TO

MY DEAREST

MUM AND DAD

VARIATION OF TEST PROCEDURE ON MASKING FACTOR

VARIATION OF TEST PROCEDURE ON MASKING FACTOR

INDEPENDENT PROJECT

PRESENTED TO

UNIVERSITY OF MYSORE

IN PARTIAL FULFILLMENT

OF THE REQUIREMENTS FOR THE DEGREE

MASTER OF SCIENCE IN SPEECH AND HEARING

May 1981

C E R T I F I C A T E

This is to certify that the independent project entitled **"Variation of Test Procedure on Masking Factor"** is the bonafide work in part fulfillment for the Degree of Master of Science in Speech and Hearing with the Register No.6.

Director
All India Institute of
Speech & Hearing
Mysore-6

CERTIFICATE-

This is to certify that this independent project has been prepared under my supervision and guidance.

GUIDE

DECLARATION

This independent project is the result of my own study undertaken under the guidance of Mr. M.N. Vyasamurthy, Lecturer in Audiology, All India Institute of Speech and Hearing, and has not been submitted earlier at any University for any other Diploma or Degree.

Mysore
May 1981

Register No.6

A C K N O W L E D G E M E N T S

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CHAPTER 1

INTRODUCTION

'Masking Factor' is one of the important variables in clinical masking. If the masking noise used in masking the test tones is not effective, whatever care taken to calculate the optimum masking level (to rule out the participation of non-test ear) would be futile. Thus it is essential that the audiologist must make sure of the masking factor of the masking noise used in getting the masked thresholds.

The methods for determining masking factor suggested by Studebaker (1964) and Martin (1967) are as follows:

Studebaker's Method:

A two channel clinical audiometer in which tone and noise can be switched into a single earphone with the level of each stimulus controlled by its own attenuator. Minimum masking level is obtained by measuring the threshold of the stimulus (pure-tone or speech) in presence of varying amounts of noise presented to a single ear of normal hearing subjects.

Introduce about 10 dB noise into the earphone and obtain threshold of t he test stimulus. Increase the noise to 20 dB and again find the test tone threshold. This is repeated at succeeding 10 dB increments of noise until it becomes clear that a 10 dB increase in noise results in approximately'a 10 dB increase in threshold.

Figure 1 below shows the expected relationship and shows one way to obtain the value of the minimum masking level. A point on this threshold curve which makes a 45° angle approximately with the abscissa is taken and from this point a line is dropped onto the abscissa. Another horizontal line from the same point on the threshold curve to ordinate is drawn. The minimum masking is then the difference between the point on the abscissa and the point on the ordinate.

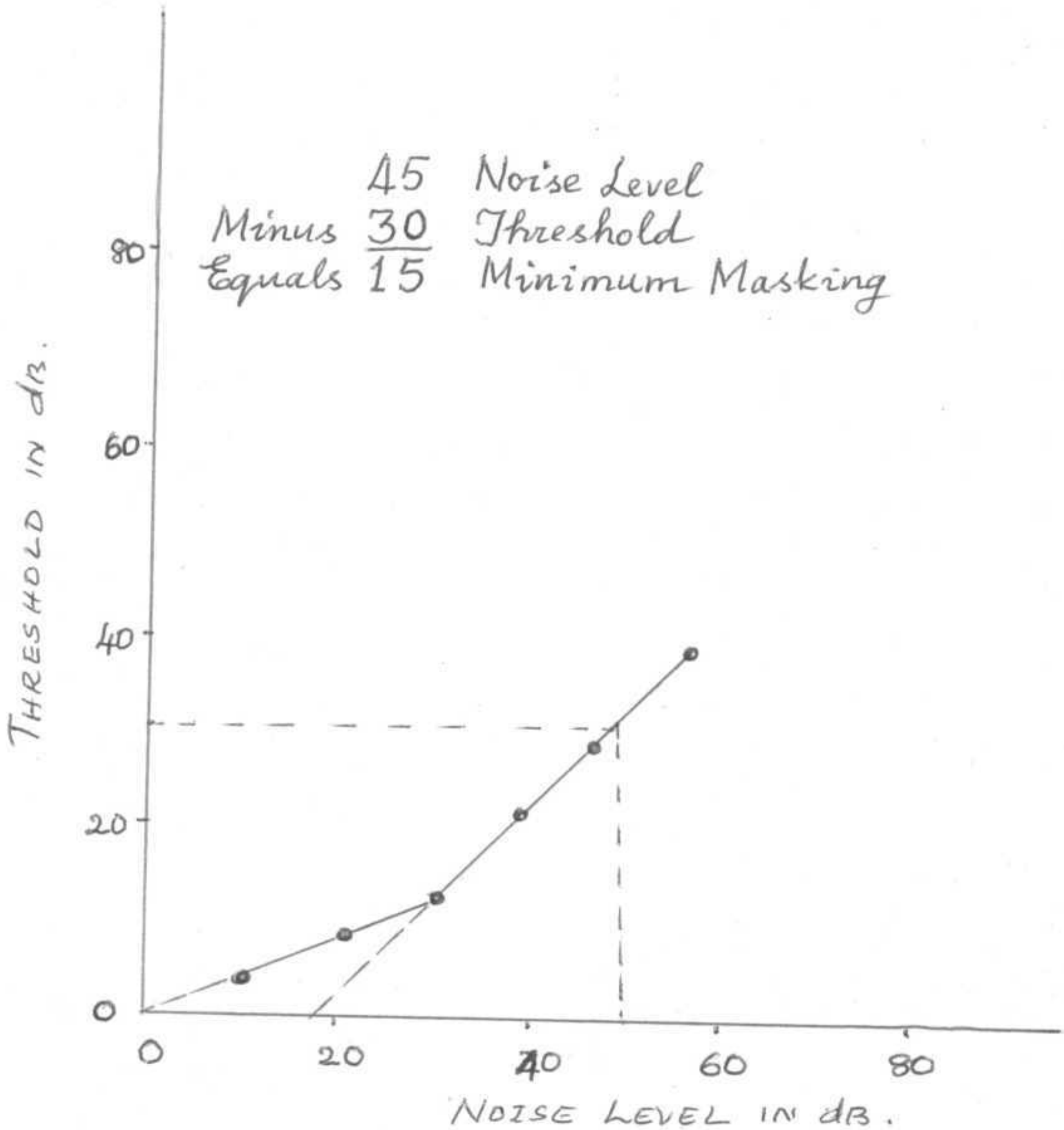
An alternative method to the above is, to take the median of the difference between the levels of the two stimuli at at least three successive masking noise intensities in a region where the difference appears to remain fairly constant. This is less affected by the results at any given point.

Martin's Method:

Select a group of reliable normal hearing subjects. Introduce a pure-tone of 30 dB HL into one ear and a masking noise into the same ear. Increase the noise intensity until the tone is just masked out. Tonal presentation should be a-periodic and about one second in duration. Then for each frequency 30 dB can be subtracted from each masking level and that level is regarded as 0 dB EM.

The instrument used for this purpose was a two-channel audiometer, one supplying noise and other a pure-tone which can be fed into a single earphone.

Figure - 1.



Graph of the expected relationship between the threshold of a pure-tone and the level of a typical noise presented to the same ear. The minimum masking level in this example is 15dB.
Studebaker (1964

The above methods show that the masking factor is determined by presenting pulsed tone in presence of continuous noise (ipsilateral masking). Further, the methods of masking indicate that the tone should be presented to the test ear for brief intervals in the presence of calculated amount of continuous noise in the non-test ear. In many clinical audiometers there will be no provision to interrupt the noise i.e. simultaneous presentation of tone and noise to the two ears or one ear for brief intervals is not possible. This clearly indicates that if such audiometers are used, the audiologist will have to present the tone for brief intervals in the presence of continuous noise in the non-test ear or test ear (ipsilateral masking).

There are also audiometers which have provision for presenting tone and noise for beief intervals simultaneously. Audiometers like, Beltone 200 C and Maico MA 22 have provision to present noise and tones for beief intervals simultaneously.

A question arises whether the method of presentation of tone and noise in finding masking factor or in finding masked thresholds has any influence on the results. This problem

has any fnfluence on the results. The available literature shows that the above problem has not been studied.

The present study attempts to find whether the methods of presentation of tone and noise would bring about significant differences in the results.

Hypothesis

The present study was undertaken to verify the following Null-Hypothesis. There is no significant differences between masking factor values obtained using the two masking procedures namely.

1. Tone and noise presented simultaneously for brief intervals through a single earphone.

2. Pulsed tone and continaous noise presented simultaneously through a single earphone.

Definitions Of The Terms Used[1]

1. Air-Conduction:

The measurement made with the air-conduction earphones of an audiometer that checks the hearing sensitivity of the entire auditory system.

2. Pure-tone:

A tone of only one frequency (i.e. no harmonics).

3. Pulsed-tone:

It is a pure-tone which has 50 m.seconds rise decay time and 200 m.second duration of the tone. This tone has air interstimulus duration of 1.5 seconds.

4. Narrow-Band-Noise:

A restricted band of frequencies surrounding a particular frequency to be masked. It is obtained by band-pass -filtering of broad-band-noise.

5. Masking:

The process by which the threshold of a sound (Maskee) is elevated by the simultaneous introduction of another sound (Masker).

1. Taken from Fredrick N. Martin, Introduction to Audiology (Englewood Cliffs, N.J: Prentice-Hall, 1975;, pp. 117-118.

6. Effective Masking (EM):

The minimum amount of noise required just ato mask out a signal (under the same earphone) at a given hearing threshold level (eg., 40 dB EM will just mask out a 40 dB HTL signal).

7. Minimum Masking Level[2]:

The masking noise level just sufficient to mask the test signal in the masked ear.

8. Masking factor[2]:

Masking factor = Noise level in dB HL - tone level in dB H

2. Taken from Jack Katz, Hard book of Clinical Audiology 2nd ed.(Williams & Wilkins, Baltimore, 1978), pp.130.

CHAPTER 2

METHODOLOGY

Subjects:

The subjects were 10 adults (5 males and 5 females) with a mean age of 19.2 years with no previous history of ear or hearing disorders. None of them had hearing loss. Their hearing was better than 15 dB HL (ANSI-1969) for the octave frequencies 250 Hz to 8000 Hz.

Apparatus:

All te sting was done using a Beltone 200 C clinical audiometer with TDH-49 earphones enclosed in MX 41/AR cushion.

Beltone 200 C is a double channel clinical audiometer. While performing pure-tone audiometry, noise can be presented either in the same ear or in the opposite ear.

Two types of noise are available for pure-tone masking, that is, white noise and narrow-band noise. Selection of noise is done by simply adjusting the channel two frequency and input dial to narrow-band noise or wide-band noise.

Presentations of the pure-tone can be determined using tone reversing switch, that is, the tone either be "normally-on" or "normally-off".

The automatic or manual switch provides automatic or manual tone production. If automatic position is selected, the tone will be presented at the rate of 0.3 seconds "on" and 0.3 seconds "off". If manual position is chosen, the tone can be interrupted using the interrupter switch. Similar control is available for noise stimuli on the channel-two. So noise can also be presented simultaneously and either pulsed or continuous.

Figure 2 can best illustrate the operational availabilitie in Beltone 200 C.

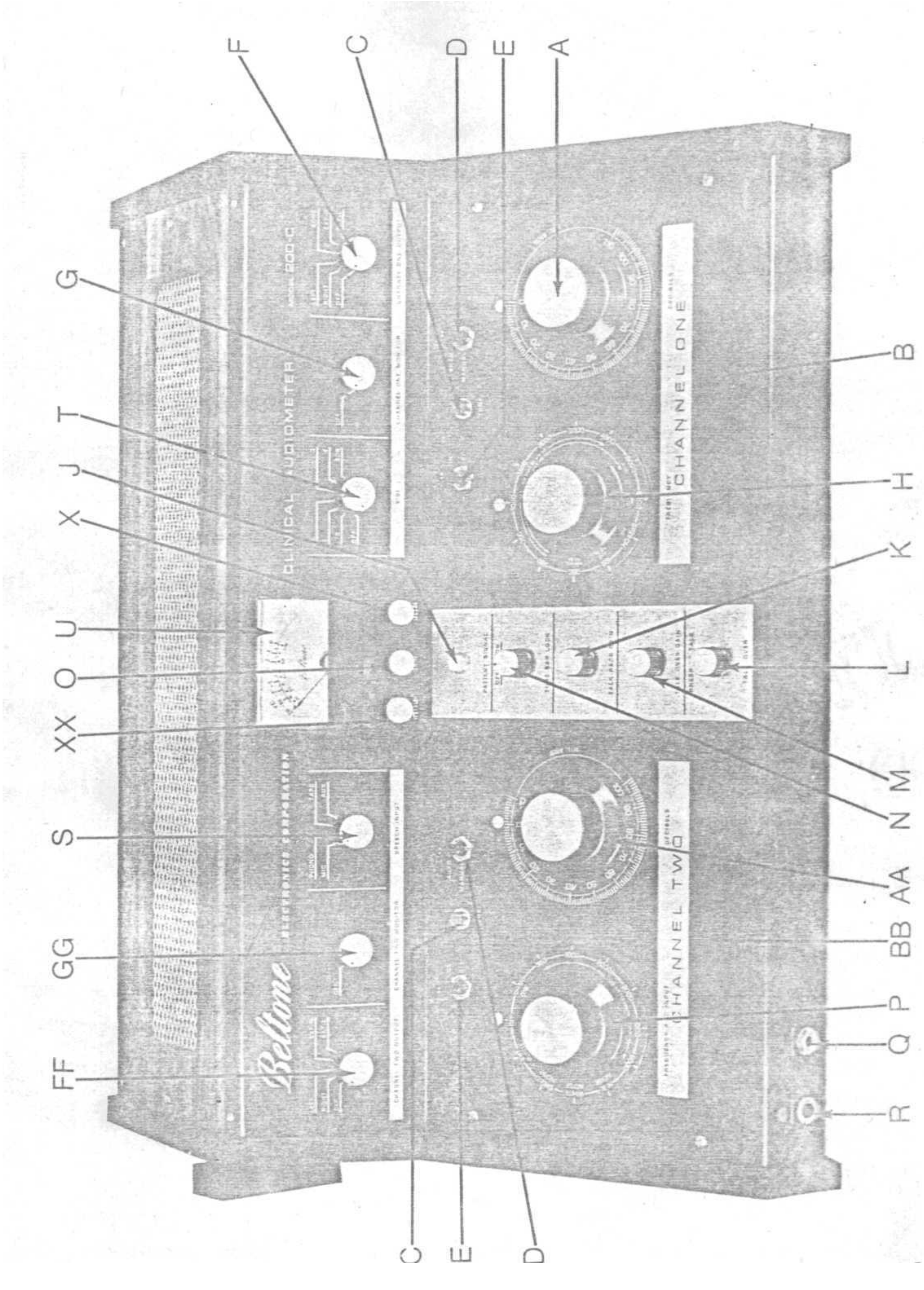
The&pobs on the two channels are as follows:

Channel 1		Channel 2	
1. Tone reversing switch	on off	4. Tone reversing switch	on off
2. Auto switch	OR off	5. Auto switch	on off
3. Interrupter	Depressed Released	6. Interrupter	Depressed Released

The manipulation of knobs of the audiometer will give the desired output in desired form. Here 5 conditions are described.

Condition 1

Channel 1	Channel 2
1. Tone reversing switch - on	4. Tone reversing switch - on
2. Auto switch - on	5. Auto switch - on
3. Interrupter - released	6. Interrupter - released



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CLINICAL AUDIOMETER
Beltone
ELECTRONICS CORPORATION
CHANNEL ONE
CHANNEL TWO

FRONT PANEL INDICATORS, CONTROL KNOBS OF BELTONE 200-C.

A, (AA) - Out put (Hearing level control).
B, (BB) - Tone Interrupter.
C, (CC) - Tone 'on' lamp.
D, (DD) - Automatic/Manual switch.
E, (EE) - Tone reversing switch.
F, (FF) - out put selectors.
G, (GG) - Monitor control.
H - Frequency.
J - Patient signal lamp.
K - Talk back gain.
L - Talk over switch.
M - Talk over gain.
N - Tone Bar Lock.
0 - vu Meter selector switch.
P - Frequency input.
0 - Monitor ear phoned.
R - Power.
S - Speech Unit.
T - SlSI.
U - VU Meter.
X - Channel one VU meter gain control.
XX - Channel two VU meter gain control.

In this condition, pure-tone and noise are pulsed automatically (0.3 seconds-on and 0.3 seconds-off). Noise pulse is in concurrence with pure-tone pulse. In this condition, depressing the interrupter switch stops the test.

Condition 2

Channel 1	Channel 2
1. Tone reversing switch - on	4. Tone reversing switch - on
2. Auto switch - off	5. Auto switch - off
3. Interrupter - released	6. Interrupter - released.

In this condition, the pure-tone and the noise are continuous and automatic.

Condition 3

Channel 1	Channel 2
1. Tone reversing switch - off	4. Tone reversing switch - off
2. Auto switch - off	5. Auto switch - off
3. Interrupter - depressed	6. Interrupter - depressed

In this condition, tone and noise are continuous. The operation is manual.

Condition 4

Channel 1	Channel 2
1. Tone reversing switch - off	4. Tone reversing switch - off
2. Auto switch - on	5. Auto switch - on
3. Interrupter - depressed	6. Interrupter - depressed.

In this condition tone and noise are pulsed but the operation is manual.

Condition 5

Channel 1	Channel 2
1. Tone reversing switch - on	4. Tone reversing switch - on
2. Auto switch - on	5. Auto switch - off
3. Interrupter - depressed	6. Interrupter - released

In this condition the pure-tone is pulsed but the operation is manual. The noise is continuously on.

There is an additional facility for this audiometer known as 'Tone-Bar-Lock' which helps to achieve electronic locking of both the interrupters. With this, interruption of stimuli in both the channels is accomplished by either tone interrupter switch.

Maico MA 22 is a dual channel clinical audiometer. Narrow band noise or wide band noise is available in the opposite ear phone to the test ear phone while using air-conduction (AC) mode and in the left ear phone while using bone conduction vibrator for the delivery of pure-tones. The narrow-band noise is automatically centered at the test frequency chosen by the channel 1. Tones can be presented either by automatic control or manual control. In both the modes tone can be presented either pulsed or continuous.

In Channel 2, noise stimuli are available either continuous or simultaneous but controlled by the channel 1 interrupter. Thus we have using auto (norm-on) position, three methods of presenting tone and with norm 'off position, we have two possibilities.

The color of the button indicates on and off positions. White means 'on' and black means 'off.

Figure 3 can best illustrate the operational availabilities in Maico MA 22.

Condition 1

Channel 1	Channel 2
1. Tone - White (on)	4. Input - Narrow-band Noise - White
2. Norm - White (on)	5. Mode - Continuous
3. Interrupter - released	

If the interrupter of Channel 1 is depressed, the tone will be put off in Channel 1. Similarly if the interrupter of Channel 2 is depressed, the output is put off. With this set up, the audiometer will deliver continuous tone in test ear phone and continuous noise in the opposite ear phone during air conduction testing. During bone-conduction testing, the tone will be delivered through vibrator and noise through the left ear phone of the audiometer. Each channel is controlled by an independent interrupter.

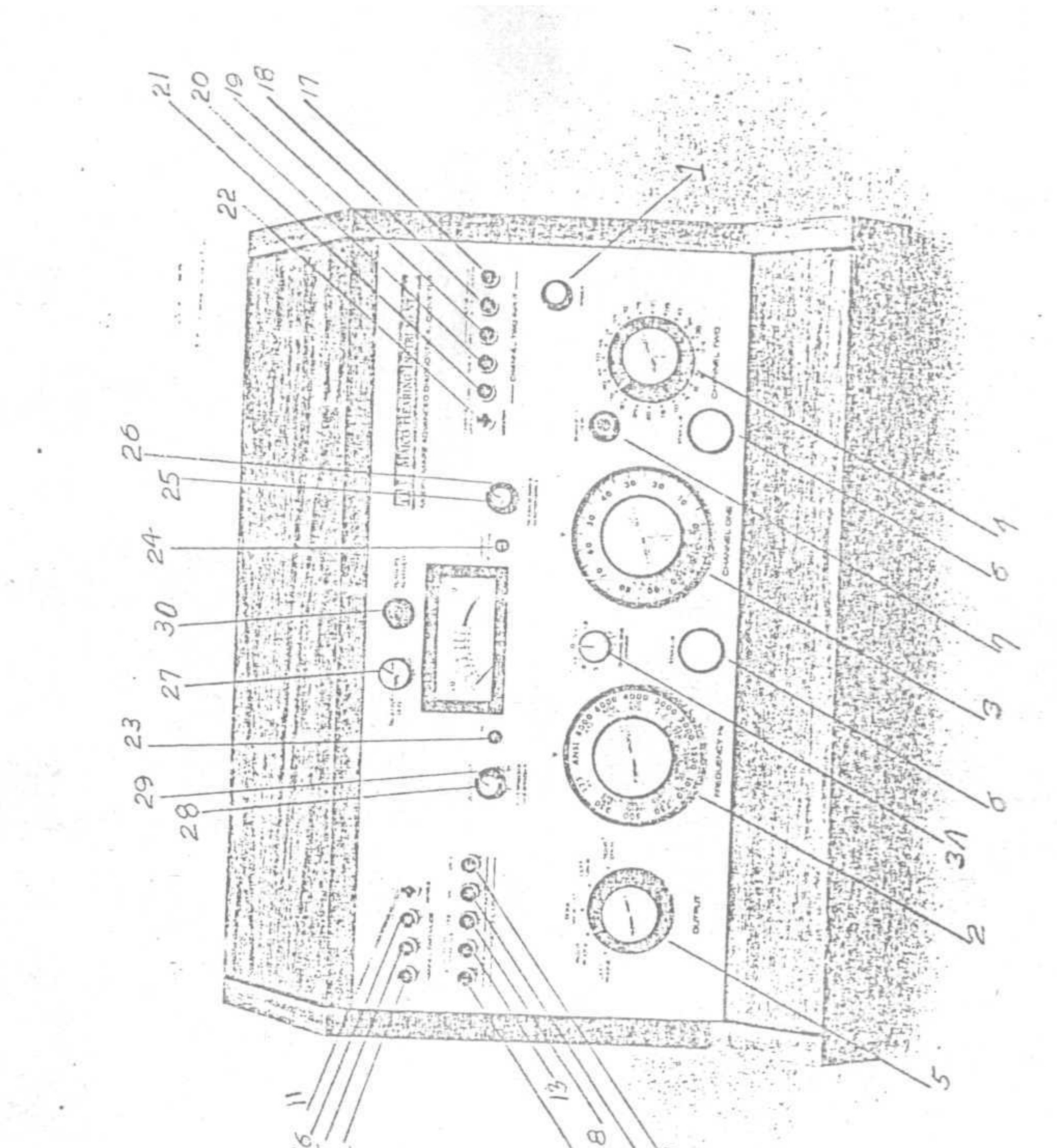
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Figure-3

CONTROLS - MAICO MA 22.

1.3 Power.
2. Frequency.
3. Channel one (Hearing level control).
4. Channel two (Hearing level control).
5. Output (Left phone, Right phone Bone).
6. Stimulus (Interrupter).
7. Channel one - 10 dB.
8. Tone.
9. Mic.
10. Tope A

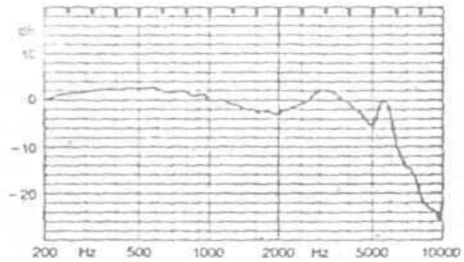
CHANNEL ONE MODE PUCH BUTTONS.

ll. Warble.
12. Pulse.
13. Norm off - Norm on.
14. Cont (Continuous).
15. Alt (Alternate).
16. Sim (Simultaneous).

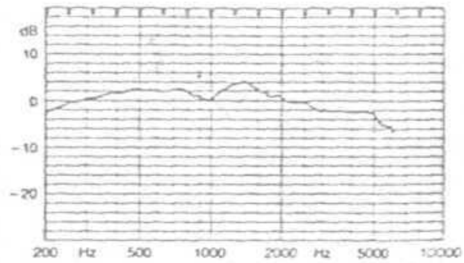
CHANNEL TWO INPUT PUSH BUTTONS.

17. Narrow Noise.
18. White Noise.
19. Speech Noise.
20. Tape B.

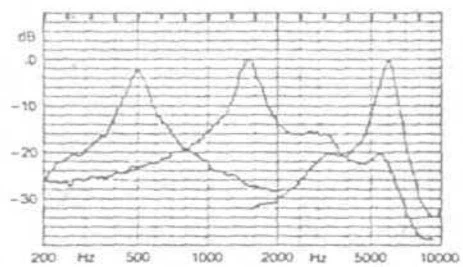
21. Chan 1.
22. Chan 1 Chan 2 monitor and VU adjust.
23. Ch 1 ON
24. Patient Response.
25. Talk back Gain.
26. Monitor Gain.
27. Talk over gain.
28. Volume control Tape/Mic.
29. Volume control Type B.
30. Talk over switch.
31. Vernier.



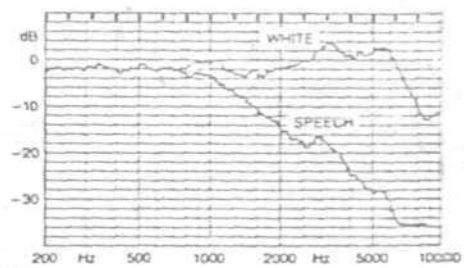
Acoustic frequency response of microphone (in anechoic chamber) to earphone (in 6cc coupler).



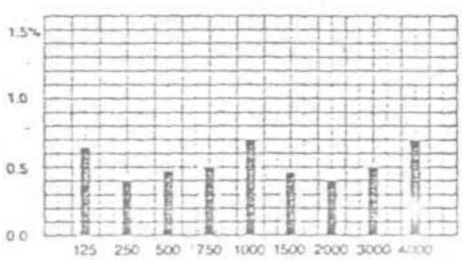
Acoustic frequency response of microphone to speaker (#5460, anechoic chamber).



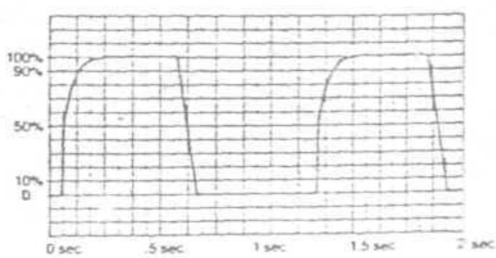
Typical acoustic spectrum of narrow band noise, 500 Hz, 1500 Hz, 6000 Hz, through earphone.



Typical acoustic spectrum of wide band noises through earphone.



Typical total harmonic distortion.



Pulse stimulus envelope.

Condition 2

Channel 1	Channel 2
1. Tone - White (on)	4. Input - Narrow band noise - White
2. Norm - Black (off)	5. Mode - Continuous - White (on)
3. Interrupter - Depressed.	

With this set up tone is present as long as the interrupter is depressed. The noise is continuously 'on'. If the interrupter of Channel 1 is released, the signal will be - put 'off. Similarly, if the interrupter of Channel 2 is depressed, the signal will be put 'off.

Condition 3

Channel 1	Channel 2
1. Tone - White	4. Input - Narrow-band noise - White
2. Norm - Black	5. Mode - Simultaneous - White
3. Interrupter - Depressed	6. Interrupter - Released.

Same as Condition 2 but noise will be present as long as the tone is presented.

Condition 4

Channel 1	Channel 2
1. Tone - White	5. Input - Narrow-band noise - White
2. Norm - White	6. Mode - Continuous - White
3. Pulsed - White	7. Interrupter - released.
4. Interrupter - Released.	

With this set up, the audiometer will deliver pulsed-tone as long as the interrupter is released and opposite ear phone will deliver continuous noise.

Condition 5

Channel 1	Channel 2
1. Tone - White	5. Input - Narrow-band noise - White
2. Norm - White	6. Mode - simultaneous - White
3. Pulsed - White	
4. Interrupter - released	7. Interrupter - released.

With this set up, the audiometer will deliver pulsed tone as long as the interrupter is released and in the opposite ear phone it will deliv er pulsed noise simultaneously. Depressing either interrupter will terminate the stimuli in both the ear phones.

Calibration Procedure Used:

The audiometer used in this study was a two channel clinical audiometer (Beltone 200 C) and the manufacturer claimed that it was calibrated to ANSI (1969) standards. However to ensure accuracy in calibration, the audiometer was calibrated periodically during the study according to the guidelines given by Wilber (1978). The exact procedure is as follows:

Figure 4 illustrates the set up for calibration.

BLOCK DIAGRAM OF CALIBRATING EQUIPMENT

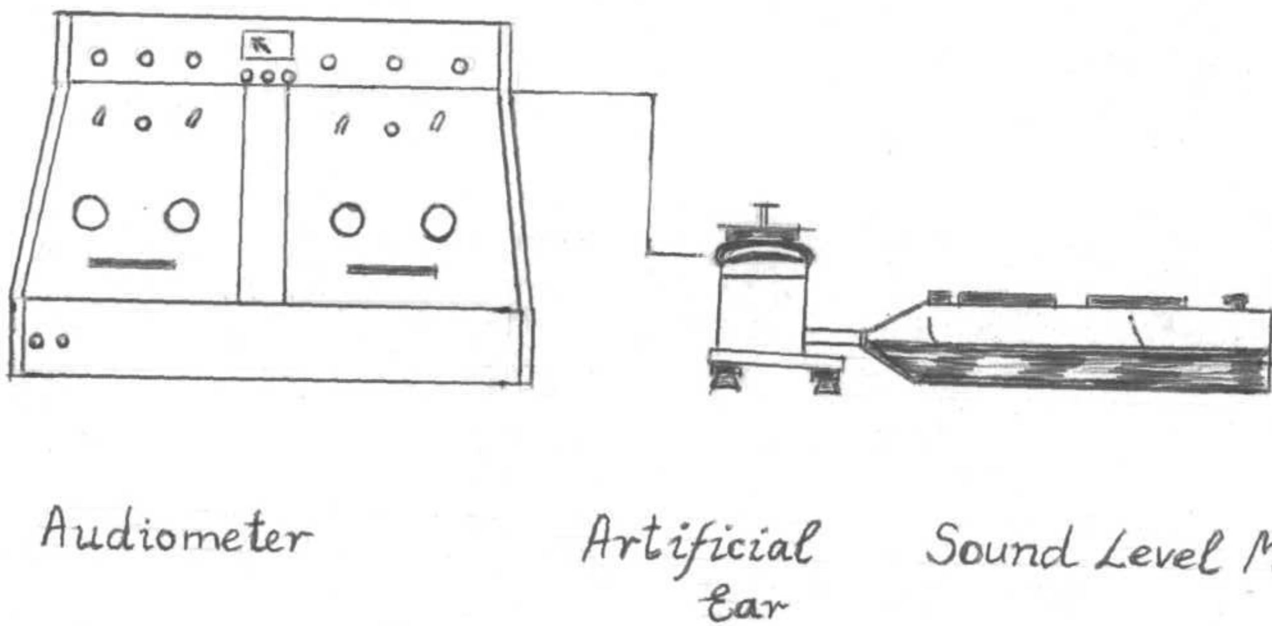


Figure-4

The audiometer Beltone 200 0 was turned 'on' and was allowed to warm up. The Sound-Level Meter (B&K 2203) was set to the following settings. The meter switch was turned to 'external filter' and to 'slow'. The weighting switch was in the 'off' position. The signal ear phone (TDH 49 with MX 41/AR cushion) of the audiometer was removed from the head band and was placed over the coupler of the artificial ear (B&K 4132). The ear phone was held in place by means of a tension of the artificial ear and it was adjusted to 0.5 Kg of pressure. After initial placement of the earphone on the coupler, a low frequency tone (250 Hz) was introduced and the ear phone was readjusted until the Sound-Level-Meter needle read the highest intensity. This is said to ensure best placement according to Wilber (1978). The frequency selector of the audiometer was set to 500 Hz. The octave filter (B&K 1630) of the Sound-Level-Meter was set to 500 Hz. The audiometer was set to right ear phone (selector switch) and the tone was continuously 'on'. The hearing loss dial was set to 60 dB for the frequency chosen. The reading on the Sound-Level-Meter was noted. Similarly other frequencies (IK Hz, 2K Hz and 4K Hz) were checked. The audiometer was found to produce intensity of tones within tolerance levels.

To check the linearity of the attenuator of the audiometer, a similar set up was used. The range finder was set to 120 dB. The hearing loss dial was set at maximum and the output of the sound level meter was noted. The hearing loss dial was dropped in 5 dB steps and the reading on the sound level meter was noted for each 5 dB drop. The readings on the sound level meter showed that the audiometer linearity was satisfactory.

The intensity of masking noise was checked in the same way as pure-tone; the only difference being instead of tone noise was introduced and the hearing loss dial was adjusted to 80 or 90 dB HL to avoid interference from extraneous noise. The sound level meter was set to linear setting. The reading on the sound level meter was within expected levels.

Environment:

The hearing test was performed in a sound treated room of All India Institute of Speech and Hearing. The ambient noise levels in these rooms were within the maximum allowable noise levels.

Procedure:

Initially all the subjects were tested for their hearing sensitivity for pure-tones using the procedure recommended by Carhart and Jerger (1959). Subjects were instructed to respond only to the pure-tone and to ignore the noise whether intermittent or continuous. Only the right ear of all subjects was chosen for the study.

In the first phase of the experiment all the subjects were asked to listen to pure-tones presented at 30 dB HL in presence of a narrow-band noise. In this procedure, tone and noise were presented simultaneously for brief period that is, tone and noise appeared and disappeared at the same time. The intensity of narrow-band noise was increased at regular intervale till the subject ceased to respond to the pure-tone. The difference between the level of noise required to mask the pure-tone and the level of pure-tone in the same ear was considered as the masking factor. Similarly masking factors were obtained for pure-tones at 50 dB HL and 70 dB HL. Using the same procedure masking factors were obtained for 500 Hz, 1000 Hz, 2000 Hz and 4000 Hz pure-tones.

In the second phase of the experiment, masking factors were obtained using the following procedure. Noise stimulus was presented continuously and the pure-tone pulsed. Both the stimuli were fed to a single ear. Subjects were asked to respond only to pulsed pure-tone and ignore the steady noise. The su bjects listened to a pulsed pure-tone at 30 dB HL in presence of continuous noise. The intensity of narrow-band noise was increased at regular intervals till the subject ceased to respond to the pulsed pure-tone. The difference between the level of noise required to mask the pulsed-tone and the level of the pulsed-tone in the same ear was considered as masking factor. Using the same procedure, masking factors were obtained for frequencies 500 Hz, 1000 Hz, 2000 Hz and 4000 Hz at 50 dB HL and 70 dB HL.

CHAPTER 3

RESULTS AND DISCUSSION.

Table 1 gives the masking factor values obtained for different frequencies (500 Hz, 1000 Hz, 2000 Hz and 4000 Hz) and at different levels (30 dB HL, 50 dB HL and 70 dB HL) using experimental procedure 1 (presentation of noise and tone simultaneously for brief intervals). Mean and Standard Deviation values are also included in the Table 1.

Table II shows the masking factor values for different frequencies (500 Hz, 1000 Hz, 2000 Hz and 4000 Hz) and at different levels (30 dB HL, 50 dB HL and 70 dB HL) using experimental procedure II (presentation of a continuous noise and pulsed tone simultaneously). Mean and Standard Deviation values are also included in the Table II.

To find whether there is any significant difference between the mean masking factor values obtained in the two procedures at different frequencies and at different levels, 't' test of signifi cance for correlated means was applied. The results are given in Table III.

Table III shows that there is no significant difference between the masking factor values obtained using the two methods at frequencies 500, 1000, 2000 and 4000 Hz and at levels 30 dB HL, 50 dB HL and 70 dB HL.

TABLE 1

Masking factor values obtained when tone and noise Pre-sented simultaneously for brief intervals

Frequency in Hertz	Inten-sity in dB HL	MASKING FACTOR VALUES										Mean	Standard Deviation
500	30	10	-5	-15	0	0	0	-10	5	-20	-10	-4.5	9.264
1000	30	5	-5	5	0	0	0	-5	0	0	5	-0.5	3.689
2000	30	0	0	5	CND*	5	0	0	0	5		1.1	3.333
4000	30	20	0	20	10	10	20	15	20	10	5	14	5.676
500	50	5	-10	5	0	10	0	0	10	-15	0	-0.5	8.045
1000	50	10	0	5	0	30	5	0	10	0	0	-6	9.368
2000	50	10	0	10	0	0	0	0	0	5	0	2.5	4.249
4000	50	20	10	20	10	5	10	0	20	10	5	11	6.992
500	70	-5	0	5	0	10	0	5	20	0	0	3.5	7.091
1000	70	15	0	5	0	15	0	0	15	0	0	5	5.651
2000	70	10	-10	5	0	0	0	-5	-10	-5	5	1	6.582
4000	70	CND	10	20	10	5	20	10	20	10	10	12.8	5.651

* (MSB - Could Not Do.

TABLE II

Masking factor values obtained when continuous noise and pulsed-tone are presented simultaneously.

Frequency Hertz	Intensity in dB HL	MASKING FACTOR VALUES										Mean	Standard Deviation
500	30	0	0	5	-5	0	0	5	0	0	0	0.5	2.833
1000	30	10	10	5	0	5	0	5	0	0	0	3.5	4.116
2000	30	0	0	10	CND	0	0	0	0	5	0	1.66	3.534
4000	30	20	20	20	10	15	15	20	10	15	15	16	3.944
500	50	35	0	5	0	5	0	0	0	5	0	5	10.80
1000	50	20	10	10	0	0	0	5	5	15	O	6.5	7.091
2000	50	25	5	5	0	10	0	5	0	5	0	5.5	7.619
4000	50	CND	20	20	15	20	15	5	10	15	15	15	5
500	70	25	5	5	0	5	0	0	0	10	-10	4	9.067
1000	70	20	5	10	0	0	0	10	0	15	0	6	7.378
2000	70	15	5	5	0	0	0	0	0	0	0	2.5	4.859
4000	70	20	15	20	10	15	20	10	10	15	15	15	4.082

TABLE III

Mean, Standard Deviation and 't' values obtained for the two procedures.

Frequency in Hertz	Intensity level in dB HL	Difference Mean	Standard Deviation	Degrees of freedom	Values at two levels of significance	t	Significant or not significant
500	30	5	10.80	9	0.05-2.26' 0.01-3.25	1.465	not significant
1000	50	4	5.164	9	0.05-2.26 0.01-3.25	2.449	Significant
2000	30	0.5	3. 01	8	0.05-2.31 0.01-3.36	0.498	Not significant
4000	30	2	6.324	9	0.05-2.26 0.01-3.25	1.0	Not significant
500	50	4.5	12.12	9	0.05-2.26 0.01-3.25	1.173	Not significant
1000	50	0.5	12.03	9	0.05-2.26 0.01-3.25	0.131	Not significant
2000	50	3	5.868	9	0.05-2.26 0.01-3.25	1.616	Not significant
4000	50	5	7.07	8	0.05-2.31 0.01-3.36	2.12	Not significant
500	70	0.5	13.22	9	0. 05-2.26 0.01-3.25	0.119	Not significant
1000	70	1.0	9.66	9	0.05-2.26 0.01-3.25	0.527	Not significant
2000	70	1.5	6.687	9	0.05-2.26 0.01-335	0.705	Not significant
4000	70	1.7	5.59	8	0.05-2.31 0.01-3.36	0.913	Not significant

Further the results show that there is significant difference between the masking factor values obtained using the two procedures at frequency 1000 Hz at level 30 dB HL. Thus the null-hypothesis is accepted.

In sum, out of twelve conditions, one condition shows that there is significant difference in the results obtained using the two methods. The remaining 11 conditions show that there is no significant differences between masking factor values obtained using the two methods. Hence, it may be concluded that the two methods yield nearly same masking factor values.

The present study has revealed that the two procedures of masking [(l) pulsed tone and pulsed noise, (2) pulsed tone and continuous noise] do not bring about difference in the results.

CHAPTER 4

Summary:

Available literature shows that the masking factor is determined by presenting pulsed tone in presence of continuous noise (ipsilateral masking). In many clinical audiometers there will be no provision to interrupt the noise that is, simultaneous presentation of tone and noise to the two ears or one ear for brief intervals is not possible. This clearly indi cates that if such audiometers are used, the audiologists will have to present the tone for brief intervals in the presence of continuous noise in the non-test ear.

There are also audiometers which have provision for presenting tone and noise for brief intervals simultaneously. Audiometers like Beltone 200 C and Maico MA 22 have this provision. A question arises whethere the method of presentation of tone and noise in finding masking factor or in finding masked thres holds has any influence on the results.

The present study was carried out to find whether the methods of presentation of tone and noise will bring about - significant differences in the results. The results showed that there was no significant differences for the masking factor values obtained using the two methods.

Implications of the study:

The results of the study indicate that either procedure that is, 1. Tone and noise presented simultaneously for brief intervals and 2. pulsed tone and continou s noise presented simultaneously would yield similar masking factors. Hence, while masking, noise may be presented simultaneously for brief intervals with the tone presentation. This method may be used with patients who find it difficult to tolerate continuous presentation of noise.

Limitation of the study:

1. Limited time was allotted to collect the data.
2. Repetition of the present study to check the reliability was not possible because of limited time allotted and also because of break down of Beltone 200 C audiometer (even now Beltone 200 0 audiometer is not functioning. It is under repair in Electronics Section of A.I.I.S.H.).

Recommendations:

1. As,in this study, reliability could not be established, a large sample may be tested in the lines of the present study and the same sample may be retested for reliability.
2. Masked thresholds may be established on clinical population using the two procedures used in the present study.
3. As some subjects reported that they had difficulty judging the presence of tone when tone and noise were presented simultaneously for brief intervals, further research is needed before this procedure is used clinically.

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