

SPEECH ASSESSMENT OF THE DEAF ADULT

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The basic purpose of any diagnostic procedure in speech and voice is to determine the speaker's relative competence or incompetence in communication. When disorders are encountered, an organized evaluation is undertaken to identify the nature of the problem. Once this is accomplished, the speech specialist is in a favorable position to outline a reasonable course of training to remediate the problem.

Procedures used at NTID to assess the speech and voice of deaf students were designed to fulfill this basic purpose and to meet other special requirements dictated by the peculiarities and complexities of this institution and its' student body. The other "requirements" are these:

1. The diagnostic procedures must serve to check the validity and reliability of intelligibility ratings derived for screening purposes.
2. The diagnostic procedures must be organized to accumulate detailed speech and voice information which will define the characteristics of the NTID population and thereby determine the character of the training program needed.
3. Because students are deaf, other requirements in assessment are imposed to facilitate a broad understanding of the student's current communication status and his prognosis for improvement. These requirements relate to his preferred mode of communication, use of amplification and his attitude toward speech.

Finally, additional requirements in assessment are dictated by the enormity and heterogeneity of the clinical load and by the clinical research responsibility assumed at NTID. The system used in assessment also must provide for computer storage and retrieval of detailed information. This is required: 1) to determine progress or regression in speech behavior over the long term; 2) to provide rapid identification of students with similar speech or voice problems; and 3) to provide data which may be correlated or studied in relation to other communication parameters such as speech discrimination, lipreading skill, or writing performance.

The paper requirements for assessment include: the speech and voice diagnostic form, the articulation test, and an attitudinal questionnaire. The real requirements for assessment are a wholesome clinical attitude, understanding of deafness, a well-trained ear, competence in manual communication, and knowledge. In essence, disorders in speech, voice, and oral language usage must be identified and inter-

puted relative to the impairment in functional hearing, (aided or unaided), and relative to the individual's functional usage of English, if an intelligent prognosis or plan of therapy is to be developed.

In initiating the assessment procedure, the situation is structured to permit rating of intelligibility. The rating scale utilized is the same as described for profile assessment. (See the paper by D. Johnson, published within these proceedings.) The circumstances in this assessment differ in that there is face to face confrontation providing visual clues for reception, the voice is live, rather than recorded, and the utterances are generated by the student not read. Both of these factors have been found to significantly influence intelligibility ratings.*

The rating scales used in the Communication Center represent five levels of performance. Generally, the rating of 5 indicates appropriate, near normal performance. A rating of 1 indicates a poor level of performance, or the presence of a severe problem. The intervening ratings of 2, 3, 4 designate progressive gradation between the extremes of poor and good performance. The speech and voice diagnostic form (See Attachment 1) follows this format, with descriptors for each rating presented for each characteristic to be evaluated.

Two ratings of pitch are secured, one for pitch register and the other for pitch control. Loudness and loudness control are also rated. This rating is included even though pitch and intensity tend to fluctuate concomitantly because intensity cannot be appropriately identified from tape recordings. A weak voice is recorded at a higher recording level to assure an appropriate signal for intelligibility assessment in profile use.

In addition to ratings for pitch and intensity, rate of syllable articulation, respiration during speech, and prosodic features are rated. Deviant quality is identified and rated in terms of degree - mild, moderate, or severe. Notations are also made relative to the student's preferable mode of communication and hearing aid usage. After completion of this portion of the assessment, an articulation test is administered. The test utilized is the Fisher-Logemann Test of Articulation Competence (1971). This test was selected because it facilitates tabulation of errors by distinctive features, thus making the articulation data more directly applicable to audiological information, such as phoneme discrimination. In addition to categorizing errors, the number of voicing errors and the number of stimuable phonemes are recorded. The stimuable phonemes are also noted on the diagnostic form to assist in deriving the prognosis for speech improvement.

*Intelligibility is generally rated higher or better when visual cues from the speaker are provided. Intelligibility of conversational or self-generated speech is generally rated lower or worse than speech produced in oral reading. The apparent explanation for this difference resides in the student's difficulty in generating appropriate English for conversational purposes when orthographic cues are not presented to assist his articulatory efforts and when the message is not structured appropriately in English.

The questionnaire, referred to earlier, was developed to get an index of student's motivation to improve speech, to gain some impression concerning the relative value he places upon oral communication, and to explore his concept of his own competence in speech and lip-reading. Previous study initiated at NTID has indicated that extroversion and independence are rather good predictors of speech improvement in therapy. For this reason, several questions are posed to explore these areas, hoping to assist in prognosis.

Some of the characteristics of NTID in-coming students may be reported briefly to illustrate the use of the diagnostic speech and voice analysis described. Approximately 13% of the students entering NTID in the Summer of 1972 had an inappropriate pitch register. Eighteen percent were unable to control pitch. Almost 20% had marked or severe problems in coordinating respiration and phonation to support tone. Ten percent had major problems in controlling the rate of syllable articulation. As would be expected from the previous data, 30% of the in-coming students had major problems in managing the prosodic features of speech.

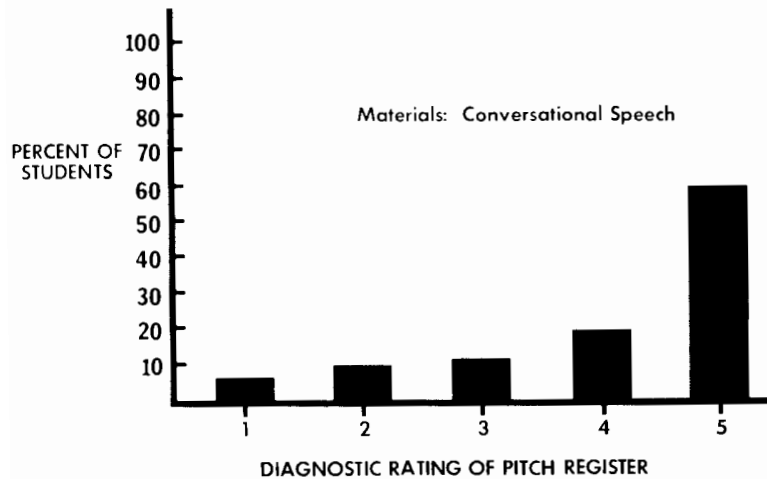


Figure 1. Distribution of ratings for pitch register (N = 162 students entering NTID Summer, 1972)

The rating scale for pitch register is defined as follows:

1. cannot sustain phonation;
2. much above (+) or below (-) optimal level;
3. moderately above (+) or below (-) optimal level;
4. slightly above (+) or below (-) optimal level;
5. appropriate for age and sex

If only severe degrees of quality deviations are considered, slightly less than 10% are affected by disturbances in quality identified as breathy, tense, or distorted in nasal resonance. Articulation error averaged 32% with huge standard deviations of 21 or 22, as would be expected here at NTID.

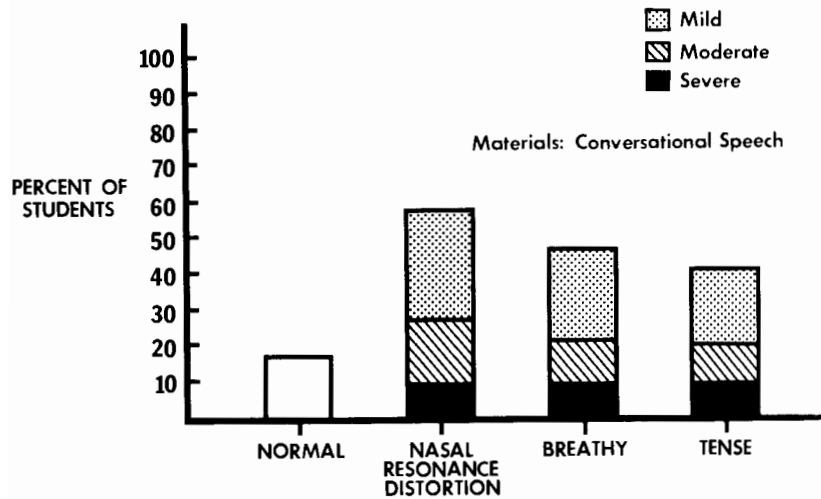


Figure 2. Distribution of ratings for voice quality (n = 162 students NTID Summer, 1977)

A major point of interest is to study the many facets of the total speech picture as they relate to intelligibility. In this regard, the highest correlation was found to exist between measures of articulation error and intelligibility rating ($r = .80$). This provides some reassurance that our present profile rating of intelligibility is valid.

Normal speech and voice production are generated by a complexly integrated biological system under precise central nervous control. The component parts of that system and their respective contribution to the total output cannot reasonably be considered separately. Functions of respiration, phonation, articulation, resonance and neural control are inter-related. In most individuals, the precision needed to operate the system is learned effortlessly by ear, with perpetual monitoring provided. This basic fact, coupled with some knowledge of physiological phonetics, renders the speech and voice pattern characteristic of the deaf quite comprehensible. Positive and significant correlations with intelligibility have been obtained for many of the speech related ratings including respiration during speech and prosodic features.

Characteristics of deaf speech and voice including aberrant articulation, pitch, quality, intensity and prosody, are commonly acknowledged by experienced educators of the deaf. New staff, especially in the NTID Communication Center need: 1) exposure or orientation

to the full range of speech and voice characteristics of the deaf; 2) training in the accurate identification and quantification of discreet yet inter-related characteristics of speech and voice; and 3) the ability to correlate identifiable features in speech with reasonable therapeutic procedures. Such comprehension generally is derived through years of experience.

In efforts to instruct and improve diagnostic skill of new members of the NTID speech staff, a tape recorded instructional package has been developed. The training tape, Part I, includes a description of the rationale, principles and procedures used to evaluate speech and voice, individual speech samples to represent the various parameters evaluated, and a script to accompany each recorded sample. The practice tape, Part II, presents instructions to the listener to rate subsequent recordings of 100 samples of deaf speech.

Although we have had limited opportunity to evaluate these training materials, at the present time it appears that the instructional package does improve diagnostic skills of the speech staff, thus assuring effective identification of all students in need of specialized speech and/or voice training.

In sum, the speech and voice diagnostic form and the procedures described have proved to adequately fulfill the specific needs at NTID. The individualized information gained is considered in conjunction with other data relative to the student's auditory function and his functional usage of English in writing and reading before establishing prognosis for improvement in speech and before designing a program of speech and/or voice training. The principles applied in selecting the targets for correction and the techniques employed in therapy are discussed in the paper by Ms. J. Smith included in these proceedings.

REFERENCES

Fisher, H & Logemann, J. *The Fisher-Logemann Test of Articulation Competence*. Boston: Houghton Mifflin Co., 1971.

**NTID COMMUNICATION CENTER
SPEECH AND VOICE DIAGNOSTIC FORM**

Date: _____

Student: _____ Sex: _____ Age: _____ Therapist: _____

School attended before entering NTID: _____

Intelligibility of two minute conversation utilizing visual cues of the face.

- 1 Speech cannot be understood.
- 2 Speech is very difficult to understand—only isolated words or phrases are intelligible.
- 3 Speech is difficult to understand; however, the gist of the content can be understood. (Intelligibility may improve after a listening period.)
- 4 Speech is intelligible with the exception of a few words or phrases.
- 5 Speech is completely intelligible.

Pitch Register—If pitch register is judged to be below optimal, mark rating with a (-).

- 1 Cannot sustain phonation.
- 2 Much above or below optimal level.
- 3 Moderately above or below optimal level.
- 4 Slightly above or below optimal level.
- 5 Appropriate for age and sex.

Pitch Control

- 1 Cannot sustain phonation.
- 2 Noticeable breaks or fluctuations of large magnitude.
- 3 Noticeable breaks or fluctuations of small magnitude.
- 4 Flat within limited speaking range.
- 5 Normal—satisfactory modulation of pitch.

Loudness—If loudness is judged to be below an appropriate level, mark rating with a (-).

- 1 Cannot sustain audible tone.
- 2 Much above or below appropriate level.
- 3 Moderately above or below appropriate level.
- 4 Slightly above or below appropriate level.
- 5 Normal intensity level.

Loudness Control

- 1 Cannot sustain audible tone.
- 2 Noticeable breaks or fluctuations of large magnitude.
- 3 Noticeable breaks or fluctuations of small magnitude.
- 4 Flat within limited speaking range.
- 5 Normal; satisfactory modulation of intensity.

Rate—If rate is too rapid for efficient communication, mark rating with a (+).

- 1 Cannot control rate of syllable articulation.
- 2 Much too slow—labored single syllable utterances. Rate definitely interferes with content of communication.
- 3 Moderately below optimal rate for efficient communication.
- 4 Slightly below optimal rate, but monitored well for clarity.
- 5 Normal.

Control of Air Expenditures During Speech

- 1 Severe problem—cannot coordinate respiration and phonation to sustain tone.
- 2 Marked excess or deficiency in air expenditure.
- 3 Moderate excess or deficiency in air expenditure.
- 4 Slight excess or deficiency in air expenditure.
- 5 Normal.

Breath Control (Record average of three trials)

- 1 Maximum duration of sustained /s/ _____ seconds
- 2 Maximum duration of sustained vowel _____ seconds
- 3 Counts on one breath, number _____.
(Provide count model 3 digits per second.)
"Count as far as you can on one breath."
- 4 Number of words per minute, in reading _____.
(Record data from second trial).

Prosodic Features—Blending, Stress and Inflection

- 1 Cannot evaluate.
- 2 Severe problem.
- 3 Moderate problem.
- 4 Mild problem.
- 5 Normal.

Voice Quality

Breathy, weak, lacking clarity:

- 1 Voice quality varies or is too weak to judge.
- 2 Severe breathiness.
- 3 Moderate breathiness.
- 4 Mild breathiness.
- 5 Normal quality.

Tense, harsh:

- 1 Vocal tension too great to sustain tone.
- 2 Severe tenseness.
- 3 Moderate tenseness.
- 4 Mild tenseness.
- 5 Normal quality.

Resonance:

- 1 Severe resonance variations cannot be judged.
- 2 Severe denasality or hypernasality.
- 3 Moderate denasality or nasality.
- 4 Mild denasality or nasality.
- 5 Normal resonance.

Mode of Communication

- 1 Uses writing instead of speech or manual communication.
- 2 Signs, fingerspells and gestures without voice.
- 3 Signs and fingerspells frequently with voice.
- 4 Resorts to signs and fingerspelling occasionally during speech.
- 5 Uses oral communication habitually.

Hearing Aid none _____ monaural _____ binaural _____.

Number of Stimulatable phonemes _____ Identify _____.

Condition other than hearing impairment which may influence prognosis for speech improvement. Comment: _____

Prognosis for Speech Improvement: Excellent _____ Good _____ Fair _____ Poor _____

Prognosis for Voice Improvement: Excellent _____ Good _____ Fair _____ Poor _____

Recommendations for speech therapy in order of first, second and third priorities: _____

- 1 _____
- 2 _____
- 3 _____