

**AN AUDIOVISUAL
ON
AUDIOLOGICAL
EVALUATION**

DEDICATED TO

DADDY, MUMMY

SWAROOP

CERTIFICATE

This is to certify that the independent project entitled : AN
AUDIO VISUAL ON AUDIOLOGICAL EVALUATION is the
bonafide work in part fulfilment for M.S.C (Speech & Hearing) of the
student with Reg.No. M9521

Mysore
May 1996



Director

All India Institute of
Speech & Hearing
Mysore-6

CERTIFICATE

This is to certify that the independent project entitled: AN AUDIO VISUAL ON AUDIOLOGICAL EVALUATION has been prepared under my supervision and guidance.

Mysore
May 1996


Dr. (Miss) S. Nikam,
Guide

DECLARATION

I here by declare that this Independent project entitled : **AN AUDIO VISUAL ON AUDIOLOGICAL EVALUATION** is the result of my own study under the guidance of Dr, (Miss) S, Nikam, Prof. & Head of the department of Audiology and Director, All India Institute of Speech and Hearing, Mysore, has not been submitted earlier to any university for any diploma or degree.

Mysore
May 1996

Reg.No. M .9521

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Jolly chetan - You are an ideal brother one can have.

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Sony & Jaison - My cute little brothers. You are someone special. Special in every way.

Jijo - Thankyou for all your concern and moral support.

Divya & Mini - You too have touched my life in very special way and your friendship has given me some of life's very special moments.

Sara - Life means so much more with friends like you to share it with.

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Rahul & Pradeep - Thanks for being such good friends.

Smitha & Sobha - Though miles away you have always been there whenever I have needed you. We have nothing in common but love.

I thank my Lord Jesus Christ - What I am today is your gift to me lord.

" The Lord is my Shepherd; I shall not want
He makes me to lie down in deep pastures
He leads me beside the still waters"

TABLE OF CONTENTS

I. INTRODUCTION

II. SCRIPT FOR AUDIOLOGICAL EVALUATION

III. BIBLIOGRAPHY

INTRODUCTION

3. Mixed hearing loss:- In mixed hearing loss both air conduction and bone conduction are affected. Here, along with the inner ear or auditory nerve problem, the external ear or middle ear is also affected. The difference between the air conduction thresholds and bone conduction thresholds are greater than 10 dB.

The degree of hearing loss can be normal, minimal, mild, moderate, moderately severe, severe, profound depending up on the intensity level at which the person is barely able to detect the presence of sound.

Speech audiometry

Assessment of hearing for puretones provides valuable information regarding sensitivity, but only limited information concerning receptive auditory communication ability. There appears to be no satisfactory means of accurately predicting speech understanding ability from puretone results. Limitations in receptive speech understanding can only be reliably demonstrated using speech stimuli.

Speech audiometry helps in measuring the ability to understand speech under various conditions of intensity and noise interference using earphones as well as speakers.

Impedance audiometry

Acoustic impedance is a general term that describes the case of, or opposition to sound flow through a system. Energy is transferred when sound waves reach the ear canal and sound pressure is applied to the eardrum. When sufficient sound pressure is applied, the eardrum and the entire middle ear and the inner ear systems are set in to motion and energy begins to flow. The middle ear system is not a perfect transducer of energy; not all of the energy that impinges on the tympanic membrane flows through the middle ear transmission system. The middle ear system opposes the transfer of energy to some extent. This opposition to the transfer of acoustic energy is termed as acoustic impedance (Z_a). The reciprocal of this opposition, or the ease of energy flow is termed as acoustic admittance. Either measurement approach can be used in impedance audiometry.

Impedance audiometry helps to get a clear picture of the middle ear and also some vital information on the cochlear and retrocochlear condition. Abnormal function of the middle ear is generally a consequence of pathological condition that might have existed in it. An abnormality in middle ear structure results in changes in impedance. Changes can be an increase or decrease in impedance. These changes in impedance is the basis of detecting middle ear pathology. After recording and plotting of a tympanogram interpretation is done by the audiologist. A proper interpretation is necessary for assessing firstly the presence or an absence of middle ear pathology; Secondly the type of middle ear pathology present.

In the simplest term " Audiology " refers to the science of hearing and the study of the auditory process. Hearing is a vital link of man to the communication world and hearing impaired is robbed of this vital experience.

Not able to hear is a condition which most of us , hearing individuals can never fully understand. It is a fact that the degree of rehabilitation depends on identification of hearing loss.

An audiologist is one who specialises in the field of hearing and hearing impairments. He is concerned with assessment of hearing habilitation and rehabilitation of auditory function.

Audiology has two branches – the diagnostic audiology and Rehabilitative audiology. Diagnostic audiology consists of identification and assessment of hearing loss where as rehabilitative audiology consists of fitting of hearing aids , providing speech stimulation and counseling.

The instruments used for hearing evaluation include various types of audiometer , impedance audiometer , Evoke response audiometer , Otoacoustic emission analyser etc.

Audiometers

Audiometers are electronic instruments used to detect the threshold of hearing.

Puretone audiometer

A puretone audiometer is used to determine the level at which a person is able to hear puretones at various frequencies. A puretone. is a tone which has only one frequency . It doesnot have any overtones. Puretones at various frequencies are generated and their levels or intensities are increased or decreased until a level at which the tone is barely heard is established. The outputs may be through earphones for air conduction testing or bone vibrator for bone conduction testing or loudspeaker for sound field or free field testing . Visually loudspeakers are used to test very young children and difficult to test children . The level at which the tone is barely heard (threshold) is plotted against each frequency in a graph called the audiogram and from the audiogram the diagnosis is made in terms of the type of hearing loss and degree of hearing loss.

Types of hearing loss

1. Conductive hearing loss:- In conductive hearing loss, bone conduction is normal and air conduction is affected i.e. the person has the problem either with the external ear or the middle ear .

2. Sensory neural hearing loss (SN):- In sensory neural hearing loss both air conduction and bone conduction thresholds are affected since the inner ear and / or the auditory nerve is affected. The difference between the air conduction thresholds and bone conduction thresholds is less than 10 dB.

Evoked Response Audiometry

When an individual is quiet and relaxed the ongoing random electrical activity of the brain can be picked up by electrodes placed on the scalp. The recording thus obtained is the (EEG) electroencephalogram. The electrical activity in a normal individual records a change when an auditory, visual or tactile stimuli is presented. Depending on the stimulus, the evoked potential may be called auditory evoked potential or visually evoked potential or tactile evoked potential.

For obtaining auditory brain stem responses the equipment essentially comprises of mainly two parts: one to record the responses and the other to generate the necessary stimuli to evoke the responses. The stimulus generating unit produces at first an electrical waveform, which gets amplified, modified and finally transduced into the acoustic waveform by a transducer which may be an earphone, a bone vibrator or a loudspeaker.

The recording apparatus consists of electrodes, amplifiers, filters, averager and display including a print out to get a permanent record.

Otoacoustic emission

Otoacoustic emission is the emission of sound energy from the ear, which can be detected at the eardrum by a miniaturized sensitive microphone. They are sounds generated within the normal cochlea either spontaneously or in response to the acoustic stimulation. There are two basic OAE phenomena

- 1) Spontaneous otoacoustic emissions (SOAEs)
- 2) Evoked otoacoustic emissions (EOAEs)

Spontaneous otoacoustic emissions occur in the absence of external stimulation, where as evoked otoacoustic emissions occur during or after external acoustic stimulation. There are several subclasses of EOAEs based primarily on the stimuli used to evoke them. These include

- 1) Transient evoked otoacoustic emissions.
- 2) Acoustic distortion product emissions.
- 3) Stimulus frequency emissions.

This video film has been developed to create an awareness among the lay man about the different facilities present for evaluating a hearing loss of a person.

By this video film it is hoped that the observers find it informative, enlightening and also join hands in spreading awareness among the lay public.

SCRIPT

VISUAL

Focus on the patient
and audiologist

AUDIO

Patient: Good morning. Is this the audiology department.

Audiologist: Yes, Please come in.

Patient: I have been having problem with hearing for quite some time and I would like to get my hearing tested.

Audiologist: Before testing your hearing I would like to ask you some questions. First of all, what is your Name?

Patient: Vivek.

Audiologist: Your age please?

Patient: 28 yrs.

Audiologist: Since how long have you been having this problem?

Vivek: Since last 6 months.

Audiologist: Is your problem of sudden or gradual onset?

Vivek: I feel it is of a gradual onset.

Audiologist: Do you get ear-ache or ear discharge?

Vivek: No.

Audiologist: Is your hearing affected to the same extend in both ears?

Vivek: I feel my both ears are affected equally.

Audiologist: Do you feel that your problem has increased over time or is it the same?

Vivek: I feel that it has increased over time.

Audiologist: Have you been exposed to noise?

Vivek: No.

Audiologist: Do you hear any ringing sound in your ears?

Vivek: Yes, Occasionally I hear.

Audiologist: Do you feel giddy?

Vivek: No.

Audiologist: Okay, Now we will move on to testing. There are 2 important things that we need to find out.

- (1) Exactly how much is the hearing loss in your right and left ear?
- (2) What is the type of hearing problem you have?

Vivek: What is meant by type of hearing loss?

Audiologist: There are basically three different types of hearing loss.

- (1) Conductive hearing loss ie hearing loss due to damage or infection of the outer or middle ear.
- (2) Sensorineural hearing loss:- Hearing loss due to damage to the inner ear or beyond the inner ear.
- (3) Mixed hearing loss ie hearing loss due to damage to both the inner ear as well as the middle ear.

Audiologist showing the Audiometer

The hearing acuity is tested using this instrument. It is called an audiometer.

Focus on the Earphones

Each ear can be tested separately by using these earphones. These earphones can be placed over each ear and a tone can be given separately to each ear.

Audiologist showing
Frequency dial and the
Intensity dial

Using an audiometer we can test a person's hearing thresholds for different frequencies, testing one ear at a time. We generally start testing lower frequencies first and then go on to higher frequencies. This dial is meant for controlling the intensity. The subject is asked to raise his hand whenever he hears the sound and to put it down the moment the sound stops, even when he hears the sound very faintly. The lowest level at which he responds at each frequency is his hearing threshold for those frequencies.

Audiologist describing
the audiogram

The result obtained on pure-tone Audiometry will be plotted on a graph called an audiogram which shows intensity against frequency. The circles marked show the hearing threshold of a person's right ear and the crosses show the hearing threshold of his left ear. The other sign (]) represents the hearing through bone conduction.

Vivek: How do you test a very small child?

Audiologist: BSERA can be done for kids.

Three electrodes are usually applied to the scalp and are commonly referred to as 'active' 'reference' and 'ground'. The 'reference' electrode is usually placed on the earlobe or mastoid of nontest ear. The 'active' electrode is placed on the earlobe or mastoid of test ear. The 'ground' electrode is placed on forehead in the

midline or vertex.

Focus on waveform patterns

The ABR waveform consists of five to seven peaks measured within the first 10ms. The interpretation of ABR is based on the physical characteristics.

- a) The response morphology
- b) The latency parameter
- c) The amplitude parameter.

Focus on Impedancemeter

Differential diagnosis of the middle ear pathologies is also possible using this instrument. The patient is instructed that he or she is going to hear tone or noise in the ear and the patient is asked to relax and not to yawn, cough or sneeze during the testing. The patient is also advised to hold the head still and is asked not to open the mouth nor swallow.

Once the patient is instructed, the ear tip is inserted in the ear canal of the test ear. When the button 'start' is pressed the pressure changes automatically from +400 to -400mm H₂O and the impedance of the middle ear is displayed on the screen.

After recording and plotting of a tympanogram interpretation is done by the audiologist. A proper interpretation of tympanogram is necessary for assessing firstly the presence or an absence of middle ear pathology. Secondly the probable type of middle ear pathology present.

HEARING AID SELECTION

AUDIO**VISUALS****AUDIOLOGIST:**

After otologic examination and medical clearance appropriate hearing aids are fitted for those patients whose hearing loss cannot be cured medically. The goal is to provide the child with maximum auditory information consistent with his hearing loss.

VIVEK: How do you select an appropriate hearing aid?

Audiologist: There are both subjective as well as objective testing for selecting an appropriate hearing aid.

Focus on IGO:

Audiologist: This instrument can be used for objective testing.

Focus on Different hearing aids: Audiologist: There are different types of hearing aids like body level, Behind the ear, inside the ear, spectacle type.

Depending on the affordability, listening needs and age suitable type of hearing aid is selected.

SUMMARY

A Video film has been taken on the different facilities available for a person with hearing impairment. It covers different evaluation procedures for adults as well as children. It also focuses on different audiometers, impedance audiometer, BSERA, Oto acoustic emission etc. It also covers briefly the selection of hearing aids. This video film has been developed to create awareness among the layman in terms of the different facilities available for evaluation as well as rehabilitation for the hearing impaired.

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