understanding cannot be accurately predicted based upon pure tone thresholds. Often an individual with relatively poor pure tone thresholds performs surprisingly well on speech understanding tasks, either clinically or day-to-day. Alternatively, a person with relatively good or even normal pure tone thresholds may complain of difficulty hearing and understanding speech, or may exhibit unexpectedly poor speech discrimination in a clinical setting. Speech audiometry findings should be compared and contrasted to pure tone results.

Speech stimuli may be “monitored live voice” or pre-recorded materials, of which there are many available. Monitored live voice (MLV) means that the test stimulus is the tester’s voice picked up through a microphone, processed by the audiometer, and presented through a transducer (supra-aural earphones, insert earphones, bone conduction headset, speaker, etc.) at a specific intensity. On occasion a voice other than that of the tester may be used, for example with a child who may be quite shy about responding to a stranger’s voice but may respond readily to a parent’s voice.

RECORDED MATERIALS v. LIVE VOICE

In general, recorded speech materials are recognized as superior to MLV for a couple of reasons. First, the recorded material is calibrated to be presented at the intensity that is required based on the audiometer setting. With MLV, depending on the speaker’s voice, the signal may be slightly louder or softer than indicated on the audiometer intensity dial. Second, recorded material will always be the same, test session after test session. For example, if an individual is tested one day with the MLV of a young female clinician and then tested again at a later date by an older male clinician, can a valid comparison really be made between the two sets of data? Couldn’t differences in test scores be realistically attributed to differences in the test stimuli? Similarly, what if the first tester hails from the Northeast U.S. while the second tester is native of Japan who speaks English as a second language? Certainly these two clinicians will have different accents and even the same list of words will be pronounced quite differently. These types of variables are eliminated when using recorded materials. Recorded materials provide a standardized test signal. Another advantage to using recorded materials is the wide variety of materials available. For example, Spanish language words are often used by a tester who does not speak Spanish. The clinician can most likely determine if the patient is accurately repeating the recorded words even if the clinician doesn’t know what the recorded (and repeated) word means. Thus a valid speech test can be performed even in the presence of a language barrier. Additionally, recorded materials can be engineered in
a nearly limitless number of ways, for example with background noise at calibrated levels in the recording, to measure speech understanding in noise, or with certain elements of speech altered subtly to examine central auditory processing ability.

There a number of recorded materials that are available and have been in use for many years. Recorded spondee words and recorded monosyllabic words are those most commonly used. These recordings have been made at recognized institutions under industrial recording conditions and have been certified by the American National Standards Institute (ANSI). Recordings that have not been certified should not be used in standard audiometric testing. Sometimes, however, in certain situations where an individual does not respond to standard stimuli (e.g., children, cognitively handicapped individuals), non-standard stimuli may be used. This can include music recordings or recordings of environmental sounds such as telephone, animal noises, etc. Use of these materials is not standard or common but sometimes provides a “last resort” when looking for behavioral responses. This would not technically be considered “Speech Audiometry” and should be noted as “Non-standard Techniques.”

**SPEECH AUDIOMETRY**

There are two basic components of the speech audiometry test battery: Speech Reception Threshold and Speech Discrimination. “Speech Discrimination” is often also referred to as “Speech Understanding” or “Word Understanding.”

**Speech Reception Threshold**

The Speech Reception Threshold (SRT) is a measure of an individual’s ability to recognize and repeat familiar words from a closed set of words. Closed set means that there are a limited number of choices available and the patient is familiar with all of the choices. In general, SRT testing is performed using “spondee” words. Spondee words have two syllables with equal emphasis on each syllable in standard pronunciation. Examples of spondee words are “baseball,” “airplane,” and “playground.”

SRT testing will begin with patient instruction to “Please repeat these words.” More complicated instructions can be given but often best results are obtained after simple instructions. Typically SRT testing would start with a presentation of five spondee words presented at intensity high enough for the patient to hear and accurately repeat the words. Once the patient has demonstrated the ability to repeat the five words at high intensity, the intensity is lowered by 10 or 15 dB and words are presented at the lower intensity. The tester will be careful to randomize the presentation order of the words. If the patient is able to correctly repeat 50% (usually two of four) of the words at the lower intensity, the intensity will again be decreased. This will continue until the patient can no longer accurately repeat 50% of the presented words. The lowest level at which he or she can repeat 50% is the “speech reception threshold” or “SRT.”

There is a wide variety of test methods described in audiology texts for SRT testing.
The SRT has two basic functions. First, the SRT should agree with the patient’s “pure tone average (PTA),” which is the average of pure tone thresholds at 0.5, 1.0, and 2.0 kHz. Depending on the degree and audiometric configuration of the hearing loss, the SRT may not agree with the PTA but may agree with the average of 0.5 and 1.0 kHz (“Fletcher Average”). In any event, this should be used as a rough guide.

The second function of the SRT is to help determine the levels used for further speech audiometry testing, such as speech discrimination. It is standard to use a presentation level 40 dB above the SRT to present words for speech discrimination. Although there are valid reasons to use other presentation levels, this 40 dB SL (sensation level) presentation level is very common.

Another use of the SRT is in pediatric testing. Often children respond poorly or inconsistently to pure tone stimuli. This may be because pure tones (i.e. beeping sounds) are not particularly interesting to a child, who may lose interest after a couple of trials. Speech stimuli, particularly child-friendly words like “hot dog” and “ice cream,” may remain interesting for a longer period of time. Obtaining a speech reception threshold may be possible when obtaining pure tone data may not be. For children who cannot or will not repeat words, a picture pointing task may be used where the child will point to a picture of a hot dog, ice cream, etc in lieu of repeating the word. This will likely require the help of a second adult in the test room.

**Speech Discrimination**

Speech discrimination testing, also known as “word understanding” or “word recognition,” is an important addition to the overall audiological test battery. This is perhaps the most relevant test from the standpoint of the patient, who very likely came in for testing based on difficulty understanding speech in day-to-day conversations. Speech discrimination scores can give information on the peripheral and central portions of the auditory system and can also be helpful in counseling about, planning, and implementing intervention and management strategies.

Speech discrimination (SD) testing is generally performed at supra-threshold presentation levels as described above. That is, rather than seeking some type of threshold, the aim is to assess how well an individual can understand words that should be fully audible based on their level of hearing (as measured via pure tones and SRT). A level of 40 dB above SRT may be used, or other levels may be preferred, depending on the specific aims of the tester. The primary goal of SD testing is to determine how well a patient can accurately repeat a list of unfamiliar but audible words. Unlike with SRT testing, the list of words will be open, meaning that the patient has no idea what the stimulus word will be. The patient is not given possible words in advance, with the possible exception of a one- or two-word practice run to familiarize them with the task. Usually one-syllable words are used. Often a “carrier phrase” is used, for example “Say the word help.” In this example, “help” is the test word, and “Say the word...” is the carrier phrase. The carrier phrase is used to provide the patient with a forewarning that a test word is coming. Also,
the carrier phrase is helpful for the tester to monitor his or her own voice on the VU meter of the audiometer.

A standard list of mono-syllabic words used for speech discrimination will contain 25 or 50 words. Some lists and procedures are described for a ten word list. Obviously the greater number of words used the lengthier the test. Most testers will limit the test to 25 words per ear, at least for the initial test.

Speech discrimination is generally expressed in a percentage, as in “100% Speech Discrimination” or “Speech discrimination score (SDS) of 100%.” It is important to distinguish the “speech discrimination score” from “percentage of hearing loss.” The latter is rarely used by audiologists as it is considered to be an inaccurate, incomplete, or even invalid description of hearing loss. It would be an easy mistake for a patient to be told that they have a “Speech discrimination score of 80%” and for the patient to misunderstand themselves to have “80% hearing loss” or conversely a “20% hearing loss.” In other words, the test results, as always, need to be thoroughly and thoughtfully explained.

In some circumstances it may be desirable to do a second SD task, perhaps at a different intensity level or using a different type of speech stimuli. A more thorough discussion of different speech discrimination materials is beyond the scope of this course.

CONCLUSIONS

Speech audiometry testing is an important component of the audiometric test battery. Speech discrimination in particular can be useful in counseling a patient in terms of the real-world trouble they may be having with speech understanding and may be helpful in predicting performance with hearing aids or other amplification devices. A pure tone audiogram is vital to determine an individual’s hearing for specific frequencies but that information cannot be used to predict the same individual’s ability to understand speech.