STANDARDIZATION OF NU AUDITORY TEST No. 6 ON AN ENGLISH SPEAKING INDIAN POPULATION*

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INTRODUCTION :

The process of communication involves a sender, a transmitter and a receiver. In case of speech communication, speaker is the sender and listener is the receiver The listener is the focus of attention in clinical audiology. A listener's ability to receive and perceive sounds are tested using pure tones noise and speech signals.

Speech materials are normally used to supplement pure tone testing and are indispensable in clinical audiological evaluation. Speech signals are used to determine the level of detectibility, the level of intelligibility and the speech discrimination code.

Speech stimuli used in audiological evaluation range from non-sense syllables to sentences. While the former have the disadvantage of being meaningless and therefore confusing, the latter have the disadvantage of being highly redundant (Carhart, 1965). Monosyllabic words have the advantage of being meaningful and at the same time they are non-redundant.

NU Auditory Test No. 6 employs monosyllabic English words to test speech discrimination. The test has been standardized elsewhere (Tillman and Carhart, 1966). Before administering the test on Indian speakers/listeners of English one needs to confirm its utility on the population under consideration. Therefore, the present study aimed at evaluating the performance of normal hearing Indian speakers/listeners of English on NU 6.

METHODOLOGY :

The methodology was planned to answer two questions: whether discrimination score increased with increase in the sensation level and whether the four lists of NU 6 Form A were similar.

Subjects : The study employed 40 subjects in the age range of 17 years to 24 years. The median age of the subjects was 21 years 4 months. The subjects were either undergraduate or graduate students of the University of Mysore. Each subject had to meet the following criteria to be selected to the study :

(i) The subject should have had English as the medium of instruction atleast for five years.

(ii) He/she should pass the two English tests employed in the study.

(iii) He/she should have a negative history of ear diseases and head injury.

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(iv) He/she should have an air conduction threshold of less than 20 dB at frequencies 250 to 8000 Hz. (ANSI 1969) in both ears.

The subjects included in the study represented fourteen Indian languages. Twentynine of them spoke languages from the Dravidian family and the rest eleven spoke languages from the Indo-Aryan group.

Materials : Two kinds of materials were employed viz., English tests and the speech material.

One of the English test was " A Test of English Ability " constructed at the Central Institute of English and Foreign Languages, Hyderabad. The other was " A Test of Vocabulary Range " (Lewis 1978).

The speech material employed in the study comprised of spondees from CID W-1 (List A) and CNC Monosyllables of NU 6 Form A.

Recording Procedure : The word lists were recorded in a quiet room using a tape recorder (Philips Pro' 12) with a stereo microphone (Philips LBB 9050/05) The recording was made on magnetic tapes at a speed of $7\frac{1}{2}$ i.p.s. The recording was made by an young adult male talker who spoke English for over 10 years.

Each spondee was preceded by a carrier phrase "You will say ...". Between two successive spondees a silent interval of 5 second was given to allow for an oral response. The monosyllabic words were recorded in a similar way, but the silent interval was increased to 8 seconds to permit a written response.

The tapes were then played on a stereo tape recorder (Sonnett ST 480). Its output was given to a level recorder (B & K 2035) and the peak average was computed for each list. A 1000 Hz. tone was then recorded from a Beat Frequency Oscilator (B & K 1022). The level of the 1000 Hz. tone was at the level of the peak average. The maximum deviation of any given peak with reference to the 1000 Hz tone was within $\pm$ 0.5 dB for lists I,III and IV and within $\pm$ 1.0 dB for list II.

Test Environment : All the measurements were done in a sound treated two room situation. The noise levels were measured with a Sound Level Meter (B & K 2209) with a condenser microphone (B & K 4165), and was found to be within permissible limits.

Test Procedure : The subject's air conduction threshold was first obtained. Speech Reception Threshold was then obtained. Later the discrimination score was determined. The tape recorder gain was adjusted so as to peak the 1000 Hz tone at VU'O' on the audiometer, before presenting the speech material.

Discrimination score was obtained at five presentation levels, viz., 8, 16, 24, 32, and 40 dB re: SRT. While all the four lists were heard by each subject, only four of the five levels were employed while testing a given subject. The list and sensation level combinations were worked out using a random number table. None of the lists nor levels were repeated for any subject. Eight subjects were assigned for each list-level combination. Of them, four heard the word lists in the left ear and four in the right ear. Written responses were taken. The data sheets were analysed on a "Right" basis. A weightage of 2% was given for each word.

RESULTS AND DISCUSSIONS :

The scores obtained were analysed to obtain mean and medium scores and the standard deviation. ANOVA was computed to check for the effect of level, list difference and their interaction, on discrimination score.

The results of the statistical analysis indicated the scores increased with increase in sensation level. The scores, however, failed to show a plateau indicating a probable increase in scores at higher sensation levels.

Variability in the scores reduced with increase in the level. The increase in the discrimination score and reduction in the vaiability with rise in the level is in consensus with the results obtained by Rintelmann, Schumaier and Jetty (1974). However, the mean and medion scores obtained by the subjects in the present study were lower than that of their subjects.

The slopes of the articulation function for the four lists were 2.2%/dB (List I), -0.18%/dB (List II), 0.43%/dB (List III), and 2.9%/dB (List IV). The slopes are slightly lower than those obtained by Rintelmann, Schumaier and Jetty, (1974).

Results of ANOVA indicated that both the level and the list-differences were significant. The latter i. e., a significant difference between lists is contradictory to the findings of Rintelmann, Schumaier and Burchfield, (1974) and of Schumaier, Penley and Rintelmann (1974).

The difference between the results of the present study and those of the previous studies could be explained in terms of the effect of familiarity and of frequency of occurrence of words and that of talker difference on speech discrimination and based on the outcome of cross-language studies on speech perception.

It has been observed that words which are more familiar to the subjects tend to be more intelligible too (Oyer and Doudna, 1960). Owens, 1961; Schultz 1964). It is possible that the subjects in the present study were less familiar with the test words than were the native speakers. However, it appears preferable to employ a test with a slightly lower familiarity than to use one with highly familiar items, as a test of the latter kind could result in spuriously high discrimination scores (Schultz, 1964).

Similar to the effect of familiarity on speech discrimination is that of frequency of occurrence of words. An increase in the frequency in the occurrence of a word would increase the probability of the word being discriminated correctly (Rosenzweig and Postman 1957; Savin, 1963). The influence of frequency of occurrence of words on speech discrimination reduces with increase in sensation level (Savin, 1963). An increase in the scores with the sensation level was observed in the present study also. This could be partly attributed to the reduction of the influence of frequency of occurrence of words or intelligibility, with increase in level.

Talker difference could be yet another factor that may be used to explain the difference between the results of the present study and those of the previous studies. Talker difference has been found to affect the speech discrimination significantly (Kruel, Bell and Nixon, 1969; Hood and Poole, 1980). However, when results obtained by Nikam (1974) on Indian subjects living in the U. S. and by Sood (1981) on Indian subjects living in India are considered talker difference does not seem to be the explanation for the difference in the results. In both these tudies, which employed a talker different from that of the present study, the subjects obtained poorer scores than the native speakers.

Results of cross-language studies on speech perception indicate that the first language of a given subject influences his perception of a second language (Weinrich. 1954; Sapon and Caroll, 1957; Singh, 1966; Singh and Black, 1966). Subjects for whom English is the second language are likely to perform poorer on speech discrimination test in English, when compared to those for whom it is the first language. Garstecki and Wilkins (1976) observed that bilingual subjects whose mother tongue was Spanish, performed poorer than native speakers of English on SSI.

CONCLUSIONS :

It may be concluded in the light of the above discussion that the results of the present study were possibly influenced by familiarity of words and by the first language of the listener. It is also possible that using a list of highly familiar words one could obtain maximum scores despite English being the second language to most Indian subjects. However, as noted earlier, sit is better to refrain from using a list of highly familiar words to ensure better clinical utility

The observation that Indian speakers/listeners of English perform poorer than the native speakers does not imply that English tests should not be employed with Indians. It only suggests that any study on native speakers of English should be applied to English speaking Indians only with reservations. The same precaution should be taken if one attempts at standardizing a speech discrimination test in Hindi or in any Indian language common to most Indians.

It could be extrapolated from the results of the present study that NU 6 could be useful clinically, as it appears to be highly sensitive to variability in speech discrimination ability across normal hearing individuals.

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