DISYLLABIC MALAY WORD LISTS FOR SPEECH AUDIOMETRY

YIAP KIM HONG

SUMMARY

A clinical study was undertaken to standardize a set of Malay word lists for speech audiometry evaluations. A set of ten word lists is drawn out to test a general Malay-speaking population. A normal discrimination curve is obtained using these materials and some examples of clinical applications are illustrated.

INTRODUCTION

Speech audiometry is used to measure threshold, to assess suprathreshold intelligibility, to measure progress in lip-reading and auditory training, to detect the presence of malingering, to evaluate the effectiveness of different aids, to predict the success of otologic surgery and to aid in the diagnosis of both peripheral and cortical disorder. They are useful and often essential in modern audiology.

Traditionally, speech audiometry is conducted by clinicians using English words. However, a large proportion of people, especially in countries like Brunei, Malaysia and Singapore, do not have an adequate knowledge of English words. Their native language is Malay and it is only appropriate that the speech audiometry tests be carried out using Malay words.

This paper attempts to construct short Malay word lists which reflect natural usage of the Malay-speaking population in this region. These materials could be used for speech audiometry.

Yiap Kim Hong
City Hearing Services
190, Clemenceau Ave
#03-16, Singapore Shopping Centre, Singapore 0923

MATERIALS AND METHODS

Test Materials

The first problem is "which Malay words shall one use". To the author's knowledge and discussions,[1] there appears to be no compilation of familiar Malay words and that Malay words are generally disyllabic.

The general criteria for the selection of these Malay words are based on: familiarity; equal average difficulty; equal range of difficulty; representative of Malay language; words in common usage.

The word lists are given in Table I. There are ten different lists, each containing 20 phonemes to form the disyllabic words. In such short lists, it is not possible to represent all the phonetic composition corresponding to that of the Malay language. The foregoing lists were all patterned so that they yielded only rough approximation of the phonetic balance found in everyday spoken Malay. According to Carhart,[2] as long as the test items are meaningful

TABLE I
DISYLLABIC MALAY WORD LISTS

1	2	3	4	5
lama	bulan	lari	laki	kati
hari	kiri	surat	isi	sudah
suka	kata	besi	juta	tipu
gaji	apa	muka	cuka	tahu
cuba	hati	buta	jadi	sama
mati	sapu	tidak	budak	silat
buruk	gula	anak	telah	budi
alat	cuci	roti	besar	bila
sakit	nasi	sana	diri	atas
batu	lupa	mahu	akan	jari
6	**7**	**8**	**9**	**10**
kami	susah	mula	laku	mata
cuma	lagu	tadi	masa	rupa
ada	dulu	basah	maju	padi
satu	bisu	kasut	bumi	kalah
biji	tiba	ahli	tali	saya
bukit	lima	buku	sijil	sila
mari	buka	gila	bola	murid
lagi	jika	jiwa	arak	mesti
biru	ajar	beli	kaki	juga
tiga	pasar	cuti	pagi	adek

monosyllables for the subjects and the phonetic distribution is approximately diversified, one set of word compilation is relatively equivalent to one another.

Test method

Disyllabic Malay word lists are recorded on a cassette tape by a Malay male newscaster. The tape lists are amplified, attenuated and switched by means of a diagnostic audiometer (Beltone Model 112) and delivered to the subject *via* earphone (Telephonics TDH–50P, 60 ohms impedance). The speech intensity is uniformly defined as the SPL in dB of a 1000 Hz calibration recorded at the average level of frequent peaks of the disyllabic words.

On the tape-recording, the words occur at regular 5sec intervals without a carrier phrase. Subjects are asked to repeat what they hear and are scored on the percentage of phonemes correctly repeated. A score of 5% is given for each correct phoneme.

In establishing the discrimination curve, 5 dB intervals are used to make discrimination measurements. Ten Malay subjects and twelve non-Malay subjects, all with hearing levels below 25 dB with pure tones at 0.25, 0.5, 1.0, 2.0, 4.0, 6.0 and 8.0 kHz are tested to obtain the normal phoneme discrimination curve. Their average age is 25.

Test re-test reliability

Seven members of the normal hearing subjects were re-tested within two weeks from the original test. The re-test procedure carried out on each subject was exactly the same as for the original test.

All the speech tests are carried out in a sound-treated room where the overall ambient noise level measured with an Amplaid sound level meter (SLM 13) is less than 40 dBA.

RESULTS

The mean and standard deviation of the maximum phonemic discrimination scores from the two groups of normal hearing subjects are shown in Table II. The differential scores obtained from the Malay and non-Malay groups are similar (within 1 dB) and are not significantly different ($t = 0.64$, $p > 0.05$). The normal discrimination curve with its mean and standard errors scored at different intensity levels is shown in Figure 1. The maximum gradient of the curve is 5% per decibel.

The inter-list differences with the mean scores obtained with list one to ten for the two groups heard at a constant, near-threshold intensity are shown in

TABLE II
THE MAXIMUM DISCRIMINATION SCORES OF NORMAL HEARING ADULTS WHO ARE FAMILIAR WITH MALAY LANGUAGE

Group	Mean phoneme score (%)	Sample standard deviation	Number in sample
Malays	95.6	1.30	10
Non-Malays	95.1	1.50	12

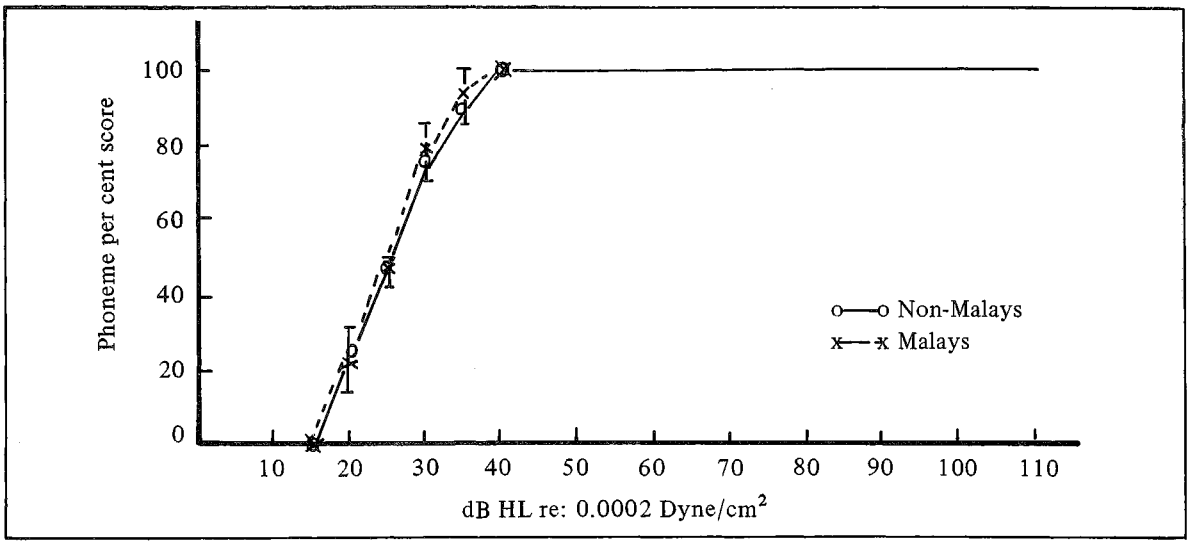

Fig. 1 Speech discrimination curves for the Malays and Non-Malays who have normal hearing.

TABLE III
MEAN SCORES OF LIST 1 TO 10 HEARD AT A CONSTANT, NEAR THRESHOLD INTENSITY

Groups	List number	1	2	3	4	5	6	7	8	9	10	Grand Mean
Malays	Mean phoneme score (%)	46.0	43.0	47.0	47.0	47.0	55.5	51.0	51.5	46.0	53.0	48.7
	Difference from grand mean (%)	−2.7	−5.7	−1.7	−1.7	−1.7	6.8	2.3	2.8	−2.7	4.3	–
Non-Malays	Mean phoneme score (%)	48.3	47.5	48.3	47.1	49.6	55.4	50.0	49.2	46.7	53.8	49.6
	Difference from grand mean (%)	−1.3	2.1	−1.3	−2.5	0	5.8	0.4	0.4	−2.9	4.2	–

Table III. An analysis of the variance on the raw data shows that the lists could be considered of equal difficulty for the Malay group ($F_{9,90} = 1.16$, $p > 0.05$) and the non-Malay group ($F_{9,110} = 1.6$, $p > 0.05$).

The mean phonemic discrimination scores obtained for the test and re-test of the seven subjects who were tested twice are given in Table IV. Their absolute values obtained at any of the lists are of similar magnitude. Statistically, using the paired t-test for (n − 1) degrees of freedom, there is no significant differences between the phonemic discrimination scores from the test results and those calculated from the re-test at any list ($t = 1.54$, $df = 6$, $p > 0.05$).

DISCUSSION

There are several problems associated with the measurement of speech discrimination which are either inherent in the test material[3] or related to the tester and/or to the listener.[4] The results may also have been brought about by the method of reproduction and administration of the test,[5] or

TABLE IV
TEST RE-TEST RELIABILITY OF DISCRIMINATION SCORE FROM LIST 1 TO 10 HEARD AT A CONSTANT, NEAR THRESHOLD INTENSITY

List	1		2		3		4		5		6		7		8		9		10	
	Mean	s.d.	Mean	s.d.	Mean	s.d.	Mean	s.d.	Mean	s.d.	Mean	s.d.	Mean	s.d.	Mean	s.d.	Mean	s.d.	Mean	s.d.
Test	50.7	7.3	45.7	10.8	50.7	7.3	46.3	7.4	52.1	7.9	56.4	7.9	48.6	8.7	49.3	10.5	45.7	6.8	52.1	8.4
Re-test	55.7	12.4	49.3	12.7	56.4	8.7	49.3	11.2	54.3	9.0	62.1	8.0	55.7	12.1	54.3	6.8	47.9	9.6	60.0	10.0
t (df = 6)	0.85		0.53		1.24		0.54		0.54		1.25		1.20		1.05		0.46		1.5	
P	NS		NS		NS		NS		NS		NS		NS		NS		NS		NS	

Phonemic Discrimination Scores (%) N = 7.

perhaps related to the particular scoring method employed.[6]

The mode of initial instruction given to the listener[7] and his previous knowledge of the test, his intelligence, linguistic competence, psychological state, etc., are important factors to consider. Furthermore, the tester's ability to recognise and score correctly the responses of the listener can introduce other variables which may influence the final scores.

Obviously, there are so many factors which can influence the speech discrimination results that our speech test described above does nothing to solve. They are mentioned solely to highlight the wide discrepancies which can arise if they are not properly taken into consideration.

However, provided the limitations are recognised and due allowance made for the limited precision of speech discrimination measurements, a number of disyllabic Malay words can be listed for speech audiometry. The phonemic scoring permits the clinician to obtain useful information regarding his phonemic perception of everyday life. This approach also allows the tester to plot complete discrimination curves in a relatively short time.

Normative data of the speech discrimination scores are obtained from the Malays and non-Malays who are familiar with the Malay language. The results show that race is not a factor to influence the discriminations scores. Their mean discrimination scores obtained from the test and re-test results are repeatable, indicating that the methods employed are reliable. Also in this present study, the interlist differences with the ten consecutive lists at a near threshold intensity were not significantly large and therefore, they could be considered of equal difficulty.

For clinical applications, a reasonable aim is to obtain three to four scores on the slope of the discrimination curve. A few examples will illustrate some of the applications of speech audiometry with the disyllabic Malay words in the differential diagnosis.

The audiogram in Fig. 2 shows a bilateral conductive hearing loss. Medical history and E.N.T. examination of the patient indicated he had bilateral chronic otitis media. Fig. 3 shows his speech audiogram and the speech discrimination curves are both parallel to that for the normal hearing subject. If the test words are presented more loudly, the patient will obtain the same score as the person with normal hearing and maximum score of 95–100% are obtainable.

The second illustration concerns an elderly man aged 60 with history of episodic vertigo accompanied by tinnitus and hearing loss in both ears. The audiogram (Fig. 4) on the right ear shows a mild sensorineural loss with a rising configuration. On the left ear, the audiogram shows a moderate sensori-

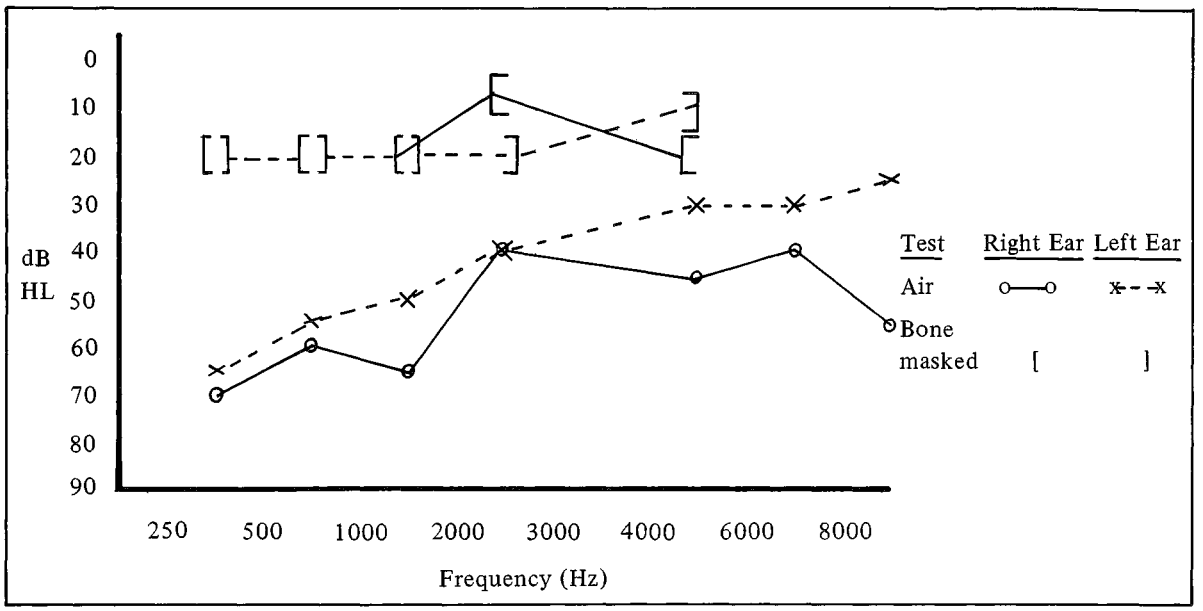

Fig. 2 The audiogram shows bilateral conductive hearing loss.

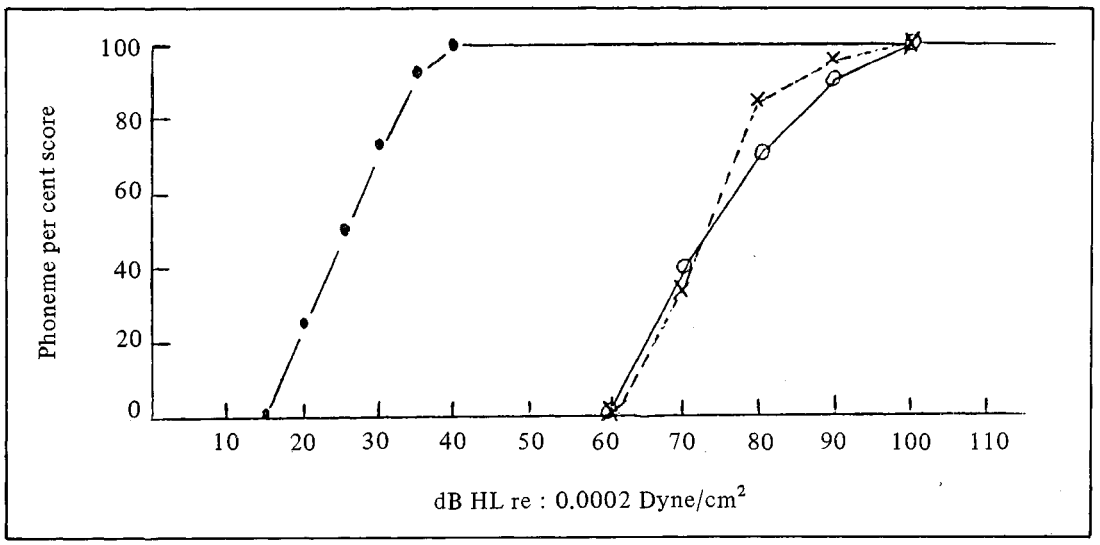

Fig. 3 The speech audiogram for the patient with bilateral conductive hearing loss.

neural hearing loss of 60 dB. Fig. 5 shows his speech audiogram. For his right ear, reasonable discriminations are obtained at higher intensity levels, but it is not possible to achieve a 100% score. The maximum score is 85%. Speech audiometry on the left ear shows reduced discriminations. Not until the intensity is raised to 90 dB, his score improves to 60%. After this point, however, the speech discrimination score deteriorates as the intensity level increases. It is because of the effect of recruitment that gives a parabolic speech discrimination curve and it is important to take this factor into consideration in the fitting of hearing aids.

The last example is a patient referred from the Industrial Health Board regarding financial compensation. He gave a history of a hearing loss in his right ear consequent to a head injury. However, clinical examination showed no abnormality in both ears. His initial voluntary pure tone sensitivity results ('1', Fig. 6) show severe to profound hearing loss bilaterally. His pure tone thresholds were repeated and his audiometric configuration ('2', Fig. 6) still shows bilateral moderate hearing loss. Speech audiometry on both ears however, shows excellent discrimination scores and their curves are shown in Fig. 7. Lack of correlation between the hearing loss as measured by pure tones and speech audiometry will alert an astute clinician. However, it is not the purpose of this paper to discuss the relation between hearing loss for pure tones and hearing loss for speech. Attempts to ascertain this relationship will be investigated.

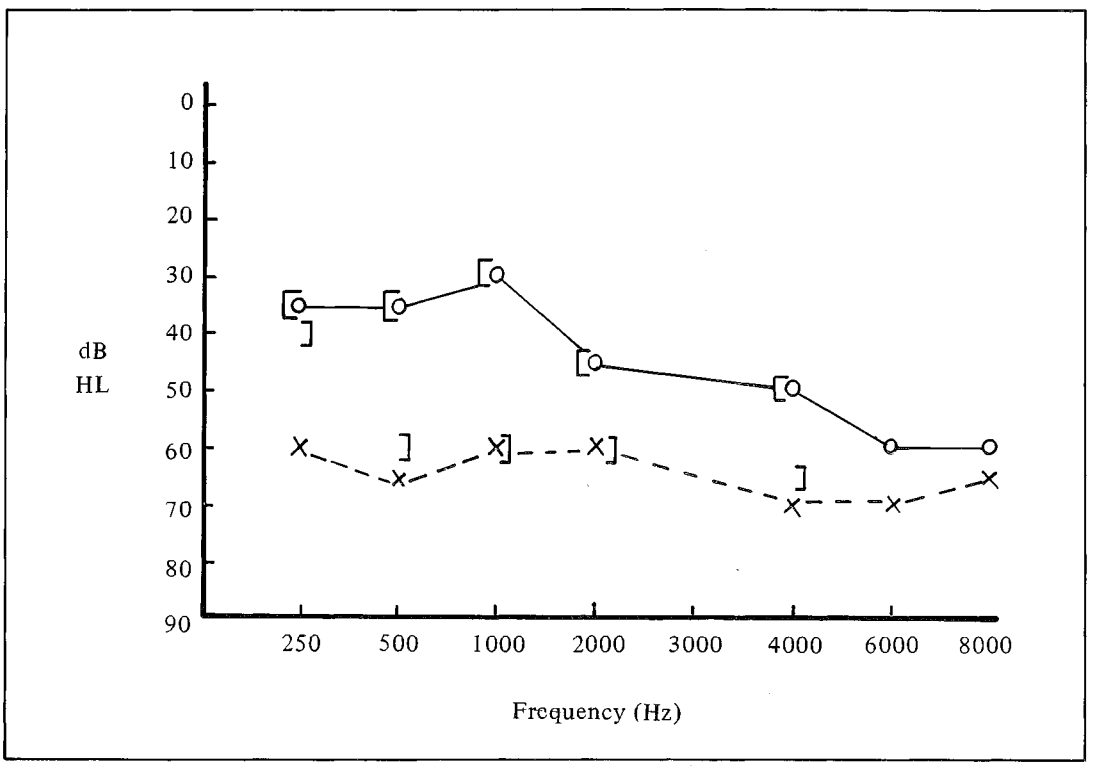

Fig. 4 The audiometric results for a patient with bilateral sensorineural hearing loss.

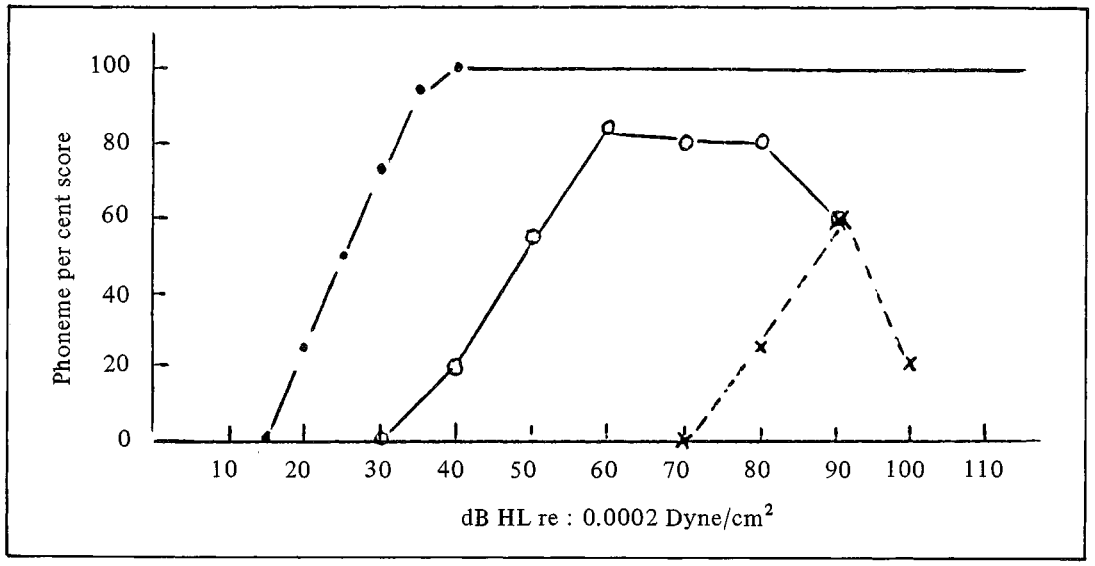

Fig 5. The speech audiogram for the patient with bilateral sensorineural hearing loss.

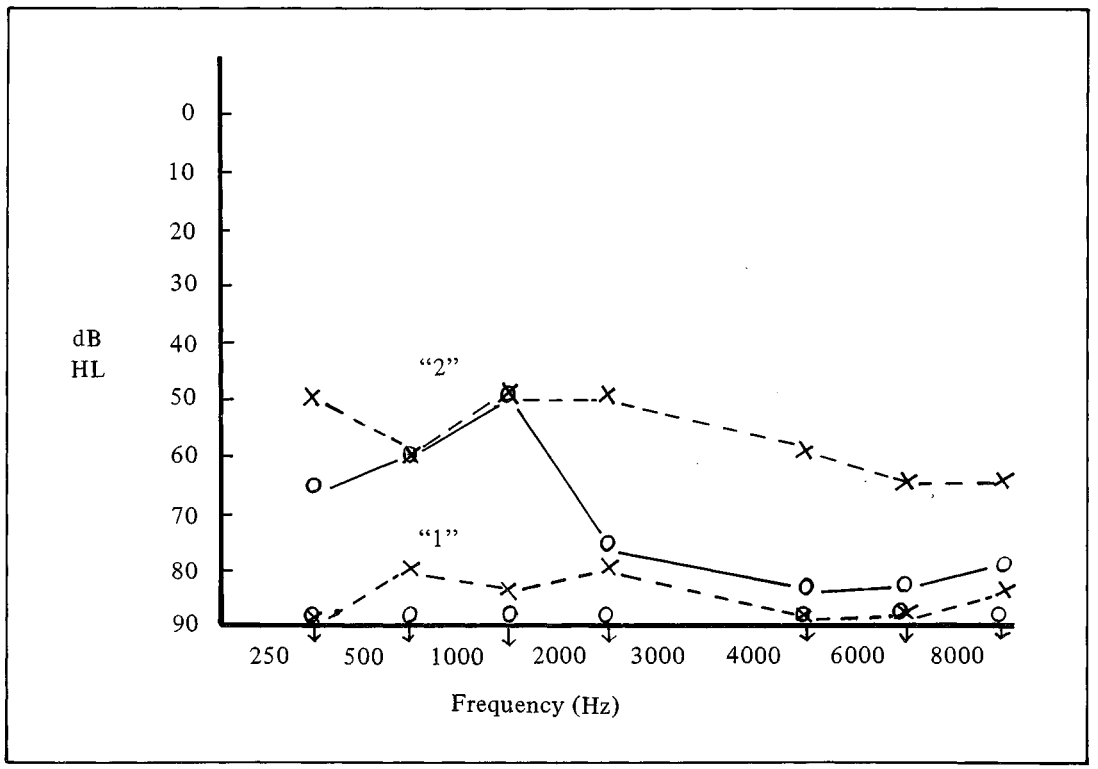

Fig. 6. A patient with a series of inconsistent pure-tone thresholds.

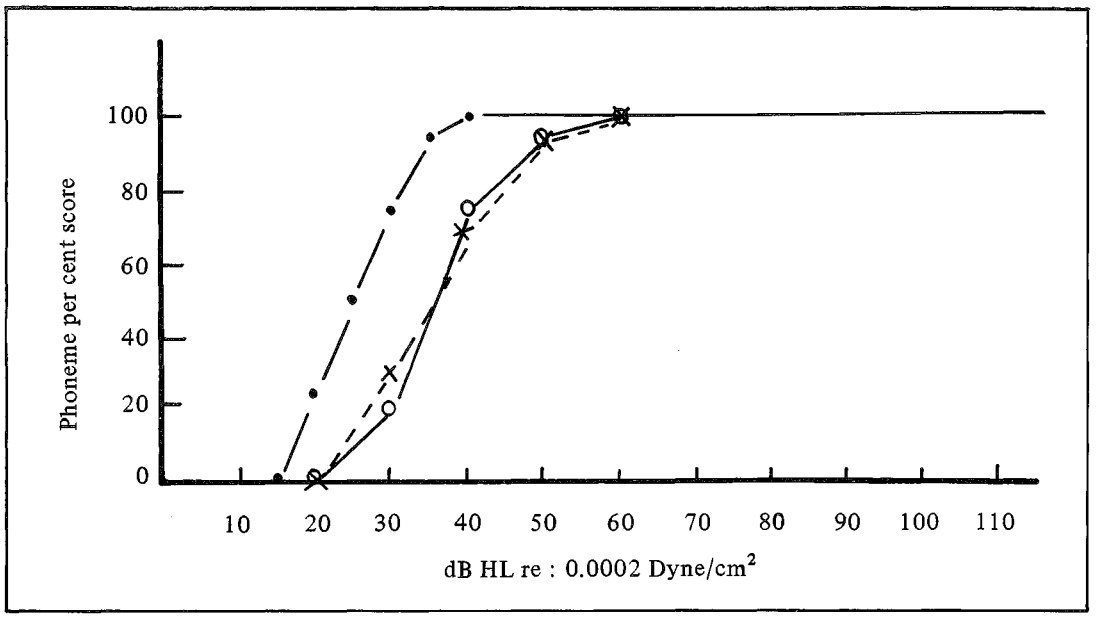

Fig. 7. The speech audiogram for the patient, suspected of exaggerated hearing loss.

It can be concluded that this speech audiometry using the Malay word lists, provides the supra-threshold hearing ability of the patient and when compared with pure tone audiogram increases the confidence of the clinicians with which audiological diagnosis can be made.

CONCLUSION

A speech discrimination test is described which uses short disyllabic Malay word lists. With these lists, a discrimination measurement can be obtained within one minute and it is therefore possible to plot complete discrimination curve. Scoring is based on the number of currently recognised phonemes. Normal discrimination curves are obtained for the Malay-speaking adults, together with the results of repeatability tests. Examples of clinical applications are outlined.