

A STUDY OF HEARING LOSS IN SINGAPORE SCHOOL CHILDREN

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SYNOPSIS

1,151 male primary school children of ages between 6 and 8, comprising of 680 Chinese and 471 Malays were screened for hearing loss under controlled conditions. 62 children (5.4%) failed to pass the test. Chinese children had a failure rate of 3.8% while that of the Malay children was 7.6%. This difference was found to be significantly high. In each ethnic group the lower age group had a higher percentage impairment than the higher age group.

INTRODUCTION

The present study is an attempt to provide some information on the hearing status of school children in Singapore as there is scarcely any available data in this field.

Even with the scarce information available from studies on hearing made in a few countries there appear to be conflicting views and doubts as to the actual factors influencing the pass/fail rates of hearing. According to Kapur (1965) the incidence of hearing loss in Indian school children is very high (16.26% to 18.63%) compared with those of the advanced countries, such as the U.S.A. (5.2%—by Tenny and Edwards).

Results of work carried out in the States by Eagle and Wishik (1961); Weber, McGovern and Zink (1967) and Tenny, Edwards and Madison (1970) were variable as to the influence of ethnic and socio-economic factors.

Others had, however, indicated that the under-privileged children had a higher rate of failure in hearing than the privileged ones (Goldman and Sanders, 1969; McAdoo, 1969; Clark and Richard, 1966). To supplement the lack of data from this region this study was undertaken to estimate the hearing status of school children of different ethnic groups in Singapore.

MATERIAL AND METHODS

Permission was first obtained from the Ministry of Education to test the children in different Government and aided schools. Seven representative primary schools in the Town areas were selected for the present study and only male Chinese and

Malay children between the ages of 6 and 8 were tested for hearing loss. An older age group (7-8 years) was taken from the Malay children after some difficulty was experienced in getting the six year olds to respond according to specific instructions. We received full co-operation from the staff of all schools and facilities were well provided.

The nature of the test was first explained to the children by actual demonstration so that they understood how they would be required to respond. Each child was asked to raise his arm on hearing the faintest sound and to lower his arm when the sound disappeared. This threshold reading was recorded and used in the assessment of the pass/fail rate of hearing.

The testing was performed by a team of teaching staff and technicians in a quiet room where environmental conditions were kept constant as far as possible. The children were sent into the room in groups of five.

A calibrated portable Maico audiometer was used. The right and left headphones were interchanged to ensure that one headphone was not performing differently from the other. The pass/fail rate was based on frequencies of 500, 1000, 2000 and 4000 cycles per second (cps) although children were tested on the frequency ranges of 250, 500, 750, 1000, 1500, 2000, 3000, 4000, 6000 and 8000 cps. Responses in decibels were recorded directly on prepared charts. All those who failed in the first test were re-tested a second or even a third time when a doubt arose.

If a child failed to hear two or more out of the four frequencies of 500, 1000, 2000 and 4000 cps above a hearing loss of 30 decibels, he was considered to have failed the test.

Hearing impairment was then determined by using the above findings and reading from a chart supplied by the Maico Company. The percentage binaural impairment was based on 3 frequencies—500, 1000 and 2000 cps as given on the chart.

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RESULTS AND DISCUSSION

Table I gives the findings in loss of hearing in the two ethnic groups.

The overall gross failure rate for 680 Chinese children was 10%. For the left ear only, failure rate was 2.4% while that for the right ear was 3.8%. For those who failed in both ears the rate was 3.8%.

Among the Malay children, the overall gross failure rate for 471 children was 24.6%. The rate of those who failed in the left ear only was 2.8% and that in the right ear was 14.2%. Failure in both ears was about 7.6%.

The tests had indicated that the total failure rate in Chinese children (10%) was rather high and even higher in Malay children (24.6%). This difference was significantly high ($p < 0.001$).

As far as socio-economic status is concerned each group was well represented by a mixture of children from middle and lower income levels. However it must be mentioned that the low or middle socio-economic levels of the two ethnic groups may not be comparable. The difference could well be due partly to socio-economic and/or partly to racial factors.

The difference between these two ethnic groups was significantly high when only those who failed in both ears were compared ($p < 0.02$).

Tenny, Edwards and Madison, 1970, found that white children had a significantly higher rate of failure (7.4%) than the black children (2.7%).

Although within each group the hearing ability of the left ear was observed to be significantly superior to the right one, this finding will have to be confirmed by further testings in which it is intended that alternate ears will be tested first.

Percentage failure of children according to age is also shown in Table I. In each ethnic group the percentage failure of the lower age group was significantly higher than that of the higher age group where both ears were concerned. The significance of this difference is tabulated in Table II.

Results on binaural impairment are tabulated in Tables III and IV.

Among Chinese children the seven year olds had a lower percentage impairment than the six year olds ($p < 0.02$). Similarly among the Malays the eight year olds were significantly less impaired than the seven year olds ($p < 0.01$). When comparing the whole of the Chinese (6 and 7 years) group with the whole of the Malay group (7 and 8 years) the Malays had a higher percentage of binaural impairment than that of the Chinese as illustrated in Fig. 1 although the ages of the Malays were higher. The difference between the two ethnic groups was extremely significant ($p < 0.0001$).

TABLE I
PERCENTAGE FAILURE OF CHILDREN ACCORDING TO
ETHNIC OR AGE GROUP

Group	No. Tested	No. Failed	No. Failed			Total Per Cent Failed	Per Cent Failed		
			Left	Right	Both		Left	Right	Both
Chinese	680	68	16	26	26	10.0	2.4	3.8	3.8
Malay	471	116	13	67	36	24.6	2.8	14.2	7.6
Chinese, 6 years	375	50	10	19	21	13.3	2.7	5.1	5.6
Chinese, 7 years	305	18	6	7	5	5.9	2.0	2.3	1.6
Malay, 7 years	249	81	9	45	27	32.5	3.6	18.1	10.8
Malay, 8 years	222	35	4	22	9	15.8	1.8	9.9	4.1

TABLE II
DIFFERENCE IN HEARING LOSS BETWEEN TWO AGE GROUPS

Groups	Both Ears	Overall Assessment
Chinese (total) \propto Malay (total)	$p < 0.02$	$p < 0.001$
Chinese, 6 years \propto 7 years	$p < 0.02$	$p < 0.01$
Malay, 7 years \propto 8 years	$p < 0.01$	$p < 0.001$
Chinese, 7 years \propto Malay, 7 years	$p < 0.001$	$p < 0.001$

TABLE III
MEAN BINAURAL PER CENT
IMPAIRMENT OF EACH GROUP

	No. of Subjects	Mean Binaural Per Cent Impairment ± S.D.
Chinese, 6 years	375	4.95 ± 8.35
Chinese, 7 years	305	3.53 ± 6.34
Chinese (6 and 7 years)	680	4.31 ± 7.54
Malay, 7 years	249	11.10 ± 8.10
Malay, 8 years	222	9.25 ± 6.47
Malay (7 and 8 years)	471	10.23 ± 7.43

TABLE IV
COMPARISON OF BINAURAL PERCENTAGE
IMPAIRMENT IN DIFFERENT GROUPS

Chinese, 6 years & 7 years	- - -	p < .02
Malay, 7 years & 8 years	- - -	p < .01
Chinese, 6 & 7 years & Malay, 7 & 8 years	- - -	p < .0001
Chinese, 7 years & Malay, 7 years	- - -	p < .0001

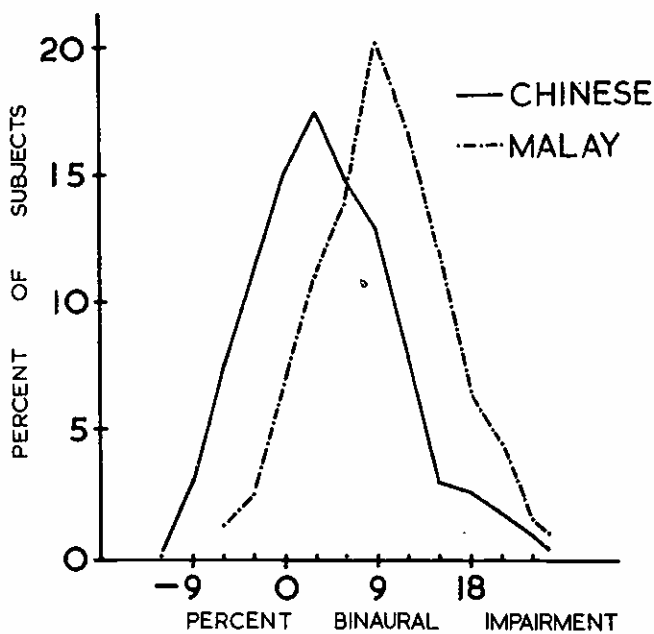


Fig. 1. Frequency distribution of percent binaural impairment in Chinese and Malay Boys.

If we consider only the seven year olds the difference between the Chinese and Malays is also extremely significant ($p < 0.0001$).

ACKNOWLEDGEMENTS

The authors are grateful to the Ministry of Education for providing facilities and the school principals and teachers for their co-operation in this investigation. They are indebted to Mr. Tye Cho Yoke, Senior Lecturer in the Department of Social Medicine and Public Health for help with the statistical work.

Sincere thanks are also due to Mr. Ng Tiang Boo, Miss Shoon Mei Yin, Mr. Robert Tay, Mr. Lim Beng Teck, Mr. Michael Ng and Miss Yap Geh Leng for technical and secretarial assistance and to many others who contributed in one way or another towards this project.

REFERENCES

1. Clark, A. D. and Richards, C. J.: "Auditory discrimination among economically disadvantaged and non-disadvantaged preschool children." *Exceptional Child.*, 53, 259-262, 1966.
2. Eagles, E. L. and Wishik, J. M.: "A study of hearing in children." *Trans. Amer. Acad. Ophthal. Otolaryng.*, 65, 261-282, 1961.
3. Goldman, R. and Sanders, J. W.: "Cultural factors and hearing." *Exceptional Child.*, 35, 489-490, 1969.
4. Kapur, Y. P.: "Hearing loss in Indian children." *Indian Med. Res.*, 54, 779-790, 1966.
5. McAdoo, quoted by Goldman, R. and Sanders, J. W.: "Cultural factors and hearing." *Exceptional Child.*, 35, 489-490, 1969.
6. Tenny, H. K. and Edwards, C.: "Race as a variable in hearing screening." *Amer. J. Dis. Child.*, 120, 547-550, 1970.
7. Weber, H. J., McGovern, F. J. and Zink, D.: "An evaluation of 1,000 children with hearing loss." *J. Speech Hearing Dis.*, 32, 345-354, 1967.