A NORMATIVE DATA ON ACOUSTIC REFLEX LATENCY IN COCHLEAR PATHOLOGY

REG. NO. 9306

AN INDEPENDENT PROJECT SUBMITTED
AS PART FULFILLMENT FOR
THE FIRST YEAR M.Sc.
(SPEECH AND HEARING)
TO THE UNIVERSITY OF MYSORE

ALL INDIA INSTITUTE OF SPEECH & HEARING
MYSORE

MAY 1994

TO

MA AND BABA

WHO LOANED ME THEIR FAITH

LOVE, CARING.........

AND TO WHOM I OWE MY EVERYTHING

CERTIFICATE

This is to certify that the Project entitled : "A NORMATIVE DATA ON ACOUSTIC REFLEX LATENCY IN COCHLEAR PATHOLOGY, is a bonfide work, done in part fulfillment for the first year degree of master of science (Speech And hearing),of the student with Reg. No. M 9306.

MYSORE
MAY-1994

DIRECTOR
AIISH

CERTIFICATE

This is to certify that this independent project entitled "A NORMATIVE DATA ON ACOUSTIC REFLEX LATENCY IN COCHLEAR PATHOLOGY", has been prepared under my supervision and guidance.

MYSORE
MAY 1994

Dr. (Miss) S. NIKAM
GUIDE

DECLARATION

I hereby declare that this independent project entitled "A NORMATIVE DATA OF ACOUSTIC REFLEX LATENCY IN COCHLEAR PATHOLOGY", is the result of my own study under the guidance of Dr. (Miss) S. NIKAM, Prof., and H.O.D. of Audiology and Director, AIISH, Mysore, has not been submitted earlier to any University for any other Diploma or Degree.

MYSORE Reg. No. M 9306

ACKNOWLEDGEMENT

I express my deep greatfulness to my Dr. (Miss.) S. Nikam, Prof, and Head of the Department of Audiology, All India Institute of Speech and hearing, Mysore, for her valuable, suggestions and guidance at every phase of my work which made possible to carry out and complete this project.

My sincere thanks to Dr. (Miss) S. Nikam, director, AIISH, Mysore for granting me the opportunity to do this project.

I am indebted to all the lecturers and clinician, Department of Audiology ,AIISH for their interest, help and guidance

I would express my gratitude to Mr.C.S.Venkatesh for allowing me to use the Ncss. And all other library staff for permitting me to use the computer.

Two people helped me at various stages of analysis SASI & RAJEEV, for their adept ways of figuring out the data - THANK YOU BOTH.

Thanks to Biji for helping me out in my **work** and giving me moral support with her strength of spirit affection and her loving presence when I needed them the most.

Hats of to Arun, Venu and all my classmates for their imaginative cortices and help imbeded at the crucial moments of this project .

Thanks a lot Shamik for the effort and support that you have given.

Thanks to RACS for the excellent, efficient and expeditious typing.

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INTRODUCTION

The acoustic reflex is a contraction of the middle ear muscle induced by an intense auditory stimulus. The reflex arc is a polysynaptic network of relay stations comprising both ipsilatral and contralateral path ways. Effective stimulation of either side should result in a consensual muscle contraction is a normal system.

The electroacoustic immittance audiometry has become an important addition to clinical audioligical test equipment, measurement of the acoustic reflex has gained acceptance as a valuable diagnostic tool in todays audiological test battery. At present there is much descriptive information regarding the acoustic reflex (A.R) response (Jerger, 1970: Lobberstonetal: 1968: Northen and Downs, 1974 Jerger etal., 1974)

Three characteristics of the the stapedial reflex are routinely used in "site of lesion" testing to distinguish cochlear from retrocochlear or central lesions. Specifically these includes 1) abnormal reflex decay, 2) elevated reflex thershould and 3) abnormal reflex growth. Two additional parameters presently being evaluated for clinical application are, 4) reflex relation phase and 5) acoustic reflex latency.

While substantial normative data have been accumulated on the acoustic reflex threshold there has been little data accumulated on the latency parameter of the acoustic reflex, latency will vary as a function of the method as by which the acoustic reflex threshold is defined. Several definitions of the acoustic reflex latency have been suggested (colletti-1975, sunder land,1974, strasser 1975, Moller,1962:Borg 1972: Liden etal: 1974). Latency like acoustic reflex threshold may be altered by certain pathological conditions of the auditory system (Norris,1974:col1ttie-1975strasser,1975). Clinically a change in latency may be pathagnomic if the change occurred prior to onset of more obvious symptoms, aadiological evaluation of latency parameter couid provide diagnostic information. Consequently there is a need for a uniform and specfic definition of acoustic reflex latency parameter in normal human audiotory system.

The effect of the acoustic signal on the latency parameter has not been throughly studied. Dolls (1964,1973) found the duration of the latent peroied was inversely proportional to the strength of the acoustic stimulus. Sudervalomd (1974) found that Latency peroid increased as the rise time of a 1000 h2 acoustic signal increased.

The purpose of the present study was to specify the acoustic reflex latency in humans with Sensory neural (Cochlear impaired) hearing loss cases and to compare them with those of the normal auditory system.

REVIEW OF LITERATURE

The Concept of impedance was first applied to clinical audiology by Metz in 1946. Impedance was measured using an electro - mechanical bridge. Development of elelctro acoustic impedance bridges led to widespread use of acoustic impedance bridges led to wide spread use of impedance audiometery and acceptance of this technique as an integral part of the clinical audiological test battery (Jerger, 1975). Impedance may be defined as a complex rates of *'2'* vector quantities; force or pressure and flow of energy. Any change in properties of the middle ear system is reflected by immpedane change at the tympanic membrane (Lilly, 1972). The electro-acoustic impedance bridge measures changes in sound pressure level (SPL) with in the occluded ear canal . Any change in the volume of this closed cavity results in a change in the SPL with in the cavity. Contraction of the intra-aural muscles causes a change in the acoustic transmission properties of the middle ear resulting in a change in acoustic properties of the occluded ear canal. The subsequent change in SPL is recorded by a microphone in the" closed" cavity and delivered to a wheat stone bridge circuit & a voltage meter. The resulting deflection of the meter is a recording of the intra-aural muscle activity (Jerger, 1970, Klockuff, 1961). Acoustic impedance measurements give an indirect indication of changes in middle ear impedance (eg : muscle contraction). It has been established that this indirect measures is a valid way of studying middle ear muscle reflex activity.

The acoustic reflex is a bilateral unconditioned muscle reflex, that occurs in response to loud acoustic stimuli. Upon contraction the stapedius muscle pulls on the stapes resulting in the impedance change of the middle ear system (Metz, 1946, Jepsen, 1963). Absence of the reflex is associated with abnormalities in the peripheral and central auditory system. The work of Jepsen (1963) & Klockhoff has shown that contraction of the stapedius muscle alone in response to intense acoustic stimulus is responsible for the change in impedance at the tympanic membrane in humans. Contraction of both the tensor tympani muscle and the stapedious muscle may be elicited by non - acoustic stimuli,such as tactile stimulation near the auricle, air jet stimulation,electric shock and anxiety arousal stimuli (Klockhoff, 1961, Fu etal., 1975, Liden etal., 1970).

Parameters of the Acoustic Reflex

Acoustic Reflex Threshold

The acoustic reflex threshold varies with the type of acoustic stimulus and the age of the subjects. A number of studies have established that the ART for white noise is lower than the ART for pure tones stimulation. (Dollos,1964; Pertson & Liden, 1972; Niemeyer & Sesterhenn, 1974; Jerger et al, 1974).

Threshold measurements of the acoustic reflex in human with normal auditory function above demonstrated that the mean ART range is from 84db to 96 dB SL for pure tones, 250 Hz through 4000 Hz, reflex thrhesholds have been found to be age dependent and are elevated in young population (New - born to 20 years and are reduced in older population (60 - 80 yrs) (Jerger, 1972, Habener & Synder , 1974, Jerger et al 1974).

Studies have established the utilization of the ART by varying stimulus type and intensity as a clinical tool for predicting hearing threshold. Neimeyer & Sesterhenn (1974) compared ARt for white noise, pure tones and 24 pure tones mixture (one single tone at every critical band width) in normal individuals and those with sensorineural hearing loss. The authors suggested methods for calculating hearing threshold based on comparison of (ART) obtained utilizing different stimuli, Jerger et al (1974) in a subsequent study used the difference between ART obtained with broad band filtered noise, pure tones to predict severity of loss (eg. normal, mild, moderate, severe, profound) using this technique it was possible to ascertain information about the configuration of the audiometric contour. This technique as suggested by Niemeyer & Sesterhen (1974) and by Jerger et al (1974) may have important potential application in testing infants and other difficult to list patients.

Amplitude of the Acoustic Reflex

The amplitude of the acoustic reflex has dynamic range of 30dB between threshold level & saturation threshold. It is both frequency and age dependent, Amplitude of other reflex is greatest at 2000 Hz & least at 4000hz. The population in the age span of 20 - 40 years & exhibits the most consistent amplitude frequencies of 500, 1000, 2000 & 4000 Hz. (Jerger, 1972; Havener & Sngder, 1974).

The extent of impedance change at the tympanic membrane when measured by the acoustic impedance bridge is a direct reflection of the magnitude of the acoustic reflex.

Acoustic Reflex Decay

Decay of the acoustic reflex is the time in seconds, that is required for the response amplitude to be reduced by 50%. The precise mechanism of decay is not known but the frequency dependent characteristics of the acoustic reflex decay indicates the mechanism in the afferent portion of the acoustic reflex arc (Anderson et al, 1970). Such decay has been shown to exist in normal ears centered around 4000Hz, However, it is virtually non existent at 500 & lOOOHz (Habener & Synder, 1974). Several researches have shown that the 4000Hz area of the basilar membrane is the area most sensitive to damage by noise, drugs and other ototoxic agents (Johnsson, 1971, Johnsson &. Hawkins, 1972a, 1972b). This may be partial explanation for abnormalities of the acoustic reflex at 4000Hz in normal hearing individual. The reduction of neural elements seen in such cases in absence of any definable pathological state may explain reflex decay in normal hearing individuals at 4000 Hz.

Rise time of the acoustic reflex:

A review of the bio acoustic literature regarding the rise time of the acoustic reflex indicates that this parameter has been studied as part of the initial response of the acoustic reflex. Rise response to change form 10% to

90% of maximum response amplitude. This same definition will be used to describe the rise time of the acoustic reflex. Collectti (1974, 1975) used a strip charb recorder connected to the output of an impedance bridge to study the acoustic reflex in a normal & abnormal human population.

Colletti observed a slow rise in some patients with multiple sclerosis. This alternation in rise time differs markedly from normal and cochlear impaired ears which exhibited a rapid rise time once muscle contraction began. This change in acoustic reflex rise time should be studied further as it relates to acoustic reflex latency. As such, it is most important for it to be defined accurately in a quantitive manner.

<u>Acoustic reflex latency</u>

Latency is the time, in seconds, it takes a biological system to respond to an appropriate stimuli. Latency of the acoustic reflex is the time taken for the middle ear muscles to contract following acoustic stimulation. Some researchers (Moller, 1972, 1974; Borg, 1972; Liden etal., 1974) describe Latency as the time, in seconds, from stimulus onset to the time when the acoustic reflex has attained 10% of maximum amplitude Colletti (1974, 1975) defines Lateney as the period from signal onset to 5% of maximum impedance change, while Suderland (1974) & Strasser (1975) have suggested measuring Lateney from signal onset of the beginnings of impedance change. Consequently it becomes awkward to compare results from various reports.

Latency of the acoustic reflex has been measured by direct observation (Luscher,1929) electroomyography recording of the cochlear microphone & observation of acoustic impedance change (Dollos, 1964), using acoustic impedance changes to measure acoustic reflex lateney in human subjects, Dolls (1964,1973) found the duration of the latent period was inversely proportional to the strength of the acoustic stimulus. Additionally, he reported a variation in individual response latencies. These qualitative observations are consistent with data reported by Borg (1972,1972 a) in animal experiments.

Dallos described acoustic reflex as an asymmetrical response: that is it is a nonlinear response whose characteristics depends on the direction (increase or decrease) and magnitude of the eliciting stimulus. The"on" response of the acoustic reflex is nonlinear while the 'off' response because it behaves in a linear fashion (Dallos, 1964). The fact that the system is nonlinear means the contraction process differs from the relaxation process. Research has indicated that latency parameters contain important biologic information and can be used as sensitive indicators of disease status (Colletti,1974,1975, Norris, 1974,Strasser 1975).

Norris etal (1974) used an ordered series of Latency-measures in an effort to find method of evaluating differences between a "cochlear impaired and a normal population". Their approach is graphically illustrated in Fig (1) and includes definition of five different Latency values. Latencies were defined as follows :

L1 = Latency from onset of stimulus to initial reflex response.

L2 = Latency from initial response to peak of the response.

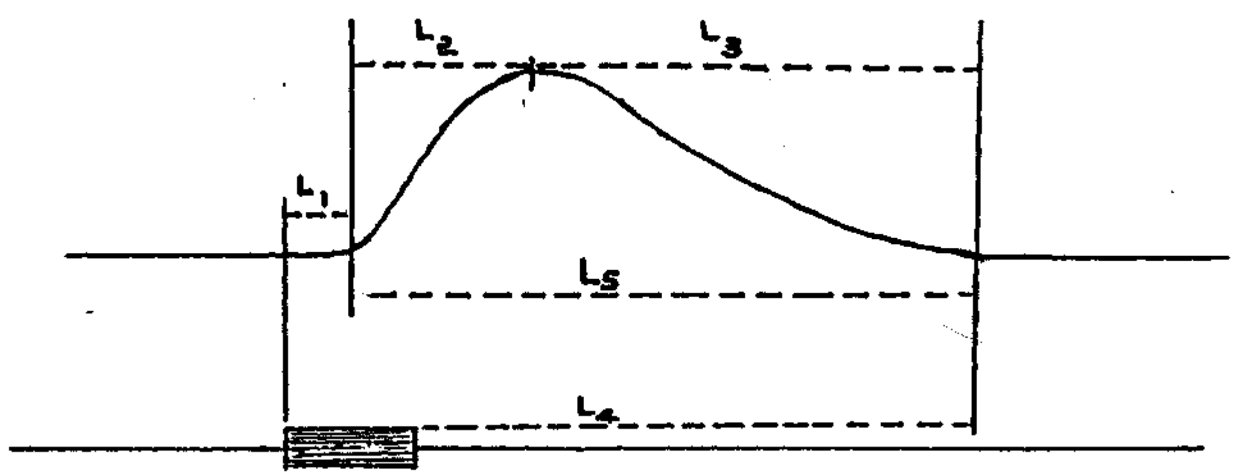
L3 = Latency from response peak to point were reflex which is 95% return to baseline.

L4 = Latency from cessation of stimulus to 95% return to baseline.

(Definitions of Latency parameters of the acoustic reflex, from Norris, 1974.)

FIGURE 1

DEFINITION OF LATENCY PARAMETES OF THE ACOUSTIC REFLEX
FROM NORRIS.1974



L1 = Latency from onset of stimulus to initial reflex response.

L2 = Latency from initial response to peak of the response.

L3 = Latency from response peak to point where reflex reachs 95% return to base line.

L4 = Latency from cessation of stimulus to 95% return to base 1ine.

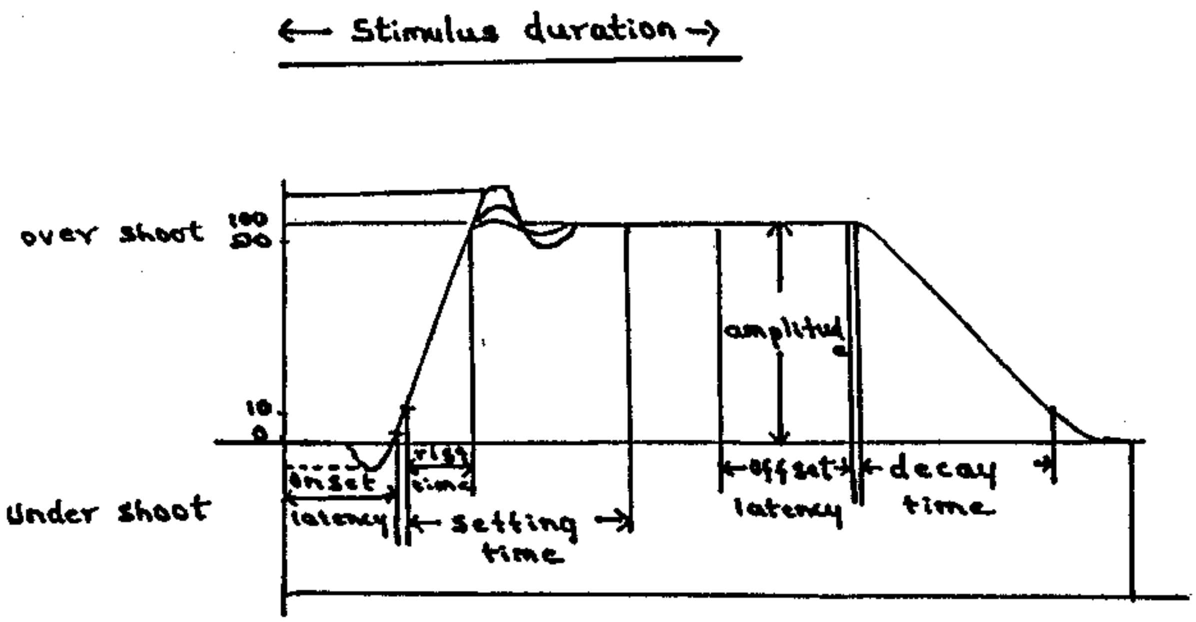
L5 = Latency total response time, L2 plus L3 .

Fig. (2) shows the definitions of the acoustic reflex parameters as given by Colletti.

Norris Etal, (1974) elicited the acoustic reflex with a 1000hz stimulus at an intensity lOdb above clinical threshold. Recording were made using an electro-acoustic impedance bridge (Madsen) and a two channel strip recorder. Latencies were measured from stimulus onset. The chief differences between the two populations studied was in relaxation time of the reflex.

FIGURE 2

DEFINITIONS OF ACOUSTIC REFLEX PARAMETERS AS DEFINED BY COLLETTI



Parameters of the Stapedius reflex.

L5 = Total response time , L2 plus L3.

The "COCHLEAR IMPAIRED" population showed a significant difference in L3, L4 and L5 values, exhibiting longer latencies in all cases. Norris (1974) felt L3 was the key variable since all contribution of the contraction phase had been eliminated. Norris (1974) hypothesized that the Cochlear impaired ear showed delay in neural response to cessation of the stimulus. If latency is to be used to detect differences between normal and abnormal auditory mechanisms, it is necessary to quantitative describe all lateny parameters of the acoustic reflex , The nonlinear portion of the response must be investigated as well as differences - in relaxation of response as noted by Norris Etal (1974).

Colletti (1974) has attempted to standardise the parameters of acoustic reflex response. He defines several lateny periods as described in fig(2) and considered 3 parameters.

Onset latency, rise time, and amplitude to contain important biologic information. Colletti' (1974) studied these latency parameters with varying intensities of step stimulus of four frequencies 500, 1000, 2000, and 4000 Hz).He reported that these three parameters are function of stimulus intensity

The definitions are :

Onset Latency

The time interval between onset of stimuli and 5% of the maximum amplitude if the response .

Rise time

The time required for the response to rise from 10 to 90% of its final value.

Amplitude

Expressed in arbitary units as width of its response at steady state.

Off set Latency

Time interval for the response to fall to 95% of its - value after cessation of the stimulus.

Decay time

The time interval between 90% to 10% of the amplitude of the response after cessation of the stimulus.

Strasser(1975) used a 1000 Hz acoustic stimulus to « elicit acoustic reflex in normal subjects and subjects with acoustic neuromas . He found that the subjects with acoustic neuramas exhibited initial latency that were

30 msec. longer than the mean latency value for the normal subjects. Latency in strasser's study was defined as the period from signal onset to beginning of initial response.

It has been suggested by a number of investigators that onset of the acoustic reflex may be a sensitive indicator of of retro cochlear pathology (RCP), (Clemis, Sarno 1980, Mangham ,etal 1980 ,Hess, 1979: Bosatra etal 1975,1976). Both Clemis and Sarno (1980) Mangham etal (1980) have reported a delayed onset lateny in the effected ear of patients with 8 nerve tumors. Hess (1779) found delayed outset latencies in patients with multiple scleroris and Bosatra etal (1975,1976),as well, for patients with various brainstem lesions.

Jerger and Hayes (1983) also reported a delayed onset latency in patient 8th nerve tumors in the affected ear.

Signal parameters and the Acoustic Reflex

The different parameters of the acoustic reflex are influenced by variations in stimulus parameters (eg intensity, duration, frequency, rise time). Djupesland & Zwislocki (1971) found stimulus duration had a definite effect on the reflex* threshold. As stimulus duration increased,the intensity needed to elicit the acoustic reflex decreased. They attributed this occurrence to temporal summation occurring at or below the level of the superior olivary complex in the acoustic reflex arch.

Woodford etal., (1975) have investigated the threshold of the reflex as a function of stimulus duration. Measuring clinical reflex thresholds,this group reported ART was dependent on duration of the stimulus. They found variations of as much as 30 db over a 10-500 msec range of stimulus durat ion.

Sunderland (1974) used as 1000 Hz tone with varying rise times to elicit the acoustic reflex in a group of normal subjects. He found that the lateny period increased as the signal rise time increased. They attributed this occurrence to temporal summation occurring at or below the level of the superior olivary complex in the acoustic reflex arc.

Fertitta & Martin (1973), Borg (1982), & Gorga & Stelmachowicz (1983) all noted longer onset latencies as frequency increased.

Church & Cudaly (1984) reported that the onset slope of the reflex elicited by a 500 Hz signal was steeper than the slope produced by a 2000 Hz signal although the initial onset lateny was similar for both signals. Finally Bosatra etal (1976) comparing latencies eqivallent sensation level (SL) noted a curious interaction betweenthe sensationl level and the puretone vs broad band noise latency difference . At a sensation level of lOdB the noise signal generally showed a shorter latency than the 500 hz signal, but at sensation levels of 20 and 30 dB, the difference was in the opposite direction i.e., the latency for the noise signal was longer than for the 500 Hz signal.

METHODOLOGY

The methodology for the present study is described under the following headings.

1) Subjects
2) Instrumentation
3) Calibration
4) Test environment and
5) Test procedure.

Subjects

The subjects for this study were of two groups, group (1) consisted of 30 adults; 15 female and male patients each, with bilateral sensory neurol hearing impairment, with minimal to moderate degree. The age group being 18 to 28 and the mean age 23.

Group (2) consists of 30 normals the group being 18 tO 28 years and mean age being 23 years. All subjects were selected on the basis of positive otologic findings, normal middle ear pressure and tympnometric curves and the presence of an acoustic reflex at 500 hz & 1000 hz.

Instrumentation

A diagnostic audiometer model Grason Stadler instrument-10 was used to establish all pure tone air and bone thresholds, using TDH-49 transducer's.

Tympnometeric curves, acoustic reflex latency data were obtained using acoustic immitance device [Grason Stadler Instrument-33] which is a microprocessor based instrument which has facilities for complete automatic or manual diagnostic testing of middle ear function. Admittance (y) and its components, susceptance (b) conductance (G), acoustic reflex and acoustic reflex latency.

Calibration

An audiometer [Grason Stadler Instrument-10] calibrated according to ISO standards was done.

Grason Stadler Instrument-33 middle ear analyzer version-2 was calibrated according to the standards specified in the manual, prior to and during the study.

The audiometer was also calibrated using sound level meter (b&k 2230) and a microphone (b&k 4144). The calibration of the transducer (earphone) output has been accomplished with the help of artificial ear (b&k 4152) along with the sound level meter of microphone of 1 inch and earphone (TDH, 39 p)

Test Environment

The test was conducted in an air conditioned sound treated room. The environmental conditions like temperature (85 F) and the humidity conditions were with in specified limits. The noise levels were measured using a sound level meter (B&K 2209).octave filter set (B&K 1613) and a condenser microphone (B&K 4165), and the noise levels were with in permissible limits as per ANSI 1977 specification.

Test procedure

Initially puretone air and bone threshold were established and routine impedance measures obtained using GSI-10 to GSI-33 .

Conformation of cochlear pathology was done using special test like Tone delay test and supra threshold adaptation test for group I .

Acoustic reflex latency

The patients was seated comfortably. The probebox was attached to the velcrostrip and placed on the shoulder of the patient. The correct size of ear tip was selected and securely inserted into the ear canal to obtain an airtight seal.

The acoustic reflex latencies was established for 500 Hz and 1000 Hz tones with a stimulus on time of 200 msec and 300 msec and the acoustic signal had a duration of 1000 msec. A probe tone frequency of 226 Hz was used and the slimuli was presented at 10 db above the established acoustic reflex threshold [[Colletti (1974) assets that 10 dB above reflex threshold is the best, most sensitive level of which to test variation in the tonicity of the stapedies muscle reflex].

RESULT AND DISCUSSION

The purpose of the present study was:

(i) To investigate acoustic reflex latency in Cochlear impaired cases.

(ii) To compare the acoustic latency in humans with normal hearing and cochlear imparid in the subject aged 18 to 28 years.

The data was collected based on the methodology given in the previous chapter. These data were subjected to statistical analysis using parameteric statistical test paired and unpaired't' test. (Garret 1966)

The parameter considered in the present study were contralateral acoustic reflex threshold (Latency) on time of the stimulus.

The result and discussion regarding each parameter studied are presented as follows.

Table 1: Normative data of acoustic reflex latency for normals in the age range of 18 to 28 years.

Table 2: Normative data of acoustic reflex latency for sensory Neural (Cochlear impaired) hearing impaired in the age range of 18 to 28 years

The Tables 1 and 2 summarise the result of acoustic reflex latency testing in normals and sensory neural (cochlear impaired) hearing loss groups. The mean, standard deviation and range for latency on- time and frequency are shown .

The data obtained from table 1 and 2 were examined overall and statistical analysis was performed with the assistance of a personal computer . Data for the normal group,group 2 (control) were analysed independently and then the sensery neural (cochlear impaired) hearing loss group, group 1, and then compared using 't'test.

Results of 't'test made no significant deference between the normals and sensory neural (Cochlear impaired) hearing loss group.

Table 3, represents the mean values for each latency conditions 'values and probability illustrating that all mean values for the sensory neural Cochlear impaired group are near same as those of the normal group and since the probability values are greater than 0.05 level there is no significant difference between the normal and Sensory Neural (Cochlear impaired) group. This study goes in agreement with the study by Clemis J.D (1980) and Sarno. C (1980) and is in contrast with Norris .T (1974) Stelmachowicz. P., (1974) Bowling .C.(1974) and Taylor.D(1974) .

Table I: Data of acoustic reflex latency (in ms) for normals in the age range of 18 to 28 years -

Acoustic signal	L1	L2	L3	L4
a) 200 ms (500 Hz)				
Mean	91.33	156.03	281.77	107.70
SD	16.32	17.35	103.49	60.69
Minimun	56.00	120.00	38.00	28.00
Maximum	128.00	208.00	528.00	276.00
b) 300 ms (500 Hz)				
Mean	95.17	166.47	296.13	120.83
SD	17.26	46.74	87.04	43.46
Minimum	68.00	.72.00	82.00	30.00
Maximum	146.00	266.00	560.00	286.00
c) 200 ms (1000 Hz)				
Mean	95.10	162.87	262.50	148.87
SD	21.72	20.14	90.38	**46.87**
Minimum	60.00	118.00	160.00	56.00
Maximum	152.00	252.00	570.00	272.00
d) 300 ms (1000 Hz)				
Moan	97.53	212.70	278.10	115.90
SD	22.92	46.22	74.57	31.71
Minimum	54.00	110.00	104.00	48.00
Maximum	168.00	272.00	552.00	210.00

Where, L1=Latency from onset of stimulus Lo initial reflex response) ie. 10% on time.

L2= Latency from response poak Lo point where reflex reaches 90% return to base line ie. 90% on time.

L3=Latency from cessation of stimulus to 90% ie. 90% off time

L4= Latency from cessation of stimulus to 10% ie 10% off time.

Table II: Data of acoustic reflex latency (in ms) for sensory neural hearing impaired (cochlear pathology) in the age range of 18 to 28 years.(Group *I*)

Acoustic signal	L1	L2	L3	L4
a)200 ms(500 Hz)				
Mean	95.83	161.67	287.88	109.75
SD	13.74	27.21	128.05	28.86
Minimun	62.00	72.00	124.00	55.00
Maximum	123.00	220.00	514.00	180.00
b)300 ms(500 Hz)				
Mean	97.82	175.57	299.95	133.57
SD	17.33	41.34	110.21	34.86
Minimum	54.00	108.00	34.00	72.00
Maximum	136.00	274.00	516.00	258.00
c)200 ms (1000 Hz)				
Mean	100.08	170.68	285.72	155.28
SD	19.61	22.87	108.10	38.48
Minimum	64.00	104.00	142.00	82.00
Maximum	134.00	244.00	584.00	284.00
d)300 ms (1000 Hz)				
Mean	104.97	222.75	273.63	132.70
SD	28.48	27.27	92.75	36.30
Minimum	58.00	142.00	88.00	68.00
Maximum	168.00	268.00	536.00	261.00

Where . Ll= Latency from onset of stimulus to initial reflex response ie. 10% on time.

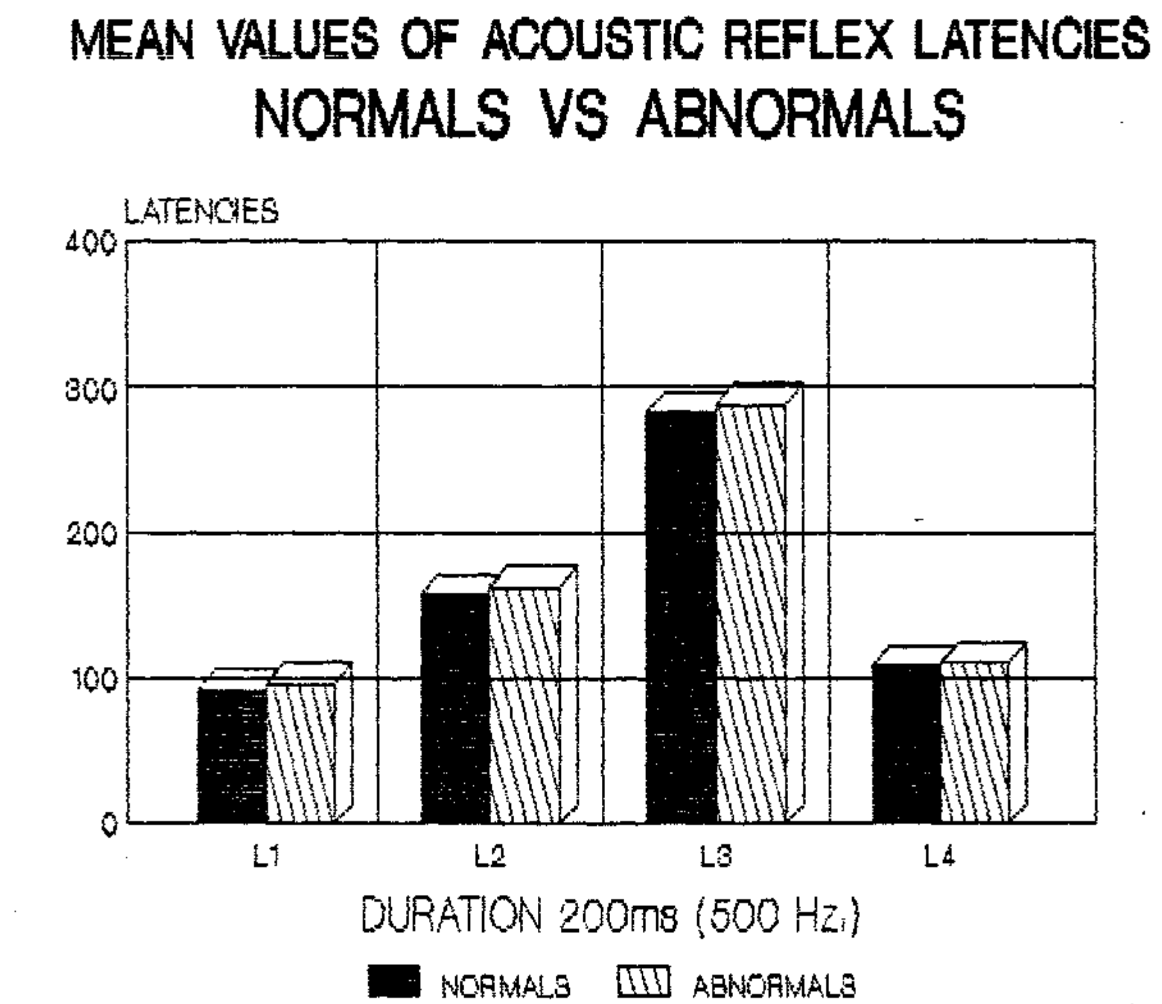
L2= Latency from response peak to point where reflex reaches 90% return to base lino io. 90% on time.

L3= Latency from cessation of stimulus to 90% ie.90% off time .

L4= Latency from cessation of stimulus to 10% ie.10% off time.

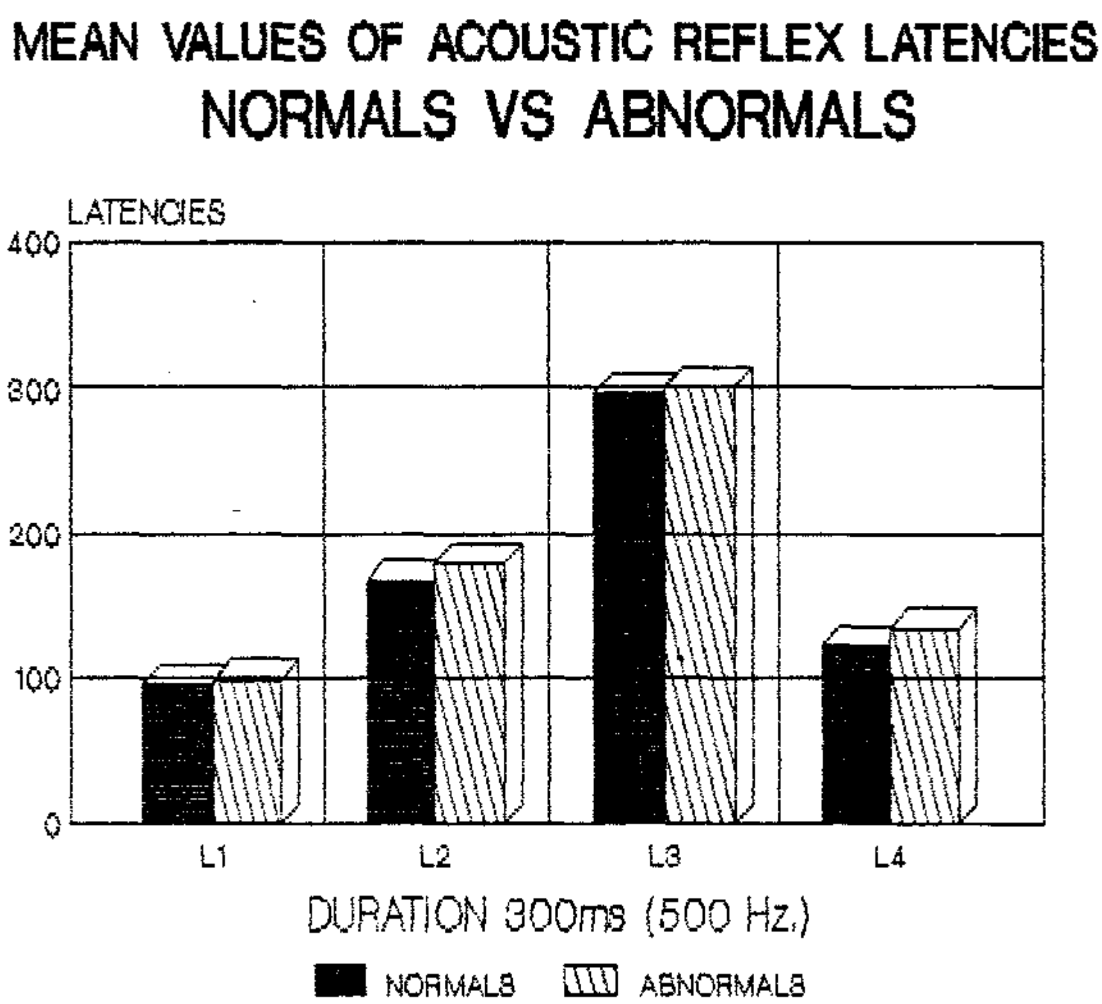
Table III: Moan, 't' value and prpbabi1 ity of acoustic ref1ex latency data between Norma ls and Sensory noura1 (cochlear pathology) hearinig loss groups in the age range of- 18 to 28 years

Acoustic signal	Mean (Normals)	Mean (Abnorma1s)	t value	Probabili ty
A) 200ms(500 Hz)				
L1	91.33	95.83	-1.7200	0.0908
L2	156.03	161.67	-1.3657	0.1772
L3	201.77	287.88	-0.3114	0.7566
L4	107.70	109.75	-0.2771	0.7826
D) 300ms(500 Hz)				
L1	95.17	97.82	-0.8980	0.3728
L2	166.47	178.57	-1.6578	0.1027
L3	296.13	299.95	-0.2621	0.7942
L4	120.83	133.57	-1.7923	0.0782
C) 200msC1000 Hz)				
L1	95.10	100.08	-1.4502	0.1523
L2	164.87	170.68	-1.6068	0.1134
L3	268.50	285.72	-0.9377	0.3522
L4	140.87	155.28	-1.9234	0.0593
D) 300ms(1000 Hz)				
L1	96.53	104.17	-1.4498	0.1524
L2	212.70	222.75	-1.5965	0.1323
L3	278.10	273.63	-0.2855	0.7763
L4	115.90	132.70	-2.5965	0.0119



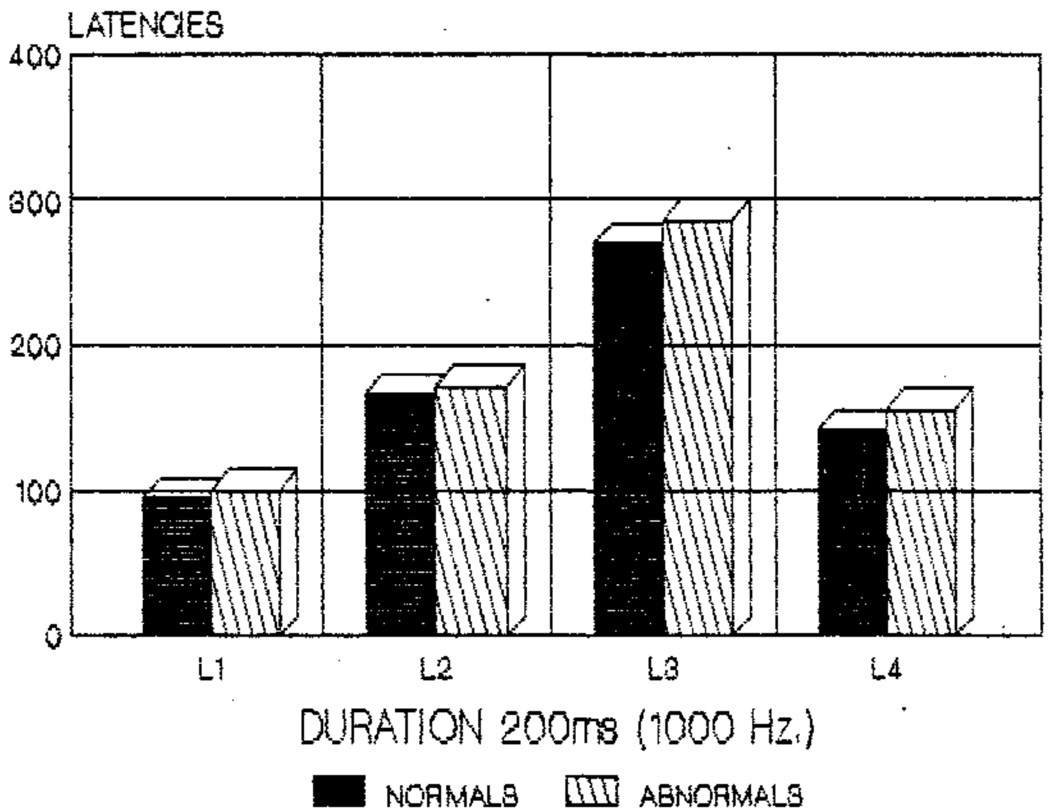
MEAN VALUES OF ACOUSTIC REFLEX LATENCIES
NORMALS VS ABNORMALS
LATENCIES
400
300
200
100
0
L1
L2
L3
L4
DURATION 200ms (500 Hz)
NORMALS
ABNORMALS

GRAPH NO. 1


MEAN VALUES OF ACOUSTIC REFLEX LATENCIES
NORMALS VS ABNORMALS
LATENCIES
400
300
200
100
0
L1
L2
L3
L4
DURATION 300ms (500 Hz.)
NORMALS
ABNORMALS

GRAPH NO. 2

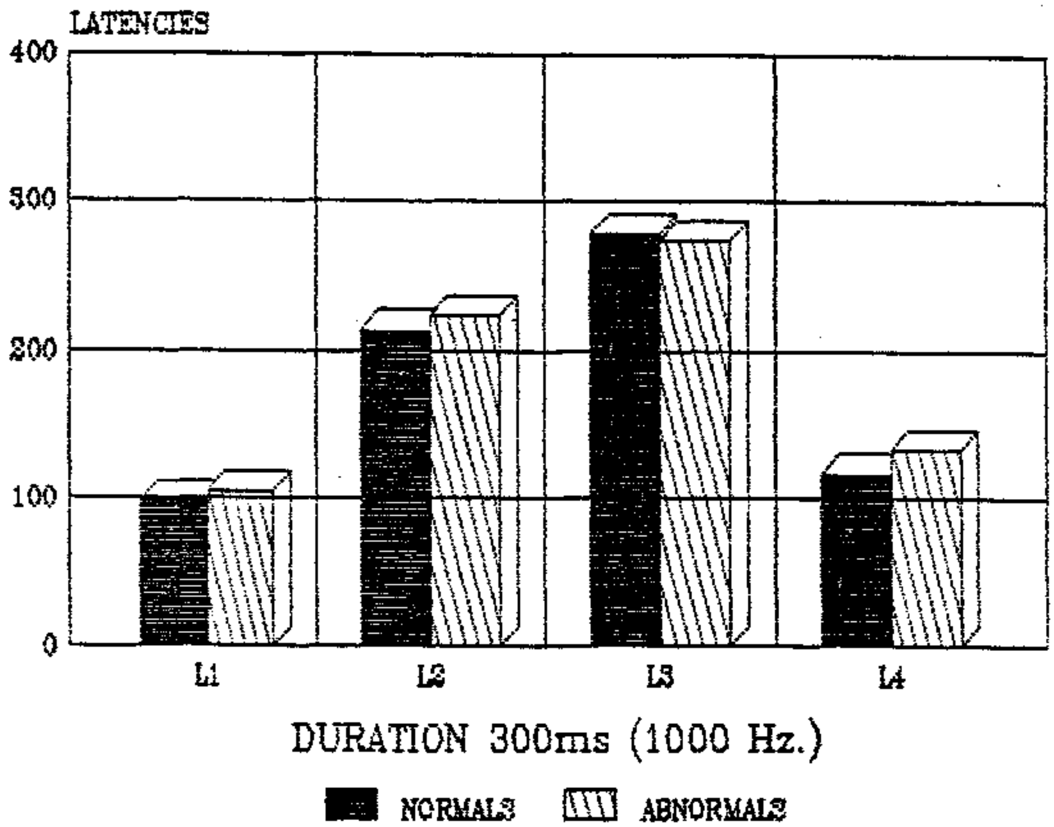
MEAN VALUES OF ACOUSTIC REFLEX LATENCIES
NORMALS VS ABNORMALS



GRAPH NO. 3

MEAN VALUES OF ACOUSTIC REFLEX LATENCIES

NORMALS VS ABNORMALS



GRAPH NO. 4

DISCUSSION

The purpose of the study was to see if there was any difference the acoustic reflex latency in normals (Males & females) and sensory neural (Cochlear impaired)hearing loss group (males and females) in the age range of 18 to 28 years.

And to establish a data for sensory neural (cochlear impaired) hearing loss group for the age range of 18 to 28 years.

This study has showed no significant difference between the normal and sensory neural (cochlear impaired) group. This study is in contract to Norris.T, Stelmachowi Bowling and D. Taylor (1974) who found no deference in the initial portion of the reflex response, especially LI and L2 and found significant difference between normal and sensory neural (Cochlear impaired) group in L3 and L4 and they conjectured that the difference observed between the two group are associated with the Cochlea. (Norris etal., 1974) Cause cochlear impaired ear shows a delay in neural response to the cessation of a stimulus.

Present study is in agreement with Clemis and Sarno

(1980) and Strsser (1975). Clemis and Sarno (1980) found Cochlear group of known etiology and Cochlear group of unknown etiology falls with in normal limits. They interpreted their findings as faster neural conduction time and this reduction in latency probably reflects recruitment which would be equivalent to latency reduction by testing at a higher sensation level.

SUMMARY AND CONCLUSION

The present study aimed to find the difference between normals and sensory neural (Cochlear impaired) hearing loss in terms of acoustic reflex latency in males and females adults in the age range of 18 to 28 years and to establish a normative data for sensory neural (Cochlear impaired) hearing loss cases. This study was carried out in a sound treated test room , Where ambient noise level met the ISO (1969) criteria. A total of thirty adults (15 males and 15 females)within the age range of 18 to 28 years having sensory Neural (Cochlear impaired) hearing loss (Group 11) and thirty normal adults (15 males and 15 females)(Group 1) were taken for the study.

These subjects were tested using middle ear analyser (1731-33) on 60 ears (30 right and 30 left) at a pressure rate of 200 dapa \second for a 226H2 probe tone.

A carefully controlled and monitored 500 Hz and 1000 Hz acoustic signal with two different on time (200 ms and 300ms) was presented 10 dB above each subjects clinical reflex threshold. The acoustic reflex latency response was obtained on a screen and later analysed. Mean values and standard deviation for the latency parameters were determined. The results were subjected to statistical analysis using parametric statistical test paired and unpaired *'t'* test. The following conclusions were drawn based on the statistical analysis.

1. There is no significant difference in the latency values for normals and sensory neural hearing loss (Cochlear impaired)with respect to 500 hz and 1000 hz tone with a stimulus on time of 200ms and 300ms.

2. The data for acoustic reflex latency threshold obtained using the middle ear analyses (GSI-33) for sensory neural (Cochlear impaired) hearing loss in the adults age ranging from (18to28) years are depicted in table 2.

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APPENDIX - I

The BSI 33 version 2 Middle Ear Analyzer (MEA) is a high tech, microprocessor - based admittance instrument designed to be used in a clinical or research setting. It contains total capabilities for complete, automatic or manual diagnostic testing for analysis of middle ear function. Admittance <Y), and its components susceptance (B) and conductance (G), may be measured with probe tone frequency of 226 Hz, 678 Hz and 1 KHz. The extensive battery of test mode choices include diagnostic tympanametry, acoustic reflex threshold and decay measurements, eustachian tube function testing, screening tympanometry, acoustic reflex latency testing, acoustic reflex sensitization and multiple frequency tympanometry (250 Hz to 2 KHz). The operator has a choice of 3 mountings to support the probe box; the standard clothes clip, as an optional operator wrist attachment. The probe box has two LEDs to indicate test status and also a right and left switch to designate the ear to be tested. The GSI-33 calculates gradient as the average of the compliance points at an interval of plus or minus 50 dapa. In GSI 33 the contralateral stimuli is presented through an insert receiver. GSI-33 was calibrated according to the specifications given by ANSI S3.39-1987), ANSI S3.6-1969, (R 1986), IEC 645-1979, IEC 126-1961, ISO 389-1975 and UL 544 Listed Hospital and Dental Equipment. (GSI 33 version 2 MEA

Instruction Manual, 1989). More in depth analysis of the acoustic reflexes, such as latency characteristics and the effects of high frequency sensitization, is possible with such sophisticated equipment. The need for manually written reports and bulky patient files even is being reduced. Test data may be stored in instrument memory and recalled for review prior to being transferred via an RS 232 interface to a PC.

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APPENDIX-II

Acceptable Noise Levels for Audiometry
(SPL - Sound Pressure Level)

Test Frequency	Under earphones only (In dB SPL) MX-41 AR cushions		Sound field or bone conduction (in dB SPL)	
	Octave Band	1/3 Octave Band	Octave Band	1/3 Octave band
125	34.5	29.5	28.0	23.0
250	23.0	18.5	18.5	13.5
500	21.5	16.5	14.5	9.5
750	22.5	17.5	12.5	7.5
1000	29.5	24.5	14.0	9.0
1500	29.0	24.0	10.5	5.5
2000	34.5	29.5	8.5	3.5
3000	39.0	34.0	8.5	3.5
4000	42.0	37.0	9.0	4.0
6000	41.0	36.0	0	- 0
8000	45.0	40.0	20.5	15.5

Table: Acceptable noise levels (in dB SPL) in audiornetric test rooms when testing is expected toreach '0' dB HL (American National Standards Institute ANSI, 1977).