SPEECH AND VOICE THERAPY AT NTID

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At NTID, the speech staff of the Communication Center all work together to define the speech and voice characteristics of each individual student, to develop programs beneficial to students with varied levels of comptetence, and to continually evaluate and revise the course offerings. The basic job is to build a broad speech training program, flexible enough to fit the needs of each individual.

Students entering NTID are carefully evaluated relative to hearing, speech, lipreading, manual communication, and language competence. By studying the results of communication testing, it is assumed that students who have some auditory discrimination with amplification should be at least semi-intelligible. With the assistance of the computer, it is now possible to identify those students who have good potential for speech improvement. That is, they have better hearing with amplification than is reflected by their speech performance profile.* For these students, individual training is available on a two hour a week basis for a minimum of two consecutive quarters. Students in need are counseled and encouraged to participate in individual speech training. In the past, approximately 110 students have received individual speech training each quarter. Continuation in speech training after two consecutive quarters is dependent upon the student's progress and motiviation. Progress is evaluated by studying speech recordings which are made before and after therapy.

Although several types of small group speech instruction are offered (interpersonal communication, pronunciation, technical communication, etc.), the major activity of the Speech Service Section involves individual speech therapy. Student questionaires have provided information which demonstrates that students prefer individual rather than group instruction. Clinical studies at NTID are in agreement with the concensus of professional opinion that improvement in speech is greater when training is provided on an individual basis.

TARGET SELECTION. The type of the training provided in individual speech instruction is dependent on need, auditory discrimination ability, and language level. Several factors are taken into consideration in selecting the targets for correction. Among these factors are:

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*See Dr. Johnson's paper *"Communication Characteristics of NTID Students"*, for a complete discussion of the Profile rating systems as employed at NTID.

1. *Stimulability* - Phoneme errors which can be improved or corrected as a result of stimulation will probably show the most rapid improvement;
2. *Frequency of occurrence in conversational English*—In general, it is felt that the greatest improvement in intelligibility will be attained if consistent accurate production can be achieved for the six consonants which appear most frequently in conversational English. Targets for the correction, therefore, will generally involve consonants /t/, /n/, /s/, /d/, /l/ and /m/ (Denes, 1963);
3. *Language Level* - Knowledge of a student's language level helps in determining which materials will be appropriate and meaningful to the student, thus facilitating carry over;
4. *Auditory functioning and discrimination ability* - If a student is able to perceive a sound aduitorally, he has a much better chance of attaining correct production. A test of the student's ability with phoneme discrimination would be particularly valuable in selecting targets for correction;
5. *Visibility and complexity of the phoneme* —Visibility provides added clues particularly for the student who has little auditory discrimination;
6. *Distinctive feature analysis* - Students who exhibit a pattern of errors as it relates to a given distinctive feature might begin work on that feature using phonemes he can produce and progressing to those he cannot. In correcting a particular aspect of the process of articulation, an effort is made to correct a set of related errors;
7. *Motivation* - Students who display a desire to improve seem to progress at a faster pace than those who exhibit a lock of motivation.

SPEECH THERAPY. For students with a low level of language ability, instruction begins by using the phoneme targets which have strong visual clues. The selected targets are used in nouns, first in the initial postion, then in the final and medial positions. This is followed by drill and practice in two word utterances consisting of an article with the noun. Later, utterance length is increased to include verbs, objects and adjectives to complete the sentence structure. Verb tense and complexity of grammatical usage are determined by the language level of the student with material presented in order of increasing difficulty. In this sequencing, it is of particular concern to do everything possible to train appropriate prosodic features, as well as articulation, in an effort to avoid the individual word utterances which are often associated with "deaf speech". Use of functional word groupings also tends to develop better respiratory and phonatory control for continous speech prodcution and assists in the reinforcement of lipreading and English instruction. The use of amplification is encouraged for all students. Even those students who do not have good auditory discrimination for speech can pick up clues related to duration, stress

and other prosodic features through the use of amplification.

At NTID, target selection for students who have more functional hearing is less dependent on visible features and more influenced by the acoustical features of the phoneme and the characteristics of hearing. If these students have a higher level of language ability, including a better vocabulary, more complex language structures may be used in training. With this group, rigorously structured therapy is used to correct articulation errors with conversational practice employed to refine prosodic features.

Previous research designed to study variables which effect speech intelligibility revealed NTID students (n=50) were judged significantly better when reading than when speaking spontaneously in response to a pictorial stimulus. On the average, ratings for reading were almost one profile rank higher (3.58) than the ratings based upon spontaneous speech (2.80). The apparent explanation for this difference resides in the students' difficulty in generating appropriate English for conversational purposes. Since adequate communication in social, academic and vocational situations requires intelligible speech generated spontaneously, not read, a specific program and facility to improve conversational speech intelligibility is needed.

This need is particularly pressing for the intelligible student (profile 4) during reading. Whereas this student is intelligible when orthographic cues assist his articulatory efforts and when the message is structured appropriately in English, many times he is unintelligible in conversation because of deficiences in his spoken usage of English. This student intelligible during reading, may also be identified by poor performance on tests of reading comprehension and writing, which may indicate faulty understanding of grammatical structures and many words.

A review of 132 NTID students with intelligible speech (profile 4 or 5) revealed that 61% had associated profiles of 1, 2, or 3 in Reading Comprehension as measured by CGPP (Comparative Guidance and Placement Program). On the basis of this data, it appears that over half of intelligible speakers have a faulty language base as reflected in reading comprehension; hence, their intelligibility in conversation might well be considerably lower than indicated by the profile.

A program of therapy with appropriate material for working with this group is being developed. This Program emphasizes an auditory approach utilizing the simultaneous "listening, reading and speaking" technique as described by the Ewings (1971) and by Dale (1969). Before and after therapy, speech recordings and written language samples will provide date which will permit: a) an evaluation of improve-in spontaneous speech as a result of this therapy and b) a comparative study to determine if the therapy technique utilized had a secondary or favorable effect upon the student's writing performance.

VOICE THERAPY. According to diagnostic evaluations performed at NTID, thirteen percent of the entering students (1972-73) have

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pitch registers grossly inappropriate for age and sex with an associated inability to control pitch. In general, this group of students is characterized by profound hearing loss, faulty coordination of respiration and phonation, and an inability to manage the aerodynamics of the breath stream for intelligible speech production. These features indicate a need to improve voice production which is considered a prerequisite to articulation training. For this group of students, a program of therapy to improve vocal pitch register and control has been designed. The training sequence attempts to make maximum use of tactile, kinesthetic, and propricoceptive feedback without neglecting the visual and auditory systems.

This program of instruction was developed to lower pitch and generate a more relaxed tone by lowering the position of the larynx during phonation. Development of the deaf student's perceptual awareness of laryngeal height and tension associated with the undesirable pitch level is critical to the success of the program.

Before therapy is initiated, manual communication, graphic, and written materials are used to make sure the student fully understands the basic concept of voice production, pitch level, and the purpose of the training program.

Specific objectives for the student in training are as follows:
1. To become aware of the vertical shifting of the laryns during swallowing;
2. To become aware of changes in the therapist's laryngeal height during phonation of vowels at high and low pitch levels;
3. To become aware of changes in the height and tension of his own larynx as he changes vocal pitch;
4. To voluntarily produce low and high pitch levels during sustained vowel phonation and during syllable repetition;
5. To stablilize self-monitoring of vocal pitch during production of syllables, words and phrases;
6. To increase the duration of relaxed phonation.

Vowels /a/, /i/, and /u/ have been selected for use in therapy because their durational and distinctive visual characteristics facilitate accurate production. In addition, the /a/ requires a maximum shift in mandibular positioning which is considered beneficial in relaxing supralaryngeal and jaw musculature. The consonants /m/, /w/ and /l/ are combined with each of the vowels in VC, VCV, and CV combinations. These syllables provide for continuous vocal fold vibration and other strong visual cues, while requiring minimal precision in aerodynamic control.

Students receive two hours of therapy each week. To evaluate the effectiveness of the training program, speech materials including sustained vowels, sentences and a continuous speech passage are recorded before and after therapy. Improvement in pitch has been found to have the most desirable side effect of improving intelligibility. The results of the NTID training program for gaining satisfactory pitch register and control have been evaluated by listener judgments

and by acoustical measures of the fundamentals of voice before and after training. This study has increased confidence in the conviction that pitch control can be learned by most NTID students who have no usable hearing.

An analysis of the speech and voice characteristics has shown that 45% of entering NTID students are intelligible. Some of these intelligible speakers do not need further individual work to improve and refine speech. However, many intelligible students need a great deal of practise in conversational speech if they are to achieve a satisfactory level of oral communication. To provide this practice, materials have been written to reinforce proper pronunciation, grammatical usage, lipreading skill and auditory discrimination. The materials used in Individual Therapy with the semi-intelligible or intelligible students emphasize content which is commonly confusing or difficult for deaf students, yet highly relevant to the student's present communication needs. Therapy in this instance, is cast within a conversational format to gain maximum practice in oral expression whicle reinforcing receptive skills. This type of practice is found to be of high interest level for NTID students.

Because of the heterogenity of the NTID student population, individual diagnostic information must serve as a basis for planning each student's communication program. Individual training programs must differ in the primary area of focus and be directed by the speech, hearing and language competence of the student. In therapy, the tape recorder and the auditory trainer are basic tools. The EFI Audio Flash Card Readers, with amplification, are used whenever possible.

SUMMARY. Ultimately, the speech pathologist must develop the ability to correlate identifiable features in speech and voice with reasonable therapeutic procedures. There is much that is known in this regard, and much which unfortunately remains unknown. The Speech Service Section at NTID is presently involved in clinical studies designed to provide information which will ultimately help strengthen the speech program.

Clinical studies conducted at NTID have demonstrated that many students are making significant gains in speech. In the future, it is hoped that the NTID Speech Service Section can increase its effectiveness by refining training techniques and by becoming more astute in identifying students who have the potential and the motivation to achieve intelligible speech.

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