

HEARING SENSITIVITY OF SINGAPOREANS IN ADVANCED AGE

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SYNOPSIS

Presbycusis is a slowly progressive decline in hearing sensitivity due to aging process. The hearing sensitivity of Singaporeans in advanced age is reported here. Audiometric pattern usually shows a bilateral, symmetrical sensorineural hearing loss with greater loss at the high frequencies and the loss increases with age.

INTRODUCTION

As life expectancy lengthens, there is a rise in the number of old persons, 60 years and above. Saw (1) reported that in 1980, the average Singaporean men could expect to live 68.9 years and the average Singaporean women 74.2 years. In 1980, there were 15 people in the working age groups for each elderly citizen. By the year 2000, the ratio will be ten to one, and in 2030, three to one.

According to various reports (2, 3) presbycusis is the most common causes of hearing impairment among the elderly population. Presbycusis is a slowly progressive decline in hearing sensitivity due to aging process. Communicative deficits caused by hearing loss may manifest themselves in psychologic problems such as withdrawal from society or attempt to deny the problem that may exist. There is a need to provide rehabilitation of these senior citizens with hearing loss so as to keep them through continued employment and participation in family and communal activities.

This paper attempts to survey the hearing sensitivity of Singaporeans in advanced age and to discuss its implications.

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METHOD

All the subjects aged 50 years and above, were previously submitted to a careful ear examination by the E.N.T. medical doctors or specialists and the relevant medical history was recorded. Patients selected for the study were chosen by criteria that excluded possible sensorineural hearing impairments due to previous ear surgery, familial history, fistula, use of ototoxic drugs, noise-induced or infection of the middle ear.

Air and bone conduction thresholds were obtained in an audiometric two-room suite using a clinical diagnostic audiometer (Beltone 200-C) calibrated to the required standard. Air conduction thresholds were obtained for the frequencies from 250 to 8000 Hz and bone conduction thresholds from 250 to 4000 Hz. The audiometric measurements were made by the necessary persons trained in audiometric examinations.

A comparison was made with a parallel study of the hearing of third year University Medical Students who were otologically normal.

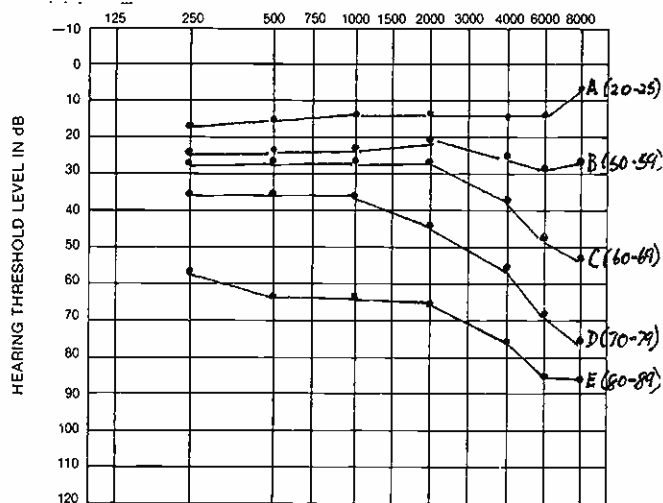
RESULTS

The age distribution of the 105 female and 117 male subjects is shown in Table I. It can be seen in Table II that the number of ears tested in each group did not correspond exactly with the number of subjects. It is because sometimes one of the subject's ear is known to have ear diseases (Example — Chronic Suppurative Otitis Media) while the opposite ear does not suggest any otologic causes. Therefore, the hearing results of the 'non-otologic' ears are then accepted. The majority of our ears reported here show bilateral symmetrical, sensorineural hearing loss.

Only air conduction thresholds are shown in Table II, as the most common type of deafness seen in our cases are of sensorineural in nature. Their audiometric mean and standard deviation obtained for various age groups are given in Table II. As can be seen, the patterns of pure tone loss at each tested frequency are similar on both sex and the hearing loss increases with age. Between the male and female populations, there is minimal variation with no more than a ± 5 dB for the 250 Hz to 2000 Hz and no more than a ± 10 dB

at the higher frequencies (except at 8000 Hz in Group B and at 4000 Hz in Group E). Generally, there is slightly more hearing loss at the high frequencies in the male groups.

Statistically, using the paired t-test for (n-1) degree of freedom, there is no significant difference between the audiometric thresholds for the male population and those obtained from the female population at any frequency ($p \geq 0.1$). The male and female populations in various age groups are therefore combined and the overall patterns of hearing sensitivity of Singaporeans are shown in Fig. 1.



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Fig. 1 Patterns of pure tone sensitivity of subjects at various age groups.

TABLE I
AGE AND SEX DISTRIBUTION OF THE SAMPLE

	Age in years					Totals n (%)
	20—25 no. (%)	50—59 no. (%)	60-69 no. (%)	70—79 no. (%)	80—90 no. (%)	
Male	10 (50)	17 (50)	48 (55.2)	34 (55.7)	8 (40)	117 (52.7)
Female	10 (50)	17 (50)	39 (44.8)	27 (44.3)	12 (60)	105 (47.3)
Totals	20 (100)	34 (100)	87 (100)	61 (100)	20 (100)	222 (100)

TABLE II
AUDIOMETRIC MEAN AND STANDARD DEVIATION OBTAINED FOR VARIOUS SEX AND AGE GROUPS

Gps (Age Range)	Mean Age	No. of ears	Frequency (Hz)															
			250		500		1000		2000		4000		6000		8000			
			mean	s.d.	mean	s.d.	mean	s.d.	mean	s.d.	mean	s.d.	mean	s.d.	mean	s.d.		
A (20—25)																		
Male	24.0	20	15.5	4.4	13.3	4.5	12.8	3.3	12.0	4.0	13.0	6.2	11.3	5.2	7.8	4.0		
Female	23.0	20	18.0	6.6	15.8	6.0	12.0	5.1	13.0	4.6	13.3	5.1	13.0	9.5	8.5	6.1		
B (50—59)																		
Male	56.5	26	25.2	6.7	23.3	7.2	21.5	6.6	22.3	6.1	28.5	12.7	34.2	12.5	33.8	12.4		
Female	53.2	27	21.7	4.7	20.4	5.1	20.0	5.8	17.8	5.8	20.7	7.4	24.1	6.7	21.1	6.1		
C (60—69)																		
Male	64.6	83	25.7	7.0	24.5	7.7	25.3	10.1	28.0	13.0	41.9	15.4	51.0	17.7	54.5	18.8		
Female	64.8	67	26.7	5.4	25.6	6.0	24.9	6.8	26.2	7.9	33.4	11.9	45.5	16.2	49.8	19.1		
D (70—79)																		
Male	73.2	66	34.7	14.2	35.2	12.6	36.7	12.5	44.4	15.2	59.0	16.2	71.2	15.4	75.5	18.1		
Female	75.0	50	36.8	11.2	35.5	13.0	37.6	12.6	41.7	12.8	53.8	15.5	67.2	15.6	72.3	15.5		
E (80—89)																		
Male	84.3	16	60.9	18.8	64.7	20.3	64.7	16.1	68.1	9.9	83.8	14.5	90.9	19.9	90.6	16.2		
Female	82.3	24	57.1	14.3	60.2	14.0	60.4	15.2	62.9	13.5	71.0	14.6	80.4	15.7	81.3	9.7		

DISCUSSION

Aging is an inevitable biological phenomenon. Presbycusis implies a hearing loss caused by the degenerative changes of aging.

In the present study, the hearing sensitivity distribution among the various age groups has been described. Certain characteristics of presbycusis among Singaporeans can be established. It is apparent from the results of our study that the majority of the elderly citizens above 60 years old undergo some degree of progressive hearing loss. The hearing loss usually shows bilateral, symmetrical sensorineural type of loss and tends to be greater at the high frequencies (above 2000Hz). Also, the pure tone hearing levels increase with age especially in the higher frequencies. However, with the older age groups above 80 years, the audiometric pattern becomes deepen and widen involving the low and middle frequencies. Our pure tone findings associated with aging are consistent with numerous studies that had been reported (2, 3). Their results showed a symmetrical thresholds in the low frequency and a sloping configuration in the higher frequencies.

Numerous studies have documented the histopathologic findings in temporal bones of aged persons. Schuknecht (4) described 4 basic processes leading to presbycusis namely; sensory, neuronal, strial and atrophy of the spiral ligament. Sensory presbycusis is characterized by degeneration of the organ of Corti; mainly of the basal coil. There may be associated degeneration of the cochlear neurons in the spiral ganglion. Neuronal presbycusis results in a loss of neurones in the spiral ganglion and their fibres. It is often characterized by poor speech discrimination. Strial presbycusis results in pathological changes in the stria vascularis, Atrophy of the spiral ligament may result in atrophy of the supporting element of the cochlear duct affecting the vibrating mechanism of the cochlear partition.

Numerous research studies (5, 6, 7, 8) have been at-

tempted to determine the effect on hearing of diet, metabolism, cholesterol levels, blood pressure, arteriosclerosis, noise, emotional stress, exercise, smoking and genetic factors. It is a difficult task to separate the various etiologic factors that contribute to the development of presbycusis. Rosen (9) reported that the hearing of the Mabaans, a Sudanese tribe that live in a relatively noise-free environment. The study revealed that their hearing sensitively was significantly better from 500 to 6000 Hz than that of the age matched control subjects from industrialised area of the United States. This fact could also be said when compared to our elderly Singaporeans of similar age groups who are generally city dwellers.

Diminished social contacts tend to be concomitant with increasing age, but occasionally it is evident that hearing loss is a major factor. Because hearing loss is invisible, it is a much misunderstood handicap. As it is reported here that high frequencies tend to be much more affected than low frequencies, the victims of hearing impairment frequently does hear speech but is unable to sort out the meaning — a situation giving rise to much misunderstanding.

For the elderly person with acquired hearing loss, there is rarely any effective form of medical or surgical treatment. It is a widely held conception, especially by general medical practitioners, is that older subjects with sensorineural hearing loss are not appropriate candidates for hearing aid use (10). Many senior citizens can, and do use hearing aids as the primary means of minimizing the communication handicap imposed by a hearing impairment (11, 12, 13). As a general rule, the best hearing aid candidate is a person with moderate to severe bilateral hearing loss of hearing sensitivity who retains good auditory discrimination ability. For some older individuals with sharply reduced auditory discrimination ability, they may not find a hearing aid to be of help. There will be an increasing number of senior citizens in Singapore and there is a need to provide rehabilitation for those with hearing loss to help them lead more productive lives.

CONCLUSION

The course of presbycusis is one of gradual onset and progressive, gradual deterioration. It is a hearing loss due to one or multiple factors, intrinsic or extrinsic. Audiometric pattern usually shows a bilateral, symmetrical sensorineural hearing loss with greater loss at the high frequencies and the loss increases with age. Generally, the male subjects have slightly greater hearing loss involving the high frequencies.

A preliminary study of this kind can only be tentative and without great depth, and it is not claimed that it is definitive. However, it is hoped that it will provide not only useful background knowledge and information but also some indications and directions for the future study of hearing sensitivity of Singaporeans in advanced age.

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