

## **SPEECH AUDIOMETRY — SPECIAL REMARKS**

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During the past fifteen years, the use of speech audiometry in clinical practice has increased and includes a large variety of speech materials and methods in many different languages. The purpose of the present remarks is to call attention of practitioners to some of the theoretical bases of speech audiometry and some of the limitations that surround its use, both in audiological diagnosis and in everyday social or medico-legal evaluation.

Perhaps the most common use for speech audiometry is the measurement of the speech reception threshold or hearing level for speech, defined as the number of decibels between the level of presentation of particular speech material required by a patient who must respond correctly to approximately one-half of the items, and the similar level that is required by the normal listener. Although the absolute values of the threshold for normal listeners vary somewhat depending upon the type of speech material and the language, it is doubtful that the hearing level or difference between a patient's threshold and the comparable normal threshold will depend upon either of these factors. If this particular aspect of speech audiometry appears to be too time-consuming in clinical practice, its value is very doubtful except as a check on routine pure-tone audiometry because this result can be predicted very well from averaging the thresholds for 500 and 1000 cps or the thresholds for 500, 1000 and 2000 cps.

The second most frequent aspect of speech audiometry is the measurement of a patient's ability to discriminate the sounds of speech. Actually we rarely measure this phonemic discrimination directly because it is too difficult to define appropriate responses to individual phonemes or nonsense syllables, and the inclusion of the phoneme or phoneme groups within meaningful words appears to carry a certain amount of validity. The measurement of discrimination or discrimination loss probably does depend upon the language and certainly depends upon the type of speech material used. The speech materials in the several languages are most different in these discrimination tests.

In addition to these two basic measures of speech audiometry, recent years have seen the introduction of more complicated tests involving the presentation of speech against a background of noise or competing speech, the filtering of speech so that low frequencies go to one ear while high frequencies go to the other, and the use of longer speech units like sentences to evaluate in a more valid way the everyday hearing ability of a patient.

Speech audiometry has been helpful in diagnosis but not all cases can be

decided unambiguously on the basis of speech audiometry. The use of speech as a stimulus in hearing tests whose purpose is the location of a lesion or pathology in the auditory system is really an intermediate step. We should prefer to utilize psycho-acoustic tests whose dimensions are most directly related to known functions of various parts of the auditory system. Since our knowledge in this area is so incomplete, however, we utilize speech on the assumption that within the complexities of the speech message will be found most, if not all, of the requirements of good auditory discrimination. Here we include the discrimination of frequency in, for example, the formants that distinguish the vowels, the discrimination of duration in the ability of a listener to separate fricatives from plosives, the discrimination of spectrum in the ability of a listener to identify different kinds of fricatives, etc. These particular kinds of discrimination cannot be separated easily one from another so long as the stimulus materials are actually speech messages.

On the other hand, the use of speech has given us some feeling that we were testing the auditory system with the kind of sound patterns to which it is normally exposed in everyday life, particularly those everyday lives that are spent in communicating with other individuals. The assumption has been made that those clinical measures in speech audiometry that were found most useful in making diagnoses concerning auditory disability could be taken over and utilized to evaluate the status of an individual's hearing for social or medico-legal purposes. This is not the case.

The consensus of medical and legal opinion in the United States is that the evaluation of a man's hearing for purposes of assigning compensation in cases of industrial hearing loss should be based upon the man's ability to understand speech. Can the usual speech audiometric measures specify such an ability? To say that he has a hearing level for speech of 40 db cannot suffice because the decibel is not a unit on the scale of disability. Neither can the statement that he has a discrimination score of only 60%, because that percentage scale is a different one from percentage of disability, and furthermore the score is obtained at a fixed level above the man's threshold which might be quite high to begin with.

But, the most talked-about difficulty was the fact that the two-syllable spondee words and the monosyllabic words used in English to measure respectively hearing level for speech and discrimination score were not thought to be valid representations of everyday speech. Speech occurs usually in phrases and sentences - not in the form of single words. A sample of English sentences was created that were representative of conversational speech with respect to sentence length, sentence mood, vocabulary level, and variety of talkers. How was the sample to be used? The hearing level for sentences would still be a result on the decibel scale and not different from the word threshold. Furthermore, almost none of the industrial hearing loss cases showed a discrimination loss for these sentences when they were repeated 20 or 30 db above the threshold. What was not planned for and is still not known is the quantification of everyday hearing along with everyday speech. Even if we could devise a method for assessing hearing ability with these sentence materials, we would still have to complicate it with different

levels of noise background, different numbers of competing talkers, and different listening situations in order to synthesize in any meaningful way everyday hearing.

At the moment, then, the usual forms of speech audiometry represent only an intermediate and unsatisfactory step in which the stimuli are not analytic enough to tell us about specific psycho-acoustic dysfunction nor are they general and valid enough to predict the listener's everyday hearing ability. It is to be hoped that future developments in speech audiometry will lead from present practice in both of these directions: one toward a more realistic prediction of socially useful hearing and the other toward analytic testing of separate functions of the auditory system, perhaps even with the use of non-speech stimuli.

### **AUDIOMETRIE VOCALE - REMARQUES SPECIALES**

L'audiométrie vocale est très utilisée dans plusieurs langues mais elle a des limites dans le diagnostic et dans l'évaluation sociale ou globale.

Le déficit auditif vocal ne varie probablement ni selon les matériaux phonétiques, ni selon les langues différentes. Il confirme le déficit auditif pour les fréquences de 500 et 1 000 c/s, ou 500, 1 000 et 2 000 c/s, et alors n'a pas une valeur très grande.

La discrimination phonétique est une partie très importante de l'audiométrie vocale. Notons, cependant, que nous ne faisons pas cette mesure directement parce qu'il est plus simple d'utiliser les phonèmes dans les mots. C'est une combinaison de la discrimination phonétique et de la perception linguistique.

Récemment, nous avons vu l'introduction d'autres tests avec la méthode de masquage par le bruit ou par d'autres locuteurs. Ces tests me semblent être des tentatives d'une évaluation plus valide et plus représentative de l'audition ordinaire. Mais certainement ce ne seront pas les mêmes matériaux qui conviendront le mieux aux deux buts — le diagnostic et l'évaluation sociale. La langue ordinaire ne se présente pas dans les mots singuliers, mais dans les phrases.

Nous avons fait un matériel représentatif de la langue quotidienne quant à la longueur des phrases, le vocabulaire, les locuteurs, etc. Mais un problème demeure — nous ne savons pas comment on mesure l'audition ordinaire, après avoir fait un échantillon représentatif de la langue ordinaire.

Le déficit auditif se mesure en décibels, mais la capacité auditive ne peut pas se mesurer en décibels. De même, le pourcentage de la discrimination n'est pas le même pourcentage que celui de la capacité auditive.

L'avenir nécessite deux sortes de développements:

- (1) l'utilisation d'autres sons, pas les sons de la parole, pour mesurer la fonction des parties du système auditif;
- (2) la mesure de l'audition quotidienne avec les sons quotidiens.

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