DEVELOPMENT AND STANDARDIZATION OF A COMMON SPEECH DISCRIMINATION TEST FOR INDIANS

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Introduction

Speech audiometry has been an important tool in the diagnostic test battery, as it provides a measure of the listener's response to speech. Discrimination testing clinically aids in the differential diagnosis of conductive, cochlear and retrocochlear pathologies.

A historical perspective of speech tests reveals that many discrimination tests have been developed utilizing different speech materials namely, nonsense syllables, monosyllables (Egan 1948) and synthetic speech sentences (Jerger and Speaks 1968). The Harvard PB lists (Egan 1948), the CIDW—22 lists (Hirsh 1952), and the speech discrimination material standardized on English speaking Indian population (Swarnalatha 1972) are limited to the English speaking population. Campbell's (1949) nonsense syllable list cannot be used with Indians owing to a lack of familiarity. Test materials in Tamil, Telugu and Malayalam (Kapur, Y. P. 1971) have been standardized utilizing disyllabic words as very few monosyllables were available. However, these test cannot be used in all the clinics, because of the language barrier on the part of the tester and the testee.

Further, the synthetic speech identification test developed by Nagaraja (1973) is meant for the literate class among Kannada speaking population. The Hindi PB lists (Abrol 1970) and N. S. De (1973) are standardized for the Hindi speaking population.

Besides these, in India there is a multilingual problem and the existence of cosmopolitan cities has paved way for the mixing up of languages. So any clinic is liable to have cases from a variety of languages. Thus the therapist faces the problem of languages. But, *any* therapist has to deal with cases of other languages.

There is difficulty in producing a test in each language as it affects the tester's efficiency, the time and effort involved in producing tests in all the languages of India is great.

In a situation like this, it is essential to devise a common speech discrimination test using monosyllables of CV (consonent and vowel) combination, that occur in most of the Indian languages. Such 'monosyllables are sufficiently unpredictable for clinical subjects and are perceived relatively independently as individual speech

elements' (Carhart 1967). With this, the other essentials like familiarity and control of language environment are satisfied. This common speech discrimination test would even solve the problem of testing the illiterates.

Thus, the present study was an attempt in constructing a new test material for a speech discrimination test, which excludes the drawbacks of the other Indian tests mentioned earlier, and which would help to solve the problems posed by the multilingual situation.

Objectives of the study

The objectives of the present study were as follows:

1. Development of speech discrimination test material common to most of the Indian Languages.
2. Establishment of the testing procedures.
3. Standardization of the test material by:

   (a) establishing validity and reliability of the test,

   (b) finding the performance of normals on this test, and,

   (c) finding the performance of clinical groups on this test.

The hypothesis of the study were:

(1) There would exist no difference in the performance of normal speaking different languages on this common speech discrimination test.

(2) It was hypothesized that the results on this test will also agree with the results of earlier speech discrimination tests, in terms of optimum scores at the most comfort level, performance-intensity function of normals and clinical groups, social adequacy index, and test scores in quiet and noise conditions.

Methodology

Construction of the test material

The Common Speech Discrimination Test material was constructed by selecting the common monosyllables of CV combination (not necessarily as independent monosyllables) as found in Indian languages. This was done by (1) obtaining data from the native speakers and (2) by a comparative study of sounds of different languages available in the literature.

The final list consisted of twenty monosyllables ranging in terms of intelligibility and meaningfulness. Appendix A.

Test procedure

Monosyllables of the speech test material were recorded in a sound treated booth using a carrier phrase 'i:ga, idannu he:II' (Noe Say this) and a time interval of ten seconds was given between each syllable.

Testing procedure Was carried out with the help of the following instruments'.

(1) Arphi audiometer (MIC *IV)* for testing purposes.
(2) A Uher stereo tape recorder Mode! 263 for feeding the recorded signals into the audiometer.
(3) A Monitoring set to enable the tester to monitor the sounds being presented to the subjects.

These instruments were calibrated periodically using Bruel and Kjaer equipment. Zero SRT for Arphi Audiometer was found to be 20 dB SPL. 1000 Hz tone was recorded on a tape and it was fed to the audiometer.

Gain of the audiometer was adjusted until the V.U. meter needle read 'O'. At input of 60 dB HL the output was 80 dB SPL. All the testing was done in a sound treated room which satisfied the prescribed levels for audiometric rooms.

For testing the clinical and normal groups, the following instructions were given:

'Now you are going to hear in your right or left ear some speech sounds like ka, ma, etc. They are preceded by a Kannada phrase 'I :ga idannu helli' you need not repeat the phrase again, but you have to repeat the syllable which you hear in the end'.

The instructions were translated into different languages depending on the subjects. The instructions were modified when the written responses of the subjects were considered.

Here the carrier phrase in Kannada was used for (1) drawing the attention of the patients to listen to the test items, and (2) for monitoring the voice while recording. It was not meant to give any meaning to the patient.

The subjects were selected on the following criteria.

(a) Normals:
  (1) Audiogram configuration of air conduction thresholds within 20 db (I.S.O. 1964).
  (2) Age range: above the age of fifteen years,
  (3) With good communicative ability (sufficient proficiency in mother-tongue).
  (4) With normal otological findings.

Clinical Groups

1. Age range: above the age of 10 years with sufficient proficiency in their mother-tongue.
2. The subjects were tested for:
   (a) E.N.T.
   (b) (l)'PTA (2) BC thresholds.
   (c) Speech reception threshold (for the cases who new Kannada and English).

TABLE 1. Indicates the number of subjects (normals), selected for different experiments of the study

Normals speaking different mother tongue	PTA range	Number of subjects	Sex	
			Male	Female
Kannada	0—15	11	8	3
Telugu	0-15	8	4	4
Malayalam	0—15	9	4	5
Tamil	0—20	11	7	4
Tulu	0—20	3	3	—
Urdu	0—20	6	4	2
Coorgi	0—15	2	—	2
Hindi	0—20	8	8	—
Gujarathi	0—15	2	—	2
Marathi	0-20	6	4	2
Konkani	0—20	6	1	5
Santoni	0—5	1	1	—

TABLE 2. Indicates the number of subjects (clinical group) selected for the different experiments

SI. No.	Type of loss	PTA Range	No. of subjects	M	F
1.	Conductive loss gp.	25—60	29	20	9
2.	Sensorineural loss gp.	20—85	30	26	4
3.	Mixed loss gp.	35—80	23	12	11
4.	High frequency loss gp.	5—20	5	5	—

Methods of testing and level of presentation

The level of presentation was kept constant, i.e., at definite sensation levels above the individual's pure tone average level. The testing was done by the experimenter with normal hearing. The test procedure was first standardized by presenting the test list on thirty normal ears and comparing their verbal and written responses. With clincal population, three responses were elicited for the same sound. As the testing was done in a one-room situation and no talk-back system was used, oral responses were chosen as the chief criteria.

Seventeen experiments were conducted for testing the hypothesis. This included the tests for determining the concurrent, content and predictive validity and test-retest reliability.

Results and Conclusions

The raw data obtained from the several experiments were statistically analyzed to yield the following results:

The level at which normals obtained miximum scores was taken as the reference level for testing other normals speaking different languages. And the performance of normals speaking different languages was compared on Kruskal Wallis test of one way analysis of Variance (Siegel ! 956).

The performance of the clinical groups was compared by using Mann-Whitney 'U' Test (Siegel 1956).

A comparison of the verbal and written responses of the subjects was made by computing the coefficient of Rank correlation (Garret 1971).

With the discrimination scores in quiet and noise situations of normals and SN loss cases, a measure of the 'Discrimination Index' (given as PB Max-PB M in/PB Max, Jerger 1971) was obtained. These values were compared by Wilcoxon Matched Pairs sign Rank Test.

The social adequacy index (H. Davis 1970) for normals and clinical groups Were computed (the average of discrimination scores at 55, 70 and 85 dB SPLs).

The concurrent validity of this test was tested by presenting the English PB list to normals and to clinical groups having a knowledge of English and analysing the scrores on 'Wilcoxon matches sign pair Rank test'.

The test-retest reliability was established by computing 'coefficient of correlation' (Rank correlation method-Garret 1971) between the test retest measures:

The results of the above statistical analysis led to the following conclusions:

1. Normals obtain optimum scores ranging from 90 to 100 per cent in this test at 40 dB SL (ref. PTA).

Note: As PTA is used as the reference level instead of the usual SRT as the reference level, the presentation level in terms of SPL would be 40+PTA (HL)+zero SRT (SPL). In this study zero SRT was 20 dB SPL. If in an audiometer zero SRT is not 20 dB SPL, the presentation level in SPL would be 40+PTA (HL)+zero SRT+(20—zero SRT) correction. correction is (—) if zero SRT is > 20 dB SPL.

2. The performance of normals speaking different Indian languages followed the same pattern.
3. There was no difference in the scores of verbal and written responses of the subjects.

4. Sex difference in terms of performance was found insignificant.
5. There was no difference in the performance of right and left ear on this test.
6. The performance of SN loss cases was different from that of normals, conductive and high frequency loss cases. There was no difference in the performance of mixed loss and SN loss groups.
7. The conductive loss group resembled normals and high frequency loss in their performance.
8. Performance of mixed loss group differed from that of high frequency loss cases.
9. The high frequency loss cases performed like normals.
10. Maximum score was obtained at different levels instead of at 40 dB SL in clinical groups. So it is desirable to determine P.I. function for each case instead of depending on the score at one level.
11. Discrimination Index of normals and clinical groups ranged from 0.05 to 0.55. DI could be considered as a diagnostic indicator in the case of retrocochlear pathologies.
12. The SAL measures for normals differed from that of the clinical groups.
13. The SN loss group yielded low discrimination scores under noise situations and hence this factor should be considered while doing hearing aid evaluation.
14. High correlation scores indicated good test-retest reliability.

Implications of the study

Discrimination testing is an important test battery for differential diagnosis. This test could be used as a common speech discrimination test in all the clinics, owing to the following advantages:

1. Cases with different language background can be tested.
2. The test can be administered by any therapist without knowing the particular language of the case.
3. Responses can be elicited either verbally or in written form.
4. The test could be administered through live voice where recording facilities are not available.

Limitations of the study

1. The test materials did not represent the everyday listening condition of the subjects.
2. This study was limited to the cases who came to the clinic at A.I.I.S.H.
3. Information regarding all languages was not available.

Further research-based on standardizing the test on large population **involving different languages would be** worthwhile.

APPENDIX—A

LIST OF THE MONO-SYLLABLES

Sl. No.		*Hindi*	*Kannada*	*Sl. No.*		*Hindi*	*Kannada*
1.	ma	म	ಮ	11.	na	न	ನ
2.	ta	ट	ಟ	12.	va	व	ವ
3.	Sa	स	ಸ	13.	Na(na)	ण	ಣ
4.	Ka	क	ಕ	14.	ya	य	ಯ
5.	ba	ब	ಬ	15.	la	ल	ಲ
6.	ra	र	ರ	16.	dha	ध	ದ
7.	ga	ग	ಗ	17.	La(la)	ळ	ಳ
8.	pa	प	ಪ	18.	ja	ज	ಜ
9.	da	ड	ಡ	19.	sha	श	ಶ
10	tha	त	ತ	20.	cha	च	ಚ

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