SEX DIFFERENCES IN LATENCY AND AMPLITUDE CHANGES FOR BINAURAL STIMULATION IN AUDITORY BRAIN STEM RESPONSES

Reg. No. 8401

A DISSERTATION SUBMITTED IN PART FULFILMENT
FOR THE DEGREE OF MASTER OF SCIENCE
(SPEECH AND HEARING)
UNIVERSITY OF MYSORE

ALL INDIA INSTITUTE OF SPEECH & HEARING
MYSORE-570006

1985

****

DEDICATED

TO MY

BELOVED

FATHER, MOTHER AND BHAIYA

****

CERTIFICATE

This is to certify that the dissertation entitled "SEX DIFFERENCES IN LATENCY AND AMPLITUDE CHANGES FOR BINAURAL STIMULATION IN AUDITORY BRAIN STEM RESPONSES" is the bonafide work done in part fulfilment for the degree of Master of Science (Speech and Hearing) of the student with Register No.

Director
All India Institute of
Speech and Hearing
Mysore - 570 006

CERTIFICATE

This is to certify that this dissertation entitled "SEX DIFFERENCES IN LATENCY AND AMPLITUDE CHANGES FOR BINAURAL STIMULATION IN AUDITORY BRAIN STEM RESPONSES" has been prepared under my guidance and supervision.

GUIDE

DECLARATION

This dissertation entitled "SEX DIFFERENCES IN LATENCY AND AMPLITUDE CHANGES FOR BINAURAL STIMULATION IN AUDITORY BRAIN STEM RESPONSES" is the result of my own study undertaken under the guidance of Dr.M.N.Vyasamurthy, Lecturer in Audiology, All India Institute of Speech and Hearing, Mysore and has not been submitted earlier at any University or Institution for any Diploma or degree.

Mysore 8401
Dated: May 1985 Register No.

ACKNOWLEDGEMENT

I wish to place on record my deep indeptedness to my guide Dr.M.N.Vyasamurthy, Lecturer in Audiology, All India Institute of Speech and Hearing, Mysore, for all his help right from the suggestion of the topic to the completion of the dissertation and for his valuable * advice rendered through out the course of this work.

My thanks are also due to Dr. Nitya Seelan, Director, All India Institute of Speech and Hearing, Mysore.

My thanks are also due to Dr. S.Nikam, Professor and Head of the Department of Audiology, for providing all the facilities.

I extend my thanks to Radhika, Kavitha and Sarguna Murthy for helping me at work.

Needless to say, my grateful thanks are due to Ms.Rajalakshmi R Gopal for having typed this dissertation.

I am of course extremely grateful to all my subjects but for whose co-operation this study would not have been possible.

I am thankful to each and every one who is directly or indirectly responsible for the present study.

****

TABLE OF CONTENTS-

LIST OF TABLES

INTRODUCTION

INTRODUCTION

Gender is found to atfect various auditory functions, but the studies in this area are scarce. Dengerink et.al. (1984) state that the studies of differences between males and females in temporary noise effects are scarce. Sex differences in absolute hearing thresholds, for pure-tones, have been shown to exist (eg. Corso, 1963; Glorig and Nixon, 1966). Tobias (1965) found that females hear binaural beats at lower frequencies than do males. Several studies have indicated that females evidenced greater sensitivity to noise at high frequencies than males (Axelsson and Lindgren, 1981; Wardn et.al., 1959; Loeb and Fletcher, 1963) but that opposite may be true at low frequencies. The literature on sex related differencesin lateralization rife with in-consistencies (Bryden, 1982). Kannon and Lipscomb (1974) found there was a significant right ear advantage for pure-tone perception, for males, but not for females. The study of Dengerink, et.al. (1984) assessing noise effect at high frequencies has supported greater sensitivity of females.

Auditory brainstem response audiometry is of great interest today, in the field of Audiology, Otology, Neurology, Neurootology and is probably one of the most exciting advances in the evoked response audiometry (ERA).

Except for EDR and BER normative data on sex related differences are not reported for other electric responses. Goldstien et al (1955) reported no significant differences in the initial, terminal or maximum skin resistance (EDR's) between males and females.

The differences in brainstem electrical response (BER) morphology for males and females has been investigated (Beagley and Shedrake, 1978; McClelland and McCrea, 1979; Stockard et al. 1978, 79). It is shown that absolute latency of wave-I is essentially the same for male and female subjects, but wave-III and wave-V latency was significantly shorter in females than males. For clicks the difference in V latency has been reported as between 0.05 and 0.36 msec, (on average 0.22 msec). (Beagley and Sheldrake, 1978), Kjaer, 1979; McClelland and McCrea, 1979; Jerger and Hall,1980; Michaleweski et al 1980; Jacobson et al 1980). The difference in III latency is slightly less on average about 0.15 msec. Wave-1 is little affected and therefore the I-V interpeak latency is about 0.21 msec shorter in female subjects (Stockard et al 1979). The sex related differences persist at lower intensities and at faster presentation rates (Kjaer, 1978; Jackobson et al, 1980). The amplitude of all components are larger in the adult female than in male (Kjaer, 1979; Michalewski et al 1980). Wave-1 appears to be about 30% larger in females; Wave-III 23% and Wave-V 30%.

The differences noted in the latency measurements do not occur in normal young children. The occasional sex differences noted in the neonatal studies (Seitz, et al 1960; Cox, et al 1981) are probably related to the increased perinatal risk in male infants do not persist (Cox,et al 1981). There is some controversy in the literature about when the adult difference begins. McClelland and McCrea (1979) found no significant sex related latency differences in a group of 9-13 years old children but noted difference related to adoloscence and it attendant hormonal changes. O'Donovan (1980) however found significant sex related latency differences from the age of 8 years onward.

Another factor that is specific to adult females is the menstrual. Picton, et al (1981) have suggested that interpeak latency (V-1) changes slightly during the menstrual cycle, being on average 3.81 msec, between the days 12 and 26,& 3.92 msec, on the other days.

McClelland and McCrea (1979) studied both adults and preadoloscent subjects and found that no sex related differences were apparent in the younger age groups. Stockard, et al (1978) suggests that separate response norms for male and female subjects should be generated in order to avoid diagnostic errors that in reality, could be attributed to sex differences.

The statistical analysis of BER normative data obtained at the Macquarie University Audiology Laboratory (1984) indicates that there is no significance latency difference between males and females for each BER wave components. However, visually it is evident that the response amplitude of the female BERs appeared to be larger than males and is in agreement with the findings of other investigators. (Satyan, 1984; Beagley and Sheldrake, 1978; McClelland and McCrea, 1979; Stockard, et al, 1978, 1979). Rowe (1978) did not find differences between males and females for BER. Kjaer (1979), Michaleweski et al (1980) and Rosenhamer, (1980) found females show shorter latency values. Gupta (1983) found no significant differences in males and females, in terms of latency and amplitude, at two intensity levels.

Statement of the Problem:

The present study was undertaken to see if ΔL, ΔA, $\Delta L_{(V-I)}$ and $\Delta L_{(III-I)}$ values are different in males and females.

Where ΔL = (Latency of response when one ear (Right or or Left) is stimulated) - (Latency of response when both the ears are stimulated)

ΔA = (Amplitude of response when both the ears are stimulated) - (Amplitude of response when one ear (Right or Left) is stimulated)

$$\Delta L(V-I) = | (\Delta L_V) - (\Delta L_I) |$$

$$\Delta L(III-I) = | (\Delta L_{III}) - (\Delta L_I) |$$

Null Hypothesis:

1. There is no significance difference for Δ L; of I to VI Peaks, between males and females.

2. There is no significance difference for Δ A, of I to VI peaks, between males and females.

3. There is no significance difference for $\Delta L_{(V-I)}$, between males and females.

4. There is no significance difference for $\Delta L_{(III-I)}$ between males and females.

.... ^*

REVIEW OF LITERATURE

REVIEW OF LITERATURE

Effects of Gender on various Auditory Functions:

sex difference in absolute thresholds for pure tones have been shown to exist (eg. Corso, 1963? Glorig and Nixon, 1966). Corso (1963) has done a comprehensive study of age and sex difference in pure tone thresholds. For the age group 18 to 24 years, he has found small differences at all frequencies tested (250, 500, 1000, 2000, 4000, 8000 Hz) In his study the mean thresholds for female subjects were slightly less than that of males.

Tobias (1965) has found that the females hear binaural beats at lower frequencies than do males. He found the averaged cross time, the median cut off frequency for females was found to be about 600 Hz, while for the males the median cut off frequency, was about 800 Hz this data for different times during the menstrual cycle show that the distribution of frequencies at which binaural beats are heard, vary the found, at the onset of menses, the range for males and females almost totally overlap. The frequency range for females moves lower during the second week of the menstrual cycle and moves back toward that of the males at the time of ovulation.

Baker and Weiler (1977) investigated changes in auditory threshold during 4-6 week intervals for men, women on birth control pills, and normal cycling women not on birth control pills. They determined the threshold at 250, 500, 1000, 2000, 4000, 8000Hz. They found normal cycling females had significantly lower thresholds during the first half of menstrual cycle than during the second half. Also, females on birth control pilla showed significantly and consistently lower threshold than the other listeners at several frequencies.

The literature on sex-related differences in lateralization is rife with inconsistencies (Bryden, 1982). Sex related differences in laterality has been studied by Bryden, 1979; McGlone, 1980. Briggs and Nebes (1976) found a slightly larger right ear effect for men than for women, although the difference was not statistically significant. Greater right ear effects for males was found for list material in the data presented by Bryden (1966), where 75% of men but only 58% of the women showed greater accuracy on the right ear. Lake and Bryden (1976) presented the subjects pairs of consonant vowel(CV) syllables dichotically and asked to report the items they had heard. They found that among men 94%.showed a right ear effect, whereas only 67% of the women did, a highly significant difference.

Furthermore, men showed an average right ear superiority of 4.31 items, whereas women averaged only a 1.47 item difference. Kannon and Lipscomb (1974) reviewed previous studies on ear differences and found there was a significant right ear advantage for pure tone perception for males, but not for females.

Dengerink et al (1984) state that the studies of differences between males and females in temporary noise effects are scarce. Several studies have indicated that females evidenced greater sensitivity to noise at high frequencies than males (Axelsson and Lindgren, 1981? Ward et al. 1959; Loeb and Fletcher, 1963), but that opposite may be true at low frequencies. The study of Dengerink et al (1984) assessing noise effects at high frequencies has supported greater sensitivity of females. They performed two experiments, the first experiment, examined thresholds at 4 KHz and 8 KHz and the threshold of octave masking at 4 KHz before and after noise exposure for males, females and females using oral contraceptives. Females using oral contraceptives evidenced greater threshold shifts at 4 KHz than either of other two groups. Their second experiment examined thresholds and loudness discrimination index at 4 KHz for males and females, before and after noise exposure. They found, the females evidenced greater loudness discrimination index both with and without noise exposure than did males. In addition, they found females responded to the noise with cutaneous vaso—dialation which males evidenced vasoconstriction.

Auditory brain stem response audiometry is of great interest today, in the field of Audiology, Otology, Neurology and Neurootology and it is probably one of the most exciting advances in the evoked response audiometry.

Effects of Gender on ABR:

Sex related differences in normative data are not reported for other electrical responses except for EDR and BSER. Goldstien et al (1955) reported on significant differences in initial, terminal or maximum skin resistance (EDR's) between males and females.

The differences in brainstem electrical response (BER) morphology for males and females has been investigated by Beagley and Sheldrake, 1978; McClelland and McCrea, 1979; and Stockard et al 1978, 1979. They showed that absolute latency of wave-I is essentially the same for male and female subjects, but wave-III and wave-V latency was significantly shorter in females. For clicks the difference in wave-V latency has been reported as between 0.05 and 0.35 msec (on average 0.22 msec) (Beagley and Sheldrake, 1978; Kjaer, 1978y McClelland and McCrea, 1979; Jerger and Hall, 1980; Michaleweski et al, 1980; Jackobson et al, 1980). They also reported that, difference in wave-IIU latency is slightly less on average about 0.15 msec. Wave-I is little affected and therefore for the V-I inter-peak latency is about 0.21 msec shorter in female subjects (Stockard et al, 1979). The sex related differences persist at lower intensities and at faster presentation rates (Kjaer, 1978; Jackobson et al 1980). The amplitudes of all components are larger in the adult females than in males. (Kjaer, 1979; Michalewski et al, 1980). According to them, wave-I appears to be about 30% larger in females, wave-III 23% and wave-V 30%.

The sex differences noted in the latency measurements do not occur in normal young children. (Cox et al 1981). Occasional sex differences noted in the neonatal studies (Seitz et al, 1980; Cox et al 1981), are probably related to the increased perinatal risks in male infants and do Not persists (Cox et al, 1981). Stockard and Stockard (1983) found no sex difference in interpeak latency in new born group (p 0.3). There is some controversy in the literature about when the adult difference in sex begins. McClelland and McCrea (1979) found no significant sex related differences in a group of 9 to 13 year old children but they noted difference related to adoloscence and its attendant hormonal changes. O'Donovan (1980) however found significantly different latencies from the age of 8 years onwards. He states that the anatomical differences between the sexes might therefore underlie, the differences in recording brainstem responses. He speculates that the only intelligible explanation seems to be based on spatial dimension of the wave generating system and volume conductor embedding it, than the electrophysiological diversity. Also the shorter pathways would give an earlier latency and might also increase synchronization so as to give a larger amplitude. Another factor that is specific to adult females is the menstrual cycle. Preton et al (1981) have reported that V-I interpeak latency changes slightly during the menstrual cycle, being on average 3.81 msec between the day 12 and 26, and 3.92 msec on the other days. According to him this is probably related to temperature changes during the menstrual cycle. Temperature difference cannot although explain the overall male female differences. Since males in general have slightly higher core temperature than females. (Picton et al 1981).

McClelland and McCrea (1979) studied both adult and preadoloscent subjects and found that no sex related differences were apparent in the younger age groups. Stockard et al (1978) suggest that separate response norms for male and female subjects should be generated in order to avoid diagnostic errors that in reality, could be attributed in sex differences.

The statistical analysis of BER normative data obtained at the Macquarie University Audiology Laboratory (1984) indicates that there is no significant difference between males and females for each BER wave components. However, visually it is evident that the response amplitude of the females on BER's appeared to be larger than males and is in agreement with the findings of other investigators (satyan, 1984? Beagley and Sheldrake, 1978? McClelland and McCrea, 1979? Stockard et al 1978, 1979) Rowe (1979) did not find differences in sex. Kjaer (1979), Michalewaski et al (1981), Rosenhamer (1980) found females show shorter latency values. Gupta (1983) found no significant differences in males and females in terms of latency and amplitudes at two intensity levels (80 dB HL and lOOdB HL). However, he has found that females at both intensity levels do yield shorter latency values.

METHODOLOGY

METHODOLOGY

Subjects;

Thirty two normal hearing <20 dB HL ANSI-1969) in the age range of 18 year to 28 years and 2 months, (mean age 20 years and 9 months) were used in the present study. Subjects were divided into Group-I and Group-II, such that Group-I consists of 16 males in the age range of 18 years to 28 years and 2 months (mean age 21 years and 3 months) the Group-11 consists of 16 females in the age range of 18 years to 22 years and 4 months (mean age 20 years and 5 months).

The subjects were selected on the following criteria:

1. They should not have any history of chronic ear discharge, tinnitus, giddiness, earache or any other otologic complaints

2. They should not have any history of epilepsy or other neurological complaints.

3. They should be able to relax and feel comfirtable with electrodes on, with in 10-15 minutes after their placement.

4. Their electrophysiological input should come below 500 microvolts within 10-15 minutes after electrode placement.

5. Their hearing sensitivity should be within normal limits i.e. within 20 dB HL (ANSI 1969) in both the ears.

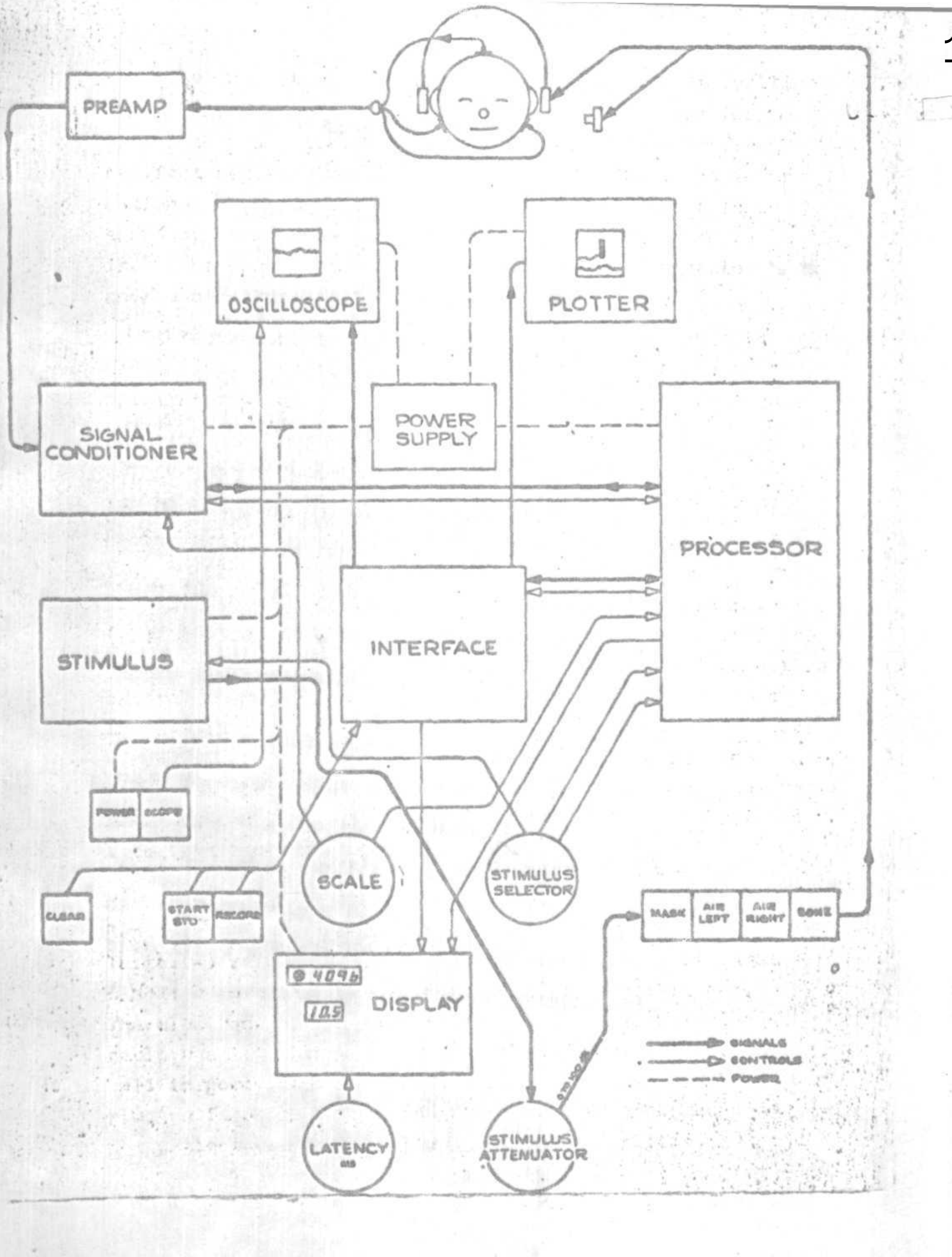

Fig. 1 - Flow chart of ERA: TA-1000 used in the present study.

Equipment:

The equipment used was, Blectric Response Audiometer model TA-1000.(See fig)

Brief Description of the instrument:

The TA-1000 system consists of the SLZ 9793 desk top console, the SLZ 9794 preamplifier and an accessory group. The SLZ 9793 console contains all of the operating controls, indicators and read outs for the system. It provides the patients an auditory stimulus and accepts patients electrical responses from the preamplifier. Signal conditioning and the digital averaging extract the patient's BSER responses from the back ground noise. Oscillographic display and ink-on-paper recording provide an on going monitor as well as a permanent record of responses.

The SLZ 9794 preamplifier is an isolated EEG preamplifier with frequency response and gain specifically designed for ERA Patient's electrical response is sensed by a set of three electrodes and after amplification, is conducted to the console by an inter connecting cable.

Accessory group used was:

1. A binaural air conduction head set with loud set.
2. Inter connecting cables, chart paper and pens.
3. Sets of electrodes, electrolyte gel and electrode adhesive pad.

Stimulus:

a) Logon : The stimulus used was the logon stimulus: In conventional pure tone audiometry, the stimulus presentation time is at least 200 msec., yielding a high degree of frequency specificity. To additionally enhance the pure tone character of the stimulus the rise and decay times are kept relatively long, seldom less than 20 msec, there by reducing the side-band which results from more rapid modulation of the pure tone envelope. For BSER, the temporal integration times are short, typically 0.5 msec or less, quite similar to the cyctocal period of exciting stimuli in the upper and mid speech frequency range. The implication is the each individual wave form is an individual stimulus and that the multiple responses to the multistimulus constent of a pure tone would intermodulate to such an extent to preclude the extraction of useful information.

Theoritically the optimum compromise between an abrupt waveform and a pure tone is the elementary signal or 'logon' described by D.Gabor. The electrical logon used as a stimulus in the TA-1000 is of 1.5 cycles duration with the first and third cycle of the same polarity and 6 dB lower in the amplitude than the second half cycle which is of opposite polarity. Each stimulus is phase inverted with respect to the previous to help suppress cochlear and other microphone artifacts in the averaged response. The cost of the second half cycle the peak of the stimulus is the reference time for latency determination.

The electrical logon used to drive either the earphone or bone vibrator is generated by a series of shaping and filtering circuits.

Level and mode of presentation of stimulus:

The stimulus was presented first monaurally and then bilaterally. Acoustic logons were presented with the repetition rate 20 per second, for 2 KHz and 4 KHz, at 80 dB HL.

Power supply:

The main A-C current was cannalized to I.T.L. model SVS-200L stabiliser with input 170-270 volts and output of 230 volts, this was stepped down by Kardio S.No.101 to 110 volts which is requirement of the instrument to function properly.

Testing Environment:

The experiment was carried out in sound treated room, at the Audiology Department of All India Institute of Speech and Hearing, Mysore.

1. Humidity was neither too high nor too low to the point where either the subject or clinician were uncomfirtable.

2. It was away from noisy drafty or excessive vibration area.
3. Away from brightness (Dimly lit)
4. It was away from electrically noisy area as large grinding motors etc.

Testing procedure:

Prior to every test the stabilizer output was checked to ensure a consistent voltage. The chart paper in the plotter was also checked for its proper position. The tabulator pen holder was uncaped.

The subject was asked to lie in the relaxed position on a medical examination table. The pillow was also provided to avoid muscle tension and to make muscle artifact negligible. Subject was informed that the electrodes would be placed on him and earphones would be placed on his ears. He would hear click type sound in his ear. First session the sound would be in one ear only and the next session there would be sound in both the ears. He was told to be in a relaxed state that he could go to sleep.

Electrodes were checked with a gentle tug on both ends. They were cleaned with cotton soaked in rectified spirit (Electrodes were of solid sterling silver). Thus there was no danger of wearing of any plating.

Cotton soaked in rectified spirit was briskly rubbed on both mastords and high forehead of the subjects and where the electrodes were supposed to be placed. This was then wiped with dry cotton.

Sufficient quantity of Beckman electrode electrolyte (electrolyte get) was placed on the electrodes to fill the recess in the electrode to the "slightly rounded" condition and to get applied to the skin. Electrode was placed on the previously cleaned area, pressing gently. The exdess of paste which oozed out from the electrode holes and sides was cleaned with dry cotton. Then Johnson adhesive of 2 x 2 cms approximately was used to hold the electrode into firm contact all around.

Electrode placement was as follows:—

Red (+) signal placed on vertex

White (-) Reference placed on low mastoid area on the stimulated earside.

Black - Guard placed on the low mastoid; area of the nonstimulated side.

The electrode end of the preamplifier patient electrode cable was attached to the bed surface near the head and held in position with adhesive plaster. Each electrode was plugged into the corresponding colored receptacle on the patient cable from the preamplifier.

Preamplifier was positioned in a convenient location and was plugged with the 3 pin patient electrode cable plug into the corresponding preamplifier (They have blue color code).

Preamplifier and ERA were inter connected by means of the cable and receptacles which are color coded (Yellow).

Headphones were placed on the ears of the subjects in such a way that it was comfirtable for the subject.

Power and scope buttons were pressed. The preamplifier high input light was checked. If the red light was on continuously, the various factor such as improper electrode attachments, excess muscular activity on the part of the patient (if he was uncomfirtable), possible such muscle strain was checked to eliminate the preamplifier high input light.

All the subjects were tested for monaural and bilateral presentation at 2 KHz and 4 KHz. One half of the male and female groups was stimulated in the right ear and the other half in the left ear.

ERA settings for monaural presentation:

* TWF/RUN/EEG was kept on RUN.
* Stimulus frequency 2 KHz or 4 KHz, 20 pulses per second.

* The scale switch on 2048 samples and 0.2 µv Div.
* Stimulus intensity 80 dB HL
* Clear was pressed and then Air Right or Air left was pressed.

ERA settings for Bilateral Presentation:

To all the subjects from male and female groups the stimulus was presented in both the ears.

* TWF/RUN/EEB was kept on RUN
* Stimulus frequency 2 KHz or 4 KHz, 20 pulses per second
* The scale switch on 2048 samples and 0.2µv/Div.
* Stimulus intensity 80 dB HL
* Clear was pressed and then Air Right and Air Left was pressed simultaneously.

Preamplifier was rechecked, where there was no indication of input START/STOP was initiated for operation.

The sample was rejected when :

1. An automatic stop occured before 2048 samples.
2. When one division marker was observed before 500 samples were completed or was not observed even when 2048 sample were reached.

When adequate samples and divisions were obtained the final recording was done by pressing RECORD button (the oscilloscope trace, representative of the patients BSER for test parameter was recorded on the plotter by tabular pen).

<u>Latency determination:</u>

Absolute latency:- The latency of a particular was obtained by moving the curson to the desired peak.

Interpeak Latency: Refers to the difference in the latency between the two peaks.

<u>Amplitude determination:</u>

Peak to peak amplitude of BSER was determin d from the plotter. The perpendicular distance (considering one box in the plot as one unit) of the crest of the desired peak and the subsequent trough was taken as (T), and (T) multiplied by sensitivity (S) and divided by marker amplitude (M) gives amplitude in microvolts (μ V).

For example: T = 3 units

M = 1

S 0 0.2

BSER amplitude = $\frac{TS}{M}$ $\frac{3x02}{1}$ 0.6 μv

ΔL, ΔA, ΔL_{V-I} and ΔL_{III-I} values were determined as

ΔL = [(Latency of response when one ear (right or left) is stimulated) - (Latency of response when both the ears are stimulated)]

ΔA = [(Amplitude of response when both the ears are stimulated) - (Amplitude of response when one ear (Right or Left) is stimulated)]

$\Delta L_{V-I} = (\Delta L_{V} - \Delta L_{I})$

$AL_{III-I} = (\Delta L_{III} - \Delta L_{I})$

ΔL, ΔA, ΔL_{V-I} and ΔL_{III-I} values were determined for 2KHz and 4 KHz at 80 dB HL, for all the subjects.

The t-scores was applied/by finding the sex difference, in terms of ΔL, ΔA, ΔL_{V-I} and ΔL_{III-I} in BSER.

RESULTS AND DISCUSSIONS

^ '

RESULTS, ANALYSIS AND DISCUSSIONS

Symbols used:

ΔL_{2KHz} = (Lateacy of response whea one ear (Right or Left) is stimulated at 2 KHz) - (Latency of response when both ears are stimulated at 2 KHz)

ΔL_{4KHz} = (Latency of response when one ear (Right or Left) is stimulated at 4 KHz) - (Latency of response when both ears are stimulated at 4 KHz)

ΔA_{2KHz} = (Amplitude of response whea both the ears are stimulated at 2 KHz) - (Amplitude of response when 6ne ear (Right or Left) is stimulated at 2 KHz)

ΔA_{4KHz} = (Amplitude of response when both the ears are stimulated at 4KHz) - (Amplitude of response when one ear (Right or Left) is stimulated at 4 KHz)

$\Delta L_{2KHz}(V-I) = |(\Delta L_{2KHz}$ of Vth Peak$) - (\Delta L_{2KHz}$ of I Peak$)|$

$\Delta L_{4KHz}(V-I) = |(\Delta L_{4KHz}$ of Vth Peak$) - (\Delta L_{4KHz}$ of I Peak$)|$

$\Delta L_{2KHz}(III-I) = |(\Delta L_{2KHz}$ of III Peak$) - (\Delta L_{2KHz}$ of I Peak$)|$

$\Delta L_{4KHz}(III-I) = |(\Delta L_{4KHz}$ of III Peak$) - (\Delta L_{4KHz}$ of I Peak$)|$

In the present study, the BSER measurements were made. The data were collected for responses when one ear (Right or Left) is stimulated and when both the ears are stimulated.

ΔL_{2KHz} ,ΔL_{4KHz},ΔA_{2KHz} ,ΔA_{4KHz}, ΔL_{2KHz} (V-I) ΔL_{4KHz} (V-I), ΔL_{2KHz} (III-I) and ΔL_{4KHz} (III-I) are compared between male and female groups.

Raw Data:

Table-1 to 4 shows ΔL_{2KHz} and ΔL_{4KHz}, of I to VI Peaks for male and female groups with means and standard deviations 80 dB HL.

Table-5 to 8 shows ΔA_{2KHz} and ΔA_{4KHz} of I to VI peaks for male and female groups with means and standard deviations at 80 dB HL.

Table-9 and 10 shows ΔL_{2KHz} (V-I), ΔL_{4KHz} (V-I) ΔL_{2KHz} (III-I) and ΔL_{4KHz} (III-I) for male and female groups with means and standard deviations at 80 dB HL.

Analysis:

The results of the present study were analysed to obtain mean score, standard deviations and t-scores to find the significance of difference between male and female groups.

Table-II shows t-scores, degree of freedom and significance of difference for ΔL_{2KHz} of I to VI peak, between male and female groups at 80 dB HL.

Table-12 shows t-scores, degree of freedom and significance of difference for Δ L_{4KHz} of I to VI peak, between male and female groups at 80 dB HL.

Table-13 shows t-scores, degree of freedom and significance of difference for Δ A_{2KHz} of I to VI peaks, between male and female groups at 80 dB HL.

Table-14 shows t-scores, degree of freedom and significance of difference for Δ A_{4KHz} of I to VI peaks, between male and female groups at 80 dB HL.

Table-15 shows t-scores, degree of freedom and significance of difference between Δ L_{2KHz}, and Δ L_{4KHz} for I to VI peaks in males.

Table-16 shows t-scores, degree of freedom and significance of difference between ^ Lgt-, and^L.^, for I to VI peeks in females.

Table-17 shows t-scores, degree of freedom and significance of difference between Δ A_{2KHz}, and Δ A_{4KHz} for I to VI peaks in males.

Table-18 shows to scores, degree of freedom and significance of difference between Δ A_{2KHz} and Δ A_{4KHz} for I to VI peaks in females.

Table-19 shows t-scores, degree of freedom and significance of difference for Δ L_{2KHz} (V-l) Δ L_{4KHz}(V-l) in male and female groups.

Table-20 shows t-scores, degree of freedom and significance of difference for $\Delta\ L_{2KHz}$ (III-I), $\Delta\ L_{4KHz}$ (III-I) in male and female groups.

Table-21 shows t-scores, degree of freedom and significance of difference between $\Delta\ L_{2KHz}$ (V-I) and $\Delta\ L_{4KHz}$ (V-I) in males.

Table-22 shows t-scores, degree of freedom and significance of difference between $\Delta\ L_{2KHz}$ (V-I) and $\Delta\ L_{4KHz}$ (V-I) in females.

Table-22 (a) shows t-scores, degree of freedom and significance of difference between $\Delta\ L_{2KHz}$ (III-I) and $\Delta\ L_{4KHz}$ (III-I) in males.

Table-22 shows t-scores, degree of freedom,and significance of difference between $\Delta\ L_{2KHz}$ (III-I) and $\Delta\ L_{4KHz}$ (III-I) in females.

Table-23 shows the summary of data given im table 11 to 18.
Table-24 shows the summary of data given in table 19 to 22.

The results of table-23 shows, that there is ao significance difference between males and females groups intterms of Δ L and ΔA, however significance difference was found of peak III for $\Delta\ L_{4KHz}$, also of peak II for $\Delta\ L_{2KHz}$ (at 0.05 level only).

The results of table-24 shows, that there is no significance difference between males and females groups in terms of $\Delta\ L_{(V-I})$ and $\Delta\ L_{(III-I)}$

Table-1Δ L_{2KHz} values of I to VI peaks, at 80 dB HL, with mean scores and standard deviations for males.

S.No.	I Peak Mon 1.	I Peak Bil 2.	I Peak Mon-Bil 3.	II Peak Mon 4.	II Peak Bil 5.	II Peak Mon-Bil 6.	III Peak Mon 7.	III Peak Bil e.	III Peak Mon-Bil 9.
1.	—	1.35	—	2.5	2.5	0	3.25	3.25	0
2.	1.5	1.2	0.3	2.5	2.5	0	3.2	3.15	0.05
	1.25	1.2	0.05	-	2.5	-	3.2	3.35	-0.15
4.	1.4	1.25	0.15	-	-	-	3.1	3.25	-0.15
5.	1.0	1.0	0	-	-	-	3.15	3.0	0.15
6.	1.2	-	-	-	-	-	3.4	3.45	-0.05
7.	1.1	1.1	0	-	-	-	3.35	3.4	-0.05
e.	1.5	1.4	0.1	2.2	2.0	0.2	3.3	3.2	0.1
9.	1.0	0.8	0.2	2.0	1.9	0.1	3.35	3.35	0
10.	1.4	1.75	-0.35	-	2.45	-	-	3.2	-
11.	0.9	1.2	-0.3	2.55	2.4	0.15	-	3.15	-
12.	1.5	1.1	0.4	-	2.2	-	3.5	3.1	0.4
13.	1.0	1.4	-0.4	0	-	-	3.2	3.4	-0.2
14.	1.15	1.15	0	1.9	-	-	3.4	3.1	0.3
15.	1.45	1.0	0.45	2.5	-	-	3.0	3.25	-0.25
16.	1.3	1.3	0	2.0	2.45	-0.45	3.5	3.15	0.35
		N	14		N	6		N	14
		M	0.043		M	0.15		M	0.032
			0.249			0.214			0.198

contd..Table-1

In continuation of Table-1

	IV peak			V Peak			VI Peak		
	Mon 10.	Bil 11.	Mon-Bil 12.	Mon 23.	Bil 14.	Mon-Bil 15.	Mon 16.	Bil 17.	Mon-Bil 18.
1.	4.3	—	—	4.9	4.9	0	—	6.5	-
2.	-	-	-	5.l	5.15	-0.05	6.35	6.7	-0.15
3.	-	—	-	5.25	5.1	0.15	6.35	6.9	-0.55
4.	4.7	4.3	0.4	4.95	5.0	-0.05	6.7	6.5	0.2
5.	-	-	-	4.2	4.8	-0.1	6.4	6.4	0
6.	-	-	-	5.1	5.15	-0.05	6.7	6.9	
7.	4.5	4.6	-0.1	5.4	5.4	0	-	—	-
8.	4.3	4.35	-0.05	5.2	5.25	-0.05	6.5	6.4	0.1
9.	-	-	-	5.1	5.2	-0.1	6.7	-	-
10.	4.8	4.2	0.6	5.5	5.0	0.5	7.4	6.8	1.6
11.	-	4.6	-	4.6	5.3	-0.7	6.7	7.2	-0.5
12.	-	-	-	5.2	4.65	0.55	6.8	6.0	0.8
13.	4.8	-	-	5.1	5.2	-0.1	6.7	6.7	0
14.	-	4.8	-	5.3	5.15	0.15	7.15	6.3	0.85
15.	4.5	4.7	-0.2	4.8	5.3	-0.5	6.8	6.7	0.1
16.	—	4.5	—	5.4	5.35	-0.45	7.5	6.3	1.2
		N	5		M	16		N	13
		M	0.13		M	0.093		M	0.265
			0.312			0.313			0.628

Mon = Monaural (Right or Left) Presentation
Bil = Bilateral presentation
N = No.of samples, M = Meanscores, = Standard deviations,

Table-2: ΔL_{2KHz} values of I to VI peaks at 80 dB HL, with meanscores and standard deviations for females.

S.No.	I Peak			II Peak			III Peak		
	Mon 1.	Bil 2.	Mon-Bil 3.	Mon 4.	Bil 5.	Mon-Bil 6.	Mon 7.	Bil e.	Mon-Bil 9.
1.	1.4	1.1	0.3	2.2	2.25	-0.05	3.15	3.05	0.1
	1.3	0.9	0.4	-	-	-	3.05	3.0	0.05
3.	1.25	1.3	-0.05	2.2	2.5	-0.3	3.2	3.1	0.1
4.	0.9	1.25	-0.35	1.9	2.6	-0.7	3.1	3.35	-0.25
5.	1.4	1.4	0	2.3	-	-	3.2	3.3	-0.1
6.	0.9	1.1	0.2	2.5	2.3	0.2	3.1	2.95	0.15
7.	1.25	1.25	0	-	-	-	3.0	3.0	0
8.	1.1	0.35	0.15	2.1	2.3	-0.2	3.05	3.0	0.05
9.	1.3	1.3	C	2.0	1.9	0.1	3.5	3.45	0.05
10.	0.8	1.2	-0.4	2.4	-	-	-	3.15	-
11.	1. 3	1.2	0.1	2.5	-	-	3.0	3.0	0
12.	0.85	1.15	-0.3	2.6	-	-	3.2	3.15	0.05
1 3.	1.25	1.0	C.25	-	-	-	3.5	3.1	0.4
14.	1.3	1.1	0.2	2.2	2.1	0.1	2.95	3.1	-0.15
15.	1.3	1.0	0.3	-	2.3	-	3.0	3.1	-0.1
16.	1.0	1.25	-0.25	2.0	2.3	-0.3	3.1	2.9	0.2
		N	16		N	8		N	15
		M	0.034		M	-0.144		M	0.037
			0.242			0.275			0.149

In continuation of Table–2

	IV peak			V Peak			VI Peak		
	Mon 10.	Bil 11.	Mon-Bil 12.	Mon 13.	Bil 14.	Mon-Bil 15.	Mon 16.	Bil 17.	Mon-Bil 18
1.	-	4.5	-	4.9	4.8	0.1	6.6	6.1	0.5
2.	-	-	-	4.8	4.6	0.2	6.3	6.2	0.1
3.	-	-	-	4.9	4.7	0.2	6.5	-	-
4.	4.6		-	5.1	5.1	0	6.6	7.0	-0.4
5.	4.2	4.5	-0.3	5.6	5.0	0.6	6.7	7.0	-0.3
6.	4.3	-	-	4.35	4.6	0.25	6.1	6.55	-0.45
7.	-	-	-	4.6	4.75	-0.15	6.35	6.25	0.1
8.	-	4.2	-	4.8	4.8	0	6.4	6.4	0
9.	-	-	-	5.4	5.3	0.1	7.5	5.e	0.7
10.	-	-	-	4.6	4.95	-0.35	6.3	6.55	-0.25
11.	4.0	-	-	4.8	4.8	0	6.8	6.2	0.6
12.	4.05	-	-	5.1	4.95	0.15	7.1	6.6	0.5
13.	-	4.6	-	5.25	5.0	0.25	7.3	6.6	0.7
14.	-	4.15	-	4.8	5.4	-0.6	-0.6	6.5	-
15.	-	4.25	-	4.6	4.8	0.35	6.2 *	6.0	0.2
16.	4.3	-	-	4.9	4.6	0.3	6.5	6.35	0.15
		N	1		N	16		N	14
		M	0.3		M	-0.0875		M	0.154
			0			0.274		0	0.388

Mon - Monaural (Right or Left) presentation

Bil - Bilateral Presentation.

Table-3Δ L_{4KHz} values of I to VI peaks at 80 dB HL, with meanscores and standard deviations for males.

	I Peak			II Peak			III Peak		
	Mon 1.	Bil 2.	Mon-Bil 3.	Mon 4.	Bil 5.	Mon-Bil 6.	Mon 7.	Bil 8.	Mon-Bil 9.
1.	1.45	1.3	0.15	2.4	2.35	0.05	3.5	3.3	0.2
2.	-	1.2	-	2.15	2.5	-0.35	3.15	3.35	-0.2
3.	-	1.15	-	2.25	2.5	-0.25	3.2	3.35	-0.15
4.	1.15	1.2	-0.05	2.5	2.7	-0.2	3.2	3.2	0
5.	1.2	1.1	0.1	2.1	2.35	-0.25	3.2	3.1	0.1
6.	1.25	1.3	-0.05	2.3	-	-	3.4	3.3	0.1
7.	1.2	1.3	0.1	2.4	2.5	-0.1	3.45	3.3	0.15
8.	1.35	1.4	-0.05	2.6	2.6	0	3.2	3.1	0.1
9.	1.1	1.2	-0.1	1.9	-	-	3.35	3.45	-0.1
10.	1.1	1.1	0	2.55	2.0	0.55	3.3	3.3	0
11.	1.2	1.2	0	2.6	2.4	0.2	3.3	3.3	0
12.	1.1	1.1	0	2.2	2.2	0	3.0	-	-
13.	1.3	1.2	0.1	2.5	2.5	0	3.4	3.4	0
14.	0.95	0.95	0	1.7	1.7	0	3.2	3.1	0.1
15.	1.1	1.0	0.1	-	-	-	3.45	3.35	0.35
16.	1.1	1.2	-0.1	2.3	2.4	-0.1	3.1	3.1	0
		N	14		N	13		N	15
		M	0		M	-0.035		M	0.08
			0.08			-0.321			0.098

contd.table-3

In continuation of Table-3

	IV Peak			V Peak			VI peak		
	Mon 10.	Bil 11.	Mon-Bil 12.	Mon 13.	Bil 14.	Mon-Bil 15.	Mon 15.	Bil 17.	Mon-Bil 18.
1.	—	-	—	5.25	5.0	0.25	7.0	6.80	0.2
2.	4.45	4.5	-0.05	5.2	5.5	0.3	6.7	7.0	-0.3
3.	4.65	4.6	0.05	5.35	5.2	0.15	6.5	6.7	-0.3
4.	4.4	-	-	5.0	5.1	-0.1	6.2	6.1	0.1
5.	4.6	4.6	0	4.8	4.8	0	6.4	6.5	-0.1
6.	-	-	-	5.1	5.15	-0.05	6.7	6.85	-0.15
7.	-	4.7	-	5.3	5.4	-0.1	6.7	6.6	0.1
8.	4.5	4.3	0.2	5.15	5.1	0.05	6.7	6.5	0.2
9.	4.6	-	-	4.9	5.0	-0.1	-	-	-
10.	4.85	4.2	0.65	5.35	5.2	0.15	6.4	6.2	0.2
11.	4.4	4.5	-0.1	5.5	5.3	0.2	7.1	6.8	0.3
12.	-	-	-	4.6	5.0	-0.4	6.0	-	-
13.	4.8	4.8	0	5.2	5.2	0	6.7	6.7	0
14.	4.8	-	-	5.0	5.1	-0.1	6.5	6.1	, 0.4
15.	4.7	4.8	-	5.35	5.3	0.55	7.2	6.1	1.1
16.	4.5		.	4.9	4.8	0.1	6.1	6.1	0
		N	7		N	16		N	14
		M	0.121		M	0.019		M	0.125
			0.231			0.216			0.337

Table-4:Δ L_{4KHz} values of I to VI Peaks at 80 dB HL, with mean scores and standard deviations for females.

		I Peak			II Peak			III Peak	
	Mon 1.	Bil 2.	Mon-Bil 3.	Mon 4.	Bil 5.	Mon-Bil 6.	Mon 7.	Bil 8.	Mon-Bil 9.
1.	1.25	1.2	0.05	2.25	2.4	-0.15	3.35	3.1	0.15
2.	1.25	1.5	-0.25	-	-	-	3.1	3.0	0.1
3.	1.25	1.2	0.05	-	2.5	-	3.35	3.2	0.15
4.	1.1	1.05	0.05	2.15	2.35	-0.2	3.2	3.05	0.15
5.	0.85	1.05	0.1	2.65	-	-	3.4	3.2	0.2
5.	1.15	1.15	0	2.2	2.15	0.05	3.1	3.0	0.1
7.	1.15	1.15	0	1.95	1.8	0.15	3.1	3.2	-0.1
8.	1.1	1.15	-0.05	2.15	2.25	-0.1	3.15	3.15	0
9.	1.2	1.0	0.2	2.3	2.3	0	3.0	3.1	-0.1
10.	-	1.2	-	2.4	2.4	0	-	3.1	-
11.	1.4	1.2	0.2	2.5	2.5	0	3.3	3.3	0
12.	1.2	1.0	0.2	2.5	2.4	0.1	3.5	3.3	0.2
13.	1.0	1.0	0	2.4	2.3	0.1	2.95	3.0	0.05
14.	1.7	1.0	0.7	-	2.2	-	2.4	2.9	0
15.	0.9	0.95	0.05	2.0	2.0	0	3.25	3.1	0.1
16.	1.2	1.0	0.2	2.5	2.4	0.1	3.5	3.3	0.2
		N	15		N	15		N	15
		M	0.1		M	0.004		M	0.08
			0.197			0.103			0.098

Contd.Table-4

In continuation table-4

		IV Peak			V Peak			VI Peak	
	Mon	Bil	Mon-Bil	Mon	Bil	Mon-Bil	Mon	Bil	Mon-Bil
	10.	11.	12.	13.	14.	15.	16.	17.	13.
1.		4.4		4.85	4.8	0.05	6.3	6.35	0.05
2.	-	-	-	4.3	4.2	0.1	6.5	6.2	0.3
3.	-	4.5	-	5.0	5.1	0.1	6.0	3.1	-0.1
4.	4.3	4.15	0.15	4.8	4.9	-0.1	6.5	6.0	0.5
5.	4.15	-	-	4.9	5.3	0.3	5.7	6.3	0.6
6.	4.6	4.3	0.3	5.0	5.0	0	6.3	6.3	0
7.	4.2	-	0	4.8	4.85	0.05	6.1	6.0	0.1
8.	-	—	-	4.9	4.9	0	6.9	6.3	0.6
9.	-	-	-	4.7	4.7	0	6.4	6.3	0.1
10.	4.0	3.7	0.3	4.8	5.7	-0.9	7.0	6.0	l.0
11.	4.5	4.5	0	5.2	5.1	0.1	6.7	6.6	0.1
12.	-	—	-	5.2	5.1	0.1	6.5	6.0	0.5
13.	-	—	-	4.8	4.6	0.2	6.5	6.7	0.2
14.	-	-	-	5.7	$.7	1.0	5.2	6.1	0.1
15.	4.25	4.5	0.25	5.1	5.0	0.1	6.2	6.2	- 0.5
16.		-	-	5.2	5.1	-0.1	6.5	6.0	0.5
		N	6		N	16		N	16
		M	0.167		M	0.062		M	0.284
			0.128			0.349			0.291

Table-5:^ A^KHz values of I to VI peaks at 80 dB HL, with meanscores and standard deviations for males.

C.NO.	I Peak			II Peak			III Peak		
	Mon 1.	Bil 2.	Bil-Mon 3.	Mon 4.	Bil 5.	Bil-Mon G.	Mon 7i	Bil 8.	Bli-Mon 9.
1.	—	0.9	—	0.01	0	-0.01	0.02	0.7	0.05
2.	0.6	0.3	-0.3	-	-		1.0	0.4	-0.6
3.	0.6	0.8	0.2	-	0.1	-	0.5	0.7	0.2
4.	1.1	1.0	-0.1	-	-	-	0.5	0.8	0.3
5.	0.6	1.0	0.4	0.1	0.1	00	1.2	1.2	0
G.	0.7	0.2	0.3	0.4	-	-	0.3	0.4	0.9
7.	0.7	0.7	0	-	-	-	0.1	0.3	0.2
e.	0.4	0.6	0.2	0.2	0.2	0	0.5	0.5	0
9.	0.5	0.3	-0.2	0.5	-	-	0.4	0.3	-0.1
10.	0.4	0.4	0	-	-	-	-	0.5	-
11.	0.4	0.4	0	-	-	-	0.6	0.6	-
12.	0.2	0.4	0.2	-	-	-	0.4	0.6	0.2
13.	0.7	0.6	-0.1	-	-	-	0.6	0.7	0.1
14.	0.7	0.6	-0.1	-	-	-	0.6	0.7	0.1
15.	0.1	0.4	0.3	0.3	0	-	0.6	0.8	0.2
16.	0.3	0.3	0	—	0.1	-	0.8	1.3	0.5
		N	15		N	3		N	15
		M	0.053		M	0.003		M	0.137
			0.196			0.0047			0.308

contd..Table-5

In continuation of Table-5

S.No.	Mon	IV Peak Bil	Bil-Mon	Mon	V Peak Bil	Bil-Mon	Mon	VI Peak Bil	Bil-Mon
	10.	11.	12.	13.	14.	15.	16.	17	18.
1.	—	-	-	0.92	1.6	0.68	—	0.7	—
2.	-	-		1.16	1.3	0.14	1.2	1.1	-0.1
3.	-		-	1.4	1.2	-0.1	0.8	0.8	0
4.	-	-		2.2	2.25	0.05	0.8	0.2	-0.6
5.	-	-	-	1.3	1.8	0	0.5	0.7	0.2
G.	-	-		1.2	2.0	0.6	0.5	0.9	0.4
7.	-		-	1.2	1.4	0.2	0.6	0.6	0
8.	0.2	-	-	0.8	1.5	0.7	-	0.5	-
9.	-	-		1.2	0.8	-0.4	0.8	-	-
10.	1.0	-		0.9	1.6	0.7	0.8	0.6	-0.2
11.	-	-	-	0.8	1.5	0.7	0.2	1.2	1.0
12.	-	-		0.9	1.2	0.3	0.4	0.4	0
13.	-		-	0.1	0.9	0.8	0.6	0.8	0.2
14.	-	-	-	0.1	0.9	0.8	0.6	0.8	0.2
15.	-	0.1		1.4	1.2	-0.2	0.1	0.7	0.6
16.				0.8	2.0	1.2	0.3	0.3	0
		N			N	16		N	13
		M			M	0.386		M	0.131
			-			0.433			0.375

Table-6: ΔA_{2KHz} values of I to VI peaks at 80 dB HL, with meanseores and standard deviations for females.

S.NO.	I Peak Mon 1.	I Peak Bil 2.	I Peak Bil-Man 3.	II Peak Mon 4.	II Peak Bil 5.	II Peak Bil-Man 6.	III Peak Bon 7.	III Peak Bil 8.	III Peak Bil-Men 9.
1.	0.2	0.2	0	0.4			1.0	0.8	-0.2
2.	0.5	0.3	-0.2	-	-	-	0.9	1.0	0.1
3.	0.5	0.7	0.2	0.4	-	-	0.5	1.2	0.7
4.	0.7	0.8	0.1	0.1	-	-	0.3	1.4	0.1
5.	0.4	0.4	0	-	-	-	1.3	0.9	-0.4
6.	1.1	0.3	-0.8	-	-	-	0.6	0.4	0.2
7.	0.5	0.9	0.4	0.1	0.2	0.1	1.0	0.8	-0.2
8.	0.4	0.4	0	-	-	-	1.3	0.9	-0.4
9.	0.5	0.6	0.1	1.4	-	-	—	0.6	
10.	0.6	0.9	0.3	0.5	0.7	0.2	0.6	0.6	0
11.	0.e	0.7	-0.1	-	0.1	-	0.2	0.7	0.5
12.	0.5	0.2	-0.3	-	-	-	0.7	0.2	-0.5
13.	0.4	0.8	0.4	-	0.1	-	0.6	0.8	0.8
14.	0.3	0.8	0.5	—	-	-	0.6	0.8	0.2
15.	0.2	0.8	0.6	0.2	-	-	0.3	0.8	0.3
16.	0.6	0.9	0.3	0.1		—	0.8	0.9	0.8
		N	16		N	2		N	15
		M	0.094		M	0.071		M	0.133
			0.336			0.05			0,416

contd..Table-6

In continuation of Table-6

S.No.	IV peak Mon 10.	Bll 11.	Bil-Mon 12.	V Peak Mon 13.	Bil 14.	Bil-Mon 15.	VI Peak Mon 16.	Bil 17.	Bil-Mon 10.
1.		—	—	1.72	2.0	0.28	1.1	0.7	-0.4
2.	-	-		1.7	1.2	-0.5	0.2	1.0	0.8
3.	-	-		1.0	i.e	0.8	0.22	0.1	-0.12
4.	0.2	-		1.4	1.6	0.2	0.6	0.3	-0.3
9.	0.1	0.1	0	0.9	1.8	0.9	0.3	1.2	0.9
6.	-	-	-	1.6	1.8	0.2	0.3	0.4	0.1
7.	-	-		1.6	1.2	-0.4	0.6	0.5	-0.1
8.	0.1	0.1	0	0.9	1.8	0.9	0.3	1.2	0.9
9.	-	—	—	l.0	2.0	l.0	1.5	1.0	-0.5
10.	0.9	-	-	2.0	1.82	-0.78	0.3	0.2	-0.1
11.	-	-	-	1.4	1.9	0.5	0.3	1.2	0.9
12.	-	-	-	1.9	1.0	-0.9	0.6	0.5	-0.1
13.	-		-	1.3	2.8	1.5	-	-	-
14.	—	—	-	1.4	1.8	0.4	0.6	0.e	0.2
15.	0.1	0.1	0	1.4	2.0	0.6	1.0	0.5	-0.5
16.				1.5	2.1	0.6	1.1	1.4	-0.3
		N			M	16		N	15
		M			M	0.386		M	0.172
			-			0.655			0.487

Table-7: ΔA_{4KHz} values of I to VI peaks at 80 dB HL, with meanscores and standard deviations for males.

	I peak			II Peak			III Peak		
S.Bo.	Mon	Bil	Mon-Bil	Mon	Bil	Mon-Bil	Mon	Bil	Mon-Bil
1	0.3	0.72	0.42	-	0.2	-	0.4	0.5	0.1
2	—	0.6	-	0.5	-	-	0.32	1.0	0.68
3	-	0.4	-		-	-	0.7	0.6	-0.1
4	0.5	0.6	0.1	-	-	-	0.6	0.6	1.0
5	0.2	0.9	0.7	0.1	-	-	1.05	1.3	0.25
6	0.6	0.4	-0.2	0.2	-	-	0.9	0.54	- 0.36
7	0.9	0.5	-0.4	-	-	-	0.1	0.5	0.4
8	0.5	0.3	-0.2	0.1	0.2	-	0.4	0.4	0
9	0.4	0.5	0.1	0.2	-	-	0.4	0.2	-0.2
10	0.4	0.4	-	-	0.1	0	0.2	0.6	0.4
11	0.4	0.4	0	-	-	-	-	0.6	-
12	0.6	0.4	-0.2	0.1	0.2	0.1	0.8	0.4	0.4
13	0.6	0.9	0.3	0.2	0.3	0.1	0.8	1.6	0.8
14	0.6	0.9	0.3	0.2	.0.3	0.1	0.8	1.6	0.8
15	0.4	0.4	0	0.3	-	-	0.3	0.5	0.2
16	0.7	0.4	-0.3	0.4	—	—	0.8	0.8	0
		N	14		N	4		N	15
		M	0.044		M	0.1		M	0.296
			0.294			0			0.286

Contd..Table-7

In continuation of Table-7

S.No.	Mon	IV Peak Bil	Mon-Bil	Mon	V Peak Bil	Mon-Bil	Mon	VI Peak Bil	Mon-Bil
	10.	11.	12.	13.	14.	15.	16.	17.	18.
1 -		—	—	1.4	1.7	0.3	0.5	0.7	0.2
2	0.08	-		0.7	1.3	0.6	0.7	0.8	0.1
3 -		-		1.3	1.7	0.4	1.3	0.4	-0.9
4 -		-		0.7	1.5	0.8	0.1	0.1	0
5 -		-	-	1.7	2.5	0.8	0.7	0.3	0.1
6 -		-		2.5	1.8	-0.7	0.6	0.7	0.1
7 -		-		0.8	1.2	0.4	0.4	0.4	0
8 -		0.2		0.5	0.7	0.2	0.3	0.4	0.1
9 -		-		1.2	1.3	0.1	-	0.4	-
10 -		0.1		0.3	1.6	0.8	0.7	0.6	-0.1
11 -		-	-	0.2	1.6	1.4	0.8	0.9	0.1
12 -		-		0.8	1.3	0.5	0.6	1.2	0.6
13 -		-	-	2.0	1.4	-0.6	0.1	1.2	1.1
14 -		-		2.0	1.4	-0.6	0.1	1.2	1.1
15	0.1	-		1.2	1.2	0	0.4	0.3	0.4
16 -		-	-	0.8	0.9	0.1	0.3	1.0	0.7
		N			N	16		N	15
		M			M	0.286		M	0.240
			-	-		0.554			0.481

Table-8:Δ A $_{4KHz}$ values of I to VI Peaks at 80 dB HL, with meanscores and standard deviations for females.

S.No.	MOM 1.	I Peak Bil 2.	I Peak Bil-Mon 3.	Mon 4.	II Peak Bil 5.	II Peak Bil-Mon 6.	Mon 7.	III Peak Bil 8.	III Peak Bil-Mon 9.
1.	0.5	0.8	0.3	0.1	-	-	0.8	1.2	0.4
	0.4	0.G	0.2	-	-	-	1.1	1.5	0.4
3.	0.9	0.9	0	-	0.2	-	0.5	0.8	0.3
4.	0.9	0.9	0	0.3	-	-	0.8	0.5	-0.3
5.	1.1	1.2	0.1	-	-	-	2.0	2.0	0
6.	0.6	1.0	0.4	0.4	0.3	-0.1	0.3	0.4	0.1
	0.8	C.e	0	0.2	0.2	0	0.8	0.9	0.1
8.	1.1	1.2	0.1	-	-	-	2.0	2.0	0
9.	0.1	1.0	0.9	0.1	-	-	0.5	0.6	0.1
10.	0.3	1.2	0.9	0.4	0.8	0.4	0.3	0.5	0.2
11.	0.6	0.6	0	0.3	0.1	-0.2	0.7	0.9	0.2
12.	0.2	0.2	0	0.2	0	-0.2	0.4	0.1	-0.3
13.	0.4	1.2	0.8	-	0.1	-	1.7	1.4	-0.3
14.	0.4	0.4	0	-	-	-	0.6	1.2	0.6
15.	0.5	0.4	-0.1	0.2	-	-	0.5	0.9	0.4
16.	0.6	0.6	0	—	—	-	0.7	0.7	0
		N	16		N	5		N	16
		M	0.225		M	-0.02		M	0.119
			0.333			0.223			0.260

coatd..Table-8

In continuation of Table-8

S.NO.		IV Peak			V Peak			VII Peak	
	Mon 10.	Bil 11.	Bil-Mon 12.	Mon 13.	Bil 14.	Bil-Mon 15.	Mon 16.	Bil 17.	Bil-Mon 18.
1.	–	–	–	1.4	2.0	0.6	0.9	0.8	-0.1
2.	-	-	-	1.6	2.0	0.4	0.4	0.7	0.3
3.	-	-	-	0.6	1.2	0.6	0.8	0.7	-0.1
4.	-	-	-	0.7	2.4	1.7	1.0	0.4	-0.6
5.	0.1	0.2	0.1	1.8	2.2	0.4	0.1	2.0	1.9
6.	-	-	-	1.2	1.0	0.2	0.1	0.7	0.6
7.	-	-	-	1.2	2.0	0.8	0.1	1.2	1.1
8.	0.1	0.2	0.1	1.8	2.2	0.4	0.1	2.0	1.9
9.	-	-	-	1.1	2.1	0.9	0.8	1.2	0.4
10.	0.6	-	-	1.2	2.0	0.7	0.3	0.6	0.3
11.	0.1	-	-	1.7	1.6	0.1	0.4	0.9	0.5
12.	-	-	-	0.7	1.3	0.6	0.2	0.48	0.28
13.	-	-	-	2.4	2.9	0.5	0.4	0.8	0.4
14.	-	-	-	1.2	1.2	0.1	0.3	0.8	0.5
15.	0.2	-	-	1.0	1.5	0.5	0.4	0.86	0.46
16.		–	–	1.5	1.5	0	0.6	0.8	0.2
		N	2		N	16		N	16
		M	0.1		M	0.531		M	0.502
			0			0.39			0.635

Table-9 $\Delta L_{2KHz}(V-I)$, $\Delta L_{4KHz}(V-I)$, $\Delta L_{2KHz}(III-I)$ and $\Delta L_{4KHz}(III-I)$ values at 80 dBHL with meanschores and standard deviations in males.

	2 KHz						4 KHz					
		V-I			III-I			V-I			III-I	
S.No.	Mon 1.	Bil 2.	Mon-Bil 3.	Mon 4.	Bil 5.	Mon-Bil 6.	Mon- 7.	Bil 8.	Mon-Bil 9.	Mon 10.	Bil 11.	Mon-Bil 12.
1.	–	3.55	–	–	1.9	–	3.8	3.7	0.1	2.05	2.0	0.05
2.	3.6	3.95	-0.35	1.7	1.95	0.25	-	4.3	-	-	2.15	-
3.	4.0	3.9	0.1	1.95	2.15	-0.2	-	4.05	-	-	2.2	-
4.	3.55	3.75	-0.2	1.7	2.0	-0.3	3.35	3.9	-0.55	2.05	2.0	0.05
5.	3.7	3.8	-0.1	2.15	2.0	0.15	3.6	3.7	-0.1	2.0	2.0	0
6.	3.9	-	-	2.2	-	-	3.85	3.85	0	2.15	2.0	0.15
7.	4.3	4.3	0	2.25	2.3	-0.05	4.1	4.1	0	2.25	2.0	0.25
8.	3.7	3.85	-0.15	1.8	1.8	0	3.8	3.7	0.1	1.85	1.7	0.15
9.	4.1	4.4	-0.3	2.35	2.55	-0.2		3.8	0	2.25	2.25	0
10.	4.1	3.25	0.85	-	1.45	-	4.25	4.1	0.15	2.2	2.2	0
11.	3.7	4.1	-0.4	-	1.95	-	4.3	4.1	0.2	2.1	2.1	0
12.	3.7	3.55	0.15	2.0	2.0	0	3.5	3.9	-0.4	1.9	-	-
13.	4.1	3.8	0.3	2.25	2.0	0.25	3.9	4.0	-0.1	2.1	2.2	-0.1
14.	4.15	4.0	0.15	2.25	1.95	-0.4	4.05	4.15	-0.1	2,25	2.15	0.1
15.	4.35	4.3	-0.95	1.55	2.25	0.8	4.25	4.3	-0.05	2.35	2.35	0
16.	4.1	4.55	-0.45	3.05	1.85	–	3.8	3.6	0.2	a.0	0.9	1.1
		N	14		N	11		N	14		N	13
		M	-0.096		M	-0.018		M	-0.039		M	0.135
			0.404			0.318			2.063			0.292

**

Table-10: $\Delta L_{2KHz}(V-I)$, $\Delta L_{4KHz}(V-I)$, $\Delta L_{2KHz}(III-I)$ and $\Delta L_{4KHz}(III-I)$ values at 80 dB HL, with meanscore and standard deviations in females.

S.No.	Mon 1.	Bil 2.	Mon-Bil 3.	Mon 4.	Bil 5.	Mon-Bil 6.	Mon 7.	Bil 8.	Mon-Bil 9.	Mon 10.	Bil 11.	Mon-Bil 12.
1.	3.5	3.7	0.2	1.75	i.95	-0.2	3.6	3.6	0	2.0	1.9	0.1
2.	3.5	3.7	-0.2	1.75	2.1	-0.35	3.55	3.2	-0.35	1.85	1.5	0.35
3.	4.0	3.4	0.25	1.95	1.8	0.15	3.75	3.9	-0.15	2.1	2.0	0.1
4.	3.55	3.85	0.35	2.2	2.1	0.1	3.7	3.85	-0.15	2.1	2.0	0.1
5.	3.7	3.6	0.6	1.8	1.9	-0.1	4.05	4.25	-0.2	2.55	2.15	0.4
6.	3.9	3.5	0.45	2.2	1.85	0.35	4.85	3.85	0	1.95	1.85	0.1
7.	4.3	3.5	-0.15	1.75	1.75	0	3.05	3.7	-0.05	1.95	2.05	0.1
8.	3.7	3.95	-0.25	1.95	2.15	-0.2	3.8	3.75	0.05	2.05	2.0	0.05
9.	4.1	4.0	0.1	2.2	2.15	0.05	3.5	3.7	-0.02	1.8	2.1	-0.03
10.	4.1	3.75	0.05	-	1.95	-	-	4.5	-	-	1.9	-
11.	3.7	3.6	-0.1	1.7	1.8	-0.1	3.8	3.9	-0.1	1.9	2.1	-0.2
12.	3.7	3.75	0.5	2.35	2.0	0.35	4.0	4.1	-0.1	2.3	2.3	0
13.	4.10	4.0	0	2.25	2.1	0.15	3.8	3.6	-0.2	1.95	2.0	-0.05
14.	4.15	4.3	-0.8	1.65	2.0	-0.35	4.0	3.7	0.3	1.2	1.9	-0.7
15.	4.35	3.8	-0.5	1.7	2.1	0.4	4.2	4.05	0.15	2.35	2.15	0.2
16.	4.1	3.35	0.55	2.1	0.65	1.45	4.0	4.1	-0.1	2.3	2.3	0
		N	16		N	15		N	15		N	15
		M	0.041		M	0.06		M	-0.031		M	0.017
			0.383			0.436			0.164			0.257

Table-11: t-scores, degree of freedom and significance of difference between for ΔL_{2KHz} of I to VI Peaks, between male and female groups.

	I Gp-I Gp-II	II Gp-I-Gp-II	III Gp-I-Gp-II	IV Gp-I-Gp-II	V Gp-I-Gp-II	VI Gp-I-Gp-II
t-scores	0.0969	2.014	0.075	0.262	0.037	0.531
df	28	12	27	4	19	25
Significance of difference at 0.05 level	N.S	N.S	N.S	N.S	N.S	N.S
at 0.01 level	N.S	N.S	N.S	N.S	N.S	N.S

N.S - Not significantly differ

Gp-I - Group-I (males)

Gp-11- Group-II (females)

Table-12: t-scores degree of freedom and significance of difference for ΔL_{4KHz} of I to VI peaks, between Group-1 and Group-11 (males and females respectively)

	I Gp-I Gp-II	II Gp-I Gp-II	III Gp-I Gp-II	IV Cp-I Gp-II	V Gp-I Gp-II	VI Gp-I Gp-II
t-scores	1.706	0.535	7.84	0.4	0.406 .	0.513
df	27	23	28	11	30	30
Significance of difference at 0.05 level	N.S.	N.S.	S	N.S.	N.S.	N.S.
at 0.01 level	N.S.	N.S.	S	N.S.	N.S.	N.S.

N.S. - Not significantly differ

S - Significantly differ

Table-13; t-scores degree of freedom and significance of difference for ΔA_{2KHz} of I to VI peaks between male and female groups.

	I Gp-I GP-II	II Gp-I Gp-II	III Gp-I GP-II	IV Gp-I Gp-II	V Gp-I Gp-II	VI Gp-I GP-II
t-scores	0.398	3.973	0.029	-	0.276	0.238
df	- 29	3	28	-	30	26
Significance of difference at 0.05 level	N.S	S	N.S		N.S	N.S
at 0.01 level	N.S	S	N.S	-	N.S	N.S

N.S = Not significantly differ
S = Significantly differ
Gp.I " Group-I
Gp-11 = Group-II

Table-14: t-scores, degree of freedom and significance of difference for ΔA_{4KHz} of I to VI peaks between male and female groups.

	I		II		III		IV		V		VI	
	Gp-I	Gp-II	Gp-I	Gp-II	Gp-I	Gp-II	Gp-I	Gp-II	Gp-I	Gp-II	Gp-I	Gp-II
t-scores	1.52		0.952		1.409		-		1.4		1.248	
Significance of different at 0.05 level	N.S		N.S.		N.S		-		N.S		N.S	
at 0.01 level	N.S		N.S.		N.S				N.S		N.S	

N.S = Not significantly differ

Table-15: t-scores, degree of freedom, significance of difference, between Δ L2KHz and Δ L4KHz of I-to VI peaks in males.

	I Peak $\Delta L_{2KHz} - \Delta L_{4KHz}$	II peak $\Delta L_{2KHz} - \Delta L_{4KHz}$	III Peak $\Delta L_{2KHz} - \Delta L_{4KHz}$	IV Peak $\Delta L_{2KHz} - \Delta L_{4KHz}$	V Peak $\Delta L_{2KHz} - \Delta L_{4KHz}$	VI Peak $\Delta L_{2KHz} - \Delta L_{4KHz}$
t-scores	0.589	0.807	7.154	1-459	1.131	1.959
df	26	17	27	10	29	25
Significance of difference at 0.05 level	N.S	N.S	S	N.S	N.S	N.S
at 0.01 level	N.S	N.S	S	N.S	N.S	N.S

N.S = Not significantly differ

S = Significantly differ

Table-16: t-scores, degree of freedom, significant of difference, between ΔL_{2KHz} and ΔL_{4KHz} of I to VI peaks in females.

	1 Peak $\Delta L_{2KHz} - \Delta L_{4KHz}$	11 Peak $\Delta L_{2KHz} - \Delta L_{4KHz}$	III Peak $\Delta L_{2KHz} - \Delta L_{4KHz}$	IV Peak $\Delta L_{2KHz} - \Delta L_{4KHz}$	V Peak $\Delta L_{2KHz} - \Delta L_{4KHz}$	VI Peak $\Delta L_{2KHz} - \Delta L_{4KHz}$
t-scores	0.805	1.423	2.437	0.147	0.222	1.007
df	29	18	28	5	30	28
Significance of difference at 0.05 level.	N.S	N.S	N.S	N.S	N.S	N.S.
at 0.01 level	N.S	N.S	N.S	N.S	N.S	N.S

N.S - Not significantly differ

Table-17:t-scores, degree of freedom, significant of difference between ΔL_{2KHz} and ΔL_{4KHz} of I to VI Peaks in males.

	I Peak ΔL_{2KHz} ΔL_{4KHz}	II Peak ΔL_{2KHz} ΔL_{4KHz}	III Peak ΔL_{2KHz} ΔL_{4KHz}	IV Peak ΔL_{2KHz} ΔL_{4KHz}	V Peak ΔL_{2KHz} ΔL_{4KHz}	VI Peak ΔL_{2KHz} ΔL_{4KHz}
t-scores	0.115	-	1.167	-	0.580	0.681
df	27	5	28	-	30	29
Significance of difference at 0.05 level	N.S	N.S	N.S	N.S	N.S	N.S
at 0.01 level	N.S	N.S	N.S	N.S	N.S	N.S

N.S = Not significantly differ

Table-18: t-scores, degree of freedom, significance of difference, between ΔA_{2KHz} and ΔA_{4KHz} of I to VI peaks in females.

	I peak ΔA_{2KHz} ΔA_{4KHz}	II Peak ΔA_{2KHz} ΔA_{4KHz}	III Peak ΔA_{2KHz} ΔA_{4KHz}	IV Peak ΔA_{2KHz} ΔA_{4KHz}	V Peak ΔA_{2KHz} ΔA_{4KHz}	VI Peak ΔA_{2KHz} ΔA_{4KHz}
t-scores	1.073	0.904	0.109	-	1.015	1.596
df	30	5	29	-	30	30
Significance of difference at 0.05 level	N.S	N.S	N.S		N.S	N.S
at 0.01 level	N.S	N.S	N.S	-	N.S	N.S

N.S = Not significantly differ

Table-19: t-scores, degree of freedom, significance of difference for $\Delta L_{2KHz}(V-I)$ and $\Delta L_{4KHz}(V-I)$, between male and female groups.

	$\Delta L_{2KHz}(V-I)$			$\Delta L_{4KHz}(V-I)$	
	Group-I (males)	Group-II (females)		Group-I (males)	Group-II (females)
t-scores	0.907		t-scores	0.113	
df	28		63	28	
Signifi-cant of difference at 0.05 level	Not significant		Significant difference at 0.05 level	Not significant	
at 0.01 level	Not significant		at 0.01 level	Not significant	

t"

Table-20: t-scores, degree of freedom, significance for ΔL_{2KHz}(III-I) and ΔL_{4KHz}(III-I) between male and females groups.

	ΔL_{2KHz}(III-I)		ΔL_{4KHz}(III-I)
	Group-I Group-II		Group-I Group-II
t-scores	0.478	t-scores	1.035
df	24	df	26
Significance of difference at 0.05 level	Not significant	Significance of difference at 0.05 level	Not significant
at 0.01 level	Not significant	at 0.01 level	Not significant

Table-21: t-scores,degree of freedom, significance of difference ΔL_{2KHz}(V-I) and ΔL_{4KHz}(V-I)

(a) in males at 80 dB HL

(b) in females at 80 dB HL

(a)	Males ΔL_{2KHz}(V-I) ΔL_{2KHz}(V-I)	(b)	Females ΔL_{2KHz}(V-I) ΔL_{4KHz}(V-I)
t-scores	0.442	t-scores	0.667
df	26	df	30
Significance of difference at 0.05 level	Not significant	Significance of difference at 0.05 level	Not significant
at 0.01 level	Not significant	at 0.01 level	Not significant

Table-22: t-scores, degree of freedom, significant of difference between ΔL_{2KHz}(III-I) and ΔL_{2KHz}(III-I)
(a) in males at 80 dB HL
(b) in females at 80 dB HL

(a)	Males ΔL_{2KHz}(III-I) ΔL_{4KHz}(III-I)	(b)	Females ΔL_{2KHz}(III-I) ΔL_{4KHz}(III-I)
t-scores	1.485	t-scores	0.316
df	22	df	28
Significance of difference at 0.05 level	Not significant	Significance of difference at 0.05 level	Not significant
at 0.01 level	Not significant	at 0.01 level	Not significant

-C-

Table-23: The summary of data given in tables 11 to 18

No.	Significance of difference	I	II	III	IV	V	VI	Level of Significance
1.	Between males and females (For ΔL_{2KHz})	N.S	N.S	N.S	N.S	N.S	N.S	0.05
		N.S	N.S	N.S	N.S	N.S	N.S	0.01
2.	Between males and females (For ΔL_{4KHz})	N.S	N.S	S	N.S	N.S	N.S	0.05
		N.S	N.S	S	N.S	N.S	N.S	0.01
3.	Between ΔL_{2KHz} and ΔL_{4KHz} (in males)	N.S	N.S	S	N.S	N.S	N.S	0.05
		N.S	N.S	S	N.S	N.S	N.S	0.01
4.	Between ΔL_{2KHz} and ΔL_{4KHz} (in females)	N.S	N.S	N.S	S	N.S	N.S	0.05
		N.S	N.S	N.S	N.S	N.S	N.S	0.01
5.	Between males and females (for ΔA_{2KHz})	N.S	S	N.S	N.S	N.S	N.S	0.05
		N.S	S	N.S	N.S	N.S	N.S	0.01
6.	Between males and females (for ΔA_{4KHz})	N.S	N.S	N.S	N.S	N.S	N.S	0.05
		N.S	N.S	N.S	N.S	N.S	N.S	0.01
7.	Between ΔA_{2KHz} and ΔA_{4KHz} (in males)	N.S	N.S	N.S	N.S	N.S	N.S	0.05
		N.S	N.S	N.S	N.S	N.S	N.S	0.01
8.	Between ΔA_{2KHz} and ΔA_{4KHz} (in females)	N.S	N.S	N.S	N.S	N.S	N.S	0.05
		N.S	N.S	N.S	N.S	N.S	N.S	0.01

N.S - Not significantly differ

S = Significantly differ

Table-Z4 : The summary of data given in table 19 to 22

No.	Significance of ΔL_{V-I} differenee		ΔL_{III-I}	Level of Significance
1.	Between males and females (at 2KHz, 80 dB HL	N.S N.S	N.S N.S	0.05 0.01
2.	Between males and females (at 4 KHz, 80 dB HL	N.S N.S	N.S N.S	0.05 0.01
3.	Between 2KHz, 80 dB HL and 4KHz, 80 dB HL (in Males)	N.S N.S	N.S N.S	0.05 0.01
4.	Between 2KHz, 80 dB HL and 4KHz, 80 dB HL (in Females)	N.S N.S	N.S N.S	0.05 0.01

N.S; Not significantly differ

DISCUSSIONS

Several previous studies have indicated that gender affects the various auditory functions. (Corso, 1963; Glorig and Nixon, 1966; Tobias, 1965; Baher and Weiler, 1977; Axelsson and Lindgren, 1965; Ward et al, 1959; Loeb and Fletcher, 1963). The effects of gender on BER have been found by Beagley and Sheldrake, 1978; HcClelland and McCrea, 1979; stockard et al, 1978, 1979; Kjaer, 1978; Jerger and Hall, 1980; Mickaleweski et al, 1980; Jackobson, et al, 1980; Seitz, et al, 1980; Cox, et al, 1981; 0'Donovan, 1980. The results of the present study show that:

1. ^L values for peaks I to VI are nearly the same for both males and females. However, there was significant difference in ΔL value at 4 KHz for the peak III between males and females.

2. ΔA values for peaks I to VI are nearly the same for both males and females. However, there was significant difference in ΔA value at 2 KHz, for the peak II between males and females.

3. ΔL_{V-I} and ΔL_{III-I} values are nearly the same at 2 KHz and 4 KHz, between males and females.

The present study, in general shows that males and females do not differ with respect to Δ L and Δ A values. Although many studies (Beagley and Sheldrake, 1978; McClelland and MoCrea, 1979; Jerger and Hall, 1980; Jackobson, et al, 1980; Michaleweski, et al, 1980; Stockard, et al, 1978, Kjaer, 1978; 0'Donovan, 1980) have shown that the gender does affect brainstem responses, the present study shows no significant difference in ΔL and Δ A values between males and females (except for ΔL_{III} for 4 KHz and ΔA_{II} for 2 KHz).

SUMMARY AND CONCLUSIONS

SUMMARY AND CONCLUSIONS

The study was carried out in a sound treated room of Audiology Department, AIISH, Mysore. 32 normal hearing ($\leq$ 20 dB HL ANSI 1969) subjects in the age range of 18 years to 28 years 2 months (mean age 20 years, 9 months). Subjects were divided into 2 groups, Group-I and Group-II. Group-I consisted by of males and Group-11 consisted of 16 females. As stated in the methodology the subjects were in supine position and 3 electrodes were used, active, ground and reference. ERA-TA-1000 was used. Logon stimulus was presented through the earphones. The frequencies of the logon stimuli used were 2 KHz and 4 KHz. These stimuli were presented for 2048 times at a rate of 20 times/sec. 10 msec, sample time was used. The intensity of logon stimulus was 80 dB HL.

The stimulus was presented monaurally (Right or Left ear) and bilaterally. In half of subjects from Group-1 and half of the subjects from Group-11, stimulus was presented in right ear and in other half of the subjects from both the groups the stimulus was presented in left ear for the monaural presentation.

ΔL, ΔA, $\Delta L_{(V-I)}$ and $\Delta L_{(III-I)}$ values were determined for 2 KHz and 4 KHz logon stimuli, at 80 HL, and these values are compared between male and female groups.

The following conclusions have been drawn:

1. There is no significance of difference for ΔL_{2KHz} of I to VI peaks, between males and females.

2. There is no significance of difference for ΔL_{4KHz}, of I to VI peaks, between males and females, (except for peak III).

3. There is no significance of difference of I to VI peaks, between ΔL_{2KHz} and ΔL_{4KHz}, in males.

4. There is no significance of difference of I to VI peaks, between ΔL_{2KHz} and ΔL_{4KHz}, in females.

5. There is no significance of difference for ΔA_{2KHz} of I to VI peaks, between males and females, (except for peak II, at 0.05 level of significance).

6. There is no significance of difference of ΔA_{4KHz} of I to VI peaks, between males and females.

7. There is no significance of difference of I to VI peaks, between ΔA_{2KHz} and ΔA_{4KHz} males.

8. There is no significance of difference of I to VI peaks, between ΔA_{2KHz} and ΔA_{4KHz} , in females.

9. There is no significance of difference for ΔL_{2KHz} (V-I) and ΔL_{4KHz} (V-I), between males and females.

10. There is no significance of difference for ΔL_{2KHz} (III-I) and ΔL_{4KHz} (III-I), between males and females.

BIBLIOGRAPHY

BIBLIOGRAPHY

Axelsson,A? Lindgren,F : Pop music and Hearing. Ear and Hearing 2: 64-69 (1981).

Baker,M.A and Weiler, E.M : Sex of listner and hormonal correlates of auditory thresholds. Brit.J. of Audiology, 11, 65-68 (1977).

Beagley, M.A; Sheldrake, J.B : Differences in brain-stem response latency with age and sex. Brit.J.Audiology, 12: 69-77, (1978).

Briggs, G.G. and Nebes, R.D : The effect of handedness, family history and sex on the performance of a dichotic listening task. Neuropsychologia, 14, 129-134 (1976).

Bryden, M.P : Left-right differences in tachistoscopic recognition: Directional scanning or cerebral dominance? Perceptual and Motor Skills, 23, 1127-1134 (1966).

Bryden, M.P : Sex differences in laterally. In Laterality: Functional Assymetry in the Intact Brain (M.P Bryden Ed.) Academic Press, New York" (1982) .

Bryden, M.P : Evidence for sex related differences in cerebral organization. In sex Related Differences in Cognitive Functioning: Developmental Issues (M.Witting and A.C. Peterson) Academic Press: New York (1979)

Corso, J.F : Age and sex differences in puretone thresholds: Survey of hearing levels from 18 to 65 years. Archives of Otolaryngol., 77, 385-405 (1958).

Cox, C et al : Brain stem evoked response audiometry: Normative Data from the preterm infant. Audiol. 20: 53-64 (1981).

Dengerink, J.E. et al : Gender and oral contraceptive effects on temporary auditory effects of noise. Audiology, 23: 411-425 (1984).

Glorig, A and Nixon, J : Distribution of hearing loss in various populations. Annals of Oto,Rhini. and Laryngol. 69, 497-516 (   )

Gupta, J.P : Normative data for clinical auditory brain stem response audiometry: effect of sex and intensity. Independent project submitted as partial fulfilment for the degree of M.Sc, (Speech and Hearing), University of Mysore (1983).

Jackobson et al : Clinical considerations in the interpretation of auditory brain stem response audiometry. J. Otolaryngol?: 493-504 (1980).

Jerger, J; and Hall,J : Effects of age and sex on auditory brain stem responses. Arch.Otolaryngol. 106: 387-391 (1930).

Kjaer, M : Differences of latencies and amplitudes of brain stem evoked potentials in subgroups of a normal material. Acta Neurol.Scand. 51: 72-79 (1979).

Lake, D.A. and Bryden, M.P : Handedness and sex differences in hemispheric assymetry. Brain and Language, 3, 266-282 (1976).

Loeb, M and Fletcher, J.L: Temporary threshold shift in successive sessions for subjects exposed to continuous and periodic intermittent noise. J.Audit Res. 3: 213-220 (1963).

McClelland, R.F and McCrea, L.S: Intersubject variability of auditory evoked brain stem potentials. Audiol.18: 462-471 (1979).

McGlone, J : Sex differences in human brain organization: A critical survey. The Behavioral and Brain Sciences, 3, 215-227 (1980).

Mlckalewski, H.J. et.al., : Sex differences in the amplitudes and latencies of the human auditory brain stem potential. EBB Neurophysiol. 48: 351-356 (1980).

O'Donovan, C.A : Latency of brain stem responses in children. Brit.J.Audiology,14: 23-29, (1980).

Picton, T.W. et.al : Auditory evoked potentials from human cochlea and brain stem. J.Otolaryngol. 10, Supp.9: 1-41 (1981).

Rosenhamer, H.J et.al : On the use of click evolved electric brain stem responses in audiological diagnosis-11 the influence of sex and age upon normal response. Scan.Audiol. 9: 95-102 (1980).

Rowe, M.J : Normal variability of the brain stem auditory evoked response in young and old adult subjects. EEC Clin. Neurophysiol. 44: 451-470 (1978).

Satyan, H.S : An evaluation of electrophysiological indices of auditory function: A theoretical appraisal. Submitted in partial fulfillment of the requirements for the degree of Master of Arts (Audiology) of Macquarie University, Sydney (1984).

Seitz, M.R et.al : The use of averaged EEC response techniques in the study of auditory processing related to speech and language. Brain and Language, 11: 261-284 (1980).

Stockard, J.J. et.al : Nonpathologic factors influencing BSAR potentials: Am.J.EEG.Technol. 18: 177-709 (1978).

Stockard, J.J. et.al : Brain stem auditory evoked responses: Normal variations as a function of stimulus and subject characteristics. Arch.Neurol. 36: 823-831 (1979)

Tobias, J.V : Consistency of sex differences in binaural beat perception. International Audiology, 4: 179-182 (

Ward, W.Dy Glorig, A; Sklar, D.L: Temporary threshold shift produced by intermittent exposure to noise.J.Acoust. Soc.Am.31: 791-794 (1959).