NETAJI SUBHAS OPEN UNIVERSITY

STUDY MATERIAL

M. Ed. Special Education
(Hearing Impairment / Intellectual Disability) - ODL

B 8 (H.I.)

IDENTIFICATION, ASSESSMENT AND NEEDS OF CHILDREN WITH HEARING IMPAIRMENT

M. Ed. Spl. Ed. (H.I. / I.D.)
ODL Programme

AREA - B

B 8 H.I.: IDENTIFICATION, ASSESSMENT AND NEEDS OF CHILDREN WITH HEARING IMPAIRMENT

A COLLABORATIVE PROGRAMME OF
NETAJI SUBHAS OPEN UNIVERSITY
AND
REHABILITATION COUNCIL OF INDIA

AREA - B
DISABILITY SPECIALIZATION
COURSE CODE - B 8 (H.I.)
IDENTIFICATION, ASSESSMENT AND NEEDS OF CHILDREN WITH HEARING IMPAIRMENT

Chairman	**Prof. Subha Sankar Sarkar,** Vice Chancellor, Netaji Subhas Open University, Kolkata-700 064
Convenor	**Prof. Atindranath Dey,** Director, School of Education, Netaji Subhas Open University, Kolkata-700 064

RCI Expert Committee

Dr. Jayanthi Narayan	Former Deputy Director, NIMH, Secunderabad.
Dr. Varsha Gathoo	Head and Reader, Department of Education, AYJNISHD (D), Mumbai.
Dr. Sanjay Kumar	Assistant Professor, DSMNRU, Lucknow,
Shri Ashok Chakraborty	Ex- Chairperson, ZCC, RCI & Secretary, SHELTER.
Dr. Hemant Singh Keshwal	Assistant Prof. of Special Education and Centre In- Charge, NIEPID- RC, Kolkata.
Shri Suman Kumar	Assistant Professor of Speech & Hearing, AYJNISHD- RC, Kolkata.
Professor A. N. Dey	Director, School of Education, NSOU.
Smt. Antara Choudhury	Assistant Professor of Special Education, School of Education, NSOU.

NSOU Expert Committee [Board of Studies (BoS)]

Professor A. N. Dey	Director, School of Education, NSOU.
Professor Dulal Mukhopadhyay	Professor of Education (Retd), NSOU.
Shri Ashok Chakraborty	Ex- Chairperson, ZCC, RCI & Secretary, SHELTER,
Professor Debasri Banerjee	Professor of Education, Department of Education, University of Calcutta
Dr. Hemant Singh Keshwal	Assistant Prof. of Spl. Education and Centre In- Charge, NIEPID-RC, Kolkata.
Shri Suman Kumar	Assistant Professor of Speech & Hearing, AYJNISHD- RC, Kolkata.
Professor Swapan Kr. Sarkar	Head, SoE, NSOU
Prof. Sanat Kumar Ghosh	Professor of Education, SoE, NSOU.
Professor Sumanta Chattaraj	Professor of Education, SoE, NSOU.
Smt. Swapna Deb	Consultant, SoE, NSOU.
Smt. Antara Choudhury	Assistant Professor of Special Education, School of Education, NSOU.
Dr. Abhedananda Panigrahi	Coordinator, B. Ed., SoE, NSOU.
Shri Prabir Naskar	Assistant Professor of Special Education, SoE, NSOU.

Title : Identification, Assessment and Needs of children with Hearing Impairment

Unit	**Name of the Unit Writer**	**Name of the Editor**
Unit-1-2	Mr.Indranil Chatterjee, Lecturer in Speech & Hearing, AYJNISHD, RC, Kolkata.	Shri Suman Kumar, Assistant Professor of Speech & Hearing, AYJNISHD, RC, Kolkata.
Unit-3	Mr.Saikat Das, Faculty, AYJNISHD, RC, Kolkata.	
Unit-4	Smt Swapna Deb, Consultant, SoE, NSOU.	
Unit-5	Shri Prabir Naskar, Asstant Professor of Special Education, School of Education, NSOU.	
General and Format Editing		Smt. Swapna Deb, Consultant, SoE, NSOU. and Smt. Baby Dutta Choudhury, Academic Consultant, SoE, NSOU,
Programme Coordinator		Smt. Antara Choudhury, Assistant Professor of Special Education, School of Education, NSOU.

The Self Instructional Material (SIM) is prepared keeping conformity with the M.Ed.Spl. Edn.(HI/ID) Programme as prepared and circulated by the Rehabilitation Council of India, New Delhi and adopted by NSOU on and from the 2020-2022 academic session.

Mohan Kumar Chattopadhyay
Registrar

Prologue

I am delighted to write this foreword for the Self Learning Materials (SLM) of M Ed in Special Education (ODL). The M Ed in Special Education in ODL mode is a new academic program to be introduced at this University as per NOC issued by the Rehabilitation Council of India, New Delhi and subject to approval of the program by the DEB-UGC.

I must admire the emulation taken by the colleagues from School of Education (SoE) of NSOU for developing the Course Structure, Unit wise details of contents, identifying the Content Writers, distribution of job of content writing, editing of the contents by the senior subject experts, making DTP work and also developing E-SLMs of all the 16 Papers of the M.Ed Spl.Ed (H.I/I.D)–ODL program. I also extend my sincere thanks to each of the Content Writers and Editors for making it possible to prepare all the SLMs as necessary for the program. All of them helped the University enormously. My colleagues in SoE fulfilled a tremendous task of doing all the activities related to preparation of M.Ed in Spl Edn SLMs in war footing within the given time line.

The conceptual gamut of Education and Special Education has been extended to a broad spectrum. Helen Keller has rightly discerned that *"Have you ever been at sea in a dense fog, when it seemed as if a tangible white darkness shut you in and the great ship, tense and anxious, groped her way toward the shore with plummet and sounding-line, and you waited with beating heart for something to happen? I was like that ship before my education began, only I was without compass or sounding line, and no way of knowing how near the harbour was. "Light! Give me light!" was the wordless cry of my soul, and the light of love shone on me in that very hour."* So education is the only tool to empower people to encounter his/her challenges and come over being champion. Thus the professional Teacher Education program in Special Education can only groom the personnel as required to run such academic institutions which cater to the needs of the discipline.

I am hopeful that the SLMs as developed by the eminent subject experts, from the national as well as local pools, will be of much help to the learners. Hope that the learners of the M.Ed Spl Edn program will take advantage of using the SLMs and make most out of it to fulfil their academic goal. However, any suggestion for further improvement of the SLMs is most welcome.

Professor (Dr.) Subha Sankar Sarkar
Vice-Chancellor, NSOU

First Edition : December, 2019

Printed in accordance with the regulations of the Distance Education Bureau,
University Grants Commission, Government of India

AREA - B

IDENTIFICATION, ASSESSMENT AND NEEDS OF CHILDREN WITH HEARING IMPAIRMENT

Unit 1: Audiological Assessment, Identification and Addressing Needs

1.1 Overview and need of various audiological assessment

1.2 Choice and selection of audiological tests according to age and functional abilities of the child

1.3 Overview of audiological assessment of children with additional/ associated disabilities

1.4 Selection of modality / method of management (auditory, speech reading vs manual communication) based on aided performance (aided audiogram & speech identification)

1.5 Recommendation of educational set-up (special, partial integration vs inclusive education) based on aided performance (aided audiogram & speech identification) as one of the factors

Unit 2: Speech Assessment, Identification and Addressing Needs

2.1 Overview of acoustics of speech; Classification of speech sounds based on major acoustic cues

2.2 Compare and contrast speech development in typical developing children and CWHI

2.3 Phonological errors as a function of audiogram configuration (flat, gradually sloping and steeply sloping) and degree of hearing loss

2.4 Selection of appropriate strategies, material, and equipment for teaching speech

2.5 Need for use of regional language based speech assessment tests

Unit 3: Language & Communication Assessment, Identification and Addressing Needs

3.1 Parameters of selecting medium of instruction for CWHI: Language/s used at home, school & society

3.2 Language assessment of the deaf: Challenges and concerns (standardized versus teacher made tools; Setting norms of children 'with' versus 'without' disability;

modality dependent nature of language; measuring receptive language; identifying measurable indicators)

3.3 Biological foundations and research in early language experiences in the past two decades: From input to uptake

3.4 Processing sign languages in early years: Neural reorganization; Access to age appropriate language; Ease of intake; Universal grammar; Modality dependent versus modality independent components

3.5 Studying language assessment component in ICF; Recommendations related to language assessment reflecting in National Curriculum Framework (NCF)

Unit 4: Educational Assessment, Identification and Addressing Needs

4.1 Concept & principles of Educational Assessment

4.2 Scope & priorities in educational assessment

4.3 Methods, Techniques & tools for educational assessment & Reporting: Formal & Informal

4.4 Outcomes of educational assessment: Identification, addressing educational needs; linking with pedagogical decisions

4.5 Setting up of an educational assessment clinic/centre: Need & Requirements (essentials & Desirables)

Unit 5: Team Approach in Assessment, Identification & Assessing Needs

5.1 Team Approach: concept & types (Multidisciplinary, Interdisciplinary and Trans-disciplinary);

5.2 Role of various stakeholders: professionals, personnel, parent and the child;

5.3 Constitution of team with respect to CWHI: Considerations on child's age, severity and associated conditions;

5.4 Team's role before, during and after assessment; Identifying and addressing the need and planning IEP / IFSP

5.5 Team's role in outcome measures: Periodic assessment and evaluation; review of performance against previously set goals

B 8 H.I. ◘ IDENTIFICATION, ASSESSMENT, AND NEEDS OF INDIVIDUALS WITH HEARING IMPAIRMENT

Unit - 1 ❑ Audiological Assessment, Identification, And Addressing Needs

Structure

1.1 Introduction

Hearing loss, also known as hearing impairment, is a partial or total inability to hear. A deaf person has little to no hearing. Hearing loss may occur in one or both ears. In children, hearing problems can affect the ability to learn spoken language and in adults, it can create difficulties with social interaction and at work. Hearing loss can be temporary or permanent. Hearing impairment can develop due to various pathological conditions, such as, at the outer ear level, it can be due to the excessive formation of ear wax, malformation of pinna, external auditory canal, or the insertion of foreign body in the EAC. At the middle ear level, the hearing loss may occur due to the infection, ear discharge, ossicular chain discontinuity, perforation of the tympanic membrane, and the inner ear level, it can be an infection, certain disease, hereditary, aging or noise and may occurs at birth or after birth.

Hearing loss can be divided into three types: - Conductive, sensorineural and mixed hearing loss.

Conductive hearing loss occurs if there is a pathology in the outer ear or middle ear, i.e., the conductive mechanism of the ear. If there is a problem in the inner ear or

auditory nerve, the hearing loss is of sensorineural type, and if there is a problem in the conductive and sensorineural mechanism it is of mixed type.

Similarly, there is a various degree of hearing loss which may vary from individual to individual. Some individuals may have a mild degree of impairment, while others have severe to profound degree of impairment.

There are also various effects of hearing loss in individuals. For example, a person may have difficulty in perception of speech, while others may have difficulty in acquiring age-appropriate speech and language skills. Similarly, a child with hearing loss may have poor academic performance. Hence, for reducing the impact of the hearing impairment, early identification and intervention are necessary and for this suitable hearing assessment is required.

An audiological assessment is a painless, noninvasive hearing test that measures a person's ability to hear different sounds, pitches or frequencies. The diagnostic test is performed in a soundproof booth under headphones. The test takes approximately 30 to 60 minutes to complete. Following the test, an audiologist will discuss the results and options for treatment, which might include hearing aids. Audiological assessment, which includes a full history and assessment of hearing and communication needs, can identify any hearing loss and associated difficulties.

There are various types of hearing tests available which helps in identifying and the diagnosis of hearing loss. Unlike most adults whose hearing loss can be defined in one clinic visit, children often require repeated visits before the configuration and degree of hearing loss is defined. Audiologic assessment in children is often a challenging, time-intensive and ongoing process, particularly when assessing the very young infant. Infants and young children do not possess the breadth of responses that adults do, requiring modifications of behavioral audiologic techniques. In addition, there is sometimes the need for electrophysiological tests to provide a baseline estimate of auditory function until complete behavioral audiologic findings can be obtained.

Along with these the audiological assessment results helps in finding the various intervention strategies which help in the development of speech-language and auditory skills in a child.

These may include speech reading activities, use of manual signs, speech therapy etc.

1.2 Objectives

After studying this unit carefully, teacher educator will able to learn about:

1) The aims, objectives, and needs of audiological assessments
2) The various audiological tests used to determine hearing loss
3) The identification and selection of appropriate tests for various age groups
4) Audiological assessment of children with additional/ associated disabilities
5) Importance of audition, speech reading and manual communication in management of hearing impairment
6) Educational management of children with hearing impairment

1.3 Overview and Need of Various Audiological Assessments

1.3.1 Need for audiological assessment:

I. Early Identification of Hearing Loss: it is important to identify the hearing loss at an early stage so that quality rehabilitation can begin at an early stage. Various causes such as trauma, infections, hereditary, inappropriate obstetric care, etc may lead to hearing loss in a child. the audiological tests helps in identifying whether there is a presence of hearing loss or not. These tests can be performed in a medical setup as well as in primary health care centers. Such tests are called screening tests.

II. Medical Diagnosis: The hearing tests help in medical diagnosis and thereby assists in further recommendation for treatment i.e. either medical, surgical or rehabilitative. The audiological tests provide information about the site of the lesion of the auditory system. Like, which part of the auditory system is normal and abnormal and helps in treating them, that is, type of hearing loss. It also provides information about how much it is affected, that is, degree of hearing loss.

III. Follow up procedures for monitoring of hearing status: In some cases, hearing sensitivity may vary over a period of time, due to which, it is important to assess the hearing sensitivity on a regular basis. It helps the audiologists to monitor their

changes in hearing and provide them further treatment advice. Hearing of a client may vary due to excessive noise exposure, any long history of ototoxic drugs, which may also lead to hearing loss. Along with these, people with progressive or fluctuating hearing loss also need to be monitored for their hearing status. That is why follow up is recommended to these individuals.

IV. Planning of rehabilitation programs: hearing tests allows audiologists to plan adequate rehabilitative programs according to the person's hearing loss. The audiological assessment helps in the selection of the suitable hearing aid, it's fitting, planning for the educational services, vocational placement and job identification. In children, the need for speech and language therapy is also selected by seeing the audiological tests result.

1.3.2 Overview Of Audiological Assessment

The goal of hearing assessment is to quantify and qualify to hear in terms of the degree, type, site (as appropriate) and configuration of the hearing loss. In all cases following a hearing assessment, the audiologist must communicate the results of the assessment to the patient. If a hearing loss is identified, the audiologist must review with the patient the impact on communication and provide initial information regarding possible treatment options. These options may include counseling, medical or surgical intervention, prescription/provision of personal hearing instruments, prescription/ provision of advanced listening technologies, skill development through aural (audiologic) habilitation/rehabilitation, or simply monitoring of the condition through periodic assessment. Hearing assessment is conducted using a test battery approach.

The basic components of this test battery approach include:

1. Case history
2. Otoscopic exam
3. Acoustic immittance measures
4. Pure-tone audiometry
5. Speech audiometry
6. Additional site of lesion testing
7. Counseling

Other tests may be included in the battery contingent on the results of the basic battery and interventions that are recommended and the nature of the patient being assessed.

On the other hand, the audiological tests can be categorized into:

I. Informal audiological tests: includes screening tests

II. Formal audiological tests: includes screening and diagnostic tests

Formal audiological tests can be further classified into:

A. Subjective audiological tests: where the subject participates like, tuning fork tests, speech audiometry and pure tone audiometry

B. Objective audiological tests: It does not require the subject's participation like immittance audiometry, otoacoustic emission, auditory brainstem response audiometry and auditory steady-state response audiometry

The Informal Hearing Assessment Process

The goal of informal audiological tests is to:

- develop an idea of how the child uses his or her hearing in various environments across the course of the day; and
- try to discover what variables support the best use of hearing in order to continuously improve the use of hearing.

The main objective of informal hearing tests is "Early Identification of hearing loss".

It includes various tests like Behavioural observation audiometry, Sound Field Audiometry, visual reinforcement audiometry etc.

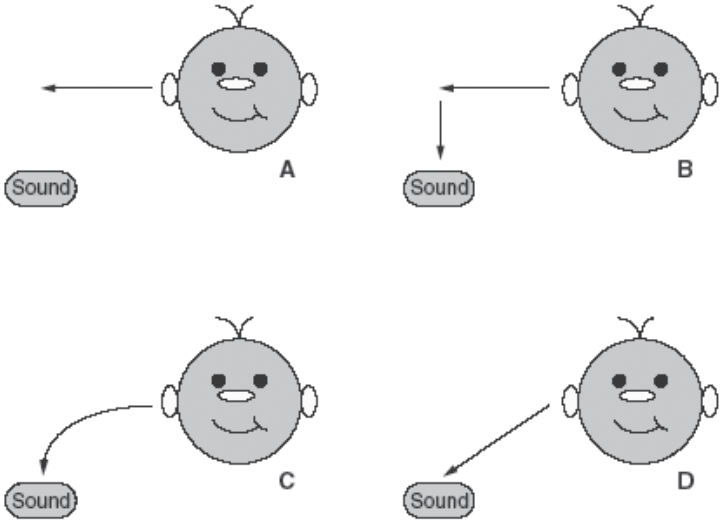
Behavioral observation audiometry:

It can be performed in hospitals, primary health centers on new-born babies, and in the school environment on school-going children. It is based on behavioral observation of a subject in response to various auditory stimuli. This test procedure only identifies/ detects the cases with a potential hearing loss. Its major limitation is that it does not provide information about the type and degree of hearing loss and any ear specific information. The test procedure is performed under certain guidelines provided by the

American Speech and Hearing Association (ASHA). It is a time and money-saving test procedure for the hearing assessment of that population who are at risk to develop hearing loss due to some pathologies.

Procedure: It can be performed on new-born babies and children up to 6months of age. Behavioral observation audiometry (BOA) is often employed with two clinicians working together. While one clinician may sit in front of the child, who may be seated on the parent's lap, to occupy the child's attention, the second clinician, located behind and to the side of the mother,

FIGURE: development of auditory localization in infants: (A) At 3 months, the head moves somewhat jerkily along a horizontal plane, (B) At 5 months, localization is in straight lines, first horizontally and then vertically. (C) At 6 months, the head and eyes move in an arc toward the sound source. (D) At 8 months, the eyes and head move directly to the sound source. Phonemes such as S, S, S, S or a variety of toys or noisemakers may be used. Crinkling cellophane or onionskin paper makes the sort of soft, annoying sound that is extremely useful in techniques such as these, but like most non-calibrated sounds, it provides little or no information about the configuration of the hearing loss. For a sound to be localized, hearing thresholds must be similar in both ears, although not necessarily normal. As a child's ability to localize sound matures, it progresses from the eye and head movement seen horizontally, then vertically, then on an arc and finally in a direct line to the sound source. If a child does not turn to locate a sound by the age of 8 months, it can be suspected that something is wrong, although not necessarily hearing loss. Mental disability and some childhood symbolic disorders may manifest themselves in a similar lack of response. If a child cannot be tested by using formal methods, an imitation of



vocalization can be tried. The clinician can babble nonsense syllables, without the child watching, to see if the child will imitate. If imitation does take place, it indicates that hearing is good enough to perceive voice. If no response is noted and the clinician babbles again in the child's line of vision, the child with a severe hearing impairment may attempt to imitate but may do so without voice. This is the most important diagnostic sign. In addition to being a strong indication of hearing loss, silent imitation indicates that the child's perceptual function is probably intact. If the child vocalizes, voice quality can be evaluated. Although the vocal quality of individuals with hearing loss is sometimes different from that of individuals with normal hearing, it must be remembered that the voice of the very young child who has a hearing impairment frequently cannot be differentiated from that of the child with normal hearing. It is possible to observe a child's reaction to the examiner's imitation of the child's sounds. In this case, the examiner gives a response to the child's babbling or other vocalizations. A child with normal hearing may cease vocalization and may sometimes repeat it. There are instances in which this procedure works when nothing else does, as the child may stop and listen, the interpretation being that the examiner's voice was heard.

In the early months (up to 4 months of age) hearing assessment is restricted to very few responses from the baby such as startle and Auro-Palpebral reflex. Also, these responses are generally seen as relatively loud auditory signal. The other responses shown by infants and/or children are widening of eyes, vocalization, awareness of sound, cessation of activity, rudimentary localization etc. Auro-Palpebral reflex is the contraction of the orbicularis palpebral muscle of the eye. It is usually seen as an eye blink (a quick closing of the eye) or tightening of the eyelids of the eyes that are already closed. The startle reflex is seen as a small jump or jerk of the infant's body. Both these responses are seen immediately after the presentation of an auditory stimulus (sound) of high intensity However these responses are momentary and disappear quickly after repeated presentation of the sound stimulus. Hence the tester needs to be alert and quick in his/her observations. In startle reflex besides small jump, the infant's arms go apart, the fingers spread, the legs extend, the eyes wide open and the head is thrown back as a response to load sound. But if any of this response is not seen/observed for loud sound then it is possible that the infant/child may have hearing loss and for the confirmation of the same.

Limitations of Behavioral Observation Audiometry

1. It is a time-consuming procedure.
2. No ear specific information is obtained about baby's/infant's hearing sensitivity.
3. It provides information only about degree of hearing loss but not about type of hearing loss.
4. The infant should be fully awake or at least in light sleep, well-fed and physically well.
5. As the judgment about the presence or absence of an infant's/ baby's response is made by the clinician hence there are high chances of "subject biasing" or "subject variation. This affects the reliability of this procedure.
6. The parental co-operation and the infant's participation is essential for the validity of responses,

Visual Reinforcement Audiometry (VRA):

Visual Reinforcement Audiometry (VRA) is based on the response of head turn or localization towards the sound source. The elicitation of this response is based on head control, which a normal child usually acquires by 6 months of age. VRA is a technique appropriate for the children between the age ranges of 6 months to 24 years. The technique is modification of a earlier well-known technique called "Conditioned Orientation Response Audiometry (CORA)". Like sound field audiometry, this procedure is also performed in a two room test situation/test environment. The tester sits in one room while the child is made to sit in other room with the parent. In child's room, two small loud speakers are placed on either side of the midline, in front of the child. Above each loud speaker an attractive picture or a doll is placed. A bulb is placed inside the doll or the picture, which can get illuminated to make the doll or picture visible each time when a sound is presented. A warble-tone of known (loud) intensity is presented from any one of the loudspeakers and the doll or the picture is illuminated at the same time. The child is made and trained to understand that when the sound is hard, a light will glow in the doll or in the picture. Thus the child is made to understand that the association between the sound and light is pleasurable and rewarding. Once the child has understood this association then the sound is presented alone. If the child turns his/her head correctly when the sound is presented then the child and his/her response is rewarded with visual reinforcement by allowing the doll or the picture to light up (illuminate). The intensity levels of the signal can be lowered gradually either in 5 dB or 10 dB steps to find out the

lowest intensity level (threshold) at which the child responds correctly. Thus the child's hearing sensitivity can be assessed reliably by using this technique. Besides warble tones, the tester can assess the child's hearing sensitivity by using 'speech' as a stimulus. Thus the tester can assess the child's hearing sensitivity by asking him to pick up a specific toy or a picture, which placed in front of him or can be asked to follow or obey simple commands. The child's responses will enable the audiologist to assess his/her hearing sensitivity.

Sound-Field audiometry

Several approaches for the testing of infants use multiple loudspeakers in a sound-field situation. Recordings of animal noises and baby cries have been effective in eliciting responses, even when filtered into narrow bands. Although a sound such as a whistle, bell, drum, or some vocal utterance may appear subjectively to represent a specific frequency range, this often turns out not to be true. What may seem to be a high-pitched sound may have equal intensity in the low- and high-frequency ranges, as verified by spectral analysis. Several kinds of responses may be observed when sounds are presented to a child from different directions in the sound field. The child may look for the sound source, cease ongoing activity, awaken from a light sleep, change facial expression, or offer a cry or other vocalized response. Once again, a response to sound has considerable significance, whereas a lack of response is not necessarily meaningful. A useful setup for sound-field localization is shown in Figure 8.3. Frequently, children respond to the off-effect of a sound but not to the on-effect. Evaluation of responses to the cessation of sound often goes well with the use of noisemakers, but it can be adapted to sound-field audiometry. A high-intensity pure tone or narrow noise band can be introduced for a minute or so and then abruptly interrupted. This interruption may produce a response, whereas the initial presentation of the sound does not. It is generally the case that at age 2 months, a soft voice begins to become a better stimulus than a loud voice. At 1 to 3 months, percussion instruments are best at eliciting APRs, startle responses such as the Moro reflex,2 and overall increases in activity or crying. At 4 months, percussion instruments are less successful than they were earlier, but the human voice gains in effectiveness. By 6 months of age, much reflex activity begins to disappear.

Sound-Field test Stimuli Audiologists do not completely agree on the best acoustic stimuli for testing small children. Many, but not all, authorities believe that pure tones are probably not the ideal stimuli because they are not meaningful to children. Pure tones have the obvious advantage of supplying information about children's hearing

sensitivity at specific frequencies. If a child shows no interest in pure tones, however, other carefully controlled acoustic stimuli may be used. The justification for narrowband filtering of a signal for a small child is obvious, and many clinicians use the narrowband noise generators on their clinical audiometers. The belief is that this provides specific frequency information if the child responds. Such an approach may be very misleading. The narrow bands on many audiometers are not very narrow at all, and they may reject frequencies on either side of the center frequency at rates as little as 12 dB per octave. This allows sufficient energy in the side bands to produce a response when a child has not heard the frequency in the center of the band. A variety of sound effects (e.g., cow mooing, bird singing, glass shattering) subjected to steep-slope filtering can be useful with very young children as well as older children and adults with special needs (Abouchacra & Letowski, 1999). It is obvious that audiologists must understand the nature of the equipment they use, and if they elect to test with narrow bands or filtered sounds, they should ascertain for themselves just what the bandwidths are.

Advantages of Sound Field Audiometry:

1. Itis useful technique to assess hearing sensitivity of newborn babies, infants, children and difficult to test population like children with multiple problem like children with mentally retardation, children with hyperactivity, autism etc.
2. The very minimal co-operation is required from the subject.

Limitations/Disadvantages of Sound Field Audiometry:

1. It is a time consuming procedure.
2. It does not provide “ear specific information” about the hearing status of a subject.
3. It provides information only about “degree” of hearing loss but no information about “type” of hearing loss.
4. Initial expense/cost is high.
5. For validate the results of sound field audiometry, it need to supplemented by at least any one objective tests like immittance audiometry, BERA or Otoacoustic Emission Test(OET).
6. For early identification of hearing impairment, several procedures have been adopted. Also due to advancement in science and technology, considerable progress

has been made in the past few years in testing the hearing of infants and children. These procedures are designed in considering the responses, which the child is capable of giving This depends upon various factors like chronological age, mental age, neurological status of child and any other addition

1.3.3 Objective of Audiological Assessment

It does not require the participation of the subject and assess the person's hearing ability by using modern and sophisticated instruments. These tests must be performed by a well-trained, well-qualified and experienced audiologist. The objective hearing tests are standardized tests and useful in both clinical audiology for diagnostic rehabilitation purposes. The various objective assessment procedures are:

1. Immittance Audiometry
2. Brainstem Evoked Response Audiometry
3. Otoacoustic Emission Tests

Immittance Audiometry

Immittance audiometry is commonly known as an impedance audiometry. It is an objective procedure to assess the integrity and functioning of the human auditory system. In this procedure a small probe is inserted into the ear canal. With the help of a pressure release pump, an air pressure is exerted on the eardrum. The pressure in the ear canal is varied from t 200 mm HO (water) to- 200 mm HO (water). The tympanic membrane responds to this chance Of air pressure in the external ear canal. This results in some degree of displacement/movement of the eardrum. There are two tvpes of drum movement namely arum tight condition and "drum free" condition. In drum tight condition, the tympanic least mobile while in drum free condition; is most mobile. The instrument shows the tympanic membrane in a graphical form "tympanogram. Depending upon pathologic ear, various types of tympanograms are obtained. This helps the audiologist to suggest proper line of treatment to the subjects suffering from various types of hearing impairment. This procedure is quick and reliable

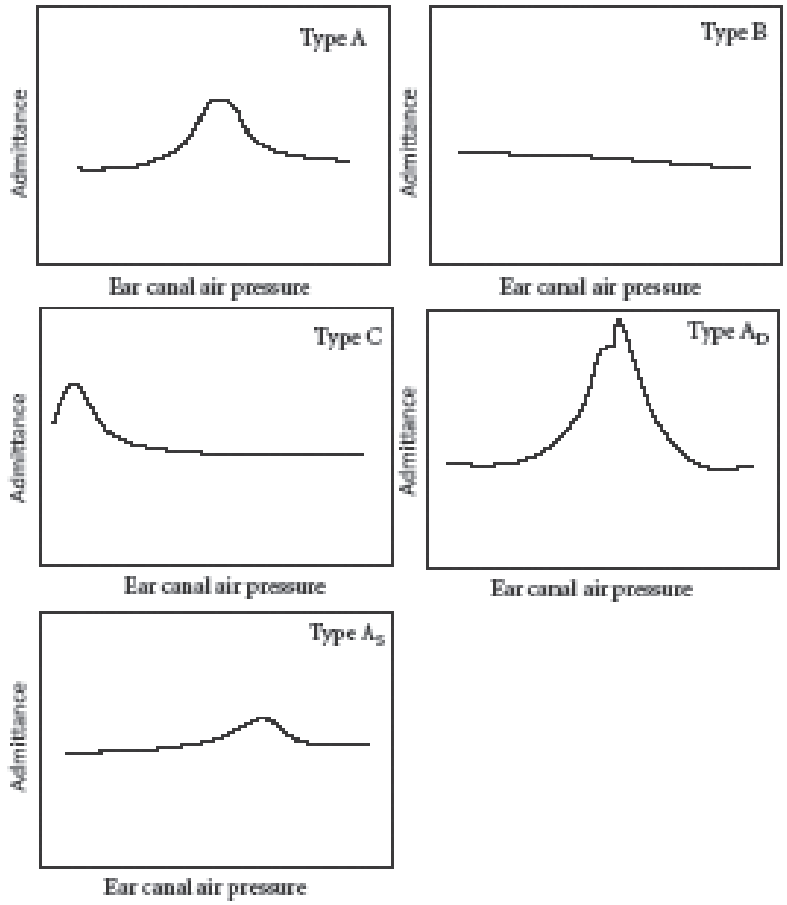


Figure: Types of tympanogram

Interpretation

Type A- Normal Middle Ear Function, SN loss, Cases with sensorineural hearing loss

Type As- Otosclerosis or Tympanosclerosis

Type Ad- Ossicular Chain discontinuity

Type B- Fluid in the middle ear

Type C- Eustachian Tube dysfunction/blockage

Type D- Abnormalities of Tympanic membrane

Advantages of Immittance Audiometry:

1. It requires very little/minimum participation of the subject.
2. The test is very fast/quick and takes few minutes to perform.
3. Itis a reliable objective test to predict the hearing sensitivity of a subject.
4. It provides useful diagnostic information about the status of the middle ear, which helps the ENT doctor and an audiologist for accurate diagnosis and management.
5. It can be used as an effective screening device.

Limitations/Disadvantages of Immittance Audiometry:

1. The cost of equipment is high i.e., it is a costly procedure.
2 Regular calibration and servicing of the instrument is must.
3. Only trained and qualified professionals can perform the test.
4. Test cannot be performed it the subject have impacted wax, ear discharge, pain in the ear and any other ear infections.
5. The test cannot be carried out on the child if he or she is crying, chewing, drinking milk, swallowing, vocalizing or talking.

Brainstem Evoked Response Audiometry (BERA)

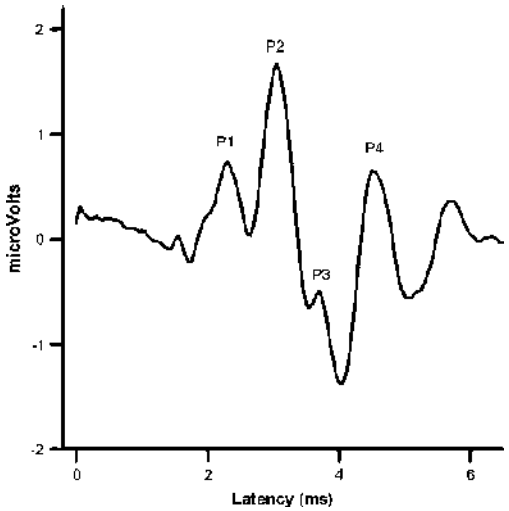
Electrical activities are continuously ongoing in human brain. It is possible to measure these activities. These activities undergo a change and results in a very definitr particular waveform patterns when any sensory stimuli are provided. For measuring responses from the brain, electrodes are usually placed on the mastoid process behind the outer ear and the vertex (top of the skull), with a ground electrode placed on the opposite mastoid, the forehead, or the neck. Stimuli with rapid rise times, such as clicks, must be used to generate these early responses. Tone pips, or bursts, which provide some frequencyspecific information, can be used. When a summing computer is used, seven small wavelets generally appear in the first 10 milliseconds after signal presentation. Each wave represents neuroelectrical activity at one or more generating sites along the auditory brain-stem pathway. The findings of Legatt, Arezzo, and Vaughan (1988) indicate the following simplified scheme of major ABR generators:

Wave Number	Site
I	VIIIth cranial nerve
II	VIIIth cranial nerve
III	Superior olivary complex
IV	Pons, lateral lemniscus
V	Midbrain, lateral lemniscus, and inferior colliculus
VI and VII	Undetermined

Routine ABR audiometry can be performed in several ways, only one of which is described here. The patient is first seated in a comfortable chair, often a recliner, which is placed in an acoustically isolated, electrically shielded room. The skin areas to which electrodes will be attached are carefully cleansed, and a conductive paste or gel is applied to these areas. One electrode is placed on the vertex or the forehead and one on each earlobe or the mastoid process behind the external ear. An electrode opposite the ear being tested serves as a ground electrode. After the electrodes are taped in place, electrical impedance is checked with an ohmmeter. The impedance between the skin and the electrodes, and between any two electrodes, must be controlled for the test to be performed properly. An insert receiver is placed into the test ear, or a circumaural earphone is placed over the test ear, and the patient is asked to relax. The lights are usually dimmed, and the chair placed in a reclining position. The ABR is not affected by sleep state; therefore, the subject may sleep while the responses are being recorded. This characteristic of the ABR is important because it allows anesthetized or comatose individuals to be evaluated. One ear is tested at a time. A series of 1,000 to 2,000 clicks may be presented at a rate of 33.1 clicks per second. The click rate must not be one that is divisible by 1 with a resultant whole number in order to differentiate the real response from electrical artifacts in the room, such as the 60 Hz electrical current. The starting level is about 70 dB nHL (n is the reference to the normative group threshold for click stimuli). In response to the stimulus, the ABR waveform appears as several narrow peaks and troughs within 1 to 10 ms of the signal onset. The main positive peaks are labeled, after Jewett (1970), in Roman numerals for Waves I, III, and V. If responses are not present, the intensity is raised 20 dB; if responses are present, the level is lowered in 10 or 20 dB steps until Wave V becomes undetectable. After the test has been completed, a hard copy may be printed out and these data may be summarized on a special form.

A complete ABR test provides the following information about each ear:

1. Absolute latencies of all identifiable Waves I to V at different intensities.
2. Interpeak latency intervals (i.e., I to V, I to III, III to V), or relative latencies.
3. Wave amplitudes (absolute and relative).
4. Threshold of Wave V if hearing threshold estimation was the purpose of the test.
5. A comparative response with a higher click rate (e.g., 91.1 clicks/second) if the ABR was for neurological assessment.



The ABR has developed into the most important test in the diagnostic site-of-lesion battery and has proven to be sensitive, specific, and efficient in detecting lesions affecting the auditory pathways through the brain stem.

Figure: A patient is seated in a comfortable chair to encourage relaxation during ABR testing and ABR waveforms

OTOACOUSTIC EMISSION

The normal cochlea are capable of producing sounds in the absence of external stimulation and it was first described by Kemp in 1979. These are known as spontaneous otoacoustic emissions (SOAEs) and it occurs in over half the population of persons with normal hearing as a continuous tonal signal that can be recorded in the external

auditory canal. A second class of OAEs occurs either during or immediately following acoustic stimulation. These responses are called evoked otoacoustic emissions (EOAEs), and there are several types. The two major types of EOAE are transient and distortion-product emissions. Transient-evoked otoacoustic emissions (TEOAEs) are produced by brief acoustic stimuli, such as clicks or tone pips. When two "primary tones" that vary in frequency by several hundred hertz (F1 and F2, where F2 7 F1) are presented to the ear, the normal cochlea responds by producing energy at additional frequencies. These are called distortion-product otoacoustic emissions (DPOAEs). A probe is placed in the external auditory canal that contains a miniature loudspeaker to present the evoking stimulus. A tiny microphone is also placed to pick up the emission and convert it from a sound into an electrical signal. The device that delivers the stimuli for DPOAE testing differs from the one for measuring TEOAEs because the probe that is fitted to the ear must have two openings (ports) that can deliver the two primary tones. Because DPOAEs are separate in frequency from the evoking stimuli, averaging background noise is less of a problem for measurement of DPOAEs than it is for TEOAEs, and fewer stimulus presentations are required, which may reduce test time slightly. Acoustic control of the test environment for OAE testing is less critical than might be imagined because the noise that must be averaged out is the noise contained in the ear of the subject. If subject noise levels are too high, for example, in crying babies, the noise may mask the emission because the sensitive microphone used cannot differentiate one acoustic signal from another. The presence of an EOAE suggests that there is very little or no conductive hearing loss caused by middle-ear abnormality. It further suggests that responding frequency regions of the cochlea are normal or exhibit no more than a mild hearing loss. If OAEs are present in sensory/neural hearing loss, then outer-hair-cell function is intact and the locus of the disorder is known to be retro cochlear. Absent OAEs in the presence of sensory/neural hearing loss confirm cochlear pathology but do not rule out the possibility of concomitant retro cochlear involvement. The result is that OAE measures allow for improved diagnostic differentiation among the different types of hearing losses (Prieve & Fitzgerald, 2009).

Pre-requisites of a Formal Hearing Test

Before performing an actual hearing test, certain basic procedures need to be pertormed. These include:

(a) Otoscopy or Examination of an-Ear: The ear of a subject needs to be examined by using an otoscope or torch before performing an actual hearing test. An ENT doctor or an audiologist usually performs this examination. An otoscope is an instrument with a magnifying glass and an attached light. This is inserted in the subject's ear canal where the doctor can see the magnified structures clearly. This is essential so as to ensure that the subject's ear carnal 1s tree trom wax, foreign body or any ear infection before performing the hearing test.

The E.N.1. doctor/the audiologist examines the subject's tympanic membrane with the help of an Otoscope and can draw some conclusions about the status of the middle ea. Such as the tympanic membrane is normal, perforated, dull etc.

(b) Case History: The case history is a very important diagnostic tool as it helps to obtain certain relevant information abuts the subject's problem. It is said that case history taking both an art and science and 50% diagnosis can be made on the basis of case history if it is taken appropriately and scientifically. This highlights/ emphasizes the importance of case history. In other words, this helps to reach a diagnosis of the hearing disorder. In case of a child, the information about the child's complaint, his general health, his birth history, any other major family history for hearing loss etc. can be collected from his family members or parents. In case of adults, the information regarding his/her hearing problem can be collected from him/her. This includes all necessary information about his problem/complaint such as duration of the problem, pain in the ear, discharge from the ear, ringing in the ear, and other signs of hearing loss. This will also include information about his/her medical problems such as diabetes, hypertension any other serious illnesses and the medicines taken for the same. All this information is very useful, important and valuable as it helps to understand the cause of deafness and thus help to plan or suggest appropriate remedial measures.

Formal Subjective Hearing Tests

These tests are those tests, which are carried out using simple or sophisticated equipments. Professionals perform these tests. In these tests the subject needs to participate actively where he has to indicate that he has heard the sound. For giving reliable and accurate response, he should understand all the instructions given to him before the test. Thus in these tests, the tester also needs to participate actively. To undergo these tests, the subject need to meet certain basic requirements such as normal intelligence

(average intelligence), adequate attention span, focusing skills to listen and to respond to various auditory stimuli, etc. The subject needs to wear headphones so as to listen to various auditory stimuli and responds accordingly.

As these tests demands and involves subject's active participation hence these tests are called "Subjective tests".

PURE-TONE AUDIOMETRY

Pure tone audiometry is generally the 1st quantitative hearing test done to assess the nature and degree of hearing loss in adults and in children over about four years of age to properly plan the most appropriate interventions. Other tests include immittance testing (testing middle ear function) and speech audiometry.

Introduction

Pure tone air conduction and bone conduction tests determine whether or not there is any hearing loss; what type of hearing loss it is; the frequencies that are affected (configuration); and whether hearing loss is unilateral or bilateral. Even though pure tone audiometry is a useful measure of basic hearing function, it does not indicate how well speech is received or understood.

Pure tone audiometry indicates what hearing thresholds (dB) are required to just be able to perceive a tone at different frequencies (Hz). A pure tone audiology threshold at a specific frequency is the decibel level at which a sound is perceived 50% of the time. The decibel scale used in pure tone audiometry is dB Hearing Level (dB HL). The dB HL intensity scale is based on normal human hearing with 0 dB HL representing the median threshold for otologically normal young adults.

Pure tone testing is the measurement of an individual's hearing sensitivity to calibrate pure tones at different frequencies. The basic audiological assessment focuses on pure tone air conduction thresholds in the frequency range 125Hz - 8 KHz. The test is conducted in a sound isolated environment. Each ear is tested separately using various transducers such as headphones, insert earphones or bone conductors. As it is a behavioral test, it is dependent on the response from the individual being tested.

Pure tone thresholds at each frequency are plotted on a graph called an audiogram, which depicts the type, degree and configuration of the hearing loss.

Pure tone audiometers

Pure tone audiometers are used to measure hearing thresholds. They vary from simple, inexpensive screening devices used in public health programs, to more elaborate and expensive diagnostic audiometers used in hospitals and clinics. They yield quantitative as well as qualitative information about hearing sensitivity.

Certain components are common to all audiometers:

- Audio oscillator generates pure tones of different frequencies, usually at discrete steps of 125, 250, 500, 750, 1000, 2000, 3000, 4000, 6000 and 8000 Hz.
- Amplifier amplifies the produced oscillations to a fixed intensity level (e.g. 110 dB HL) without appreciable distortion.
- Attenuator controls the amplified oscillations so that the energy reaching the ear may be varied over a range of 0 to 110 dB HL in 5 dB HL increments. The maximum intensity allowed at each frequency is indicated on the hearing level disc. Due to variations in sensitivity of the ear at different frequencies, more energy is needed at the very low and very high frequencies. For this reason, only the mid frequencies (1000 Hz to 3000Hz) may be presented at a level of 110 dB HL. For all the other frequencies a reduced maximum value is indicated. Due to lower sensitivity for bone conduction, these maximum values are lower for bone conduction than for air conduction. The maximum hearing level for the lower frequencies (125 – 250 Hz) is generally 70 dB HL.
- Earphones transform electrical energy into acoustic energy which is presented to the ear. Alternatively a bone conductor may be used when the sound is to be sent directly to the inner ear via the skull. Rubber cushions are fitted to the earphones. Alternatively insert earphones may be used, which are inserted into the ears.
- Producing a masking noise is an important facility available on most audiometers. Masking is especially required when the hearing thresholds differ significantly between of the ears.

It is necessary to calibrate the audiometer to ensure accurate testing. Exchange of information across the world is possible if audiometers are all calibrated in the same way. The Calibration Standard of the International Standards Organisation (ISO) has been widely accepted; some countries, including the USA, have their own standards (ANSI). According to this standard the audiometer is adjusted in such a way that a

previously determined sound pressure for each frequency is delivered to the earphone. This known sound pressure was determined by testing large numbers of 1825yr olds with normal hearing to determine how much sound pressure must be delivered to the earphone to reach normal hearing thresholds.

Pure tone audiometry

An audiogram is a graphic representation of a hearing test. With a pure tone test, it is called a pure tone audiogram. It is usually drawn in graphic form, with the frequencies of the signals presented on the horizontal axis (Hertz / Hz) and the intensities of the signals on the vertical axis (decibels / dB).

Pure tone audiometry determines a hearing threshold i.e. the lowest level in dB HL at which certain sounds can just be heard 50% of the time that it is presented at that level. This threshold is then plotted on the audiogram and the value is compared to normal and abnormal thresholds.

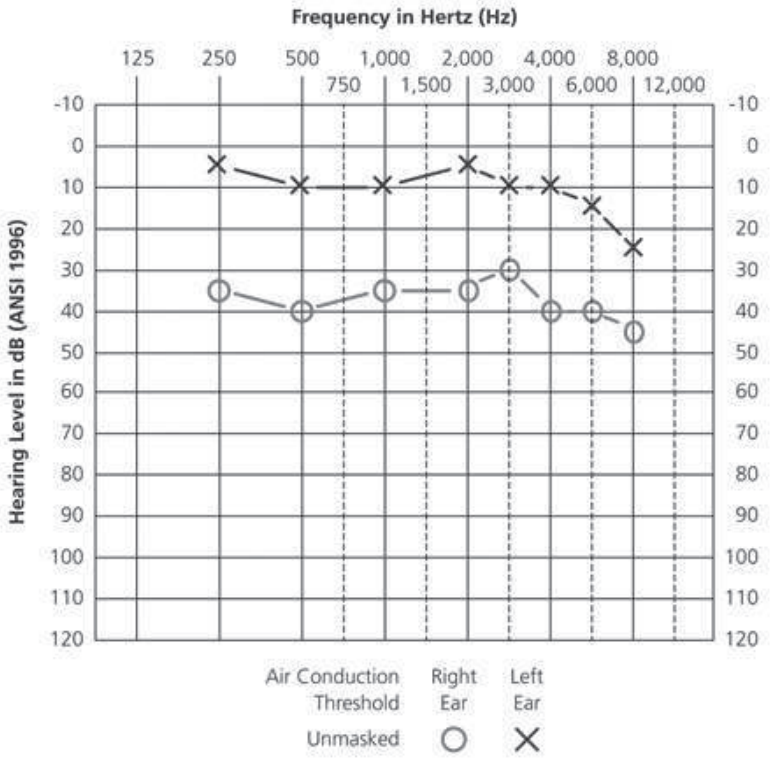


Figure: an audiogram

Pure Tone Air Conduction Testing

Figure: Pure tone audiometry conducting in a audiometric room

Pure tone air conduction audiometry determines the hearing levels at different frequencies at which one can only just hear a tone presented to the external ear canal. Before testing is commenced, very clear instructions must be given so that no misunderstanding exists about how to respond during testing:

- Tell the client that earphones will be placed on the head and that tones will be presented at different frequencies, to one ear at a time
- Explain that the purpose of the test is to determine the hearing threshold level i.e. the level at which he/she can just hear the tone
- Tell the client to respond by pressing the button or lifting his/her finger as soon as he/she hears the tone
- The tone is initially be presented loudly so that the client hears it properly • Then the sound is presented more and more softly
- He/she must release the button or drop the finger as soon as the tone is no longer audible

- Explain that the tone will then be presented a little louder, and that he/she must respond as soon as he/she hears the tone as before
- It must be understood that the button must be pushed or the finger lifted every time the tone is heard
- Ask whether he/she is conscious of the fact that one ear may perhaps hear better than the other. If this is the case, then testing should commence with the better ear so that when testing is begun in the poorer ear, and it appears that the discrepancy between the ears is >40 dB, a masking noise can be presented to the better ear to prevent the client from hearing with that ear. If the client thinks the hearing is similar in both ears, then testing may be commenced in either ear
- Before commencing the test, ensure that the client understands all the instructions. During the test, continuously check that the client is responding correctly; if not, the test must be stopped to repeat the instructions before continuing the evaluation

PURE TONE AUDIOGRAM

For a beginner it is wise to follow a fixed testing procedure until sufficient experience has been obtained. The following stepwise approach about how to conduct a pure tone audiogram in adults and older children is intended as a guide for beginners. The experienced tester may alter the steps to adapt to the situation and to the client.

Step 1: Connect the audiometer to the power supply and switch it on. Ensure that it is “live” by noting whether the power light is on

Step 2: Properly connect the earphones to the apparatus and place them on the client’s head. It is usual to place them in such a manner that the blue phone covers the left ear and the red phone the right ear. Some phones are marked “Right” and “Left”. Ensure that the opening of the earphone is positioned directly over the external ear canal; the height of the phones may be adjusted to allow proper positioning. Ensure that hair is not interposed between the earphone and the ear. Insert earphones may also be used

Step 3: Select the 1000 Hz frequency and set the output switch so that the tone is presented to the better ear. The reason that the test commences with 1000 Hz is because this falls in the middle of the most sensitive area of the hearing spectrum. It is also a clear tone to hear for a person who has never been tested before

Step 4: Initially present the sound at 30 dB HL. If a response is obtained it suggests that 30 dB sound is above the client's threshold. If no response is observed the level is raised to 50 dB and then raised in 10 dB increments until a response is elicited or the limit of the audiometer is reached at that frequency

Step 5: Once a response is obtained the level is lowered in 10dB steps until the client stops responding. It is then raised in 5dB steps until he/she again responds. The sound is at this stage raised and lowered in 5dB steps until the client indicates 50% of the time that he/she hears the sound. The hearing threshold for that specific frequency is defined as the lowest intensity level in dB where a person hears a sound 50% of the time. This level is then transcribed onto the audiogram

Step 6: Switch the frequency to 500 Hz and repeat the above steps. In most cases the difference between the thresholds of neighbouring frequencies does not differ much. Therefore the threshold level at 1000 Hz in Step 5 is used as the starting point for Step 6.

Step 7: Repeat the tests at 250 and 125 Hz

Step 8: Repeat the test at 1000 Hz as a control. If the difference between the initial and repeat measures is < 5 dB, it is assumed that the accuracy is satisfactory. If the difference in thresholds between the two tests at 1000 Hz is >10 dB, then the reliability of the test is suspect and it should be repeated from the start

Step 9: Proceed to test at 2000, 4000 and 8000 Hz (intermediate frequencies at 750, 1500 and 3000 Hz are only tested if there are sharp drops i.e. >20 dB) in the audiogram at the octave frequencies 1

Step 10: Repeat all the above steps on the poorer hearing ear. Determine for every frequency whether it is necessary to mask. When, why and how to mask is discussed later. In general, if the air conduction threshold of the test ear, and the bone conduction threshold of the nontest ear 1 Interval between one pure tone and another with half or double its frequency differ by >40 dB, then the better ear must be masked to ensure that only the responses from the poorer ear are recorded. The reason for this is that interaural attenuation for air conduction is approximately 40dB. In other words, a sound presented to the test ear must be 40 dB louder than the bone conduction threshold of the non-test ear before that ear hears the sound

Step 11: Masking: A signal of significant magnitude presented to one ear may be perceived by the other ear. This is known as crossover of the signal. Air conduction and

bone conduction audiometry are often confounded by such crossover or contralateralisation of the signal.

When crossover occurs one therefore needs to isolate the ear you are trying to test. Masking is the procedure whereby noise is presented to the non-test ear (NTE) to keep it occupied while the test ear is being evaluated.

Masking Procedure:

- Tell the client that he/she will hear a "noise" in the NTE which he/she must try to ignore • He/she must only react to the pure tone ("whistle" or "beep-beep")
- Determine the initial masking level as indicated above
- Present the tone at the unmasked threshold level
- If there is a response, check the masking level by raising the masking level by 5 dB and again by 5 dB • If there is a response - stop! The threshold is correct
- If there is no response, raise the tone by 5 dB steps until a response is elicited
- Check whether it is correct by raising the masking level twice in 5 dB steps
- Indicate the masked threshold on the audiogram as well as the minimum and maximum masking levels used

Pure Tone Bone Conduction Test

Figure: a bone vibrator

The purpose of a bone conduction test is to determine whether an abnormal air conduction test is due to conductive (middle ear), or sensorineural (inner ear or auditory nerve) pathology. Normal bone conduction with abnormal air conduction indicates a middle ear pathology. When the hearing threshold in both tests is more or less equal, it is likely to be a sensorineural problem.

Figure: placement of bone vibrator on mastoid during bone conduction testing

Bone conduction audiometry is done with an electromagnetic vibrator or bone conductor which is placed on the mastoid bone behind the ear and is held in place with a headband. The procedure for masking is usually the same as the air conduction testing.

1.4 Choice and Selection of Audiological Tests According to Age and Functional Abilities of the Child

1.4.1 Introduction

Most of the audiometric can be applied with great reliability to children beyond ages 4 or 5 years. In such cases, the examination is often no more difficult than it is with cooperative adults. However, in many instances, because of the level at which a particular child functions, special diagnostic procedures must be adopted. Because the average prevalence of hearing loss in children identified through newborn hearing screening programs is 1 per 1,000 infants screened and because up to 3.1 percent of children and youth have hearing loss in at least one ear (Mehra, Eavey, & Keamy, 2009), the need for choice and selection of assessment procedure for children is self-evident.

1.4.2 Birth to 2 years of age

Infant hearing Screening must be performed after birth in order to identify the presence and absence of hearing loss. As earlier there were no such tests available to detect hearing impairment just after birth, legislation for the implementation of universal infant hearing screening has been passed throughout most of the United States. Since the implementation of newborn hearing screening programs, an encouraging trend has been seen in the reduction of the age of hearing loss identification and subsequent intervention (Harrison, Roush, & Wallace, 2003). The purpose of early hearing detection and intervention (EHDI) programs is to identify children with hearing loss before they reach the age of 3 months. A number of criteria must be met before newborn screening of any disorder can be justified, including

(1) a sufficient prevalence of the disorder to justify the screening,

(2) evidence that the disorder will be detected earlier than would be the case without screening, (3) the availability of follow-up diagnostics immediately after the failure of a screening,

(4) treatment accessibility immediately following diagnosis, and

(5) a documented advantage to early identification

Infant's hearing screening can be done by using various tests like, APGAR test, Auditory brain-stem response (ABR) audiometry, Otoacoustic emissions etc.

Auditory brain-stem response (ABR) audiometry has become increasingly popular as a neonatal testing system When testing infants on the high-risk registry, it is important to compare responses to norms that correspond to children's gestational ages, rather than to their chronological ages, because immaturity of the central nervous system in a premature child can have a profound effect on results and must be taken into account. Follow-up testing is essential when ABR results are either positive or negative for infants on the high-risk registry. Equipment used for measuring ABRs in infants was initially rather costly and more sophisticated than that which was required in the neonatal nursery. Less expensive, dedicated units that have a higher degree of portability without sacrifice in quality have replaced this equipment. In recent years, automated systems have been developed that are easy to use; require little in the way of interpretation of results; and can be used by trained technicians, including volunteers. Electrodes and earphones are disposable and easy to apply and remove. Results with this kind of equipment have been very encouraging and can have a pronounced effect on lowering the cost of neonatal screening.

Figure: Auditory brain-stem response (ABR) audiometry used to screen an infant's hearing sensitivity

The use of otoacoustic emissions (OAE) as a neonatal screening method has emerged rapidly in recent years. The OAEs have been shown to be specific, sensitive, and cost-effective measures in infants (Dhar & Hall, 2011). If all the requirements can be met, including a tightly fitting ear piece, quiet test environment, and so on, it can be assumed that infants whose ears produce evoked emissions have normal peripheral hearing, or no worse than a 30 dB hearing loss. The first few days of life are ideal for measuring OAEs because bodily movement makes it difficult to perform and evaluate, and neonates spend many hours each day in sound sleep. However, the presence of even a slight conductive hearing loss eliminates the measurable emission. Those who fail the OAE screenings should be followed up with ABR or other testing as deemed appropriate by the attending clinician. If the cochlea is normal and a lesion exists in a retrocochlear area, there is a good chance for normal-appearing emissions to be evoked. This fact produces a cogent argument in favor of a combination of OAE and ABR testing. Some screening programs pass an infant when an ABR screen is passed following a failed OAE screen. Given that a failed OAE may signify outer-hair-cell damage, some have questioned if such practice might be missing an early predictor of late-onset progressive hearing loss in children if strict adherence to follow-up guidelines is not maintained (Mann et al., 2001). Auditory neuropathy/

dys-synchrony (AN/AD) is often missed in newborn children because most hospitals screen using otoacoustic emissions. Patients with auditory neuropathy/dys-synchrony exhibit no auditory brain-stem response (ABR), no middle-ear muscle response, and both normal otoacoustic emissions and normal cochlear microphonic. An absent or grossly abnormal ABR is not always associated with deafness. In contrast, a hearing loss of 30 dB or more usually predicts absent otoacoustic emissions, but normal emissions can be seen in some patients whose behavioral audiograms imply total deafness.

Observation of each child must be done by the audiologist before beginning of the audiological tests, like the relationship between the child and adult, their posture while standing or sitting and gaits. ASHA's most recent guidelines for pediatric hearing assessment (American Speech-Language Hearing Association, 2004) recommend that testing include behavioral, physiologic, and developmental measures, with a corroboration of test results with the child's case history, parental reports, and the clinician's behavioral observations. Presence of otoacoustic emissions can quickly give the audiologist the knowledge that hearing is no worse than the level of a mild hearing loss. Tympanometry can determine a number of middle-ear disorders, including abnormal middle-ear pressure; eustachian tube dysfunction; effusion, mobility, and integrity of the middle-ear ossicles; thin or perforated tympanic membrane; and patency of pressure-equalization tubes. Additionally, the sensation level or absence of the acoustic reflex can give general kinds of information about a possible sensory/neural hearing loss. Subsequent pure-tone testing (preferably done with insert earphones to circumvent potential ear canal collapse from the pressure of supra-aural earphones) can yield meaningful results without the addition of bone-conduction measures if normal tympanograms and the presence of acoustic reflexes have ruled out a conductive component to any identified hearing loss.

A major problem with otoacoustic emissions and immittance tests with very small children results when children move about or cry. For a test to be accurate, the patient must be relatively motionless. Furthermore, any vocalizations—for example, crying—will be picked up by the probe microphone. An experienced team of clinicians can often work so efficiently that children are distracted and tested before they have time to object.

At 1 year of age, the child with hearing loss may begin to lose the potential for normal spoken-language development. For this very reason, early screenings are of great importance. Lack of speech often brings a potential problem to the attention of the

parents or other caretakers. At 18 months, the normal child usually obeys simple commands. Speech tests are useful to evaluate children at this age because a child may give good responses to soft speech while apparently ignoring loud sounds. It is interesting that quiet-voiced speech sometimes elicits a response when whispered speech does not.

Broadband signals and speech signals are used to test children below 2 years of age as these types of signals catches the attention of the child. But it has a major drawback, as many children with hearing loss have reasonably good sensitivity in some frequency ranges and impaired sensitivity in other ranges. During the first 6 to 8 months of age, behavioral observation audiometry (BOA), visual reinforcement audiometry (VRA) and sound field audiometry is often employed for the better responses of the child.

1.4.3 2 years to 5 years of age

At 2 to 3 years of age, children who have no problems other than hearing loss can often be taught to respond to pure tones, especially warble tones. For this reason, awareness tests with voice, whispers, pitch pipes, and other special stimuli may begin to take a back seat in the evaluation process as clinicians increasingly rely on test stimuli with greater frequency specificity and procedures that more closely approximate true threshold responses. In spite of the goal to obtain frequency-specific auditory responses, behavioral assessment with children frequently begins with speech audiometry.

Speech audiometric procedures permit a greater interplay between the audiologist and child, allowing for the establishment of the requisite rapport needed for subsequent pure-tone testing. Some children do not respond to pure tones, and by their almost stoic expressions, it appears that they cannot hear. A large number of these children can be conditioned to respond to speech signals. If they possess the appropriate language skills, many children can point to parts of their bodies or to articles of clothing. If this kind of response can be obtained, the clinician can recite a list of items, to which the child points. The level of the signal can be raised and lowered until speech threshold is approximated. Speech audiometry could be performed by doing speech detection threshold (SDT), speech recognition threshold (SRT) by using pictures of spondaic stress. Speech audiometry is often possible with children, even when they have very severe hearing losses. Use of the Ling Six Sound Test (Ling, 1989; Ling & Berlin, 1997) can provide frequency-specific hearing-loss information even when reliable tonal responses cannot be attained. The six sounds /a/, /u/, /i/, /S/, /s/, and /m/ are representative

of the speech energy contained within all the speech sounds of English. In particular, audibility of /a/, /u/, and /i/ indicates usable hearing through 1,000 Hz; audibility of /S/ suggests hearing through 2,000 Hz; and audibility of /s/ indicates hearing through 4,000 Hz. How well children can recognize those phonemes, and the formant frequencies they represent, can illustrate how well a hearing aid may meet their acoustic needs. At times the Six Sound Test is the only speech measurement that a child can or will perform. It is most useful when carried out in conjunction with other speech and pure-tone audiometric procedures.

Many times, in testing small children, the problem is to get them to respond. The ingenuity of the clinician can frequently solve this problem. For a child to want to participate, usually the procedure must offer some enjoyment. Some children, however, are so anxious to please that they deluge the clinician with many false positive responses on pure-tone tests, so that it is difficult to gauge when a response is valid. In such cases, slight modifications of adult-like tests may prove workable with some older children. A child may be asked to point to the earphone in which a tone is heard. The ears may be stimulated randomly, and in this way the appropriateness of the response can be determined. The same result may be achieved by using pulsed-tone procedures, asking the child to tell how many tones have been presented. Many times it appears that no approach to a given child produces reliable results. This is particularly true of children with mental disability. However, Spradlin and Lloyd (1965) suggest that, given sufficient time and effort, no child is "untestable," and they recommend that this term be replaced by the phrase difficult to test. In operant conditioning audiometry (OCA), food is often used as a reward for proper performance. A child may be seated in the test room before a table that contains a hand switch. Sounds are presented either through the sound-field speaker or through earphones. The child is encouraged to press the switch when the sound, which can be either a pure tone or a noise band, is presented. If the child's response is appropriate, a small amount of food, such as a candy pellet, or a token is released from a special feeder box. Once children see that pressing the switch results in a reward, they will usually continue to press it in pursuit of more. It is essential that the switch that operates the feeder be wired in series with the tone-introducer switch so that no reward is forthcoming without presentation of the sound. In this way, the child gets no reinforcement for pushing the switch unless a tone is actually introduced and, presumably, heard. Signals that are thought to be above the child's threshold must be introduced first, after which the level may be lowered until threshold is reached. If severe hearing loss is suspected, a good starting point is 500 Hz at 90 dB HL because there is a strong likelihood of hearing at this frequency and level. Operant conditioning

audiometry requires much time and patience if it is to work. Often, many trials are required before the child begins to understand the task. As in other audiometric procedures, it is essential that the signals be introduced aperiodically because the child may learn to predict a signal and to respond to a sound that has not been heard. Often operant conditioning audiometry can be successful when other procedures have failed. The term tangible reinforcement operant conditioning audiometry (TROCA) was coined by Lloyd, Spradlin, and Reid (1968) to describe specifics of operant conditioning to audiometry. For a number of years clinicians have been using instrumental conditioning in testing younger children—that is, teaching the children to perform in a certain way when a sound is heard. This requires a degree of voluntary cooperation from the children, but the clinician can select a method that evokes appropriate responses.

Play Audiometry: Often, using elaborate devices and procedures to test the hearing of young children is unnecessary. Many can simply be taught by demonstration to place a ring on a peg, a block in a box, or a bead in a bucket when a sound is introduced. The more enthusiasm the clinician shows about the procedure, the more likely the child is to join in. Children seem to enjoy the action of the game. Tones can be presented through earphones if children tolerate them, or through the sound-field speaker if they do not. Many children readily accept insert receivers because they are light and do not encumber movement. As has been discussed earlier, insert receivers increase interaural attenuation, which often decreases the need for masking and minimizes the possibility of overmasking in most cases. Any time testing is completed using sound-field speakers, the examiner cannot know which ear has responded.

Electrophysiological Hearing Tests: It has been obvious for some time that objective tests for measuring hearing in young children are highly desirable. Thus, there has long been a search for a clear electrophysiological measure of hearing sensitivity to employ when other measures of hearing are inconclusive. Past electrophysiological tests have monitored changes in pulse rate, respiration, heart rhythm, and skin resistance. Procedural limitations and poor reliability have precluded these attempts at electrophysiological assessment from gaining popularity in the assessment of children. Electrophysiological tests today for the assessment of hearing thresholds primarily involve auditory evoked potentials through auditory brain-stem response (ABR) audiometry and the auditory steady-state response (ASSR). A primary advantage to these objective measures is that the procedures are effective during sleep. Many small children will sleep naturally during ABR testing or may be anesthetized with no effects on test accuracy.

1.4.4 School age Children

The exact number of school-age children who have hearing impairments is not known. Surveys that attempt to come up with figures are also confounded by factors such as geographic location and season of the year; there are more failures during cold weather. It is probable that more than 5 percent of the public school population has a hearing impairment at any given time. Thus it is important to perform early hearing screening programs in schools by an audiologist.

1.5 Overview of audiological assessment of children with additional / associated disabilities

1.5.1 For children with language disorders:

A young child's unwillingness to cooperate may be common to all sensory modalities and could indicate a disorder or combination of disorders other than hearing loss (e.g., mental disability or emotional maladjustment). If a child does not respond to visual stimuli such as lights or shadows or to touching or vibration, one might wonder whether the problem is in fact behavioral. However, if a positive response is obtained in one modality and a negative one in another, a certain pattern appears, which is more significant than a generalized response (or lack of response). Although long lists of possible causes for significant language delay have been postulated, such delay is usually produced by hearing loss, some congenital or early acquired symbolic disorders, attention deficit hyperactivity disorder (ADHD), mental disability, emotional disturbance, or autism. A common error committed by clinicians is to consider causes as an either-or condition and to attempt differential diagnosis to rule out all but one cause. The experienced clinician will have observed that the presence of one significant disorder increases, rather than decreases, the probability of another. When a small child has a language disorder, and hearing loss cannot be eliminated as a possible causal factor, the resources and experience of the clinician are called on for an appropriate diagnosis. The behavioral characteristics of the clinical entities mentioned here can frequently be ruled out on the basis of observation of behavior and developmental history. The problem then remains to differentiate between the hard-of-hearing and the otherwise language disordered child. Even though the child with brain injury is said to manifest such symptoms as impatience, hyperactivity, poor judgment, perseveration, and dysinhibition, often there is a symbolic disorder without the presence of bizarre behavior. Audiologists

frequently see children who are either believed to have hearing losses or whose auditory behavior is so inconsistent as to cast doubt on the presence of normal hearing. A parent or teacher may complain that a child's responses to sound are inconsistent, that performance is better when background noises or competing messages are at a minimum, and that it is possible that the child "just doesn't pay attention." Sometimes auditory test results appear normal on such a child, and the parents are mistakenly assured that all is fine. The audiologist must constantly be alert for auditory-processing disorders that can coexist with other learning and language disabilities. Screening tests are needed so that children with auditory processing disorders, however mild, will not be overlooked but will be correctly referred to the proper specialists, such as speech-language pathologists, for complete diagnosis and therapy (Martin & Clark, 1977).

1.5.2 Auditory processing disorder:

The term auditory processing disorder is often applied to children whose recognition or use of language is not age-appropriate and/or is inconsistent with their level of intelligence. Many of these children also have additional learning disabilities that prevent them from progressing normally in their education. APD has been estimated to occur in 2 to 3 percent of children, with occurrence twice as likely in boys (Chermak & Musiek, 1997). Since APD has become recognized, it may be a favored diagnostic category, and there may be reason to be concerned that over diagnosis of this condition may occur, leading to inappropriate educational methods. Accurate diagnosis of APD is based on a multifaceted, comprehensive assessment, which includes input from audiologists, speech-language pathologists, psychologists, and educators.

Auditory Neuropathy is probably rare in children, although this is controversial. Symptoms include mild-to-moderate sensory/neural hearing loss, abnormal or absent ABRs, absent or markedly elevated acoustic reflexes, and normal OAEs. The presence of OAEs strongly indicates that the lesion in these cases is medial to the cochlea. Amplification with hearing aids is met with mixed success, and many experts urge the use of signs for the teaching of language.

1.5.3 Psychological Disorders:

Hearing loss that is congenital or acquired early in life can have an effect on social, intellectual, and emotional development, including "egocentricity, difficulty in empathizing with others, rigidity, impulsivity, coercive dependency, and a tendency to express feelings by actions rather than by symbolic communication" (Rose, 1983). As a child without normal hearing continues to develop, the normal parent–child relationship

is invariably affected, lending further justification for intervention at the earliest possible time.

1.5.4 Developmental Disabilities:

Children with developmental disabilities may include those with mental disability, cerebral palsy, epilepsy, autism, or a wide variety of physical or mental challenges. While a high percentage of children with developmental disability have cognitive impairments as well, many have normal or greater than normal intelligence. Hearing loss among these children may go undetected because behaviors of auditory inattention may be attributed to the child's more overt handicap. Evaluation of children with developmental disabilities presents a true challenge to the audiologist. Responses from children who are profoundly multidisabled may be more reflexive than representative of true attention behaviors (Flexer & Gans, 1985). Such responses may be better evaluated in the context of the child's developmental age than his or her chronological age. Hearing may be considered normal if the development of auditory responses is generally consistent with the age level of the child's other developmental behaviors. This judgment becomes more difficult if the child's cognitive and developmental ages have not yet been determined.

1.6 Selection of modality/method of management (auditory, speech reading vs manual communication) based on aided performance (aided audiogram & speech identification)

1.6.1 Introduction

Clinical hearing assessments deûne the auditory thresholds for a wide range of frequencies. This information assists clinicians in prescribing an aid with the proper acoustic parameters to amplify the speech spectrum at a comfortable level, while ensuring that other sounds do not exceed the dynamic range of the subject (Byrne et al, 2001).

There are many communication choices available for those who are hard of hearing. Factors that may affect choices for improving communication for individuals who are deaf or hard of hearing include:

- Degree and type of hearing loss
- Individual differences in ability to use certain options
- Personal preference

1.6.2 Oral Communication

Oral communication is a choice for many hard-of-hearing individuals, whether they have mild, moderate, or severe hearing loss. Those with milder hearing loss may participate in "speech training," which helps them to determine the words being spoken by the shape and movement of the lips. The combination of auditory information and visual information helps these individuals to communicate using spoken language.

Along with speech reading training, individuals may receive speech and articulation training to help their speech to become clearer, more precise, and easier to understand.

AUDITORY TRAINING

Hearing aid fitting marks the beginning of the habilitation or rehabilitation program of a child with hearing impairment. It is not enough to only fit a good hearing aid to the child. The child has yet to learn to make the maximum use of the information that he or she is getting through the hearing aid. This can be achieved through systematic 'auditory training' which is aimed at teaching a child with hearing impairment to make use of residual hearing to the maximum extent possible." There are many philosophies and approaches to auditory training. All of them aim to help the child use the auditory sense effectively. Auditory training should become an integral part of the child's intervention program.

"Auditory training is a set of procedures aimed at helping the aurally handicapped become more proficient in attending to the sounds of speech, discriminating one from another and effecting or increase in retention of sounds." (Kelly, 1953)

"Auditory training constitutes a systernatic procedure designed to increase the amount of information that a person's hearing contributes to his total perception." (Sanders, 1971)

"Auditory training consists of three facets: (1) discrimination of individual speech sounds, (2) hearing all orientation, (3) improvement of tolerance levels". (Alpiner, 1978)

"It is the creation of special communication conditions in which the teachers and audiologists help hearing impaired children acquire many of the auditory percept on abilities that normally hearing children acquire naturally without their intervention". (Erber, 1982)

Stages of Auditory Training

As mentioned before, there are different approaches to auditory training and different philosophies. However the very basic framework of auditory training which involves a step-by-step approach from the least to most difficult tasks is more or less maintained. The stages described below are the basic ones followed in the Traditional Approach' promoted by Hirsch (1966), Ling (1976) and Erber (1982).

1. Awareness or Detection of sound: It is the basic process of determining whether the sound is present or absent. It involves orientation towards the sound in readiness to get more information about it. It helps the child understand which things produce sound and which do not. It is also the basic step which must be acquired before the child can be taught to associate the sound and its source. Awareness of sounds helps the child to remain in contact with the surrounding acoustic world.
2. Discrimination: It involves perceiving the difference between sounds-the acoustic qualities, intensities, durations etc., understanding that different objects produce different sounds or that the same source may produce different sounds. Discrimination of same vs. different and generalization of sounds into different categorios are complementary abilities.
3. Identification: It involves labelling or naming what has been heard. The child can indicate the ability to identify a by pointing to the sound, pointing to a picture associated to the sound, pointing to a written word or sentence or repeating whatever is heard. identification of speech stimuli is related to the child's developing awareness that objects have names and these names have acoustic representations. This is a very important skill in communication.
4. Comprehension: It involves understanding. the meaning. It depends on language skills. It implies that the child can acquire new information through hearing and can act appropriately on that basis. It is a prerequisite for communication.

1.6.3 Manual Communication

Individuals with more severe hearing loss, for whom communicating through speech presents more difficulty, may choose to pursue manual communication.

One of the more popular communication choices for individuals with severe to profound hearing loss is manual communication. "Manual" refers to use of the hands in communicating language. One commonly known method is American Sign Language (or ASL). Sign language has its own grammar, denoted by hand position, movement, and placement in space.

Another form of manual communication (used in conjunction with oral language) is cued speech. Deaf or hard of hearing individuals may use cued speech, a manual system, to aid in their production and comprehension of spoken language. Cued speech uses a combination of hand movements and spoken language to differentiate between sounds that look the same on the lips.

1.6.4 Speech Reading

Speech reading involves attempting to perceive speech by using visual cues to supplement whatever auditory information is available. Speech reading is used selectively in some instances such as an adult with severe, progressive hearing losses or some cochlear implement recipients where speech perception is challenging at best and attempting to maximize the use of visual cues.

Traditional speech reading method:

During the early 1900s, four methods of teaching speech reading were popularized.

1. *Bruhn method* (*Mueller- Walle method*) Martha Emma Bruhn (1912)

- Give emphasis on rapid syllable drill e.g. she/may/fe (She-may-free)
- Practiced recognizing homophonous words using sentence context cues.

2. *Nitchie method* Edward B Nitchie (1912)

- Emphasized the importance of the psychological process of speech reading practice centered on sentence materials and the identification of homophonous words through contextual cues.

2. *Kinzie method* (1917): Cora Kinze

- Combined the analytic syllable drill of Bruhn with more synthetic exercises of Nitchie. The constructed graded lessons for adults and children.

3. *Jena method*: (Karl Brauckmann 1944)

- Emphasis on mimetic (imitating or copying movements) and kinesthetic (perception of movement position and tension of body parts) forms sensations. Syllables are presented in a rhythmic pattern

Speech reading includes (Cherry .R, and Rubinstein A 1988):

- Lip-reading
- Facial expression
- Gesture, posture, and movement
- Situational cues
- Knowing the topic
- Knowledge of language
- Keeping informed
- Emotional factors
- Use your hearing.

Speech Reading Training Techniques

Speechreading approaches use one of two general approaches (analytic or synthetic) for speech reading instruction.

A. Analytic speech reading training

Analytic approach advocated by Bruhn and Brackman to speech reading is based on the concept that before an entire word sentence or phrase (the whole) can be identified it is necessary to preserve visually each of its basic parts.

E.g. Phonemes → words → sentences.

Analytic speech reading training objectives are directed towards developing vowel recognition and consonant recognition skills. The logic underlying much speech reading curricula is gradually to increase patient's reliance on the auditory signal for discriminating phonemic contrasts while they speech read.

Vowel speech reading training objectives:(Tye –Murray 1992)

One possible hierarchy of analytic vowel speech reading training objectives will discriminate words with /i/ and /u/ e.g. me and moo.

One possible hierarchy of analytic vowel speech reading training objectives:

- Will discriminate words with /i/ and /u/ e.g. me and moo.
- Will discriminate words with /i/ and /a/ à keep from cop.
- Will discriminate words with /u/ and /a/ à coop from cap.
- Identification of words with /i/, /u/ and /a/, using a four-item and then six-item response set. For e.g. Bean from bean, pot, pit, pool.
- Identification àwordsà/i/, /u/, and /a/ àopen set of familiar vocabulary.

Consonant speech reading training objectives:

There are three different types of speech features: Manner, Voice, & Place and consonants can be categorized according to this. The visual signal associated with consonant production ideally complements the auditory signal. Cues that signal manner and voice often are easier for hard of hearing persons to hear than are cues that signal place of articulation.

Hierarchy of consonant analytic speech reading training objectives:

- Will discriminate consonant pairs that differ in place of production and share either voice or manner. e.g.: tag from the bag
- Will discriminate consonant pairs that share similar places of production but differ in manner and voice. e.g.: pan from man
- Will Discriminate consonant pairs that share place and manner and/or voice oe.g.: park from bark
- Identification à share manner à using four-item and then six-item response set oe.g. tag from tag, bag, back, and gas
- Identificationà voiced or voiceless àusing four items and then six-item response set e.g pop from pop, cop, cap, and top.
- Identification share place àusing four-item and then six-item response set o e.g. pan from pan , man, bat, and mat
- Identification of words from an ***open set*** of familiar vocabulary

B. Synthetic speech reading training

Synthetic approaches of Nitchie and Kinzie to speech reading emphasizes that the perception of whole is paramount regardless of which of its parts is perceived visually. It considers the sentence and phrase to be the basic units.

Synthetic speech reading training objectives:

- Will follow **simple directions** using a closed response set.
- Will identify a **sentence** illustration from a set of four **dissimilar** pictures.
- Will identify a **sentence** illustration from a set of four **similar** pictures.
- Listen to **topic** related sentences and repeat and paraphrase them
- Listen to **two related sentences** and then draw a picture of them or paraphrase them.
- Will speech read **a paragraph** –long narrative and then answer questions about it.

A procedure known as continuous discourse tracking (CDT) developed by De Fillipppo and Scott (1978) is being used in speech reading assessment and therapy.

Rules to follow when speech reading

1. *Watch the talker's lips:* This seems obvious but often a speech reader can be distracted by other events in the room, or the talker's hand gestures. Also, there may be a boundary to watch the talkers' eyes instead of the mouth.
2. *Provide information to the talker about how to communicate: T*his may include asking the talker to speak clearly and at a slightly louder than normal conversational level. The talker should not shout or exaggerate lip movements. The talker should face speech readers, and should not show or cover the mouth such as with a hand.
3. *Try to ensure that the room is well lit and that position in the room allows for optimal speech reading performance*. Light sources should not cast shadows on the talker's face. The speech reader can position himself near to the talker so that he can see the talker's mouth and facial expressions.

4. *Try to minimize background noise*: Background noise might be minimized by ensuring that radios and TV are turned down or off.
5. *Know the topic of conversation:* During the conversation, ask someone the topic of conversation. It is much easier to recognize a message. Speech readers can learn something about the topic beforehand if he knows the topic in advance.
6. *Pay attention to context cues:*The situation in which the conversation occurs may provide information about what is being said the talker's facial expressions and what has been discussed beforehand may also be informative.
7. *Keep a positive attitude:*Speech reading can be tiring stay motivated and do not be distracted by anxiety and self-doubts.

1.7 Recommendation of Educational Set-up (Special, Partial Integration Vs Inclusive Education) Based On Aided Performance (Aided Audiogram & Speech Identification) As One Of The Factors

1.6.1 introduction

Educational obstacles related to hearing impairments stem around communication. A student with a hearing impairment may experience difficulty in:

- the subjects of grammar, spelling, and vocabulary
- taking notes while listening to lectures
- participating in classroom discussions
- watching educational videos
- presenting oral reports

Underscoring the difficulty that students with hearing impairments may have in presenting oral reports are the potential language development problems linked to hearing impairments. Arizona's Department of Education's Parent Information Network notes that "Since children with hearing impairments are unable to receive some sounds accurately, they often cannot articulate words clearly."

1.7.2 Special school:

Children with hearing impairment study either in a special school or in a regular mainstream school. It is possible for these children to cross over from a special to a regular mainstream school if and when they want to. Special Education as a separate system of education for disabled children outside the mainstream education evolved way back in the 1880s in India. It was based on the assumption that children with hearing impairment had some special needs that could not be met in mainstream schools and therefore, they need to study in a separate school with other children having similar needs. In 1947, India had a total of 32 schools for the blind, 30 for the deaf and 3 for mentally retarded. The number of schools rose to around 3000 by the year 2000 (Department of Education, 2000).

1.7.3 Segregated in a Special School or partial school:

Children diagnosed late or those who have not developed adequate functional language are enrolled in Special pre–school programmes. In special schools, special teachers help children build a strong foundation of language which would ease out the formal education in primary and secondary school, again, either in an integrated setup or in a special school depending upon the child's achievements. Teachers in special schools develop conversational skills by using various techniques. Special preschool curriculum to suit the needs of the children is devised and activities such as directed activity, storytelling, guided play are contrived to develop receptive and expressive language in the preschool hearing-impaired children.

1.7.4 Integrated education in regular school:

For children diagnosed and intervened at a very early stage and most importantly who have developed functional language could be included in regular preschool programs. However, assistance from special teachers or resource teachers would be required so that the child develops good reading and writing skills and a continual language enhancement program.

Inclusive education means refers to an education system that accommodates all children regardless of their physical, intellectual, social, emotional, linguistic or other conditions. Inclusive Education is about restructuring the cultures, policies, and practices in schools so that they respond to the diversity of students in their locality. It has the following characteristics: Inclusive Education

- acknowledges that all children can learn;
- acknowledges and respects differences in children: age, gender, ethnicity, language, disability, HIV and TB status, etc.;

- ❑ enables education structures, systems, and methodologies to meet the needs of all children;
- ❑ is part of a wider strategy to promote an inclusive society; and
- ❑ is a dynamic process that is constantly evolving

1.8 Let Us Sum Up

- Various audiological tests were used to assess the hearing ability of a child with hearing loss. It may be objective or subjective depending upon the various factors like, age, cognition, motor skills etc. of the child.
- Behavioural observational audiometry is done for the screening purpose, combined with the sound field testing.
- Pure tone audiometry is one of the most reliable subjective test to find out the exact threshold of the child with hearing loss.
- Audiological assessment are needed to identify the children with hearing loss by using various formal and informal tests, and based on the tests results the appropriate intervention strategies, that is, amplification and speech and language therapy is suggested to the child with hearing impairment.
- Sometimes we need to assess the difficult to test population which may include children with ADHD, autism, Intellectual disability etc. audiological assessment may be carried out with the various behavioural tests along with the objective tests like, Otoacoustic Emissions, Auditory brainstem implant and Auditory steady-state response audiometry on behalf of the conventional pure tone audiometry.
- Depending upon the various audiological tests, the intervention strategies are selected. The methods and modality of intervention is selected based on the aided performance of the child with hearing loss.

1.9 Unit end exercises

1. Discuss the need for the audiological assessment.
2. Discuss various audiological tests used to identify the children with hearing loss.
3. Write shot-notes on:

- Pure tone audiometry
- Behavioural observational audiometry
- Difficult to test population.
- Auditory brainstem response
- Special and partial school
- Integrated education vs inclusive education
- Speech reading

4. Discuss the audiological assessment of children with difficult to test population.
5. What are the different methods of management in a child with hearing impairment according to his/ her aided performance?
6. Discuss the various educational set up according to the aided performance of a child with hearing impairment.

1.10 References:

1. Bagatto, M. P., Moodie, S. T., Seewald, R. C., Bartlett, D. J., & Scollie, S. D. (2011). A Critical Review of Audiological Outcome Measures for Infants and Children. Trends in Amplification, 15(1), 23–33. doi: 10.1177/1084713811412056
2. Katz, J. (2015). Handbook of Clinical Audiology (7th ed.). Philadelphia: Wolter Kluwer Health.
3. Martin, F. N., & Clark, J. G. (2015). Introduction to audiology (12th ed.). NY: Pearson.
4. Newby, H. A. (1985). Audiology: principles and practice (5th ed.). New York: Appleton-Century-Crofts.
5. Northern, J. L., Downs, M. P., & Hayes, D. (2014). Hearing in children (6th ed.). San Diego: Plural Publishing.
6. Sabo, D. L. (1999). The Audiologic Assessment of the Young Pediatric Patient: The Clinic. Trends in Amplification, 4(2), 51–60. doi: 10.1177/108471389900400205

Unit 2 ❑ Speech Assessment, Identification And Addressing Needs

Structure

2.1. Introduction

Acoustic phonetics is a subfield of phonetics, which deals with acoustic aspects of speechsounds. Acoustic phonetics investigates time domain features such as the mean squared amplitude of a waveform, its duration, its fundamental frequency, or frequency domain features such as the frequency spectrum, or even combined spectrotemporal features and the relationship of these properties to other branches of phonetics (e.g. articulatory or auditory phonetics), and to abstract linguistic concepts such as phonemes, phrases, or utterances.

2.2 Objective :

The main objective of this unit is to make students/ teacher educator aware about:

- The acoustic of speech and speech sound classification according to acoustic cues

- The difference between development of speech sounds in normal and hearing impaired children
- Phonological errors according to the different audiogram configurations
- Different strategies, material, and equipment for teaching speech
- Need for use of regional language based speech assessment tests

2.3 Overview of Acoustics of Speech; Classification of Speech Sounds Based on Major Acoustic Cues

The study of acoustic phonetics was greatly enhanced in the late 19th century by the invention of the Edisonphonograph. The phonograph allowed the speech signal to be recorded and then later processed and analyzed. By replaying the same speech signal from the phonograph several times, filtering it each time with a different band-pass filter, a spectrogram of the speech utterance could be built up. A series of papers by Ludimar Hermann published in Pflügers Archiv in the last two decades of the 19th century investigated the spectral properties of vowels and consonants using the Edison phonograph, and it was in these papers that the term formant was first introduced. Hermann also played back vowel recordings made with the Edison phonograph at different speeds to distinguish between Willis' and Wheatstone's theories of vowel production.

Further advances in acoustic phonetics were made possible by the development of the telephone industry. (Incidentally, Alexander Graham Bell's father, Alexander Melville Bell, was a phonetician.) During World War II, work at the Bell Telephone Laboratories (which invented the spectrograph) greatly facilitated the systematic study of the spectral properties of periodic and aperiodic speech sounds, vocal tract resonances and vowel formants, voice quality, prosody, etc.

Integrated linear prediction residuals (ILPR) was an effective feature proposed by T V Ananthapadmanabha in 1995, which closely approximates the voice source signal. This proved to be very effective in accurate estimation of the epochs or the glottal closure instant. A G Ramakrishnan et al. showed in 2015 that the discrete cosine transform coefficients of the ILPR contains speaker information that supplements the mel frequency cepstral coefficients. Plosion index is another scalar, time-domain feature that was

introduced by T V Ananthapadmanabha et al. for characterizing the closure-burst transition of stop consonants.

Speech sounds can be analyzed from the viewpoint of three as-pects:

(1) acoustic,

(2) physiological and articulatory,

(3) functional.

Phonetics is connected with linguistic and non-linguistic sciences: acoustics, physiology, psychology, etc. Speech sounds have a number of physical properties, the first of them is frequency, i.e. the number of vibrations per second.

Phonetic contrasts are signaled by various acoustic dimensions in the temporal and spectral domains. Those dimensions that are used perceptually to identify speech sounds are called "phonetic cues"; they are acoustic cues that contribute to phonetic categorization. For example, the ûrst formant (F1) of a vowel sound corresponds to the height of that vowel; as the vowel height decreases, F1 increases. Hence, F1 serves as a phonetic cue for contrastive vowel height. There are multiple co-occurring phonetic cues for any particular contrast, which creates a high amount of redundancy in the signal. A classic example is the contrast between voiced and voiceless stops in word-medial position, which has been claimed to contain at least 16 different acoustic cues (Lisker, 1978). A wealth of literature has revealed that changes in one acoustic dimension can be compensated by conûicting changes in another dimension (for multiple examples, see Repp, 1982). For example, trading relations can be observed in the integration of cues for syllable-initial stop consonant voicing; changes in voiceonset-time that signal voicing can be somewhat offset by changes in the pitch domain that signal voicelessness (Whalen et al., 1993). As these and other cues covary in natural speech, the listener must integrate them in a way that yields reliable and accurate identiûcation of the incoming information. It has been shown that the use of acoustic cues for phonetic contrasts is affected by the developmental age (Nittrouer, 2004, 2005) as well as language background (Morrison, 2005) of a listener.

The vocal cords vibrate along the whole of their length, producing fundamental frequency, and along the varying portions of their length, producing overtones, or harmonics. When the vibrations pro-duced by the vocal cords are regular they produce the acoustic impression of voice or musical tone. When they are irregular noise is

produced. When there is a combination of tone and noise, either noise or tone prevails. When tone prevails over noise sonorants are produced. When noise prevails over tone voiced consonants are produced.

The complex range of frequencies which make up the quality of a sound is known as the acoustic spectrum.

The second physical property of sound is intensity. Changes in intensity are perceived as variation in the loudness of a sound. The greater the amplitude of vibration, the greater the intensity of a sound; the greater the pressure on the ear-drums, the louder the sound. Intensity is measured in decibels (dbs).

Although acoustic descriptions, definitions and classifications of speech sounds are considered to be more precise than articulatory ones, they are practically inapplicable in language teaching, because the acoustic features of speech sounds cannot be seen directly or felt by the language learner. Acoustic descriptions, however, can be ap-plied in the fields of technical acoustics. They are also of great theo-retical value.

The research work made in acoustic phonetics is connected with

1) the methods of speech synthesis and perceptual experiment for the study of cues of phonemic distinctions and for the exploration of dif-ferences in tone and stress;

2) the design of speech recognizing ma-chines, the teaching of languages, the diagnosis and treatment of patho-logical conditions involving speech and language.

The future work in acoustic phonetics will be connected with brain functioning and ar-tificial intelligence. “Experimentation will involve the whole of speech programming and processing, including the relations between the acoustic level of speech and operations at the grammatical, syn-tactical, lexical and phonological levels.”

Speech sounds are broadly divided into two categories, namely, Vowels and Consonants. If we say the English word shoe, we realize that this word is made up of two sounds, one represented by the letter sh and the letter oe. When we produce the word represented the letter sh slowly, we realize that during the production this sound, the air escapes through the mouth freely and we do not hear any friction. The sound that is represented by the letter sh in the word shoe is a consonant and the sound

represented by the letters oe in the word shoe is Vowel. (All sounds during the production of which we hear friction are consonants, but not all consonants are produced with friction).

If we say the words she, shoe, shy, show, ship and shout, we will realize that when we produce the sounds represented by the letters e, oe, y, ow,i and ou in these words, the air escapes through the mouth freely without any friction. All these sounds are therefore vowels but each one of them sounds different form the others. These sounds should therefore be sub-classified. Similarly, if we say the words shoe, see, zoo, and who, we will hear friction during production of the sounds represented by the letters sh, s, z and wh. All the se sounds are therefore consonants.

The air -stream mechanism: All English sounds (vowels as well as consonants) are produced with a pulmonic regressive air-stream mechanism, i.e., lung-air pushed out.

The state of glottis; Speech sounds can be classified voiceless or voiced, depending upon whether the vocal cords are wide apart and the glottis is wide open (voiceless) or the vocal cords are kept loosely together and they vibrate (voiced).

The position of the soft-palate; Speech sounds can be classified as oral or nasal, depending upon whether the soft-palate is raised so as to shut off the nasal passage of air (oral) or it is lowered to open the nasal passage of air simultaneously with an oral closure (nasal). Sounds can also be nasalized.

And (e) The active and passive articulators: Of the various articulations described, at least two are required for the production of any speech sound; some articulators move during the production of speech sounds. These are termed active articulators. Certain other articulators remain passive and the active articulators move in the direction of these. These are termed passive articulator. The lower tip and the tongue are the active articulators. The upper lip and the entire roof of the mouth are the passive articulators. It should be remembered, however, that the upper lip and the soft palate are capable of independent movement; but when either of these is one of the articulators involved in the production of a sound, it is always the other articulator (the lower lip in the case of the upper lip and the back of the tongue in the case of the soft palate) that moves towards these. So the upper lip and the soft palate are considered passive articulators.

The stricture involved: The term ‘stricture’ refers to the way in which the passage of air is restricted by the various organs of speech.

Types of stricture:

Complete closure and sudden release: The stricture may be one of complete closure, i.e., the active articulators come into firm contact with each other, thus preventing the lung-air from escaping through the mouth. Simultaneously there is a velic closure, i.e., the soft palate is raised, thereby shutting off the nasal passage of air. Thus the lung-air blocked in the mouth. When the oral closure is released, i.e., when the active articulator is suddenly removed from the passive articulator, the air escapes with a small explosive noise. "Sounds produced with a stricture of complete closure and sudden releases are called Plosive". The initial sounds in the English word pin, bin, tin, din, kin, and gun are plosives.

Complete closure and sudden release: If after blocking the oral and the nasal passages of air, the oral closure is removed slowly, i.e., if the active articulator is removed slowly from the passive articulator, instead of the explosive noise that is characteristic of plosive consonants, friction will be heard. "Sounds that are produced with a stricture of complete closure and slow release are called Affricatives." The initial sounds in the English word chin and jam are affricate consonants.

Complete oral closure: the active and passive articulators are in firm contact with each other, thereby blocking off the oral passage of air completely. But the soft palate is lowered so that there is a velic opening, i.e., the nasal passage of air is opened. The lung-air will then escape through the nostrils freely. "Sounds that are articulated with a stricture of complete oral closure are called Nasals". The final sounds in the English words sum, sun, and sung are some examples of nasal consonants.

Intermittent closure: The soft palate is raised, thereby shutting off the nasal passage of air. The active articulator strikes against the passive articulator several times with the result that the air escapes between the active and passive articulators intermittently. Such a stricture is termed intermitted closure. Sounds that are articulated with a stricture of intermittent closure are called trills or rolled consonants. The letter r in English words like red and ran is pronounced as a trill by most Scottish people.

For some consonants the active articulator strikes against the passive articulator just once and then quickly flaps forward. Such consonants are called taps or flaps. The letter r in very is pronounced as a tap by some English people.

Close approximation: The active articulator is brought so close to the passive articulator that there is a very narrow gap between them. The soft palate is raised so as

to shut off the nasal passage of air. The lung-air escapes through the narrow space between the active and passive articulators, producing audible friction. “Sounds that are articulated with a stricture of close approximation are called Fricatives”. The initial sounds in the English word five, vine, thin, then, sip, zip, sheep and hat are fricatives.

Partial closure: the active and passive articulators are in firm contact with each other. The soft palate is raised, thereby shutting off the nasal passage of air. If the sides of the tongue are lowered so that there is plenty of gap between the sides of the tongue and the upper molar teeth, the air will escape along the sides of the tongue without any friction. “Sounds that are articulated with a stricture of complete closure in the centre of the vocal tract but with the air escaping along the sides of the tongue without any friction are called laterals”. The initial sound in the English word love is a lateral.

Open approximation: The soft palate is raised, thereby shutting off the nasal passage of air. If the active articulator is brought close to the passive articulator so that the gap between them is wide the air will escape through this gap without any friction. “Sounds that are articulated with a stricture of open approximation are called frictionless continuants and semi vowels. In fact, Peter Ladefoged uses the term approximants to refer to sounds that are articulated with a stricture of open approximation.

2.4 Compare and Contrast Speech Development in Typical Developing Children and CWHI

During the first year of life, babies produce a variety of vocalizations (sounds), beginning with simple cries at birth and progress through various stages to the first meaningful word. Babies first seem to develop speech naturally as they grow and most parents are not even aware how the process of speech development unfolds. However, not all children develop speech at the appropriate time.

Hence, it is important to know and understand how speech and language develop in normal children. Once we know how normal development takes place it will provide a base to understand how the development of speech gets affected in children with hearing impairment.

By 3 months	Makes cooing sounds
By 5 months	Laughs and makes playful sounds
By 6 months	Makes speech-like babbling sounds like **puh, ba, mi, da**
By 1 year	Babbles longer strings of sounds like **mimi, upup, bababa**
By 3 years	Says **m, n, h, w, p, b, t, d, k, g,** and **f** in words Familiar people understand the child's speech
By 4 years	Says **y** and **v** in words May still make mistakes on the **s, sh, ch, j, ng, th, z, l,** and **r** sounds Most people understand the child's speech

The chart shows the ages when most English-speaking children develop sounds. Children learning more than one language may develop some sounds earlier or later.

The foundation work for communication development begins in the first year of life. As the child matures he/she gains control over speech mechanism and moves on to various stages like reflexive crying, babbling and to voluntary speech production (i.e., meaningful words and sentences). The rate of acquisition varies from child to child as in vocabulary growth, and the process can go on throughout one's life. This development follows an orderly sequence and is predictable in character. The early stages are very important for the development of subsequent stages. Regardless of the linguistic community in which they grow up, all infants seem to pass through the same stages of vocal development. These stages are not discrete, that is, they may overlap from one stage to another. Description of these stages and the approximate ages associated with each are as follows:

Reflexive Vocalizations (Birth to Two Months): Newsborns produce predominantly reflexive sounds such as crying and vegetative sounds (burping and swallowing). Reflexive sounds are mainly produced on exhalation and consist of sounds, which are vowel like in nature. The vegetative sounds are produced on both inhalation and exhalation and are of brief duration. Both reflexive sounds and vegetative sounds are

involuntary and not under the immediate voluntary control of the child. The common sounds made by the newborn are cries and comfort sounds.

Crying sounds: Early crying is generally a discomfort sound and is also the first attempt of the infant to communicate in the environment. This cry is short and may accompany inspiration as well as expiration of air. Initially there is no variation in the cry but as the baby gains better control over respiration and phonation, cries increase in length and variation. When the baby is around 2 months old, parents can differentiate several distinct types of cry, that is, cry of hunger, discomfort etc., by its different pitch levels. Crying sounds help in the practicing of essential motor coordination and in the establishment of necessary feedback loops between

the larynx, the mouth and the ear. In addition, the differential cry establishes a primitive communication (interaction link) between the child and the parent. Some vowel like sounds, that is, sounds like a, e and ai which sound nasalized may also occur in the early period. Cooing and laughter: During this stage, the infant begins to produce some comfort state vocalizations generally known as cooing gooing or gurgling sounds. They are mainly observed during orjust after feeding or some other forms of relief from distress, that is, when the child is in a comfortable state. When the cooing sound is heard carefully, the front vowels i, e and back consonants k, g will seem to predominate, but they are not nasalized as in crying.

However, the child still lacks control over reflexive sounds like burping gurgling which appear frequently. Crying helps the child become accustomed to modified breathing patterns required for speech production. Apart from this, they produce other non-crying sounds during feeding or in response to smiling or laughter by the mother. All these sounds increase Development of Speech in production as crying decreases. The child at this stage shows signs of social awareness, which is evident in his following the adult's movements with the eyes and smiling. He responds selectively to the speech of the adults and also discriminates speech from non-speech sounds. By 3 months of age, the infant does show control of timing of vocalizations. This is evident when the infant vocalizes in response to speech of others. By four months of age there is more laughter. They produce self- generated babble sounds for their own enjoyment but appear more different sounding like "ma-ma-pa-pa or ta-ma-ta-ma.

Babbling (4 to 7 Months): The stage of reflexive vocalization is followed by vocal play and babbling. Around 4 months of the sounds they produce in vocal play are

characterized by the appearance of very loud and soft sounds, very high and very low sounds (squeals and growls). Some babies produce long series of raspberries (bilabial trills), sustained vowels and occasionally rudimentary syllables of consonants and vowels occur. A good amount of this vocal play is carried on when the child is alone and it disappears when someone attracts his attention. Babbling refers to the child's production of chains and series of syllables (4 to 5) in a single breath. It is characterized by the chaining and linking of sounds together on one exhalation and may sound like ka-ka ge-ka or ba-ba da-ba-da. Syllables of all types, are produced including the CV (Consonant Vowel as in ba) which is most common followed by VC (Vowel consonant as in ab) and VCV (Vowel Consonant Vowel as in aka).

Although these strings of syllables are more similar to standard sounds of a language they do not have any meaning. The baby just seems to be exploring by playing with his tongue, lips and larynx and gaining control over them and producing various sounds. In babbling we often hear the repetition of intonation and stress patterns so similar to the patterning of adult utterances that many parents feel that their baby is trying to tell them something. This is because they change the series of sounds in a sequence and may also change the length of the pause between the individual syllables. During this period sounds of other languages occur in the free speech. One of the important characteristics towards the end of this period is they often appear to listen carefully to their own babble and repeat it with slight change.

Socialized babbling: Around 6 to 7 months when the infant can sit up and tries to crawl, some of the babbling seems to have an instrumental function which is evident when he seems to use it to get attention to reject, to demand and to request, that is, he babbles more in a social context. This is also known as socialized babbling. In this, front vowel ai or mid-vowels a and consonants like t, d, n and I are heard in combination ta da ba. Now the child seems to take more pleasure in babbling in front of others. He seems to be talking to himself and also sometimes to parents/caregiver. Canonical babbling (6 months and older): The main features of this period is the production of sequences of consonant vowel syllables with adult like timings. For the first time, babies sound as though they are actually trying to produce words. Multisyllabic utterances in this period are often classified into two groups. Reduplicated babbling ie, strings of identical syllables, like baba or Variegated babbling (i.e., strings with varying consonants and vowels like bagidaba. Both types of utterances occur at this stage, although reduplicated babble predominates initially. With the increase in age, the variety of

consonants increase in hearing babies. The infant hearing his own vocalizations and the vocalizations of those around him takes on increased importance during this time. At this point vocalizations of the child with deafness begin to decrease. In addition, the range of consonants within babbling also decreases especially after eight months. The hearing child increasingly produces h, l and r sequences. Some hearing infants begin to produce more speech like sounds as early as six weeks of age; however, children with H.I. do not show the same patterns.

Inflected Vocal Play (8 Months to 10 Months and Above) Babbling which has a rich variety of sounds, can be heard as expressions of questions, commands, surprises etc. This is possible because of the addition of the tonal characteristics (intonation) that are imposed on babbling. Usually these utterances have no meaning but sound pleasant and delightful. There is marked gain in back vowels and front consonants. The infant begins to sound as though he is talking and masters' coordination necessary for meaningful speech. His imitation is more purposive. This is the last stage of babbling, which overlaps with the early period of meaningful speech. It has a rich variety of stress and intonational patterns. This is also known as jargon, conversational babble, or modulated babble. This jargon speech continues in some children for a longer duration whereas some children quickly move on to first words. Around 8 months the infant begins to imitate the communication of others, using echolalic speech. This period according to some authors is called as echolalic stage. Echolalia is speech that is an immediate imitation of some other speaker. In the beginning the child imitates only those sounds he has produced spontaneously.

He will also imitate stressed syllables for example, he may repeat "na-na" when mother says "banana" though he may not be associating the production with the actual object. At the later part of this period, the babbling patterns becomes short and phonetically more stable. The jargon may sound like questions, commands and statements. By nine to thirteen months, children "understand" some words based on a combination of sound, non-linguistic and paralinguistic cues and context. Many speech sounds will develop sound-meaning relationships knows as Phonetically Consistent Forms (PCFs) e.g., biki for biscuit. These sounds function as words for the infant even though they do not resemble the adult model (word used by adults). During the age of 1 to 1% years the child has been an active listener and explorer. The child listens to the parents and others speaking throughout the routine tasks. The child responds to parental stimulation but selectively. The parent's smile, gesture or spoken word acts as rewards and increases the frequency of vocal behavior.

First Word: By the age of 1 to 1 h years most of the children say their first words. Their first utterances are single words and are often duplicative like baba for daddy, mama for mummy. The labials and dental sounds are most prominent in the first words. First word stage is marked by the presence of ideomorphs or self-made words. Before producing adult like words, the child uses different self-made syllables and words to denote different objects and actions, which are known as ideomorphs or protowords. Some ideomorphs could be short forms of the jargon. The child uses these utterances to describe a range of objects and events e.g. if... for injury or hot milk. He uses different intonations on the same ideomorphs to denote different meanings in different situations. And the child, does this till he masters the adult models. provides a summary of the development of speech. In the next the six months that follow the first word, the baby acquires more words with his vocabulary growing to approximately 50 words. Up to this point, the primary focus was on the sounds of language providing some detail on how vocalization development leads to the production of true words in a baby. Now we will see that how these jargon is replaced by coded and rule bound language.

Development of Speech in Children with Hearing Impairment

For the development of normal speech and language it is believed that the period of development from birth to approximately three years is a critical period. Thus, the domain of language is most directly affected by hearing loss in infancy. The development of speech and language can vary according to the onset of the hearing impairment and the type of hearing loss. In the following sections these are discussed in children with pre-lingual and post lingual hearing impairment.

Pre-lingual Hearing Impairment

A significant degree of impairment in hearing before acquisition of speech and language is known as pre-lingual hearing loss. Such as loss affects the child's normal development of speech and language His deafness does not permit (deprives) him to hear the verbal communication interactions present in his environment. Hence, the pre-lingual hearing impaired child has delayed speech and language or has problems in developing the spoken/verbal language at both comprehension and expression levels and it if not habilitated, will have other impairments that are secondary to the hearing loss. This is because, firstly, hearing loss sharply reduces the number of listening experiences that the child has and thus slows down the process of learning to talk. Secondly, certain type of loss makes it impossible for the child to distinguish some of

the elements of speech for example, a child with high frequency loss may misarticulate high frequency sounds such as s or sh because he is not able to hear them. As a result, he will not be able to say sounds he does not hear unless he uses hearing aids or undergoes structured special training. The development of speech by children with hearing impairment child and the degree to which an auditory verbal feedback loop can be directly related to the severity of the hearing loss, age of established. When a young child has hearing loss, he cannot learn to understand or express verbal language without assistance. This is because hearing loss reduces drastically the number of listening experiences the child has. This also reduces the process of learning the following aspects of language:

1. The hearing loss hampers the initial mastery of sounds of his language and/or affects the auditory feedback control, which is required for speech development.
2. In cases with severe hearing loss it makes it impossible for a person to hear the non-phonetic elements (suprasegmentals) in his own speech. This disturbs the effectiveness of his oral communication.
3. Hearing loss also disturbs the ability to adjust the levels of one's voice to the situation.

2.5 Phonological Errors as A Function of Audiogram Configuration (Flat, Gradually Sloping and Steeply Sloping) and Degree of Hearing Loss

Phonological" errors", both pathological and slips of the tongue, are not" errors" in the sense of deviation from a learnable grammar. Rather," errors" follow a grammar, although it may be different from the target grammar native speakers acquire regularly. Children with a language pathology make consistent" errors" that follow identifiable rules.

Phonological errors are seen in children with even mild to moderate sensorineural hearing loss (Zanichelli & Gil, 2011).

Phonological slips are" errors" that involve phonological units which do not carry semantic content, including phonetic features, segments (consonants or vowels), sub-

syllabic sequences of segments (consonant clusters, rimes), syllables, and lexical stress (Jaeger 2005). Phonological "errors" are assumed to have two different causes: perceptual misidentification of sounds, or accurate perception but inability to reproduce the sound, leading to substitution of an unpronounceable syllable for a friendlier one (Stemberger 1989)." Errors" are thus generally divided into the classes contextual and non-contextual. The source of contextual" error" can either be found in the utterance itself or in the planning of the utterance.

"Errors" can be further classified as either paradigmatic or syntagmatic. Paradigmatic "errors" have target and "error" units that share a quality of some linguistic paradigm, such as they are both words, both morphemes or both phonemes, and they are competing for the same spot in the utterance.

Research has resulted in the classification of six different types of" errors": substitution, addition, omission, movement, exchange and blend. Substitution" errors" occur when one element of the utterance is substituted for another, which can occur on the phonological, morphological and lexical levels.

Addition" errors" of phonology involve an inserted element into an incorrect location. If the "error" is contextual, the source is still spoken in the correct location.

Omission" errors" occur in two different ways phonologically. First, there are assimilation" errors", where a phonological unit is omitted in the context of another phonological string which also lacks the element, making the "error" and source more structurally similar.

The other type of omission "error" is the dissimilation "error", which occurs when a segment is planned for several slots in an utterance, and one of these instances is deleted. It is difficult to judge an "error" as dissimilation or assimilation because often, both possible sources occur in the utterance.

Movement" errors" are a combination of omission and either addition or substitution. One element is deleted from its originally planned location and either added or substituted elsewhere.

Exchanges and blends are strictly contextual and syntagmatic. Exchange "errors" occur when two elements exchange positions. Blend "errors" involve two different lexical units that are planned for the same slot in a phrase and their phonological forms blend together in a single unit.

2.6 Selection of Appropriate Strategies, Material, and Equipment for Teaching Speech

Teachers frequently approach the speech therapist with questions and concerns regarding how a student is functioning within the classroom. Often these concerns are brought up at a Needs Assessment Team Meeting. In addition, parents also express concerns about the student and are an integral part of the team. Strategies can be provided to both teachers and parents as a part of the Needs Assessment Team process or on an individual basis as concerns arise.

These speech and language strategies were primarily developed to provide classroom teachers with ideas to implement within the classroom prior to considering a referral for a speech and language evaluation. A chart to facilitate documentation of prior interventions is included also.

When developing the strategies, efforts were made to address the most common areas of need. Please note that all suggestions may not be appropriate for every student and you may need to modify them on an individual basis.

There are various teaching strategies used for teaching speech to the hearing impaired are:

1. Auditory global approach
2. Multisensory syllable unit approach
3. Associated phoneme unit approach

1. Auditory global approach

For correct acquisition and production of speech the child must have an intact auditory channel. The child listens to adult speech, internalizes them and then starts producing them. The Journey from starting to produce a speech sound to fully master is production needs lot of self- corrections by the child him herself. He/she hears to adult speech, imitates and learn from it as a model then produces it correctly by sent corrections (with the help of auditory feedback).

However, the child also uses other cues such as visual, kinesthetic along with auditory cues for speech acquisition. In case of children with hearing impairment mainly the auditory channel is used, along with the other sensory channels.

The selection of modality depends on the child's hearing level after amplification.

For example in case of minimum benefit from amplification device, the visual, and tactile modes are largely used to supplement the minimum residual hearing.

The term "auditory global" was given by Calvert and Silverman (1975). It mainly stresses the use of auditory method with minimum or no use of visual and tactile cues. The authors also emphasized early and continuous use of amplification device, comprehensive intervention at school as well as home, natural methods to model and teach speech and use of connected speech.

2. Auditory-Oral Approach

In this approach speech reading and contextual cues are used along with residual hearing for understanding speech. The child is taught to combine hearing cues (with amplification device) with speech reading (lip reading cues) and understanding the context in which the conversation is carries out. This is a very useful approach for children with restricted residual hearing. However, this approach needs lot of practice by the child. Moreover, in absence of contextual cues, understanding becomes difficult. It can be easily incorporated by teachers in classroom during teaching sessions. The teacher can model the child how to speak, utter certain sounds/words etc. When used with young children after early identification and intervention, they can be easily mainstreamed.

3. Aural-Oral Approach

The focus is on speaking and sound production. The therapist uses different types of modelling to show the child how to speak correctly. The child's aural skills(auditory) are developed for attaining oral (veroal skilis). ln this approach the following is advocated and used by therapist/teachet

1) Directly talking with the child

2) Use of simple speech

3) Use of facial expressions and body language

4) Repeat the key words

5) Speak things from the child's context

4. Auditory verbal approach

lt is a parent oriented approach, where the child's residual hearing is maximally used to understand speech of others and to learn to use spoken language for communication. In this approach the audition is taught in four classical levels: detection, discrimination and identification. VT is based on some fundamental principles like early detection, fitting of appropriate amplification device, regular assessment and therapeutic management, direct parent involvement, mainstreaming the child into regular educational system. With improved technology in amplification devices. it is very much possible to teach the child only through auditory channel.

5. Multi-sensory syllable unit approach

As the name suggests the auditory channel is accompanied by other sensory channels. It is useful for children with limited residual hearing. Visual and tactile stimulation is used with auditory stimulation. Written forms /orthographic representation of sounds, words are used along with oral speech. Labelling is used for all the vocabulary in the child's environment.

6. Ling's approach

Developed in 1976 by Ling. In this approach maximum use of residual hearing is advocated. In this approach the child is taught to understand speech of others as well as correct own speech production by using residual hearing. Two principals of Ling's approach are:

1. The hearing impaired child should be taught to develop speech in the same order as a normal hearing child will follow.
2. The speech organs move rapidly and precisely during speech production, which should be taught to hearing impaired children so that they can produce correct speech.

Speech is taught at phonetic and phonological level, e.g., in phonetic level- nonsense syllables, repeated syllables are used. Then these skills are adapted to the phonological level. Initially vowels are taught in imitation, then consonants are taught.

Teaching is an art which includes knowledge, presentation, an art of dissemination and above all every aspect of paralinguistic. Teaching demands broad knowledge of subject matter in all horizons, complete curriculum with standards, positive and caring attitude with enthusiasm, and a desire for learning and techniques of classroom management and a desire to make a difference in the lives of children with hearing impairment.

The existence of materials is totally based on the creativity and innovative ways of teachers.

No one can assume even a single material without a Teacher because it is a teacher who uses the materials in the classroom effectively and the effective usage of those materials is reflected by the involvement of the students. We should know the difference amongst Teaching, Aid and Material. As per www.dictionary.com, "material used by a teacher to supplement classroom instruction or to stimulate the interest of students.". As per Merriam Webster, "Teaching Aid is an object (such as a book, picture, or map) or device (such as a DVD or computer) used by a teacher to enhance or enliven classroom instruction" and "Material denotes or consists of physical objects rather than the mind or spirit."

There are various materials and aids developed for correcting the speech of a child with hearing impairment. Auditory aids, auditory trainer or speech trainer, tactile aids, visual aids and some electronic equipment like- N-indicator, vocal two, and S-indicator are used.

An auditory aid is a device designed to improve hearing by making sound audible to a person with hearing loss. It includes hearing aids, speech trainer and other assistive devices.

Hearing aids are classified as medical devices in most countries, and regulated by the respective regulations.

Tactile aids are those which make use of the modality of touch for providing feedback about the speech production.

Visual aids provide visual feedback about the aspects of speech production.

2.7 Need For Use of Regional Language Based Speech Assessment Tests

Clinical history is critical for speech and language assessment. Information from relatives, friends, or witnesses is often necessary owing to the patient's decreased ability to communicate.

ASHA's *Preferred Practice Patterns for the Professions of Speech-Language Pathology*(2004)indicates that comprehensive speech-language pathology assessment includes these components:

- Case history, including medical status, education, socioeconomic, cultural, and linguistic backgrounds and information from teachers and other related service providers
- Patient/client/student and family interview
- Review of auditory, visual, motor, and cognitive status
- Standardized and/or non-standardized measures of specific aspects of speech, spoken and non-spoken language, cognitive-communication, and swallowing function, including observations and analysis of work samples
- Identification of potential for effective intervention strategies and compensations
- Selection of standardized measures for speech, language, cognitive-communication, and/or swallowing assessment with consideration for documented ecological validity and cultural sensitivity
- Follow-up services to monitor communication and swallowing status and ensure appropriate intervention and support for individuals with identified speech, language, cognitive-communication, and/or swallowing disorders

There are various speech assessment tests developed for the children with hearing impairment in English. But due to language problem, most of these tests are not reliable for the assessment of speech for children who are apart from the English speaking areas. This causes the tests to be unreliable for the assessment of speech in child who speaks Hindi or other languages. Hence, there is a need for the development of speech assessment tools in regional language as to improve the validity and reliability of the tests. And a valid tests results.

2.8. Let Us Sum Up

- Phonetics is connected with linguistic and non-linguistic sciences: acoustics, physiology, psychology, etc. Speech sounds have a number of physical properties, the first of them is frequency, i.e. the number of vibrations per second.
- Speech sounds are classified into two categories i.e., vowels and consonants.
- The development of speech in a typical developing children is quite different from the development of speech in children with hearing impairment as the child

who has hearing loss has already missed some phonemes in the normal developmental ages.

- The children with hearing impaired may go for various educational setups like, special schools, partial schools etc. They also go for inclusive education and integrated education with some assistance.

2.9 Unit end exercises

1. Discuss the acoustics of speech.
2. What are the different classification of speech sounds based on the major acoustic cues?
3. Discuss about the phonological errors. What are the phonological errors seen in a child with hearing impairment based on their audiogram configuration?
4. Write short notes on:

- Acoustic phonetics
- Inclusive education
- Integrated education
- Vowels and consonants

5. Write about the different treatment approaches for teaching hearing impaired child.

2.10 References:

1. A G Ramakrishnan, B Abhiram and S R Mahadeva Prasanna, “Voice source characterization using pitch synchronous discrete cosine transform for speaker identification,” Journal of the Acoustical Society of America Express Letters, Vol. 137(), pp., 2015.
2. A. P. Prathosh, T. V. Ananthapadmanabha, and A. G. Ramakrishnan, “Epoch extraction based on integrated linear prediction residual using plosion index,” IEEE Transactions on Audio, Speech and Language Processing, 2013, Vol. 21, Iss. 12, pp. 2471-2480.

3. Essays, UK. (November 2018). The Classification And Description Of Speech Sounds English Language Essay. Retrieved from https://www.ukessays.com/essays/english-language/the-classification-and-description-of-speech-sounds-english-language-essay.php?vref=1

4. T. V. Ananthapadmanabha, "Acoustic factors determining perceived voice quality," in Vocal fold Physiology - Voice quality control, O.Fujimura and M. Hirano, Eds. San Diego, Cal.: Singualr publishing group, 1995, ch. 7, pp. 113–126.

5. T V Ananthapadmanabha, A P Prathosh, A G Ramakrishnan, "Detection of the closure-burst transitions of stops and affricates in continuous speech using the plosion index," Journal of the Acoustical Society of America, Vol. 137, 2015.

6. Winn, M. B., Chatterjee, M., & Idsardi, W. J. (2012). The use of acoustic cues for phonetic identification: effects of spectral degradation and electric hearing. The Journal of the Acoustical Society of America, 131(2), 1465–1479. doi:10.1121/1.3672705

Unit-3 □ Language & Communication Assessment, Identification and Addressing Needs

Structure

3.1 Introduction

A communs1ication option, mode, modality, or method is the means by which the child and family receive and express language. The choice of a communication modality that facilitates language development and allows the child who is hard of hearing or deaf to readily engage in communication interchanges with family and caregivers is a primary issue throughout childhood (Carney & Moeller, 1998). There is a huge continued controversy exists over the specific communication options. Frequently, professionals with whom parents are in contact in clinical and educational settings have strong opinions regarding the issue (Tye-Murray, 1998). Every child who is hard of hearing or deaf needs to develop language early in life and that the child and family need a method to communicate which facilitates natural, meaningful, and abundant interchanges.

3.2 Objectives:

After studying this course the student- teachers will be able to

- *Explain the parameters of selecting medium of language instruction for children with hearing impairment at home, school & society*
- *Critically analyze challenges and concerns related to language assessment of the deaf*
- *Comprehend the biological foundations of language and related research in early language experiences of deaf*
- *analyze the processing of sign languages in early years of deaf children*
- *Study the language assessment component in ICF*

3.3 Parameters of selecting medium of instruction for CWHI: Language/s used at home, school & society

As families choose a medium of instruction or communication approach for use by the family with infants who are deaf or hard of hearing there are multiple parameters or factors that impact their decision. Several of these parameters or factors are explored further below

3.3.1 Age of Identification and Intervention

The advent of newborn hearing screening has lowered appreciably the age of detection and subsequent intervention to between three and five months of age (Harrison et al., 2003), significantly earlier than the previous ages of identification of hearing loss in children late in the language-learning period (2.5 years and greater for mild and moderate hearing loss (Harrison and Roush, 1996). Language-based family centered early intervention provided before the first six to eleven months of life results in better language scores at older ages than intervention later in childhood (Yoshinaga-Itano et al., 1998 & Moeller, 2000).

Language ages of children who received early intervention were within the average range when compared to hearing-age matched peers (Moeller, 2000). Five-year-olds who received later intervention had significantly lower vocabulary and verbal reasoning scores than the matched hearing-age sample. The benefits of early intervention on later language development were found for children who communicated using either an auditory-oral or a Total Communication approach, with little influence of degree of hearing loss (Yoshinaga-Itano et al., 1998 & Moeller, 2000).

3.3.2 Family Involvement

The active involvement of the family in various aspects of the Early Intervention process appears to be a primary mediator of outcome regardless of the communication option used. Two factors accounted for a significant amount of the variance in children's language scores: family involvement and age of enrollment. The factor accounting for the greatest variance was family involvement. This was measured through family participation in the intervention program, and characteristics such as family adjustment and effectiveness of communication with the child (Moeller, 2000). There were numerous earlier studies which also supported the benefits of active participation of families in the early intervention process (Greenberg, 1983; Greenberg et al., 1984; Watkins, 1987).

Status of hearing within families:

Some commonalities exist in language development between children who are deaf and children who are hearing. Language development is contingent on frequent, consistent, and accessible communication. These factors are the same for children of parents who are able to hear, as well as children of parents who are not able to hear. The mode of communication (signed or spoken language) is not a factor (Marschark, 2001).

However, children who are deaf and born to hearing parents generally start learning language later, and with less consistent and less useful experiences. Such children do not share a native language with their family. Their hearing loss, on average, is not identified until their first birthday. These children are exposed to less linguistically rich environments than deaf children of deaf parents or hearing children of hearing parents. Because of these differences in language exposure, children who are deaf in homes with hearing caregivers commence their language learning at a later age than their peers (Marschark 2001).

In families where parents are learning a new language, such as Sign Language (SL) or Signed English (SE), with which to communicate with their child, children have a tendency to acquire inconsistent or incorrect linguistic input (Kuntze, 1998; Marschark 2001). This early language deprivation explains the troublesome statistic that 90 percent of deaf children born into homes with only hearing caregivers experience delays in language acquisition compared to hearing children in hearing families and deaf children in deaf families (Kuntze 1998; Meier & Newport, 1990). Because most children who are deaf do not have deaf parents (Moores, 2001), it is not surprising to see language delays from these children. Many actually are

language deprived up until their school exposure, which might be their first experience with a competent language model.

Use of Hearing Aids/Cochlear Implant:

Several of the communication options available for use with children are highly dependent on the child having access to the acoustic features of speech through the use of either hearing aids or a cochlear implant that will facilitate the development of spoken language. The majority of children with hearing loss of mild to severe degree benefit from conventional amplification devices for the reception of spoken language and environmental sound. Even families who choose visual language may desire their child to use a hearing aid for the purpose of environmental sound awareness, alertness, and safety. The age of the child at hearing aid fitting was negatively correlated with children's number of words produced per minute, proportion of questions asked, and vocabulary, controlling for age at the time of the initial testing (Ramkalawan & Davis, 1992). Notably, all children received amplification after the age of 12 months. Evidence suggests that earlier cochlear implantation (two to three years of age) results in greater overall vocabulary growth than children implanted later (four to five years of age) and a reduction in the gap between the chronological age and the language age of deaf children and their hearing peers (Brackett and Zara, 1998; Nikolopoulos et al., 1999).

Speech Intelligibility:

Access to the acoustic features of speech through conventional hearing aids or a cochlear implant appears critical if a goal of the family is for their child to develop intelligible speech. Children with lesser degrees of hearing loss tend to have more intelligible speech than those with greater impairments; those with profound hearing loss have great difficulty developing intelligible speech using conventional forms of amplification (Boothroyd, 2000). Early speech reception skills appear to facilitate good speech production and speech intelligibility. Evidence suggests that children who were trained to communicate using an auditory or auditory-oral approach versus a sign language method (even one that incorporates the use of residual hearing) have better speech intelligibility at later ages (Geers et al., 1984; Markides, 1988; Geers & Moog, 1992). Compared to deaf children who use conventional hearing aids, there is evidence that children who use cochlear implants have better speech intelligibility and larger phonetic inventories (similar to that of children with normal hearing), with age of implantation apparently related to speech outcomes (Brackett & Zara, 1998). For this group of young children with profound hearing

loss, the cochlear implant provided sufficient acoustic speech features and self-monitoring capabilities for optimal speech production to occur, information that could not be provided by conventional amplification devices.

Presence of Additional Disabilities:

The numbers of children who are hard of hearing or deaf who have one or more additional disabilities (cognitive, visual, motor, attention, behavioral) is large. A family of a child with one or more developmental disabilities in addition to hearing loss has greater challenges in the selection of a communication approach. The ongoing family-centered diagnostic process appears critical for this population, particularly in infancy and early childhood when the child's strengths and limitations for communication have not been delineated fully. Children who are hard of hearing or deaf and who are visually limited or blind represent a unique population with regard to available communication options that called somatosensory form of communication.

Following Table presents some of the additional parameters that can influence the family's selection of a communication medium.

Parameters	**Considerations**
Language used in the home	● Spoken (English) ● Bilingual (use of 2 spoken languages) ● Visual (SL) ● Combination of visual and spoken (bilingual)
Family Involvement communication in the home	● Abundant opportunities for language learning and ● Level of participation in intervention ● Home situation/family membership and other demographic factors ● Consistency in learning & using SL, cued speech ● Socio-economic circumstances ● Work schedules
Age of Identification & Intervention	● Before 6 to 11 months of age ● After 6 to 11 months of age
Literacy	● Speech perception ● Development of phonological awareness

Community resources	● Availability of certified AV therapists; auditory-oral therapists, sign language interpreters, SL community, etc.
	● Availability of Early Intervention programs that use above approaches
Hearing status	● Degree of hearing loss
	● Stability of hearing loss
Hearing Aids & Cochlear Implants	● Consistent use of Hearing Aids/FM system ● Cochlear implant candidacy ● Financial constraints related to acquiring assistive device technology ● Expectations regarding benefits of device
Speech Intelligibility	● Access to acoustic speech features through hearing aids/cochlear implant ● Speech therapy
Presence of additional disabilities	● Visual ● Motor ● Cognitive ● Attention/Behavior
Availability of later educationaloptions	● Mainstream with support services ● Special school

3.4 Language assessment of the deaf: Challenges and concerns (standardized versus teacher made tools; Setting norms of children 'with' versus 'without' disability; modality dependent nature of language; measuring receptive language; identifying measurable indicators)

Assessment is an important part of monitoring learning, creating educational programming, and identifying children for services. For deaf children, engaging in meaningful assessment is a complex and multifaceted process (Miler, M.et.al, 2016 & Wood, N. & Dockrell, J., 2010). Well done assessments support learning and growth, while inaccurate assessment data may lead to potentially faulty decision-

making and poorly designed educational plans for deaf children in schools. Inaccurate assessments can also lead to the misdiagnosis of additional disabilities. Of particular importance is capturing the language and literacy development of deaf children in schools, as understanding these skills is essential to educational planning and decision-making.

There are many approaches that can be utilized during the assessment process, and no one test can provide all the information necessary for the deaf children. Assessment and evaluation of progress among children who are deaf or hard of hearing is a complex process. Challenges often go undetected by individuals unfamiliar with the hidden impact of a hearing loss. Challenges to professionals in the field of deaf education are particularly notable in the areas of information access, communication modalities, language, selection and application of assessment tools, technology, and access to highly qualified personnel. Therefore, there is need to (Miler, M.et.al, 2016) address the challenging nature of assessing language for the deaf population and (Wood, N. & Dockrell, J., 2010) review the factors that influence the selection of assessment approaches and tools for deaf children, including the assessment purpose and language being assessed.

3.4.1 Challenges and concerns:

Language and literacy development are essential to educational programming for deaf children; however, assessing these skills remains a challenging task. Deaf children often use a wide variety of languages and/or communication systems in their home, school, and community, which make assessing language proficiency difficult For example; the language of instruction, language of socialization, and language of the home may all be different for a deaf child. As such, a child may use spoken language, sign language, or some combination of both in their daily lives. This unpredictability in language use may leave gaps in a child's linguistic repertoire, making it hard to establish the primary language to be used during the assessment administration or even which languages should be included in the assessment. Although there are challenges to appropriately assessing the language and literacy development of deaf children, the conditions of the assessment will be improved if the child is assessed in what is believed to be the child's most proficient language based on background information about the child and her/his language history. The length of time a child has used a language should always be a factor in determining the language in which an assessment will occur. The assessment of all languages and communication systems used by the child is also necessary for a comprehensive portrait of a child's abilities (Jamieson & Simmon 2011 & Pizzo

& Ford). When conducting the assessments of these various languages, the use of a qualified examiner who can communicate directly with the child contributes to the validity of the assessment. Finally, the assessment should also include multiple sources of information from across various contexts (e.g., home, school, community) and informants (e.g., educators, family, etc.) in order to document across- and within-context skills (Pizzo, L.& Chilvers, 2016).

3.4.2 Standardized versus teacher made tools:

The various types of assessment approaches have been traditionally grouped into two categories: formal and informal assessment. Despite being controversial for some groups of learners (e.g., young children and culturally and linguistically diverse children), formal assessment is often preferred in schools, as each test is constructed to produce scores that are valid and reliable. Informal assessment, however, is the most widely used form of assessment in classrooms and educational settings, as it lends itself well to monitoring and documenting a child's learning on a regular basis.

Formal assessment uses psychometrics to create a test with the power, validity, and reliability to isolate specific skills and compare a child's performance to that of other children **.** In order to have confidence in the scores produced, the test must be administered the same way each time it is given .When a test is administered outside of its intended population, however, there may be required deviations to the administration protocol that can impact the validity of the scores. In most standardized assessments are intended to be used nationwide and are created based on a sample of children that often mimics the Census data. For deaf children, these standardized tests can provide insight into how a deaf child compares to other children at their age or grade using normative data. A handful of these assessments have also collected normative data specifically with deaf children; however, the heterogeneity of the population, small sample size compared to their hearing counterparts, and sample bias all render the scores problematic at best . There are very few tests designed for deaf children, which creates challenges to the validity of the tests, as the items may be based on auditory concepts inaccessible to a deaf child and it may be impossible for them to be translated into a signed language (Jamieson, J.R.; Simmons, 2011). As a result, deviations to the administration protocol may be necessary for equity (Case, B. 2005). For deaf children who use a sign language, sign translations of test content are frequently used, as the overwhelming majority of standardized tests are designed and administered in spoken English. These translations can occur in three ways. First, if the examiner

is proficient in the child's sign language, they can directly administer the test to the child in that language. Second, the examiner can collaborate with an ancillary examiner who is proficient in the language and understands how to administer tests appropriately. Finally, the examiner can use a sign language interpreter to translate the test during the testing session. While these strategies can help to expand the available test materials for deaf children, the interpretation process creates challenges of their own. Even when an examiner is able to administer a test in sign, without standardized test administration protocols or a sign language script, it is hard to administer the test in exactly the same way each time it is given. Access to an ancillary examiner who has both the knowledge of the assessment and the language skills necessary is not typical outside of schools for the d/Deaf. Even when there is a trained person to assist, they might be taken away from other important duties in order to assist in the test administration. Sign language interpreters may be available for the assessment even when ancillary examiners are not; however, without formal training on assessment, the interpreter may inadvertently affect the child's scores (Cromwell, J.2005).

Each of these situations poses threats to the semantic equivalence for the test, an important aspect of test validity. Semantic equivalence is when a translation of the test keeps the item content and difficulty the same across both languages (Barrueco, S.; Lopez, M.; Ong, C.; Lozano, P.2012).

3.4.3 Setting norms of children 'with' versus 'without' disability:

A classical issue in the development of assessment instruments for children is a decision on who constitutes the norm (Singleton & Supalla, 2003). Ideally, separate norms are developed for children 'with' and 'without' disability subgroups of the total sample when it is known that the developmental path of the acquisition of the language in question is different for these groups. To illustrate, spoken language tests sometimes have separate norm for boys and girls (Zink & Lejaegere, 2002), or for children who are born in bilingual families or in families in which the parents do not speak the language in question (Verhoeven & Vermeer, 2001). Deaf children of deaf parents would constitute such a subgroup as deaf children of deaf parents, on average, tend to have a higher level of proficiency in comparison with deaf children of hearing parents (Boudreault & Mayberry, 2006; Hoiting, 2005; Herman & Roy, 2006; Maller et al., 1999). Johnson (2004), very rightly, has questioned the appropriateness of using an entire population of children who are exposed to sign language to develop normative scores. With the exception of the sign language assessment instrument developed by Anderson and Reilly (2002),

which was normed with exclusively deaf children of deaf parents, all the norm-referenced assessment instruments that have now been developed have used combined groups of native (deaf and hearing) children and nonnative deaf children to develop normative scores (Herman et al., 1999; Maller et al., 1999). At present, deaf children of deaf parent is unfortunately not large enough to develop separate norms for subgroups. The norms were extracted on the basis of all the deaf children who participate in norming study.

3.4.4 Modality dependent nature of language:

Crossing modalities from oral to sign language impacts the semantic equivalence of the assessment, as appropriately signing the test item may affect the content of that item through a concept called iconicity. Iconicity is when a sign used to represent a concept or object may look visually like the referent (Miller, M. 2008). When the iconicity is high, a sign may inadvertently give a child the cues to the correct answers . For example, if the test item asked, "which shape is the circle?" and the answer choices were a square, circle, triangle, and a diamond, simply signing the question inadvertently gives clues to the answer, as the signs for these shapes mimic them closely. When translation does not modify the content of an item, it still may change the level of difficulty of it. For example, sign language phonology or morphology can affect the difficulty of an item by providing cues that can help elicit the correct answer. These content changes have been well documented for ASL translations of math assessments, as they may provide number or mapping cues that can be used to solve the problem presented (Ansell, E.; Pagliaro(2001),& Ansell, E.; Pagliaro,(2006) & Kritzer, K.; Pagliaro, C.; Ansell, E. (2004). For example, an item might ask, "If Sally has 3 balls and Bobby has 2 balls, how many do they have altogether?". The sign for "altogether" also means "to add" in the context of math. The use of this sign thus signifies which mathematical operation to use.

Identifying measurable indicators:

(1) Use a variety of assessment tools and strategies to gather relevant functional, developmental, and academic information about the child, including information provided by the parent that may assist in determining–

(i) Whether the child is a child with a disability under disability acts.

(ii) The content of the child's IEP, including information related to enabling the child to be involved in and progress in the general education curriculum

(2) Use multiple measure or assessment as the sole criterion for determining whether a child is a child with a disability and for determining an appropriate educational program for the child; and

(3) Use technically sound instruments that may assess the relative contribution of cognitive and behavioral factors, in addition to physical or developmental factors.

(4) In other evaluation procedures public agency must ensure that–

(i) Instruction are provided and administered in the child's native language or other mode of communication and in the form most likely to yield accurate information on what the child knows and can do academically, developmentally, and functionally, unless it is clearly not feasible to so provide or administer;

(ii) Are used for the purposes for which the assessments or measures are valid and reliable;

(iii) Are administered by trained and knowledgeable personnel; and

(iv) Are administered in accordance with any instructions provided by the producer of the assessments.

(5) Assessments and other evaluation materials include those tailored to assess specific areas of educational need and not merely those that are designed to provide a single general intelligence quotient.

(6) Assessments are selected and administered so as best to ensure that if an assessment is administered to a child with impaired sensory, manual, or speaking skills, the assessment results accurately reflect the child's aptitude or achievement level or whatever other factors the test purports to measure, rather than reflecting the child's impaired sensory, manual, or speaking skills (unless those skills are the factors that the test purports to measure).

(7) The child is assessed in all areas related to the suspected disability, including, if appropriate, health, vision, hearing, social and emotional status, general intelligence, academic performance, communicative status, and motor abilities;

(8) Assessments of children with disabilities who transfer from one public agency to another public agency in the same school year are coordinated with those children's prior and subsequent schools, as necessary and as expeditiously as possible

(9) In evaluating each child with a disability under disability act, the evaluation is sufficiently comprehensive to identify all of the child's special education and related service's needs, whether or not commonly linked to the disability category in which the child has been classified.

(10) Assessment tools and strategies that provide relevant information that directly assists persons in determining the educational needs of the child are provided.

3.5 Biological foundations and research in early language experiences in the past two decades: From input to uptake:

Human being is the only living being on the earth to have a highly developed language system, which no other creatures possess. To understand this extraordinary capacity of linguistic behavior, we have to find out the way human differs from the rest of the animal kingdom, in terms of the evolutionary aspect. In evolutionary biology, one concept is very popular and has a wide range of implications in different branches of the human cognition, and that one is as follows – ontogeny repeats phylogeny. The most vital proof of this fact can be traced out from the structure of the human brain. It can be divided into three constituents, among which the most fundamental one is popularly known as the reptilian brain. Out of this reptilian brain evolves the mammalian brain. After that the deposition of the gray matter, popularly known as the neocortex, ultimately transformed it into the human brain. This neocortex is divided into different hemispheres, popularly known as the left and the right hemispheres.

3.5.1 Human Brain:

The mammalian brain became the human brain by adding the massive grey matter (neocortex) which envelopes most of the earlier brain and amounts to about 85 per cent of the human brain mass. The brain is actually divided into its 'hemispheres' by a prominent groove. At the base of this groove lies the thick bundle of nerve fibers which enable these two halves of the brain to communicate with each other. The left hemisphere usually controls movement and sensation in the right side of the body, while the right hemisphere similarly controls the left side of the body. We saw that with the mammalian brain emerged feelings such as attachment, fear and anger and associated behavioral response patterns. And human emotional responses depend on neuronal pathways which link the right hemisphere to the mammalian brain which in turn is linked to the even older reptilian brain. The way is fascinating in which work is divided between the two halves of the brain, their different

functions and the way in which they supplement and co-operate with each other. A general overview of the functional division of activities between the two hemispheres would be: Left Hemisphere: Communicates by using words, has highly developed verbal abilities, is logical and systematic, concerned with matters as they are. Right Hemisphere: Communicates using images has highly developed spatial abilities, is intuitive and imaginative, concerned with emotions and feelings.

3.5.2 Evolutionary Aspect of Brain and Language:

Brain and language both are subject to the evolution. Evolution is, as Darwin recognized, a complex process that inherently involves all aspects of the life cycle and environment of the species and its relationships to other species. Everything depends on everything else, and the interaction through natural selection is the crucial factor if anything is. A Darwinian approach to the study of language of course involves more than the application of the theory of the natural selection. We will, for example, make use of the principle of pre-adaptation, that is, natural selection channeling development in a new direction because of previous modifications for some other role. This principle is extremely important, for it demonstrates how natural selection operating in small steps can effect radical changes in behavior. Therefore in case of language, same thing can be referred to. From some of the present day experiments it can be clearly deduced that the principle of pre-adaptation, works an important role even in the work of the linguists. They are referring to the fact that there is a biologically determined language acquisition device, acquired in course of evolution, which plays a crucial role in case of the language acquisition. This theory of innateness is nothing but the resonance of the same principle of pre-adaptation. Moreover it is found that even a pre-linguistic child has the capacity to make a differentiation between voiced and voiceless bilabial sounds at the time of sucking. The rate of sucking gets higher when (s) he is exposed to the voiced bilabial sounds, in comparison to there non-voiced counterparts. This type of pre-linguistic ability is basically acquired by the human being by the course of evolution. And this ability, by and large, is universal throughout the different cultures. Even in case of the deaf child, it is found that the pattern of babbling is quite same as that of the normal child, in the prelinguistic period. The difference originates only in the level of the verbal child, which is specific to the culture. Therefore the notion of language essentially incorporates two levels of discussion- one, the pre-linguistics evidences shows that the existence of a universal pre-adaptive principle, which can be equated with the concept of the innateness hypothesis and two, in course of development, the child acquires the language specific particular grammar,

which is channelized to a particular direction because of the preadaptive innate principle.

3.5.3 Biological basis of language: Selectivist vs. Constructivist

There is a big issue related to language is that whether it is innate, for, clearly, language must be learned. Nor is the issue whether the aptitude for learning a language is inborn: it takes a human being, with a functional brain to learn a tongue. The question to explore is whether there is biological foundation at the root of organization and internal structure of language. The scholars considering spoken language acquisition have divided over internal and external causation dichotomy. Two prototypical models of language acquisition are "Selectivist" and "constructivist" models, respectively. The Selectivist model, which depends on internal causation argument, can be associated with Noam Chomsky. The Selectivist model assumes that "language template is pre-organized in the neuronal structure of the brain, so that the fact of being an integral part of a given environment selects the borders of each individual neuronal structure, without affecting its fine organization, which pre-exists". The constructivist model, which assumes external causation of language acquisition, follows lines drawn by behaviorists such as Piaget and Skinner. This model assumes that "language is built up constantly from a continuous interaction with a well-structured environment".

3.5.4 Bio linguistics vs. Connectionist approach:

Bio linguistics approach involves the study of questions concerning (1) language, (2) language development, and (3) language evolution. It is explicitly considered to the study of the biology of language. The connectionist approach is radically different, as is explained in Rethinking Innateness. The main query is how seriously one should take biological constraints. Connectionist approach is concerned with intelligent behavior in general. It includes organically based intelligence (human language, basket weaving, nest building, etc.) as well as silicon based intelligence (chess playing computers, computers that recognize speech etc.). Thus connectionists are interested in general-purpose learning algorithms that work across domains and across organisms, whether based on DNA or on silicon.

3.5.5 Review on related literature related to Language Delay and Deprivation and Literacy:

Historically, researchers frequently cited the hearing level of the d/hh child as the sole culprit for performance, or lack of performance, in a variety of areas, including literacy, theory of mind, and language development(Goldin-Meadow, S.; Mayberry,

R. 2001& Woolfe, T.; Want, S.C.; Siegal, M. 2002). In recent years, however, some have posited that deprivation of language at early ages may be responsible for difficulties with later achievement in these areas rather than hearing loss itself (Hall, M.; Eigsti, I.; Bortfeld, H.; Lillo-Martin, D.(2017) & Henner, J.; Caldwell-Harris, C.L.; Novogrodsky, R.; Homeister, R.J.(2017). This perspective allows for a broader consideration of languages and modalities and a wider array of strategies for meeting the needs of d/hh children and places special emphasis on the importance of language access at early ages. Although the literature on language deprivation and its effects on academic outcomes such as literacy is in its early stages, researchers have examined the differences between d/hh students who had early versus late exposure to language for a number of years. Mayberry(2007)and Mayberry and Lock(2003), for instance, documented differences in language development and language outcomes for children who were exposed to ASL early in life as compared to those exposed to ASL later. However, such differences are not only present in those who go on to use ASL: there is also potential for children with even a mild to moderate hearing loss and who use primarily or only spoken language to experience the effects of language delay (Halliday, Tuomainen, and Rosen,2017). Other researchers have found a strong relationship between language proficiency (regardless of modality) and literacy among older d/hh learners. Together, these bodies of literature suggest a strong need for accessible exposure to language from birth. The important research documenting the effects of language delay or deprivation on literacy development is of paramount importance to the field. However, the research base is still limited in terms of our knowledge of language and communication interventions that may be most effective for those children who do not receive the ideal early language exposure. Below, we explore the development of and instruction in the most common modes of communication for d/hh children. We have broken these into two major areas: the use of natural languages, such as ASL and spoken English are explored first. These are grouped together because they are both languages that can be naturally acquired and are full and independent languages. Then, we examine what is known about systems that involve spoken language and visual supports, specifically signed versions of English and cued speech. These are grouped together because they are systems of communication that have been created to support the learning of a natural language (English) among d/hh children. Neither of these are a language in their own right, but are tools that have the goal of making English more accessible and visual. Natural languages and visual systems differ in how they develop, but users of both have the goal of providing d/hh children with educational experiences that will support their development of both language and literacy skills.

3.5.6 Review on related literature related to Spoken Language Development:

In this section, we summarize existing studies on the development of listening and spoken language (LSL) skills among d/hh students, beginning with predictors of proficiency and continuing with a summary of studies that explore the impact of various amplification strategies. We then consider potential influences on listening and spoken language development over time, and its relationship to literacy and language proficiency in general.

According to the Gallaudet Research Institute, in 2010, the majority of d/hh children in the United States were educated using spoken English only (53%). Because our knowledge of and discourse around how spoken language develops among d/hh children and the availability of technologies that may support access to speech have both changed dramatically in recent years, this review focuses only on the research published on this topic within the last 20 years. Among studies of language acquisition after cochlear implantation, study designs and salient participant demographics vary widely from longitudinal case studies of a single child (Ertmer, D.J.; Strong, L.M.; Sadagopan, N. 2003) to short-term investigations with multiple children (Vavatzanidis, N.K.; Murbe, D.; Friederici, A.; Hahne, 2015)

Some studies focus on participant language development from as early as seven months old (Cejas, I.; Barker, D.H.; Quittner, A.L.; Niparko, J.K. 2014) while others investigate the period immediately after implantation or several years after implantation up to ages 10–15 (Johnson, C.; Goswani, U. 2010).Other researchers focus on exposure to early intervention rather than age or time relative to implantation (Yanbay, E.; Hickson, L.; Scarinci, N.; Constantinescu, G.; Dettman, S.J. 2014) and thus, include a range of ages and language histories within their samples. These differences in participant age, language history, age of implantation, and time after implantation are sensitive to differences in the exposure to language and language training among participants. Because of the diversity of language and implantation histories among children with cochlear implants (CI), there are no instances of replication or direct extensions of previous studies, which makes it difficult to compare or accumulate findings in efforts to generate cohesive, research-based conclusions about the nature of language development in this diverse population. However, there are some patterns related to language proficiency, the impact of CI and LSL on language acquisition, and the development of phonological awareness through spoken language and its impact on later reading. Findings from recent research suggest that purposeful interactions and early language exposure and learning are important for d/hh students to develop spoken language proficiency. Purposeful

interactions with educators and family members impact the overall language outcomes of d/hh children regardless of when they were identified as having a hearing loss.

However, children who are identified with hearing loss earlier and provided with early intervention services at a younger age demonstrate more robust vocabulary knowledge compared to infants and toddlers identified and enrolled in intervention services later. Likewise, in a study by Miller, Lederberg, and Easterbrooks (2013) of five emergent d/hh readers, the researchers demonstrated the effectiveness of explicit instruction in syllable and onset-rime awareness (Figueras, B.; Edwards, L.; Langdon, D. 2008). This suggests that purposeful interactions and early language exposure are important throughout development and that earlier exposure to these interactions is supportive of early language development. A higher volume of purposeful interactions and language exposure also supports the development of executive function skills. For example, Figueras and colleagues argued that "the behavioral manifestations of EF [executive function] difficulties observable in deaf children are unlikely to be a consequence of deafness per se but rather result from the language delays that are a consequence of the deafness."

This is similar to the language deprivation argument put forth by Hall and colleagues .Therefore, the literature suggests that exposure and interactional experiences are key factors in early language and social development, regardless of how this exposure or experience is achieved or the modality in which it is delivered.

There is great variability regarding the impact of cochlear implants on d/hh children's proficiency and rate of spoken language acquisition; however, the patterns of interactions and language exposure identified above are relevant to CI users, as well. Early identification and access to language impact language acquisition for CI users as they do for the general LSL population. For example, in a study by Figueras and colleagues researchers found strong correlations between executive functioning and spoken language, but no difference between children who used CIs and those that did not. Similarly, Jones and colleagues found that there was no difference in narrative performance between deaf children using hearing aids and those with CI. Further, they found that there was also not a difference based on hearing levels. However, it is documented that the volume of exposure to accessible auditory input produces great variability in results related to children's language acquisition. Taken together, these findings again point to language access and interactions using meaningful language as the salient variables, not merely access to sound. This complex relationship between language, speech, and audition requires nuanced research into how this is related to literacy development. The

relationship between language proficiency and literacy outcomes is well documented (Ching, T.Y.C.; Cupples, L.2015). Therefore, students with complex language histories often demonstrate difficulty when developing literacy. However, there are some areas of literacy where d/hh students demonstrate proficiency on par with hearing peers, such as written expression discourse and phonological awareness among young LSL users. Many studies of literacy achievement examine subtest scores for isolated areas of literacy in order to better understand composite skills of literacy (e.g., phonological awareness, word recognition, vocabulary). For example, Goldberg and Lederberg (2015) found that d/hh preschool children who used amplification and had better phonemic awareness recalled more letter names and letter sounds than their peers with less developed phonemic awareness and that the preschoolers learned letter sounds partly through the use of phonological information contained in letter names (Coryell, J.; Holcomb, T.K.1997).

However, Jones and colleagues found that "deaf children showed equivalent performance to their hearing peers at the macro-level; however, performance on micro-level narrative skills was poorer, and less relevant and detailed answers were provided to the inferencing probe questions than hearing peers." This suggests that relative weaknesses on some literacy-related sub skills may not entirely be indicative of overall literacy proficiency among d/hh students using LSL because of differences in how language is perceived and processed. However, Nelson and Crumpton demonstrated that "vocabulary awareness was the major predictor of d/hh students' [using LSL] listening comprehension, reading comprehension, and nonword spelling skills:: [and] phonemic awareness skills significantly contributed to their reading decoding.".

Overall, the evidence suggests that regardless of modality, language development has profound implications for the literacy development of d/hh children. Interventions that systematically use ASL to support reading (among signing d/hh students) seem to show promise, though more and rigorous research is needed to fully understand this complex relationship between languages and modalities. In general, earlier exposure to an accessible language seems to be key for supporting language development and later literacy skills. In the section that follows, we turn our attention to visual systems that have been invented with the purpose of supporting the English language development of d/hh children, specifically the research available on signed forms of English and on cued speech.

3.5.7 Review on related literature related to Systems Combining Spoken Language with Visual Codes:

The second popular method for exposing d/hh children to a means of communication is through the use of invented communication systems that seek to represent English visually in order to make it more accessible to this population. There are two more frequently-used communication systems used with d/hh children. The first is the use of signed representations of English, which to greater and lesser extents use invented signs to express morphemes and words from English that did not have natural sign language equivalents. These systems also use signs borrowed from ASL, but which are presented in English word order. The second is cued speech, which is an invented system of hand positions placed systematically around the face to disambiguate phonemes in English to assist with speech reading.

3.5.8 Sign Systems' Development and Intervention

In this section, we explore the literature available on signing systems that were created and intended to be representations of English expressed via the visual modality. Unlike the research with ASL and spoken English, there has not been as much new research on sign a system in recent years. As a result, we included all available research on sign systems, how they develop, and interventions to support their use here. Sign systems are artificially-derived forms of English expressed using signs, some borrowed from ASL and some invented to differentiate between similar English words or to express words in English that did not previously have a sign equivalent (Luetke-Stahlman, B.1996 & Bennett, J.G.; Gardner, R., III; Leighner, R.; Clancy, S.; Garner, J.2014). There are a number of different sign systems, such as Signing Exact English, Seeing Essential English, Manually-Coded English, and Pidgin Sign English. Though each of these systems has features that make it distinct from the others, they are all representations of English conveyed through the signing modality; therefore, we review the research available on each of them together. According to the Gallaudet Research Institute, in 2010, 12.1% of d/hh students were educated in classrooms that used sign-supported spoken language. Though this statistic may under-represent the number of students who are taught using signed English, it is the nearest approximation available. The data-driven research available across all of these systems is somewhat dated, but includes single case intervention studies, small-scale pilot studies, larger group designs, surveys, and one quasi-experimental study. While some researchers have completed

studies with the intention of testing what type of communication is more accessible or preferable for use with d/hh children (signing systems, ASL, or written English), because the purpose of this article is to explore outcomes related to language development or impacts on literacy based on signing system usage, we do not include articles of this type in this review. The purpose of sign systems was to support the development of English language skills among d/hh students. The reasoning behind this was that because d/hh children did not have auditory access to English, providing a pathway to English that relied on the eyes instead of the ears may provide the accessible input necessary for language acquisition. Some researchers specifically felt that the use of signing systems held particular promise for conveying English morphemes. This resulted in a great deal of debate among researchers and others, starting in earnest regarding whether the potential exists to learn an auditory language through visual channels. Some have argued that a contact version of a signed English system may be useful in codes witching between ASL and print English or for teaching English grammar or as a tool to support communication among children with cochlear implants. However, others have posited that signed English systems used in classrooms are frequently ungrammatical in both English and in ASL, thus sending a confusing linguistic message to children. In fact, in a study of preschool-age children, researchers found that d/hh students interacted more during a storytelling activity that was in ASL or contained ASL-like signing as compared to storytelling activities using strict signed English. There is also evidence that teachers using signed English tended to use fewer complex grammatical structures as compared to teachers who were just speaking in English. This could be due to the cognitive strain of attempting to use multiple modalities of expression simultaneously. Critically, evidence has shown that even among teachers who had high levels of proficiency in signed English, at best, they were found to be only 86% accurate in their representation of English using this system. Like all languages and communication systems, there is an issue of complete and accessible opportunities for exposure among d/hh children for signed English. Overall, there have been a limited number of studies that systematically examined the relationship between signing systems and English knowledge or reading comprehension. Studies investigating the impact of using signing systems on literacy achievement have produced mixed results. For instance, one study found a correlation between signed English proficiency and reading comprehension .However, other studies suggested that poor achievement in English syntactical knowledge among

d/hh children who were educated using a signed English system meant that signed English was ineffective at supporting the development of English syntactic understanding. Others have found that students raised in signed English environments showed typical development in terms of lexical and syntactic skills, but a significant deficit in morphological knowledge, an important facet of language development [58]. Longitudinally, time in a signed English program was not predictive of English skill among a group of d/hh students, suggesting that exposure over time to signed English may not support the development of English grammatical understanding . More recently, researchers found significant variability in the overall language and literacy abilities of d/hh learners who use signed English, ranging from two standard deviations below the mean to at or above the mean . Problematically, in this line of research, assessments of language development (i.e., the Clinical Evaluation of Language Fundamentals [CELF]) administered using simultaneous communication were found to be predictive of reading scores, but these findings cannot distinguish between the effects of mastery of signed English versus general mastery of English. Therefore, it is difficult to ascertain whether signing systems specifically are related to these scores.

In perhaps the only study explicitly examining the effects of an intervention using signed English, Bennett and colleagues found using single case research that four children were able to correctly articulate signed English sentences following English grammar after an intervention that explicitly taught English grammatical structures via simultaneous communication. Unfortunately, this study did not include a measure of comprehension, meaning that participants could have learned to copy the pattern without necessarily acquiring a deeper understanding of the syntax. Similarly, incorporating signed English pictures into written texts appeared to increase d/hh students' comprehension; however, it is unclear whether it was the presence of the signs at all compared to the signs specifically being signed English that provided the scaffolding students needed to access the texts. The research exploring signed English systems is limited in that, although colloquially, many in the field use the term signed English as a "catch-all" for all signing systems, these studies explored different manifestations of signed English systems that may be more or less comparable to one another. In general, the findings do not tell a generalizable story: some found higher achievement in some areas after instruction in signed English, while others found lower achievement or areas of significant difficulty. In many cases,

it is difficult to tease apart the effect of the presence of signs in general versus the specific use of signed English as the causal factor contributing to children's development of English knowledge.

3.6 Processing sign languages in early years: Neural reorganization; Access to age appropriate language; Ease of intake; Universal grammar; Modality dependent versus modality independent components

Development for children with hearing impairment differs greatly from children born with normal hearing. Children with normal hearing will learn the sound of their mother and fathers voice, and learn to cry when they are hungry to let their parents know to feed them. Beginning at birth a baby frequently communicates with his or her caretakers, by using sounds to do so. Children are able to learn and take in their environment while adapting to constant change in their development.

During this time they are able to take in new languages; this time is crucial in their language development because they have to be constantly learning. As children develop they go through different stages of learning words and beginning to talk. Around 4-6 months babies start to become more responsive usually starting to understand the word "no" they also begin to start babbling. Babbling, or baby talk, is referred to as when the infant begins experimenting with uttering sounds. It can be described as, "a speech-based phenomenon that reflects the maturation of the articulatory apparatus responsible for spoken language production" (Petitto, 2005).

Babbling is usually in repetition for vowel-consonant combination like ba ba ba. At about 7-12 months their development has strongly increased since birth. At this age they know familiar faces and their babbling changes into using first words. At one-two years of age the child may start to use short sentences and they also can start to follow simple commands. During this time the child will like to listen to stories and will enjoy them repeated several times. Between the ages of two-three, a child will start being able to understand more complex commands and their vocabulary should be expanding during this age.

Throughout this period of development it is common that parents might start noticing some speech errors while the child is communicating. During this age it is normal for speech errors to occur as the child's language starts to develop. From ages three to four children start attending preschool. Their sentences should be much longer then years past and they should be able to understand questions. From ages four to five years old a stranger should be able to understand about 90% of

what the child is saying. A child at this age should be able to speak fluently and should be clear in what they are saying. Although not all children will develop along these exact times, it is important for a child to be around these ages in their development (Owens, 2012). If the child is not developing along this developmental time frame it could be cause for concern for language disorders.

3.6.1 Speech and Language Development children with deafness:

Baby signing:

Deaf children usually do not speak at the normal developmental time period. Children who are born deaf have no way of knowing what an auditory language sounds like and do not know how to imitate words. Then it is important for parents or caregivers to begin teaching their child Sign Language and help the child to develop their communication. Baby signing is a great way to get a head start on a child's communication. It is a type of sign language infants can use in order to communicate with their caregivers. Even though baby signing could be confused with Sign Language it is considered a simpler form of Sign Language. The reason that babies do not use the complete form of Sign Language is because they do not have the fine motor skills yet and caregivers may not be fluent in Sign Language, thus not exposed to the full and complex language structure. Baby signing is used because it teaches simple words that are functional for a child to use in their environment (milk, more, tired, etc.). Baby signing is a great way of communication for baby and caregiver because the infant can express their needs before they start using words. This makes the infant less frustrated and it helps the parent have a better understanding of their child's wants. Parents have found that baby signing can be extremely helpful during these early times in development (Pizer, 2007).

Neural reorganization:

Neural plasticity is the functional and structural reorganization of the brain in response to a given event or set of events. These can arise from physiological or developmental processes or damage and can be mediated by cognitive or sensory mechanisms. In congenitally deaf people, neural plasticity has been observed in the superior temporal cortex (STC) a region that is associated with auditory and speech sound processing. Although sensory deprivation triggers the reorganization of the cortex, the origin of the anatomical and functional changes observed in the superior temporal cortex of deaf individuals is not only sensory, but also cognitive, as they cannot acquire language through sound, and visual communication strategies, such as the use of sign language and speech reading, need to be developed. Understanding the differential contribution of sensory and cognitive experience to

neural reorganization is fundamental for establishing the relationship between plasticity and underlying functional specialization.

Sign languages have developed naturally in deaf communities. Like spoken languages, they are organized at phonological, morphological, syntactic and semantic levels. Not only do auditory deprivation and language experience mediate plastic changes in deaf individuals, but the robust left-hemisphere involvement in language potentially allows a clear anatomical segregation between them: as the left STC is involved in the processing of language independently of modality, plastic changes in this region are likely to be mediated by mechanisms supporting the development and acquisition of sign language, and not by general visual processing effects; this constraint may not be true of the right STC. Studying neural reorganization in deaf brains allows us to disentangle plastic changes, and their interaction, both when they are due to life-long sensory-motor adaptation to auditory deprivation, and when they are due to life-long sign language experience. Several research findings reveal that plastic effects in the left STC have a linguistic origin, and are shaped by sign language experience, whereas the right STC also shows plasticity due to sensory deprivation. So we may conclude that sensory and cognitive factors cause plasticity in anatomically and functionally distinguishable substrates, and that after plastic reorganization, cortical regions preserve the nature of the computation they perform both at a sensory and cognitive level.

3.6.2 Access to age appropriate language and ease of intake:

In Western countries, it is founded that only 5–10% of deaf children are born to deaf parents or in an environment where there is adequate sign language input for the child to develop language competence in a natural way (Neidle et al., 2000; Mitchell and Karchmer, 2004). This means that the remaining 90–95% of deaf children at birth is not surrounded by a natural language in the visual-gestural modality, which is fully accessible to them, but rather by spoken language. A variety of factors determines the language acquisition path for them: (1) hearing parents can decide to learn and use sign language themselves with the child (Chen-Pichler and Lillo-Martin, 2018); (2) parents can choose a schooling model that favors interaction and instruction in sign language to different degrees (3) parents are often confronted with the choice of giving their child a cochlear implant that will facilitate access to the spoken language signal after regular and intensive training. These elements make it evident that for most deaf children access to language during the critical period will be uncertain and in any event more incomplete or degraded than in the default case where rich language input is part of the environment. Take for instance the favorable, albeit uncommon, case where parents

decide to use sign language with the child and choose for a day care and school that offers a bimodal bilingual approach: even in this favorable case, most adult language models will be non-native (hearing parents, hearing teachers and classroom interpreters that learn sign language as a second language) and some of them will use mixed forms of language (in general, spoken structure imposed on sign), thus providing an input that is strictly speaking qualitatively different from the native one. The obvious consequence of this situation is that the majorities of signers in Deaf communities have acquired their sign language under such special circumstances and do not fall under the strict definition of native speakers or signers. To this we must add the fact that regular contact with sign language may happen at different stages in life and it is quite common for deaf children to be initially raised only with spoken language and for them to be exposed to sign language past the first year of life, turning them technically into early or late learners of what normally becomes their main language of communication. In this situation, it is quite often the case that access to spoken language is so limited in early life that late acquisition of a sign language is not second language learning, but simply delayed in first language learning at an abnormal age (late childhood, adolescence, or adulthood), leading to abnormal neurological mappings of language (Mayberry, 2010; Mayberry and Kluender, 2017; Woll, 2018). Research has confirmed the expectation that such different paths of language acquisition should impact on language competence (Boudreault and Mayberry, 2006; Cormier et al., 2012; Skotara et al., 2012; Hänel-Faulhaber et al., 2014, 2018, unpublished; Lillo-Martin, 2018).

Next to such a typical language acquisition paths, linguistic research must also take into account that most deaf signers have bilingual competence as a result of spoken language acquisition to varying degrees, even if it is the language acquired first chronologically. Nowadays spoken language competence in signers takes two different paths: mostly competence in the written form, as a result of schooling and interaction with the ambient hearing society; competence in the spoken modality because of the spreading of cochlear implants, which typically involves mainstreaming in education and intensive speech therapy. In this picture, post lingual deaf children constitute yet another case, as they will have acquired spoken language for the most part when they lose their hearing, thus being able to rely on full-fledged language acquisition during the first year of life as base for subsequent sign language acquisition. For linguistic research, they also required (3) capability to make grammaticality judgments with ease. Freel et al. (2011) also establish this age limit of 3 years in the acquisition of sign language in order to count someone as native signer. Such accommodations seem desirable in practical terms, but it might be the

case that even with these slight departures from strict native hood, it is still hard to find sign language consultants, given their scarcity in some areas.

Grammar:

Sign languages employ various articulators such as the hands, the upper part of the body, the head, and the face to express grammatical features simultaneously. It uses the geometrical properties of the signing space to realize morphological. syntactic, semantic, and pragmatic categories in the three-dimensional signing space (Engberg-Pedersen, 1993; Padden, 1998; Aronoff et al., 2005; Pfau and Steinbach, 2016; Steinbach and Onea, 2016). Sign languages grammaticalize and integrate gestural elements, since sign languages and manual as well as non-manual gesture use the same modality. As a consequence, the interface between these two systems is permeable (Liddell and Metzger, 1998; Emmorey, 1999; Liddell, 2003; Pfau and Steinbach, 2011; Grosvald et al., 2012; Goldin-Meadow and Brentari, 2017) and leads to a more prominent presence of iconicity at different grammatical levels (Taub, 2012). By contrast, there is much less transparency between the signals used in auditory communication and their meaning (Schlenker, 2018).

Modality components:

Sign and spoken languages use two different modalities, the visual-gestural modality of sign languages and the oral-auditory modality of spoken languages. Although the two modalities clearly differ in the production and perception of communicative signals, the underlying linguistic structures seem to be very similar across both modalities (Meier, 2002, 2012; Sandler and Lillo-Martin, 2006). In addition, psycho and neuro-linguistic studies with non-impaired and impaired deaf signers show that sign languages access the same neural networks involved in auditory speech processing, albeit with some concrete modality-specific features (Poizner et al., 1987; Emmorey, 2002, 2003; Corina and Knapp, 2006; Campbell et al., 2008; Corina and Spotswood, 2012; Dye, 2012; Woll, 2012).

3.7 Studying language assessment component in ICF and Recommendations related to language assessment reflecting in National Curriculum Framework (NCF)

3.7.1 Studying language assessment component in ICF:

The International Classification of Functioning, Disability and Health, known more commonly as ICF, classified health and health-related domains. As the functioning and disability of an individual occurs in a context, ICF also includes a list of

environmental factors. It also measure health and disability at both individual and population levels. ICF was officially endorsed by all 191 WHO Member States in the Fifty-fourth World Health Assembly on 21st May 2001, taken the international standard to describe and measure health and disability.

ICF is operationalized through the **Second Edition of WHO Disability Assessment Schedule** (WHODAS 2.0). It was developed through a collaborative international approach with the aim of developing a single generic instrument for assessing health status and disability across different cultures and settings.

Descriptors	**Components of Assessment & Analysis of Capacity & Performance**
Purposeful Sensory Experiences Listening ***Learning and Applying Knowledge*** learning to reading copying solving simple problems ***Communication*** receive spoken receive non-verbal speaking producing nonverbal receive/produce ASL conversation ***Interactions and Relationships*** complex interpersonal informal social relationships family relationships	• Yearly formal assessment of auditory comprehension of language • Document continued typical growth in first language ASL skills for semantics, grammar/morphological, syntax, pragmatics, conversation, Metacognitive/play • Assess ab ove ASL skills with parents in the interactions • Assess spoken English skills : receptive & expressive semantics, grammar/morphological, syntax, pragmatics, conversation, metacognitive/play

Impairment-based goals/Build Capacity:

- Increase spoken English vocabulary, grammar/morpheme development, syntactic complexity: present and past verb tenses, prepositions and prepositional phrases, descriptive vocabulary, question forms
- Increase skills in social language and conversation for spoken English
- Improve ability to initiate interactions appropriately in both languages

Socially-based goals/ Build Performance for Participation:

- Use more complete spoken English sentences with enough information for turn-taking with partner in a conversation
- Ask friends to play and tell them what he is doing
- Ask friends what they are doing and join into their play

- Make a simple play plan with friends with pretend roles and sequence
- Participate with friends in songs, finger plays, and nursery rhymes; act them out with props; Imitate and then independently sing songs and finger plays with movements or signs
- Problem solve and negotiate with peers during play

Activity & Participation: Profoundly Deaf Child

Descriptors	Components of Assessment & Analysis of Capacity & Performance
Communication • producing/receiving non-verbal messages • Receiving messages in formal sign language • Producing messages in formal sign language • Conversation **Interactions and Relationships** • Complex: forming relationships • Informal social: friends • Family relationships **Learning** • Learning to read • Learning to write • Rehearsing • Copying **Self-Care** • Maintaining health	• Document ASL vocabulary & grammar skills • Assess ability to answer questions at varying levels of abstraction • Document relevancy of T's comments in conversation • Document frequency of conversations T initiates and number of turns in conversations • Compare performance at home & school; & performance between adults & peers • Monitor parents 'development of ASL • Document development of relating past events (reports who, where, when, what) • Document # of elements included in story retells • Document how he accesses his nurse

Activity & Participation: Profoundly Deaf Child

(Impairment-Based Goals to Build Capacity)

- Increase ASL vocabulary and syntactic complexity (including classifier phrases)
- Relate present & past experiences reporting who, where, what, when
- Determine if he has enough information to do activity
- Develop more elaborate play scripts (sequence, roles)
- With picture support retell/act out stories that have been read/told
- Develop sight word vocabulary
- Identity what a letter, word, sentence,
- Identify letters with mouth shapes; identify letters with hand shapes
- Lip read peoples' names
- Write sight word vocabulary

Activity & Participation: Profoundly Deaf Child

(Socially-Based Goals/Build Performance for Participation)

- Use whole body strategies & sign modifications to compensate for lack of facial cues in communicating
- Tell ASL classifier stories (whole entity classifiers, instrumental, physical characteristics)
- Ask clarifying questions to adults & peers
- Determine who has needed information
- Ask peers to play; tell peers what he's doing
- Begin conversations with peers
- Maintain turn-taking in conversation with peers
- Age appropriate use of interpreter
- Ask Nurse for help with health care at school

India - A Linguistic Giant

Our language scenario has tempted researchers to call India variously as a "sociolinguistic area" "a linguistic giant" and a "language laboratory". The multilingual and pluricultural nature of our society makes it clear that we need more than one language for 'national cohesion', 'cultural integration' and 'social area mobility'. Different languages have different roles to play; they are complementary. The imagery of 'salad bowl' is appropriate: each language has its characteristic features and contributes to the richness of the overall pattern.

India is a country in which the Indo European family of languages is spoken mostly in north and central India. Of this group, 54 languages constitute 3/4 of the Indian population. About 1/4 of languages i.e. 20 belong to South India of Dravidian family. In Assam 20 languages are spoken. In northeast India 98 languages are spoken, even though its population density is much less than that of other states of the country. In total therefore, in the NE 118 languages are spoken. In this context, the role of Hindi and English becomes very important. In spite of all this diversity, it is to be acknowledged that Indian languages have been gaining through tourists, media, print and electronic, and other sources.

Therefore, what should a language teacher or a teacher of any other subject know about the language he/she is teaching in? Obviously, that the teacher has to be fluent in the language being used and can handle it with ease. The teacher has to be effective and economical given our limited time and facilities.

NCF 2005 Gives a Fresh Impetus to Language Education:

1. A renewed attempt should be made to implement the three language formula.
2. Children's mother tongues, including tribal languages should be considered as the best medium of instruction.
3. Proficiency in multiple languages including English should be encouraged in children.
4. Reading should be emphasized throughout the primary classes.

Culture and language are intermingled. NCF 2005 advocates an interdisciplinary approach. However, teachers of different subjects do not discuss these matters. Language can relate all the subjects, as it is the heart of education so is the heart of children. Centrality of language, and achieving it would be a great milestone.

The three-language formula is an attempt to address the challenges and opportunities of the linguistic situation in India. The primary aim of the formula is to promote multilingualism and national harmony.

Home Language/ First Language/ Regional Language / Mother Tongue:

Primary school education must be covered through the home language(s). It is imperative that we honour the child's home language(s). According to Article 350A of our Constitution, 'It shall be the endeavour of every State and of every local authority within the State to provide adequate facilities for instruction in the mother tongue at the primary stage of education to children belonging to linguistic minority groups." In the non-Hindi speaking states, children learn Hindi. In the case of Hindi speaking states, children learn a language not spoken in their area. Sanskrit may also be studied as a modern Indian language in addition to these languages.

Care must be taken to honour and respect the child's home languages / mother tongues. At the primary stage, child's language(s) must be accepted as they are, with no attempt to correct them. It is known that errors are a necessary part of the process of learning and that children will correct themselves only when they are ready to. We have to spend time by providing children comprehensible, interesting and challenging inputs.

While children come to school equipped with basic interpersonal communicative skills, they need to acquire cognitively advanced levels of language proficiency. In addition, higher-level proficiency skills easily transfer from one language to another. It is thus imperative that we do everything we can to strengthen the sustained learning of Indian languages at school.

Second Language – English:

The goals for second language curriculum are twofold: attainment of a basic proficiency such as is acquired in natural language learning and the development of language into an instrument for abstract thought and knowledge acquisition through literacy improving linguistic skills in one language improves it in others, while reading failure in one's own languages adversely affects second language reading. Other Indian languages need to be valorized to reduce the perceived hegemony of English.

Home Language and School / Standard Language:

A child acquires his / her home language, naturally through larger kinship groups, street and neighborhood and societal environment. Children are born with an innate language facility, and research has shown that Indians have a flair for languages. (domestic help, multilingual beggars, tsunami spoilers, spelling bees, scrabble)They internalize an extremely complex system of language before they come to school.

They come armed with 2/3 languages of which we do not make use, we do not exploit them.

Languages provide a bank of memories and symbols inherited from fellow speakers and created in their own lifetime. It is a medium through which knowledge is constructed. Language is identity. Let us first recognize this inbuilt language potential of our children as well as remember that languages get socio culturally constructed and change our daily lives.

There is a difference between dialect and language. Similarly, the language spoken at home is different from the one spoken in the school, which is usually the standard language, though there is much give and take between the two. For instance, standard Hindi has been derived from Khari Boli. Sometimes, the converse is also true, Avadhi, Brij, Maithili, Bhojpuri were fully developed languages once, now they are dialects. Whenever the child enters the school in his / her locality it is assumed that his/her first language, or mother tongue is the one spoken in the school, which may not always be true. Therefore, the child is educated in the standard form of the language. In such a situation the child is placed in a dilemma as to which language is to be used or which one is correct. At home, e.g., the student may use Brij, but in the school he / she learn standard Hindi, which is different. Other subjects taught through the medium of Hindi also use its standard form.

Multilingualism - A Resource:

A creative language teacher must use multilingualism, a typical feature of the Indian linguistic landscape, as a classroom strategy and a goal. This is also a way of ensuring that every child feels secure and accepted, and that no one is left behind on account of his / her linguistic background. Language subsumes multilingualism / bilingualism. Multilingualism - where each language is assigned its own distinctive societal functions - may be the wave of the future. The Constitution of India perceives multilingualism as a resource. We should talk about medium of education instead of medium of instruction. The need is to explore the role of language in education and the role of language in a child's life, since language is not content, but language gives life to content. Studies have shown that bilingual or multilingual people are capable of greater cognitive flexibility and creativity, and perform better academically than monolinguals. Polyglots may be polymaths as well. Perhaps it is the ability to switch codes that comes from knowing more than one language. Bilingualism / multilingualism confer definite cognitive advantages.

Braille, Sign language:

Languages would ideally build on this resource, and would strive it through the development of literacy scripts including Braille for the acquisition of academic knowledge. Children with language-related impairments might be introduced to standard sign languages, which can support their continued growth and development to the fullest. Studying sign language and Braille could be included as options for learners without disabilities.

3.7.2 Recommendations related to language assessment reflecting in National Curriculum Framework (NCF):

Language evaluation need not be tied to "achievement" with respect to particular syllabi, but must be reoriented to the measurement of language proficiency. Evaluation is to be made an enabling factor for learning rather than an impediment. Ongoing assessment could document a learner's progress through the portfolio mode. National benchmarks for English language proficiency would help greatly in achieving certain basic standards. English is perceived to open up opportunities.

A student may be allowed to 'pass without English' if an alternative route for English certification (and therefore instruction) can be provided outside the regular school curriculum. The transfer of skills could be achieved from one language to another. In this context the objective of teaching languages is not simply to make the students learn language skills but to enable them to play their communicative roles effectively and select languages from their linguistic repertoire and within those chosen, select registers and styles, befitting the roles they are playing.

Conclusion

The right to choose any language is fundamental for searching for and earning the right to livelihood. More so in a globalized world, whose opportunities are to be availed of with the skills one possesses, may be, as language teachers. For instance, the culture of the English speaking may be dominant but English is no longer a political instrument of the downtrodden. Today proficiency in the language is a skill, liquid assets and financial gains for educators in India and abroad. Language as a constellation of skills, thought encoders and markers of identity cuts across school subjects and disciplines. Language has to be maintained as a marketable skill. And therefore, he / she who can will talk his / her way in a world of global opportunities.

3.8 Let us sum up

In unit 3.1 we thoroughly studied the parameters of selecting medium of instruction for CWHI at home, school & society. After that we go through the challenges and concerns related to language assessment of the deaf, problems faced by assessor while using standardized and teacher made tools, setting norms of children 'with' versus 'without' disability; measuring receptive language etc. In unit 3.3 we again able to comprehend the biological foundations and related research in early language experiences of deaf. We also able to know the neural reorganization; access to age appropriate language and Ease of intake; grammar; and modality components of sign language, At the end we also comprehend the recommendations made in National Curriculum Framework (NCF) related to language assessment and language assessment component in ICF.

3.9 Unit end exercises

1. Describe the parameters of selecting medium of language instruction for children with hearing impairment at home, school & society.
2. Critically analyze the challenges and concerns related to language assessment of the deaf.
3. Explain biological foundation of language.
4. Illustrate the processing of sign language in early years within deaf individuals.
5. Describe the recommendations made in National Curriculum Framework (NCF) related to language assessment.

3.10. References & Links:

American Psychological Association Procedural Manual and Guide for the Standardized Application of the ICF: http://www.apa.org/monitor/jan06/changing.aspx

Australian ICF-related data standards: http://meteor.aihw.gov.au/content/index.phtml/itemId/320319

Hollenweger, J., Lienhard, P. (2007). Schulische Standortgespräche. EinVerfahren zur Förderplanung und Zuweisung von sonderpädagogischen Massnahmen. Bildungsdirektion des Kantons Zürich. Zürich: Lehrmittelverlag des Kantons Zürich.

Hurst R 2003. The international disability rights movement and the ICF. Disability and Rehabilitation Vol 25, No, 11- 12, 572-576 ICF checklist: http://www.who.int/classifications/icf/training/icfchecklist.pdf

Martinuzzi, A, Salghetti, A, Betto, S, et al. (2010). The international classification of functioning disability and health, version for children and youth as a road-map for projecting and programming rehabilitation in a neuropaediatric hospital unit.

J Rehabil Med 42: 49-55 Stucki G, Reinhardt JD, Grimby G, Melvin J 2007. Developing 'human functioning and rehabilitation research' from the comprehensive perspective.

J Rehabil Med 2007; 39: 665-671 United Nations 2006. Convention on the Rights of Persons with Disabilities. http://www.un.org/disabilities/default.asp?navid=12&pid=150

Veitch C, Madden R, Britt H, Kuipers P, Brentnall J, Madden R, Georgiou A, Llewellyn G 2009. Using ICF and ICPC in primary health care provision and evaluation: http://www.who.int/classifications/network/WHOFIC2009_D009p_Veitch.pdf

Washington Group on Disability Statistics http://unstats.un.org/unsd/methods/citygroup/washington.htm

WHODAS2 http://www.who.int/classifications/icf/whodasii/en/index.html WHO Family of International Classifications http://www.who.int/classifications/en/

WHO Family of International Classifications Network (including a list of Collaborating Centres): http://www.who.int/classifications/network/en/

World Health Organization 2001. ICF browser: http://apps.who.int/classifications/icfbrowser/ World Health Organization 2001. The International Classification of Functioning, Disability and Health (ICF).

Geneva: WHO. http://www.who.int/classifications/icf/en/

World Health Organization (2007) The International Classification of Functioning, Disability and Health, Children and Youth version Geneva: WHO. http://www.who.int/classifications/icf/en/ FURTHER INFORMATION AND RESOURCES.

Boothroyd A. (2000). Management of hearing loss in children: no simple solutions. In: Seewald RC, editor. A sound foundation through early amplification.

Proceedings of an international conference. Staefa, Switzerland: Phonak AG. p 1–12.

Brackett D, Zara C. (1998). Communication outcomes related to early implantation. Am J Otol 19: 453–460.

Carney A, Moeller MP. (1998). Treatment efficacy: hearing loss in children. J Speech Lang Hear Res 41:S61–S84.

Geers A, Moog J, Schick B. (1984). Acquisition of spoken and signed English by profoundly deaf children. J Speech Hear Dis 49: 378–388.

Geers AE, Moog JS. (1992). Speech perception and production skills of students with impaired hearing from oral and total communication education settings. J Speech Hear Res 35: 1384–1393.

Greenberg MT. (1983). Family stress and child competence: the effects of early intervention for families with deaf infants. American Annals for Deaf 128:407–417.

Greenberg MT, Calderon R, Kusche C. (1984). Early intervention using simultaneous communication with deaf infants: the effect on communication development. Child Dev. 55:607–616.

Harrison M, Roush J. (1996). Age of suspicion, identification and intervention for infants and young children with hearing loss: a national study. Ear Hear 17: 55–62.

Harrison M, Roush J. Wallace J. (2003). Trends in age of identification and intervention in infants with hearing loss. Ear Hear 24:89 –95.

Kuntze, M. (1998). Literacy and Deaf children: The language question. Topics in Language Disorders, 18(4), 1–15.

Markides A. (1988). Speech intelligibility: auditory oral approach versus total communication. J Brit Assoc Teachers Deaf 12:136 –141.

Marschark, M. (2001). Language development in children who are deaf: A research synthesis. Alexandria, VA: National Association of State Directors of Special Education. ERIC ED 455 620

Moeller MP. (2000). Early intervention and language development in children who are deaf and hard of hearing. Pediatrics 106:E43.

Nikolopoulos TP, O'Donoghue GM, Archbold S. (1999). Age at implantation: its importance in pediatric cochlear implantation. Laryngoscope 109: 595–599.

Ramkalawan TW, Davis AC. (1992). The effects of hearing loss and age of intervention on some language metrics in young hearing-impaired children. Brit J Audio 26:97–107.

Tye-Murray N. (1998). Intervention plans for children. In: Tye-Murray N. Foundations of aural rehabilitation. San Diego: Singular. P 381–413.

Watkins S. (1987). Long term effects of home intervention with hearing-impaired children. American Annals for Deaf 132:267–271.

Yoshinaga-Itano C, Sedey A, Coulter DK, et al. (1998). Language of early and later identified children with hearing loss. Pediatrics 102:1161–1171.

Anderson D, Reilly J. The MacArthur communicative development inventory: Normative data for American Sign Language, Journal of Deaf Studies and Deaf Education, 2002, vol. 7 (pg. 83-106)

Braden, J.P. Hard of hearing and deaf clients: Using the WISC-IV with clients who are hard of hearing or deaf. In WISC-IV: Clinical Use and Interpretation; Scientist-Practitioner Perspectives; Priftera, A., Saklofske, D.H., Weiss, L.G., Eds.; Elsevier Academic Press: London, UK, 2005; pp. 352–381.

Boudreault P, Mayberry RI. Grammatical processing in American Sign Language: Age of first-language acquisition effects in relation to syntactic structure, Language and Cognitive Processes, 2006, vol. 21 (pg. 608-635)

Herman R, Holmes S, Woll B., Assessing BSL development—Receptive skills test, 1999Coleford, EnglandForest Bookshop

Herman R, Roy P. Evidence from the wider use of the BSL receptive skills test, Deafness and Education International , 2006, vol. 8 (pg. 33-47)

Hoiting N. Schick B, Marschark M, Spencer P. Deaf children are verb attenders: Early sign vocabulary development in Dutch toddlers, Advances in sign language development of deaf children, 2005New YorkOxford University Press (pg. 161-188)

https://successforkidswithhearingloss.com/for-professionals/assessment-of-student-skills-challenges-needs/

Johnson T. The assessment and achievement of proficiency in a native sign language within a sign bilingual program: The pilot Auslan receptive skills test, Deafness and Education International, 2004, vol. 6 (pg. 57-81)

Jamieson, J.R.; Simmons, N.R. Children and youth who are hard of hearing: Hearing accessibility, acoustical context, and development. In The Oxford Handbook of Deaf Studies, Language, and Education; Marschark, M., Spencer, P.E., Eds.; Oxford University Press: Oxford, UK, 2011; Volume 2, pp. 290–305.

Maller S, Singleton J, Suppalla S, Wix T. The development and psychometric properties of the American Sign Language Proficiency Assessment (ASL-PA), Journal of Deaf Studies and Deaf Education, 1999, vol. 4 (pg. 249-269)

Cejas, I.; Barker, D.H.; Quittner, A.L.; Niparko, J.K. Development of joint attention in young deaf and hearing children: Effects of chronological age and language skills. J. Speech Lang. Hear. Res. 2014, 57, 1831–1841

Scott, J.A.; Homeister, R.J. American Sign Language and academic English: Factors influencing the reading of bilingual secondary school deaf and hard of hearing students. J. Deaf Stud. Deaf Educ. 2017, 1, 59–71

Strong, M.; Prinz, P.M. A study of the relationship between American Sign Language and English literacy.J. Deaf Stud. Deaf Educ. 1997, 1, 37–46.

Goldin-Meadow, S.; Mayberry, R. How do profoundly deaf children learn to read? Learn. Disabil. Res. Pract. 2001, 16, 221–228.

Hall, M.; Eigsti, I.; Bortfeld, H.; Lillo-Martin, D. Auditory deprivation does not impair executive function, but language deprivation might: Evidence from a parent-report measure in Deaf native-signing children.J. Deaf Stud. Deaf Educ. 2017, 1, 9–21

Woolfe, T.; Want, S.C.; Siegal, M. Signposts to development: Theory of mind in deaf children. Child Dev. 2002, 3, 768–778.

Henner, J.; Caldwell-Harris, C.L.; Novogrodsky, R.; Homeister, R.J. American Sign Language syntax and analogical reasoning skills are influenced by early acquisition and age of entry to signing schools for the deaf. Front. Psychol. 2017, 7, 1982.

Mayberry, R.I. When timing is everything: Age of first-language acquisition effects on second-language learning. Appl. Psycholinguist. 2007, 28, 537–549.

Mayberry, R.I.; Lock, E. Age constraints on first versus second language acquisition: Evidence for linguistic plasticity and epigenesis. Brain Lang. 2003, 87, 369–384.

Halliday, L.F.; Tuomainen, O.; Rosen, S. Language development and impairment in children with mild to moderate hearing loss. J. Speech Lang. Hear. Res. 2017, 6, 1551–1567.

Johnson, C.; Goswani, U. Phonological awareness, vocabulary, and reading in deaf children with cochlear implants. J. Speech Lang. Hear. Res. 2010, 53, 237–261.

Nelson, N.W.; Crumpton, T. Reading, writing, and spoken language assessment profiles for students who are deaf and hard of hearing compared with students with language learning disabilities. Top. Lang. Disord. 2015, 2, 157–179.

Gallaudet Research Institute. Regional and National Summary Report of Data from the 2009–2010 Annual Survey of Deaf and Hard of Hearing Children and Youth; GRI, Gallaudet University: Washington, DC, USA, 2011.

Ertmer, D.J.; Strong, L.M.; Sadagopan, N. Beginning to communicate after cochlear implantation: Oral language development in a young child. J. Speech Lang. Hear. Res. 2003, 46, 328–340.

Vavatzanidis, N.K.; Murbe, D.; Friederici, A.; Hahne, A. The basis for language acquisition: Congenitally deaf infants discriminate vowel length in the first months after cochlear implantation. J. Cogn. Neurosci. 2015, 12, 2427–2441.

Yanbay, E.; Hickson, L.; Scarinci, N.; Constantinescu, G.; Dettman, S.J. Language outcomes for children with cochlear implants enrolled in different communication programs. Cochlear Implant. Int. 2014, 15, 121–135.

Vohr, B.; Jodoin-Krauzyk Tucker, R.; Johnson, M.; Topol, D.; Ahlgren, M. Early language outcomes of early-identified infants with permanent hearing loss at 12 to 16 months of age. Pediatrics 2008, 3, 535–544.

Figueras, B.; Edwards, L.; Langdon, D. Executive function and language in deaf children. J. Deaf Stud. Deaf Educ. 2008, 3, 363–377. [CrossRef] [PubMed]

Jones, A.C.; Toscano, E.; Botting, N.; Marshall, C.R.; Atkinson, J.R.; Denmark, T.; Herman, R.; Morgan, G. Narrative skills in deaf children who use spoke English: Dissociations between macro and microstructural devices. Res. Dev. Disabil. 2011, 59, 268–282.

Demir-Lira, Ö.E.; Applebaum, L.R.; Goldin-Meadow, S.; Levine, S.C. Parents' early book reading to children: Relation to children's later language and literacy outcomes controlling for other parent language input. Dev. Sci. 2019, e12764.

Ching, T.Y.C.; Cupples, L. Phonological awareness at 5 years of age in children who use hearing aids or cochlear implants. Perspect. Hear. Hear. Disord. Child. 2015, 25, 48–59.

Goldberg, H.R.; Lederberg, A.R. Acquisition of the alphabetic principle in deaf and hard-of-hearing preschoolers: The role of phonology in letter-sound learning. Read. Writ. 2015, 28, 509–525.

Coryell, J.; Holcomb, T.K. The use of sign language and sign systems in facilitating the language acquisition and communication of deaf students. Lang. Speech Hear. Serv. Sch. 1997, 28, 384–394.

Luetke-Stahlman, B.; Milburn, W.O. A history of Seeing Essential English (SEE I). Am. Ann. Deaf 1996, 1, 29–33.

Bennett, J.G.; Gardner, R., III; Leighner, R.; Clancy, S.; Garner, J. Explicitly teaching English through the air to students who are deaf or hard of hearing. Am. Ann. Deaf 2014, 1, 45–58

Moores, D.F.; Sweet, C. Relationships of English grammar and communicative fluency to reading in deaf adolescents. Exceptionality 1990, 2, 97–106.

Schick, B.; Moeller, M.P. What is learnable in manually coded English sign systems? Appl. Psycholinguist.1992, 13, 313–340.

Gaustad, M.G. Longitudinal effects of manual English instruction on deaf childrens' morphological skills.Appl. Psycholinguist. 1986, 7, 101–128.

Geers, A.; Moog, J.; Schick, B. Acquisition of spoken and signed English by profoundly deaf children. J. Speech Hear. Disord. 1984, 4, 378–388. [CrossRef]

Nielsen, D.C.; Luetke, B.; McLean, M.; Stryker, D. The English-language and reading achievement of a cohort of deaf students speaking and signing standard English: A preliminary study. Am. Ann. Deaf 2016, 3,342–368.

Miller, M.; Thomas-Presswood, T.; Metz, K.; Lukomski, J. Psychological and Psychoeducational Assessment of Deaf and Hard of Hearing Children and Adolescents; Gallaudet University Press: Washington, DC, USA, 2016.

Pizzo, L.; Ford, L. Developing a comprehensive linguistic profile to support learning: The assessment of d/deaf and hard of hearing multilingual learners. In Deafness and Diversity Supporting: Learners Who Are d/Deaf or Hard of Hearing Multilingual Learners; Cannon, J., Guardino, C., Eds.; Gallaudet University Press: Washington, DC, USA, in press; Volume 2.

Pizzo, L.; Chilvers, A. Assessment and d/Deaf multilingual learners: Considerations and promising practice. Am. Ann. Deaf 2016, 161, 56–66.

Singleton JL, Supalla S. Marschark M, Spencer P. Assessing children's proficiency in natural signed languages, Oxford handbook of deaf studies, language and education , 2003New York Oxford University Press(pg. 289-302)

Verhoeven L, Vermeer A., Taaltoets alle kinderen [Language test for all children] ,2001Arnhem, The NetherlandsCitogroep

Wood, N.; Dockrell, J. Psychological assessment procedures for assessing deaf or hard-of-hearing children. Educ. Child Psychol. 2010, 27, 11–22.

Zink I, Lejaegere M., N-CDIs: lijsten voor communicatieve ontwikkeling [N-CDIs: Lists for communicative development], 2002Leuven, The Netherlands Acco

Boudreault, P., and Mayberry, R. I. (2006). Grammatical processing in American sign language: age of first-language acquisition effects in relation to syntactic structure. Lang. Cogn. Process. 21, 608–635.

Chen Pichler, D., and Lillo-Martin, D. (2018). "Hearing parents and deaf children learning a sign language together" in Talk at the 4th International Congress on Family-Centered Early Intervention for Children who are Deaf or Hard-of-Hearing ; Bad Ischl, Austria; June 15, 2018.

Cormier, K., Schembri, A., Vinson, D., and Orfanidou, E. (2012). First language acquisition differs from second language acquisition in prelingually deaf signers: evidence from sensitivity to grammaticality judgements in British sign language. Cognition 124, 50–65.

Freel, B. L., Clark, M. D., Anderson, M. L., Gilbert, G. L., Musyoka, M., and Hauser, P. (2011). Deaf individuals' bilingual abilities: american sign language proficiency, reading skills, and family characteristics. Psychology 2, 18–23.

Hänel-Faulhaber, B., Kügow, M., Skotara, N., Salden, U., and Röder, B. (2014). ERP correlates of German sign language processing provide evidence for sensitive/critical periods of language learning. BMC Neurosci. 15:62

Lillo-Martin, D. (2018). Differences and similarities between late first-language and second-language learning. Biling. Lang. Cognit. 21, 924–925

Mayberry, R. I. (2010). "Early language acquisition and adult language ability: what sign language reveals about the critical period for language" in Oxford handbook of deaf studies, language, and education, Vol. 2. eds. M. Marschark, and P. Spencer (Oxford: Oxford University Press), 281–291.

Mayberry, R. I., and Kluender, R. (2017). Rethinking the critical period for language: new insights into an old question from American sign language. Biling. Lang. Cognit. 21, 886–905. doi: 10.1017/s1366728917000724

Mitchell, R. E., and Karchmer, M. A. (2004). Chasing the mythical ten percent: parental hearing status of deaf and hard-of-hearing students in the United States. Sign Lang. Stud. 4, 138–163.

Owens, R. E. (2012). Language development an introduction. Geneseo, NY: State University Press.

Petitto LA. How the brain begets language. In: McGilvray J, editor. The Cambridge Companion to Chomsky. Cambridge, UK: Cambridge University Press; 2005. pp. 84–101.

Pizer, G., Walters, K., & Meier, R. P. (2007). Bringing Up Baby with Baby Signs: Language Ideologies and Socialization in Hearing Families. Sign Language Studies, 7(4), 387-430. Neidle, C., Kegl, J., MacLaughlin, D., Bahan, B., and Lee, R. G. (2000). The syntax of american sign language. Functional categories and hierarchical structure. Cambridge, MA: MIT Press.

Skotara, N., Salden, U., Kügow, M., Hänel-Faulhaber, B., and Röder, B. (2012). ERP correlates of early language deprivation: a comparison of native signers and signers with delayed language acquisition in processing German as L2. BMC Neurosci. 13:44.

Woll, B. (2018). The consequences of very late exposure to BSL as an L1. Biling. Lang. Cognit. 21, 936–937.

Unit-4 ❑ Educational Assessment, Identification And Addressing Needs

Structure

4.1 Introduction

The partial or total inability to hear is termed as hearing loss , also known as hearing impairment. A person with little or no hearing is known as deaf. Hearing loss can be unilateral or bilateral. Hearing loss can affect the ability to learn spoken language and in adults it can create difficulties with social interaction and at work. Hearing loss can be caused by a no. of factors like genetics, ageing, exposure to noise, some infections, birth complications, trauma to ear, and certain medications or toxins being chronic ear infections. Conductive hearing loss, mixed hearing loss and sensory neural hearing loss are the three main types of hearing losses. The increase in intensity of sound above the

usual level necessary before the listener can detect it can categorize the severity of hearing loss. 10% of the total population is globally affected by hearing loss.

There are well established legal requirement for providing comprehensive educational and related services to hearing impaired and deaf children. Children with hearing impairment are included among those with a wide range of handicaps covered under the individuals with disabilities education act of 1975, better known as public law (PL) 92-142. For our purposes, PL 94-142 mandates – the least restrictive, individually appropriate free public education for hearing impaired children from 3 – 21 years old, a provision of the full range of intervention modalities involved in aural rehabilitation and the empowerment of parents with significant input into the child's educational plan. The factors to be considered for optimal educational place go beyond the degree of hearing loss, and issues requiring special needs for issues including the presence of other handicaps, maximization of the child's psychosocial development, family considerations, geographical considerations, and viewpoints about educational approaches for the hearing impairment. A systematic process of documenting and using empirical data on knowledge, skill, attitudes and beliefs to refine programs and improve student leaning is called as educational assessment or educational evaluation.

Those children who cannot benefit fully from the curriculum provided for children of their age or cannot be catered adequately in an ordinary educational setting are considered to have special educational needs. Children with hearing impairment can be considered for special educational needs(SEN children).

4.2 Objective

The objectives of the education of hearing impairment are;

- Helping in Development of full potential by providing learning experiences in school of hearing impaired children,
- Use of residual hearing for the development of speech and language skills to master communication skills in everyday situations of the hearing impaired,
- To help hearing impaired children develop a correct sense of value and citizenship,
- To help hearing impaired children grow up well-adjusted and independent so that they can integrate into society.

4.3 Concept & Principles Of Educational Assessment

Audiology is an education related service along with other related services such as speech language pathology, psychology and occupational therapy. There are definition differences impacting the services given by an audiologists like agency responsibility including the education system of all states and the specified lead agency within each state , identification specifying the use of appropriate screening techniques as a part of identification program, assessment of communication functions as determined by use of audio logic procedures, habituation by orienting about assistive listening devices, direct provision of services, creation , administration of programs to prevent hearing loss, selection and fitting of assistive listening devices along with counseling.

4.5 Principles of Educational Asssessment

The important principles are-

1. VACS
2. SMART

- **V**alid- the work is relevant to the assessment criteria
- **A**uthentic- the work has been produced solely by the learner.
- **C**urrent – the work is still relevant at the time of assessment.
- **S**ufficient- the work covers all the assessment criteria.
- In short, we can say that VACS help in assuring assessment details are accurate
- **S**pecific- the activity relates only to what is being assessed and is clearly stated
- **M**easurable- the activity can be measured against the assessment requirements, allowing any gaps to be identified.
- **A**chievable- goals can be achieved at the right level.
- **R**elevant- the activity is realistic and give consistent result.
- **T**ime bound- the target dates and times can be agreed

4.6 Scope And Priorities In Educational Assessment

Scope and priorities in educational assessment of hearing impaired is more focused on communication access in the school environment extending the traditional clinical evaluation. The goal is not only limited to define the parameters of hearing loss, including the necessary referrals for diagnostic treatment, hearing instrument fittings, but also determining the individual educational implications. Assessment should always include information directly from the child whether as a series of question or play through counseling tools summarizing the individual and environmental assessment areas and recommended procedures. A comprehensive profile of child's auditory abilities as standard measures is included as a part of audiologic assessment of individuals hearing. Information about speech recognition tests in varied acoustic situations, detailed information about speech perception to analyze suprasegmentals and phonetic features of speech, phonemes, words, sentences and discourse as considered as a part of hearing assessment. Otoacoustic emissions test should be used for analyzing the child's integrity of auditory system. Child's personal hearing instruments should also be tested to assure intended benefits. Child's communication in classroom and school environments with teachers and peers is also required for assessing information for assessment of communication access.

Measurement and assessments has always played an important tale in helping man cope with his environment. A task or series of tasks used to obtain systematic observations, that are presumed to be representative of educational or psychological traits are called as tests. Evaluation may be defined as a process through which a value judgment or decision is made from a variety of different measurements or tests.

The purpose of assessment is to obtain relevant and accurate data necessary for making important decisions with least possible error, for planning effective future strategy, the most important to a special educator being in the area of program development, design and remediation.

Educational assessment or educational evaluation is the systematic process of documenting and using empirical data on the knowledge skills, attitudes and beliefs to define programs and improving student learning. Assessment is often used interchangeably with tests, but not limited to tests. Assessment can focus on the individual learner, the learning community, a corse , an academic program, or the educational system as a whole.

IDEA 2004 provides language that impacts the assessment and eligibility determination for all students who are suspected of having a disability. A child may not be determined to be eligible for special education or a child with a disability [Determination of Eligibility: §300.534 (b)(1)(i, ii)] if the determinant factor for that eligibility determination is: · Lack of instruction in reading or math~ or · Limited English proficiency ~ and · The child does not otherwise meet the eligibility standards under §300.7(a). IDEA 2004 addresses the evaluation and assessment of all students [Determination of Needed Evaluation Data §300.533(a)(a)(iiii)] in requiring the assessment and alignment of core curriculum using

Researchbased instructional strategies that are student focused. This would include review of existing evaluation data on the child, including:

- Evaluations and information provided by the parents of the child~ ·
- Current classroombased assessments and observations~.
- Observations by teachers and related services providers

Historical Perspective

Education for students who are deaf or hard of hearing is one of the earliest areas of specialized education in this country. The focus of educational practice has evolved over time between language instruction with emphasis on spoken language to emphasis on using sign language and everything in between. While educators may disagree on methods and practice, all educators agree that language development is the heart of educational need for these children. As an invisible disability, the impact of hearing loss is challenging at best to understand.

In 1817 Thomas Hopkins Gallaudet and Laurent Clerc established the first school for deaf students in the United States~ the American Asylum for the Deaf and Dumb, in Hartford, Connecticut. The first educational programs in the United State were in state schools where most instruction was conducted in American Sign Language and English was taught in its written form. This followed the method of instruction used in France where Clerc, a deaf man, was educated. However, in 1880 the Milan (Italy) Conference voted to ban use of sign language with students worldwide in favor of oral educational techniques viewingsigns as an inferior means of communicating. Throughout the United States, stateschools and private schools changed their educational methods to one of an Auditoryoral approach.

In Tennessee, as in most states, services for students who were deaf or hard of hearing began at the state school for the deaf. The Tennessee School for the Deaf (TSD) opened in 1844 by an act of the state legislature. Today the school offers an individualized and comprehensive educational program. The school provides a total learning environment that utilizes state of the art curricula, materials, and methods to prepare students for adult life. Students from all over the state stay on campus throughout the school year, going home every weekend, for school holidays, and for summer vacation. The school also offers a comprehensive outreach program to assist Local Education Agencies in educating children who are deaf and hearing impaired in the local community.

Educational assessment can be sub divided into-

- Placement, formative, summative and diagnostic assessment
- Objective and subjective
- Referencing
- Informal and formal
- Internal and external

4.7 Methods, Techniques, Tools For Educational Assessment, Reporting Formal And Informal

Types and approaches to educational assessment-

- Formative- summative
- Informal- formal
- Continuous-final
- Process- product
- Divergent- convergent

1. Formative vs. summative assessment

   The assessment that is designed to assist the learning process by providing feedback to the learner, which can be used to identify strengths and weakness and hence improve future performance, is called as formative assessment.it is most appropriate when the results are to be used internally by those involved in learning

process.The assessment primarily used to make decisions for grading or determine readiness for progression is called as summative assessment. It usually occurs at the end of an educational activity for judging the learner's overall performance. It helps in providing communication between students and stakeholders.

2. Informal vs. formal assessment-

   Informal assessment is most often used to provide formative feedback in which the judgments are integrated into other tasks.it is comparatively less threatening and less stressful to students but prone to subjective bias.When the students are aware that the task they are doing is for assessment purposes are called formal assessment.it has a higher standard of reliability and validity, summative in nature, tending to have greater motivation impact but increased stress.

3. Continuous vs. final assessment-

   Continuous assessment occurs throughout a learning experience, is most appropriate when student/ instructor knowledge of process or achievement is needed to determine the subsequent progression or sequence of activities.

   Final or terminal assessment is that which takes place at the end of learning activity. It is most appropriate when learning can only be assessed as a complete whole rather than as constituent part basically used for final decision making.

4. Process vs. product assessment-

   The assessment focusing more on steps/ procedures underlying appropriate ability or task i.e. the cognitive steps in performing certain tasks whereas product assessment focuses more on result or outcome of a process, is more useful for documentation of proficiency or competency in a given skill, i.e. summative purposes .

5. Divergent vs. convergent assessment –

   Divergent assessment are those for which a range of answers or solutions might be considered correct whereas divergent assessment tend to be more authentic and most appropriate in evaluating higher cognitive skills . Convergentassessment is easier to evaluate or score than divergent assessment.

Approaches and methods of educational assessment

Approach is an axiomatic, flexible emphasizes in planning overall strategy providing general guideline on ways of performing a work. it does not identify all the steps involved. Instead it just indicates the direction to proceed in or ways of handling some major or important tasks.

Method refers to how you are going to assess. It is more rigid, procedural, specific emphasizing on techniques used in class. It can also be defined as a overall plan for orderly presentation of language material based upon a selected approach.

Stern (1983: 453) defines approaches as the conceptualization of language teaching has a long, fascinating, but rather tortuous history.

Assessment Tools for Students who are Deaf or Hard of Hearing

Recommended Assessment Tools: The specific tests listed under each area represent possibilities from which to choose. Many tests are usable only in part, such as the use of only visual or performance subtests from a more comprehensive standardized evaluation. Almost all evaluation tools require some form of modification which the evaluator must note in the student's record.

Cognitive/Intellectual Assessments

- Universal Nonverbal Intelligence Test (UNIT) – (Bracken & McCallum)- it is a set of individually administered specialized tasks. These tasks are designed to measure fairly the general intelligence and cognitive abilities of children and adolescents from ages 5- 17 years who may be disadvantaged by traditional verbal and language loaded measures.
- The Wechsler Intelligence Scale for Children –Fourth Edition (WISC-IV) – (David Wechsler) – individually administered clinical instrument for assessing the intellectual ability of children aged 6 years through 16 years, 11 months.
- Kaufman Assessment Battery for Children (K-ABC) – (Alan S. Kaufman & Nadeen L. Kaufman)- assesses the intelligence and achievement of 2 ½ - 12 ½ - year-old children.
- The Test of Nonverbal Intelligence-Third Edition (TONI-III) – (Linda Brown, Rita J. Sherbenou, Susan K. Johnson) – Language free measure of cognitive ability.

- Comprehensive Test of Nonverbal Intelligence (CTONI) – (Donald D Hammill, Nils A Person, J. Lee Wiederholt) – also a language free measure of cognitive ability.
- Cognitive Assessment System (CAS) – (Jack Naglieri, J.P. Das) – an assessment battery designed to evaluate cognitive processing in children 5-17 years of age. Derived from the Planning, Attention, Simultaneous, and Successive (PASS) theory.
- The Battelle Developmental Inventory (BDI) – (Jean Newborg, John R. Stock, Linda Wnek) – a standardized individually administered assessment battery of key developmental skills in children from birth to 8 years-of-age.
- Benton Visual Retention Test (BVRT) – (Abigail Benton Sivan) – assessment of short term visual memory.
- Test of Visual Motor Integration (VMI) – (Keith E. Beery)- A developmental sequence of geometric forms to be copied with paper and pencil to assess visual perception and motor coordination

Psycho-social

- Meadow-Kendall Social/Emotional Assessment Inventory for Deaf Students (MeadowOrlans)
- Kinetic House-Tree Person Drawings – (Robert C. Burns) Projective drawings used to assess social emotional functioning.
- Children's Apperception Test (C.A.T.,) – (Leopold Bellak, Sonya Sorel Bellak) – an apperceptive method of investigating personality by studying the dynamic meaningfulness of individual differences in the perception of standard stimuli.
- Children's Depression Inventory (CDI) – (Maria Kovacs) assessment to identify depression in children.

Behavior

- Conners' Rating Scales (C. Keith Conners) – Identifies a behavioral profile of a child in six specific areas based on responses from teachers, parents, or the child themselves.

- Achenbach Child Behavior Checklist – (T.M. Achenbach) – Identifies a behavioral profile of a child in eight specific areas based on the responses from teachers, parents, or the child themselves.

Expressive and Receptive Language:

- Test of Auditory Comprehension of Language-Third Edition (TACL-3). The TACL-3 measures a child's auditory comprehension skills including word classes and relations, grammatical morphemes, and elaborated sentences. The child is presented with a picture and points to the phrase or sentence that matches what he/she hears.
- The Screening Instrument for Targeting Educational Risk (S.I.F.T.E.R.) /The Preschool S.I.F.T.E.R. The S.I.F.T.E.R. is used by the teacher to rate the child in comparison to other children in the classroom on 15 items. The responses are plotted on a chart which indicates pass, marginal or fail for each of the five areas of academics, attention, communication, classroom participation, and school behavior. If a child fails in a specific area, they should be referred for further evaluation. The Preschool S.I.F.T.E.R. was developed to be used with preschool children and is similar to the S.I.F.T.E.R.
- Cottage Acquisition Scales For Listening, Language, and Speech. This curriculum includes a developmental checklist for assessment and planning for diagnostic therapy. The language section includes steps from pre-verbal through to complex sentences including pragmatic development.
- The Bzoch-League Receptive-Expressive-Language Test (REEL-2), 2 nd . Ed. The REEL-2 is a scale designed for infants and toddlers up to 3 years of age. It measures and analyzes emergent language for intervention planning. Results are obtained from a parent interview and are given in terms of an Expressive Language Age, A Receptive Language Age, and a Combined Language Age.
- The Reynell Development Language Scales III (RDLS III), 3rd ed. The RDLS III assesses receptive and expressive language using real objects rather than pictures for the child to interact with. It is designed for children from 15 months to 7 years of age. The comprehension scale comprises sections such as agents and actions, attributes, locative relations, vocabulary and complex grammar, and inferencing, etc. The expressive scale comprises sections such as verb phrases, auxiliaries, clausal elements, inflections, etc.

- The Preschool Language Scale-4 (PLS-4) The PLS-4 is a standardized test of auditory comprehension and expressive communication for infants and toddlers. The auditory comprehension subscale assesses basic vocabulary, concepts and grammatical markers in preschool and higher-level abilities such as complex sentences, making comparisons and inferences, etc. in older children. The expressive communication subscale asks preschoolers to name objects, use concepts that describe objects, express quantity, use grammatical markers, etc. For older children it includes word segmentation, completing analogies, telling a short story in sequence, etc. This test also includes an articulation screener and a language sample checklist.
- Preschool-Clinical Evaluation of Language Fundamentals (CELF-P) The CELF-P evaluates expressive and receptive language ability. It focuses on word meanings, word and sentence structure, and recall of spoken language. This tool was standardized for children ages 3 years, 0 months to 6 years, 11 months and uses pictures as stimulus for all three areas of language development. The linguistic concepts subtest evaluates the child's knowledge of modifiers and his/her ability to interpret one-level oral directions. The sentence structure subtest evaluates comprehension of early acquired sentence formation rules and the child's ability to comprehend and respond to spoken sentences. The recalling sentences in context subtest evaluate recall and repetition of spoken sentences. Formulating labels assesses the child's ability to name pictures. The word structure subtest assesses the child's knowledge and use of early acquired morphological rules and forms.
- The MacArthur Communication Development Inventory: Words, Gestures, and Sentences These questionnaire/checklists ask parents to identify various words that their child either says or signs. It includes vocabulary relating to: things in the home, people, action words, description words, pronouns, prepositions, question words, as well as sentences and grammar.
- The Rossetti Infant-Toddler Language Scale: A Measure of Communication and Interaction This scale assesses preverbal and verbal areas of communication and interaction including: Interaction-Attachment, Pragmatics, Gesture, Play, Language Comprehension and Language Expression. The examiner can directly observe or elicit a behavior from the child or use the caregiver's report to equally credit the child performance. Results reflect the child's mastery of skills in each of the areas

assessed at 3 month intervals. A parent questionnaire with guidelines for parent interview is also included.

- Systematic Analysis of Language Transcripts (SALT) A 30 minute play session is videotaped and every spoken and signed language utterance is transcribed. This analysis includes information regarding the number and types of spontaneous utterances that the child and caregiver produce. This analysis is intended to provide a portrait of the child's language, as well as the type of language the caregiver uses while communicating with the child. In order to measure the child's growth a videotape is made every six months.
- SKI-HI Language Development Scale This scale is developmentally ordered and contains a list of communication and language skills in varying intervals for different ages. Each age interval is represented by enough observable receptive and expressive language skills to obtain a good profile of a child's language ability.
- Oral and Written Language Scales (OWLS) The OWLS assesses higher order thinking, semantics, syntax, vocabulary, and pragmatics. It includes a Listening Comprehension Scale (picture pointing), an Oral Expression Scale (answering questions, and sentence completion) and a Written Expression Scale (use of conventions, syntactical forms, and ability to communicate meaningfully).
- Grammatical Analysis of Elicited Language, Pre-Sentence Level(GAEL-P) This test contains three sections: readiness skills, single words, and word combinations. The examiner uses structured play and pictures to elicit language specific to these three areas. The test was developed for children with hearing loss and can be administered in spoken or signed English.
- Teacher Assessment of Grammatical Structures (TAGS) The TAGS consists of rating forms to be completed by the therapist regarding the child's understanding of grammatical structures in sentences of at least four words that contain a subject and a verb. The grammatical categories are noun modifiers, pronouns, prepositions, adverbs, verbs, and questions.

Teacher Assessment of Spoken Language (TASL)

Auditory/Listening Skills:

- Early Speech Perception Test (ESP) for Profoundly Hearing-Impaired Children. The ESP test battery is a test of speech perception for profoundly deaf children as

young as 3 years of age. The ESP may be used to establish objectives and to measure the effects of a hearing aid or cochlear implant in terms of their impact on the child's speech perception ability. The kit includes a manual, response forms, box of toys, full color picture cards and audiocassette.

- The Lexical Neighborhood Test (LNT) and the Multi-syllabic Lexical Neighborhood Test (MLNT) Lexical Neighborhood Test (LNT) and the Multi-syllabic Lexical Neighborhood Test (MLNT) are two new open-set tests of word recognition. The LNT and MLNT are based on the lexical characteristics of word frequency and neighborhood density, and include words found in the vocabularies of children age three to five. Studies have shown that normal hearing three- and four-year old children are able to recognize all the words from these two open-set speech perception tests at very high levels of performance. Therefore, these results have been used as a benchmark for children with hearing loss.
- Functional Auditory Performance Indicators (FAPI): An Integrated Approach to Auditory Development. The FAPI assesses the functional auditory skills of children with hearing loss. It examines seven categories of auditory development: sound awareness, sound is meaningful, auditory feedback, localizing sound source, auditory discrimination, short-term memory, and linguistic auditory processing.
- Meaningful Auditory Integration Scale (MAIS)/Infant-Toddler: Meaningful Auditory Integration Scale (IT-MAIS). These scales were developed for children who have a profound hearing loss and designed to be administered to parents by an audiologist. The parent is asked questions regarding use of amplification/ cochlear implant and auditory behaviors regarding environmental and speech sounds.

§ The Listening Inventory for Education: an Efficacy Tool (L.I.F.E.) The L.I.F.E. is designed to determine amplification benefit and considers input from both the student and the teacher. The protocol also provides suggestions for intervention accommodations designed for the specific situations that are identified as problems.

Speech Skills.

(suprasegmental, phonetic and phonologic development)

- The Arizona Articulation Proficiency Scale-Third Edition The Arizona-3 is a tool designed to identify misarticulations and total articulatory proficiency. The stimulus

pictures show children in more current clothing styles and activities. The test materials also include ethnic diversity.

- The Goldman Fristoe: Test of Articulation 2 This test assesses a child's articulation ability by sampling both spontaneous and imitative speech production. Pictures and verbal cues are used to elicit single word answers that demonstrate common speech sounds. It measures the articulation of speech sounds and identifies and describes the types of articulation errors produced by the child.
- The Ling Phonetic-Phonologic Speech Evaluation Record: A Manual. This tool is used to assess the segmental and nonsegmental aspects of speech at both the phonetic and phonologic levels. The phonetic level responses are obtained through imitation. Phonologic level responses are obtained from spontaneous language samples.
- Identifying Early Phonological Needs in Children with Hearing Impairment This is a standardized test used to assess how young children with hearing loss spontaneously use first-level phonological patterns. It numerically rates whether the child's patterns are missing, emerging, or mastered.
- St. Gabriel's Curriculum for the Development of Audition, Language, Speech and Cognition. This curriculum outlines the development of early speech, the development of early auditory feedback skills, and an order for the acquisition of vowels, diphthongs, and consonants. It also provides a developmental checklist of phonological processes.
- Cottage Acquisition Scales For Listening, Language, and Speech. This curriculum provides a developmental checklist for assessment and diagnostic planning for therapy. The speech section tracks objectives from Phonetic-Phonologic Speech Evaluation Record and also links these objectives to phonetic listening development.
- Spoken Communication for Students Who are Deaf or Hard of Hearing: A Multidisciplinary This curriculum includes a Student Speech Record (SSR) which is used to evaluate the following: non-verbal communication (attention, turn taking, eye contact, and breath support) and suprasegmentals, vowels and diphthongs, and consonants at the phonetic, phonologic, and pragmatic levels. The SSR also includes an oral peripheral examination form.

- The Central Institute for the Deaf (CID) Picture Speech Intelligibility Evaluation (SPINE) The SPINE uses colorful pictures to evaluate speech intelligibility in children as young as 6 years of age. The assessment package includes 300 full-color picture cards, a test manual, and 25 response forms.
- Paden-Brown Phonological Kit This tool is designed to assess spontaneous use of first level phonological patterns in children with hearing loss. It utilizes a list of 25 words that are typically within the speaking vocabulary of young children with hearing loss.

Vocabulary:

- Peabody Picture Vocabulary Test (PPVT-3) The PPVT measures a child's understanding of individual words (receptive vocabulary). It is designed for children 2 years 6 months to 18 years of age. Raw test scores are converted into standard cores, percentile ranks and age equivalents. *The Expressive Vocabulary Test (EVT)*
- Expressive One-Word Picture Vocabulary Test (EOWPVT) The EOWPVT assesses a child's English speaking vocabulary by asking the child to name objects, actions and concepts pictured in illustrations. The test ends on 6 consecutive incorrect responses.
- Receptive One-Word Picture Vocabulary Test (ROWPVT) The ROWPVT assesses a student's knowledge of vocabulary by asking the child to point to the object being named. The test ends when the child cannot correctly identify the pictured meaning of the word in 6 out of 8 consecutive items.
- Test of Early Reading Ability-3 rd ed (TERA-3) The TERA-3 measures reading ability of young children ages 3-6 through 8-6. Rather than assessing a child's reading readiness it assesses their mastery of early developing reading skills. The three subtests include: Alphabet (knowledge of the alphabet and its uses), Conventions (knowledge of the conventions of print), and Meaning (measuring the construction of meaning from print). An overall Quotient is computed using all three subtest scores.

Basic Concepts:

- Boehm Test of Basic Concepts-Revised (BTBC-R) The BTBC-R is administered to children in Kindergarten, 1st, and 2nd grade (and older children who are deaf or hard of hearing) and tests basic concepts of comparison, direction, position, quantity, and time.
- Bracken Basic Concept Scale-Revised (BBCS-R) The BBCS-R measures basic concept acquisition and receptive language skills of children from 2 years, 6 months to 8 years of age. It includes eleven conceptual categories-colors, letters, numbers, counting, sizes, comparisons, shapes, direction/position, self/social awareness, texture/materials, quantity, and time/sequence.

Sign Language:

- Checklist of Emerging ASL Skills Available in: Easterbrooks, S & Baker, S. Language Learning In Children Who Are Deaf And Hard Of Hearing: Multiple Pathways. (2002) Allyn and Bacon, Boston, Mass. This checklist provides a series of indicators to judge whether a deaf child has components of ASL in his or her communication system. The evaluator should not judge a child's skills based on English ability. The focus should be on ASL. The checklist should be filled out by at least three different evaluators who are familiar with the child and who are proficient in ASL.
- ASL Development Observation Record Available through: ASL Resource Teacher, Early Childhood Education Program, California School for the Deaf, Freemont (CSDF), 39350 Gallaudet Drive, Fremont, CA 94538 (510) 794-2536 This tool was developed by the Early Childhood Education program at the CSDF to document the ASL language development of deaf children from the time they entered the program to Kindergarten. The goal of the observation record is to identify the language strengths and needs of each child and to document the progress made over the time spent in the Early Childhood Education program. This record also serves as a guide for teachers in assessing their role as language models and how they use language with the children.
- The American Sign Language Proficiency Assessment (ASL-PA) Available by contacting: Dr. Sam Supalla, Department of Special Education, Rehabilitation, and School Psychology, College of Education, University of Arizona, Tucson,

AZ 85721 (520) 621-9466 (TTY) E-mail: ssupalla@u.arizona.edu The ASL-PA globally assesses the expressive ASL skills of children ages 6-12 years of age. Items/target features are based on ASL acquisition studies. Language samples are elicited from varied discourse contexts. There are no sample norms presently available.

- Test of American Sign Language (TASL) Available by contacting: Dr. Philip Prinz, Department of Special Education and Communicative Disorders, San Francisco State University (415) 338-7655 E-mail: pm@sfsu.edu The TASL consists of two production measures (Classifier Production Test, and Sign Narrative) and four comprehension measures (Story Comprehension, Classifier Comprehension Test, Time Marker Test, and Map Marker Test). It is designed to be used with deaf students ages 8-15 years.

Assessment methods

Assessment methods are the strategies, techniques,, tools and instruments for collecting information to determine the extent to which students demonstrate desired learning outcomes. Assessment methods can be categorized into 2 broad categories i.e. direct method or indirect method also known as formal or informal method of assessment.

Below are several guidelines to follow when selecting assessment methods:

1. Collect information that will answer the program's questions
2. Use multiple methods to assess each student learning outcome
3. Include both indirect and direct assessment methods Include both qualitative and quantitative methods
4. Choose methods that allow the assessment of both strengths and weaknesses
5. Utilize capstone courses or "second-year" projects/assignments to directly assess student learning outcomes
6. Use established accreditation criteria/standards when developing the assessment plan.

There are several methods of educational assessment of hearing impaired, some are listed below-

Method	Description	Direct/ indirect data
Alumni Survey	Surveying program alumni can provide information about program satisfaction, preparation (transfer or workforce), employment status, skills for success. Surveys can ask alumni to identify what should be changed, altered, maintained, improved, or expanded.	Indirect
Capstone Project or Course	A capstone project or course integrates knowledge, concepts, and skills that students are to have acquired during the course of their study. Capstones provide a means to assess student achievement across a discipline.	Direct
Certification or Licensure Exam	These standardized tests are developed by outside, professional organization to assess general knowledge in a discipline.	Direct
Competitions (Juried)	External reviewers score, judge the performance, work, etc. of students	Direct
Course Evaluation Survey	Course evaluations assess student experience and satisfaction with an individual course and are generally administered at or near the end of the semester. They provide the faculty, department, and institution with student perceptions of the classroom aspect of their educational experience	Indirect
Embedded Techniques	Embedded assessment techniques utilize existing student course work as both a grading instrument as well as data in the assessment of SLO.	Direct

Method	Description	Direct/ indirect data
Entrance/Exit Interviews	Interviews are conducted with students when they enter college and when they leave—either through graduation or early departure. These interviews can be designed to measure SLO, but can also be used to learn about students' perceptions, gather feedback, on various college services, activities, etc	direct
Exit Exam/ Comprehensive Test	A comprehensive exam given near the end of the student's academic career (usually during the final semester prior to graduation). The exam is generally given to determine a student's acquisition and application of a particular type or form of knowledge or skill, as well as the ability to integrate knowledge from various disciplines. The exam can be written, oral, or a combination.	Direct
Focus Groups	A series of structured discussions with students who are asked a series of open-ended questions designed to collect data about beliefs, attitudes, and experiences	Indirect
Performance	Students can be evaluated on participation in campus and/or community events, volunteer work, presentations, clinical, internships, musical or art performances, etc. The performance of students is rated/ scored using a rubric/scoring guide.	direct
Pre and post tests	Typically an exam is administered at the beginning and at the end of a course or program in order to determine the progress of student learning	Direct

Method	Description	Direct/ indirect data
SWOT Analysis	A facilitated analysis of the internal strengths & weaknesses of the course, program, department as well as the external threats & opportunities	indirect
Standardized tests	A test that is developed outside the institution for use by a wide group of students using national or regional norms	Direct
Observations	Information can be collected while observing "events" such as classes, social gatherings, activities, group work, study sessions, etc. Observation can provide information on student behaviors and attitudes	Indirect
Locally developed tests	A test that is developed within the institution to be used Direct Tests internally. The test is typically administered to a representative sample in order to develop local norms and standards	Direct
"Maps" and/or Matrices	A map/matrix is a grid of rows and columns that organizes information that can be used for assessment purposes by summarizing relationships between goals, SLO, courses, syllabus outcomes, course work, assessment methods, etc. Maps/ matrices can be used to review curriculum, select assessment methods, make comparisons, etc.	Indirect
Reflective Student Essays	Reflective essays can be used as an assessment method to determine student understanding of course content and/or issues as well as students' opinions and perceptions	Direct/ Indirect

Method	Description	Direct/ indirect data
Portfolio	Students' work is collected throughout a program which is assessed by faculty using a common scoring guide/rubric. Portfolios may contain research papers, reports, tests, exams, case studies, video, personal essays, journals, self-evaluations, exercises, etc.	Direct
Syllabus review	Reviewing a syllabus involves determining if the course is meeting the goals and outcomes that have been established In	Indirect

4.8 Outcome of Educational Assessment

Analysis, reporting, interpretation, documentation, feedback and pedagogic decisions

The American association of higher education (AAHE) assert in its Nine principles of good practice for assessing student leaning (1992) that –

….assessment makes a difference when it begins with issues of use and illuminous questions that people really care about.

Best ways to analyze, report, interpret and document assessment information are-

The*University* of California at Chicago (1998) recommends-

- Identified goals and objectives should be presented in relation to data.
- Data analysis must be done using by selecting and using appropriate procedures.
- Well balanced picture of the program must be presented using qualitative and quantitative method.
- Varying analysis and reporting procedures according to the identified audience.
- Elaboration of pros and cons of the academic program in prepared written statements.

- Recommendations based on analysis of data using identified goals as a framework
- Interpretation of data about student's mastery of subject matter, of research skills or of writing and speaking.
- Any graduate of your program getting jobs, accepted into reputable graduate school.

PEDAGOGIC DECESIONS

In designing pedagogic decisions consider and include the following

Learning process	For achieving their objectives what learning experiences and strategies will be used for students
Assessment methods	How will the information be collected? What measures will be used to know that students are meeting learning objectives? From whom, and at what point, will you gather data?
Assessment process	When will the assessment be conducted? Who will be responsible for each component? What is the overall timeline for the assessment plan?
Status, outcomes	What do you find and how did the data support these findings?
Decisions , plans, recommendations	Based on your findings what will you plan now?

Salient features of NCF (2005)

- Values enshrined in the constitution of India.
- Reduction of curriculum load
- Ensuring quality education for AII (EPA).
- Systematic changes and common schools system

NCF (2005) has also recommended 5 guiding principles for curriculum developments-

- o Connecting knowledge to life outside school
- o Ensuring that learning shifts from role method
- o Enriching curriculum so that it goes beyond text books
- o Integration of examination and classroom life.
- o Nurturing an overriding identity informed by caring concerns within the democratic policy of the country.

RTE ACT 2009

It was enacted on 4 august 2009, describing the modalities of free and compulsory education for children between 6- 14 in India.

The important features are-

- Free and compulsory education toall.
- Admission to all.
- Quantity and quality of teacher
- No discrimination and harassment
- All round development
- No detention
- Justiciable
- Establishment of school management committees (SMC) to strengthen participatory democracy and governance in elementary education
- Reservation of 25% of seats for children belonging to socially disadvantaged, economically weak to ensure better education.

4.9 Factors Affecting Educational Performance

Results of the CADS survey and other reports have identified multiple factors that influence communication and education of the hearing impaired in the USA. Specifically, these factors affect the child's ability to acquire competency in English as the language of instruction in American schools. In February 1988, the United States Federal

Commission on Education of the Deaf (COED) submitted a report entitled, Toward Equality: Education of theDeaf, which emphasized the need for a higher level of competence in the English language among the deaf (The Commission on Education of the Deaf, 1988). A recent study by Geers and Moog (1989) suggests that such mastery of English is the predominant predictor of reading achievement. The degree to which the hearing-impaired child masters language depends on a number of patient and program variables (Nowell, 1985).

Student Progress Monitoring

- Monitoring student progress assists teachers, parents and administrators in making informed instructional decisions.
- Monitoring student progress demonstrates the student's rate of growth toward meeting the annual instructional goals
- Monitoring student progress provides documentation for informed decision making regarding placement, effective use of communication modalities, and language development.
- Monitoring student progress provides students with feedback and motivation to learn.
- Monitoring student progress provides D/HH teachers with objective evidence that the student is progressing academically.

IDEA -2004, mandates accountability at several levels including the demonstration of student progress. While achievement tests (e.g. SAT-HI, IBS) have been used for decades in the field of education with learners who are deaf or hard of hearing, there is a need and mandate to monitor student's academic growth at frequent and regular intervals. Documentation of student progress may include formal and informal assessments including those described previously e.g. systematic observations, formal and informal assessments. The only evidenced- based measures currently available include Curriculum Based Measurement (CBM) and Mastery Monitoring (MM).

- CBM- Correct Word-Incorrect Sequence (C-IWS) and Total Words Written (TWW) may be use dot monitor students' progress in written English.
- Criterion- based assessment (e.g.Brigance,Syntactic Structures, DIBELs,) may be used as Mastery Monitoring progress monitoring tool

- Test of Silent Contextual Reading Fluency (TOSCRF) may be used with secondary students who are deaf or hard of hearing and who are reading at the 4+ grade level
- Functional Behavior Analysis (FBA) – to monitor students social behavior

Individualized educational plan

An IEP must be developed for those eligible for special educational services after the evaluation is completed. The IEP is a legal document jointly developed and agreed on by parents and representatives of the educational agency. Professionals from outside agencies may be asked to participate when appropriate. The IEP must specify the current status of the child, annual goals and short-term objectives for instruction, the educational and support services needed to meet the goals, the type of classroom in which the instruction will take place, the extent to which the child will participate in regular school activities, the evaluationplan, and the date the services will be

SETTING UP OF AN EDUCATIONAL ASSESSMENT CLINIC/ CENTRE-

India is a land of diversity. It has multiplicity in languages, in people and this tradition.it has rain forest and desserts, high mountains and long coasts. Similarly the educational setup in India does not have a uniform pattern.

There are:

1. village and town level set up

- Municipal corporations
- Municipalities
- panchayats
- Community level participations
- Bringing the community closer to the school

Taking the school closer to the community

- Parent teacher association
- School complex

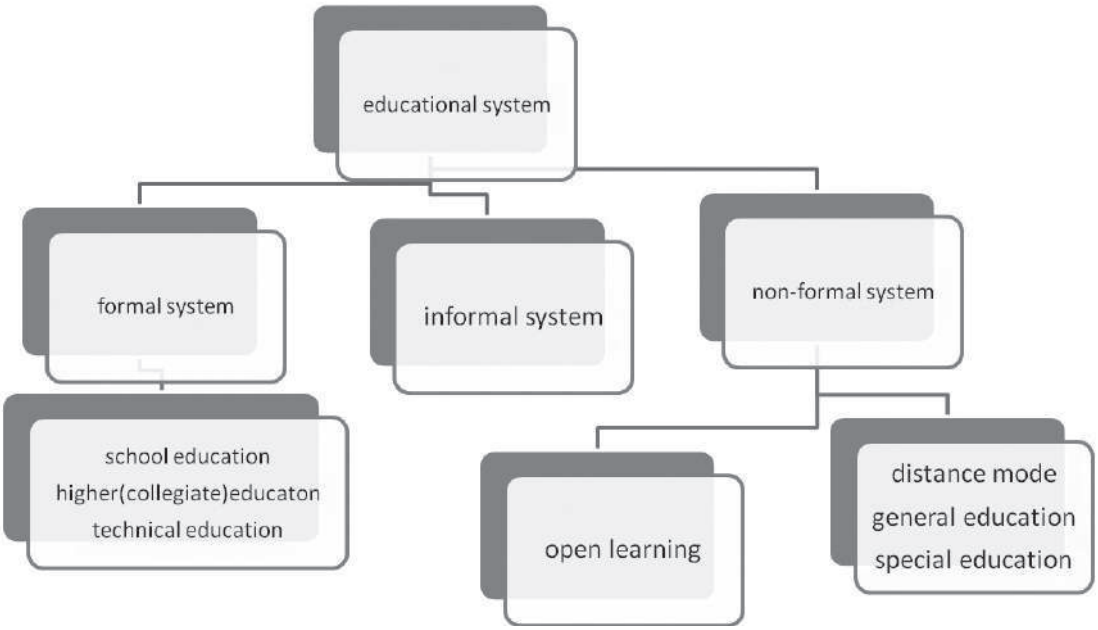
2. District level set up

- District institute of education and training

- District board of education

3. State level setup

- Unitary set-up
- Two tier set-up
- Three tier set- up
- Four tier set- up
- State level bodies



Comparison of features of systems of education

Features	Formal system	Informal system	Non- formal system
Duration	Fixed, eg-10+2 system of schooling, 3 years for graduation.	No duration can be specified	Flexible, may vary according to needs
Age	Age groups well defined at every age	A continuous process, any age and all ages.	No age bar Children outside

Features	Formal system	Informal system	Non- formal system
Clientele	Young people of specified age, sex and socio-economic status	Free for all	schools, the unemployed youth, working people adult literates and illiterates
Cost	Costly	Almost free	Cost- effective
Objectives	Academically sound	Unspecified	Goal oriented
Nature	Rigid	Unorganized	Flexible

4.10 Let's Sum Up

- Assessment is the process of observing, recording, and documenting children's growth and behavior over time in order to make decisions about their education.
- Assessment has many purposes, but it is primarily used in planning developmentally appropriate curriculum. An initial assessment is made of all children when they enter a program, but ongoing assessment continues as long as a child remains enrolled in a program.
- Most assessment methods involve observing children. Formal observation by researchers has led to the creation of developmental milestones. Early childhood teachers usually use informal observation methods to collect data.
- There are several types of assessment tools that are used in early childhood programs. These include anecdotal records, checklists, participation charts, rating scales, samples of products, photographs, and tape recordings. All of these methods have advantages and disadvantages.
- Materials that have been collected during the assessment process should be placed in a portfolio for each child. Portfolios document children's learning and development. When observing children, it is important to record only objective statements. Once data is recorded, it may be interpreted.
- This interpretation takes knowledge and skill. It requires a thorough understanding of child development. Information you collect on children must also be kept confidential. This is perhaps the most important guideline to follow.

4.11 Unit end exercises

- Write about the principles of educational assessment?
- What are the tools of educational assessment?
- Write short note on set up of educational assessment?
- Discuss about pedagogic decisions for CHWI.
- What are the techniques /methods of educational assessment?
- How Will You Measure The Outcome Of Educational Assessment?

4.12 References

12. Albertini, J. & Schley, S. (2003). Writing: Characteristics, instruction, and assessment. In M. Marschark & P. Spencer (Eds.), Handbook of deaf studies, language, and education (pp.123-131). New York: Oxford University Press.
13. Allen, T. E. (2001). A comprehensive evaluation of the Postsecondary Educational Opportunities for Students who are Deaf or Hard of Hearing. Washington, DC: Gallaudet University.
14. Amselle, J. (1997). Adios bilingual education. Policy Review 86, 52-55.
15. Anderson, G. B., & McGee, S. (1998). Creating school to work initiatives for deaf students. Perspectives in Education and Deafness, 16(5), 4-7.
16. Bahr, P. R. (2007). Double jeopardy: Testing the effects of multiple basic skill deficiencies on successful remediation. Research in Higher Education, 8(6), 695-725. 6
17. DCS. (2007). Deaf Community Services. Website. Retrieved April 25, 2008, from Deaf Community Services of San Diego Inc.: http://www.dcsofsd.org/about.php
18. Dickinson, J. (2010). Access all areas: Identity issues and researcher responsibilities in workplace settings. Text & Talk, 30(2), 105-124.
19. Escobedo, G. (2007). A retention /persistence intervention model: Improving success across cultures. Journal of Developmental Education, 31(1), 12-37. Garcia, F. (2004). Developing Sociopolitical Literacy. AERA (pp. 34-40). San Diego:

20. Heldref. Harris, R., Holmes, H. M., & Mertens, D. M. (2009). Research ethics in sign language communities. Sign Language Studies, 9(2), 104-131.

21. Hermans, D., Knoors, H., Ormel, E., & Verhoeven, L. (2007). Modeling reading vocabulary learning in deaf children in bilingual education programs. Journal ofDeaf Studies and Deaf Education, 13(2), 155-174.

22. Humphries, T., & Allen, B. (2008). Reorganizing teacher preparation in deaf education.

23. Sign Language Studies, 8(2), 160-180. Lang, H. (2002). Higher education for deaf students: Research priorities in the new millennium. Journal of Deaf Studies and Deaf Education, 7(4), 267-280.

24. MacSweeney, M., Waters, D., Brammer, M., Woll, B., & Goswami, U. (2007). Phonological processing in deaf signers and the impact of age of first language acquisition. NeuroImage, 40(3) 1369-1379.

25. Manning, K. (1992). A rationale for using qualitative research in student affairs. Journal of College Student Development, (33)2, 132-136.

Unit-5 ◘ Team Approach in Assessment, Identification & Assessing Needs

Structure

5.5.1 Function

5.5.2 Member of constitution team

5.5.3 Respect to Children with Hearing Impairment

5.5.4 Consideration on child's age

5.4.5 Severity

5.5.6 Associated condition

5.6 Team's role before, during and after assessment; Identifying and addressing the need and planning IEP / IFSP

5.6.1 Team Role before Assessment

5.6.2 Team role during Assessment

5.6.2.1 Role of Audiologist

5.6.2.2 Role of Services Coordinator

5.6.2.3 Role of Family-Infant Teacher

5.6.2.4 Role of Speech/Language Pathologist (SLP)

5.6.2.5 Role of Teacher of the Deaf/Hard of hearing

5.6.2.6 Role of ENT Physician

5.6.2.7 Role of General Physician

5.6.3 Team role after Assessment

5.6.4 Identifying and addressing the need and planning IEP / IFSP

5.6.4.1 Need and planning IEP / IFSP

5.6.4.1 Difference between an IFSP and an IEP

5.7 Team's role in outcome measures: Periodic assessment and evaluation; review of performance against previously set goals

5.7.1 Concept

5.7.2 Team Role of outcome measures

5.7.2.1 Cognitive abilities

5.7.2.2 Linguistic and Commutation abilities

5.7.2.3 Self-directed movement

5.1 Introduction

No single treatment or intervention is the answer for every child or family. Good intervention plans will include close monitoring, follow-ups and any changes needed along the way. There are many different options for children with hearing loss and their families. These are working with a professional (or team) who can help a child and family learn to communicate,getting a hearing device, such as a hearing aid andjoining support groups.Taking advantage of other resources available to children with a hearing loss and their families. The said course helps learners to appreciate the role of professionals to address the needs of the child with hearing impairment in a holistic manner using team approach and its importance to reflect on their role in assessment and identification of needs.

5.2 Objectives

After learning this unit learner will be able to understand

- Team Approach: concept & types (Multidisciplinary, Interdisciplinary and Trans-disciplinary)
- Role of various stakeholders: professionals, personnel, parent and the child
- Constitution of team with respect to CWHI: Considerations on child's age, severity and associated conditions
- Team's role before, during and after assessment; Identifying and addressing the need and planning IEP / IFSP

- Team's role in outcome measures: Periodic assessment and evaluation; review of performance against previously set goals

5.3: Team Approach: concept & types (Multidisciplinary, Interdisciplinary and Trans-disciplinary)

Team approach is a model involving a team of professionals with complementary backgrounds and skills working together toward common goals. This approach is increasingly advocated by scholars and policy makers as a means of assuring quality of outcomes and quality of work environment. In terms of hearing impairment requires the expertise of professionals from multiple disciplines e.g., ENT Doctor, Audiologist, Speech-Language Pathologists, Auditory-Verbal Therapist, Rehabilitation Worker, Special Educator, Parents and Family member. Specially, family involvement is a key component of a collaborative intervention approach for successful infant-toddler interventions. With the help of team approach we get specifically the line provides information about:

- Different types of hearing problem.
- Diagnosis and intervention strategies of therapy
- Educational opportunities
- Vocational training and job opportunities
- Special Employment Exchanges
- Government Schemes and facilities
- Organizations working for PWDs
- Prevention and management.

5.3.1.-Concept

Team approach is a model involving a team of professionals with complementary backgrounds and skills working together toward common goals. This approach is increasingly advocated by scholars and policy makers as a means of assuring quality of outcomes and quality of work environment. Also team approach should be idea generation, conflict and performance. At this time, accurate evaluation of hearing for children of all ages is possible. Therefore, if any adult involved in the care of a child suspects the possibility of hearing loss, an immediate referral should be made for appropriate diagnostic evaluation. Universal newborn screening

does not rule out the possibility of a newly acquired hearing loss or a progressive loss that had been previously undiagnosed. The development of symptoms or physical examination findings consistent with a syndrome should be used to direct further diagnostic testing. The main benefit of team approach is team collaboration more heads is better than one head. Because more heads provide a particular pin point diagnoses and treatment plans referrals to one professional that help family get informed and connected complete all evaluations/consultation in quickly.

5.3.2.-Types of Team approach:

A child with hearing loss means delay the speech, language and cognitive ability. Early identification and effective treatment of hearing loss improves language, communication and cognitive skills. In this regard most agencies work with the team of professionals to establish an individual treatment plan for hearing impairment child for the purpose of the development of speech, language and auditory attention. Because speech, language and auditory attention is a most important factor for the development of academic skill. That is why team approach is very essential part in children with hearing impairment. There are three types team approach. These are Multidisciplinary, Interdisciplinary and Trans-disciplinary. The terms multidisciplinary, interdisciplinary and Trans-disciplinary are increasingly used in the interchangeably. But when applied the team approach to a specific context in the field of hearing impairment it should be most important that with the help of team approach students with hearing impairments development academic functioning, communication skills, sensory- motor skills, social / emotional skills, daily living skills, strategies or adaptations career / vocational skills and utilization of residual hearing. Therefore, to achieve quality education for students with hearing impairment, services must be provided using a team approach, including members with disability specific expertise in educating students with hearing impairment.

5.3.2.1-Multidisciplinary Team approach: The term multidisciplinary refers to cooperation

of experts from different scientific disciplines. In multidisciplinary team approach focus on two or more disciplines work together on a common problem. Like that a particular

task and project etc. So in this regard Multidisciplinary Team approach is provide the serve serves children with hearing loss comprehensive evaluations. These extensive assessments are designed to address hearing, health, communication, academic, psychological and behavioral concerns. The evaluation process is dynamic in nature

as the student's family, school team and the Hospital's assessment experts work together to share perspectives, identify assessment goals and collaborate to obtain the best developmental outcomes for students with hearing loss. Another part is Educational options. In education option children with hearing impairment vary on according to the degree of hearing loss and cognitive ability of the child. Development of communication skills is the basic goal of early education programs for hearing-impaired children.

Advantages of a Multidisciplinary Team (Galiie, B.2018)

- It gives a full access to an entire team of experts and every access to the best possible options that are currently available.
- It improves service coordination for greater efficiencies offered to the child for easier.
- It expedites the referral process and that referral process must be specific maintain their health status.
- It creates new avenues for service implementation in different departments and organizations. That help pulls the resources to provide immediate care whenever it may be necessary.
- It allows children to create goals for themselves. These are specific daily, weekly, monthly, and yearly goals for themselves.

Disadvantages of a Multidisciplinary Team (Galiie, B.2018)

- There is always a time pressure involved in providing services.
- Different team members come from unique backgrounds. Like jobs happen on different schedules as well, which creates challenges when trying to provide services. Then there is the issue of a psychiatrist not necessarily knowing what a social worker does, and vice-versa.
- It requires frequent collaboration to be effective.
- It is dependent upon available resources.
- Incomplete decisions happen without complete information.

5.3.2.2-Interdisciplinary Team Approach: The interdisciplinary team approach is approach in the evaluation and assessment of children with hearing impairment. The interdisciplinary process involves professionals from various disciplines providing their unique contribution regarding different aspects of the child's development

and also emphasis on family functioning. The defining feature of this approach is the ability to integrate and synthesize information through an interactive group process. So that here member is aware about their interpretation informs the whole and are able to formulate conclusion and also recommendations based upon the combined efforts of all. The member are psychiatrists, neurologist, pediatric audiology, speech language and auditory verbal therapy, child development for cochlear implant team, genetics, ophthalmology, radiology, medical social work and psychology working closely together with the child, family and schools is needed to develop a cost-effective and comprehensive management programme for children with hearing impairment.

Advantages (BBA,2018)

- It is a multimodal methodology. Because it has Psychological, social and cultural factors enter into the process and also effectively a singular approach.
- It is a coordinating approach. Because here all the team member is present in one umbrella and provide all essential support service for the develop the functional ability.
- **It is Effectiveness of Interdisciplinary Care. Because its develop in** psychological well-being and quality life.

Disadvantage, Cassady, (n.d)

- It is a time demand, more energy from faculty and also complex.
- It is a depend on Personality Issues. Because Some team member has rigid their personalities and want to stick to a single method of assessment.

5.3.2.3.-Trans-Disciplinary Team Approach:

The transdisciplinary approach was introduced in the United States in the 1970s as a team model for educating children with cerebral palsy. The approach has since been adopted in some rehabilitation settings. Specially in children with hearing impairment. They have oral language disorders due to lack of normal auditory processing. This disadvantage effect on academically, socially and vocationally. We are knowing very much about that most learning is mediated by language and most curriculum development and teaching within the school context proceeds on the assumption that students have the age-appropriate listening and speaking skills necessary to cope with the social and academic language demands that are placed upon them in school. The trans-disciplinary team works to deliver training where

needed and to support students across the school with a hearing loss. This includes working alongside other professionals. The ultimate goals of the trans-disciplinary approach are to promote integrated assessment and to develop a unified treatment plan that is jointly carried out by all team members.

Three primary features trans-disciplinary model from other team models. (Arch Phys Med Rehabil Vol 79, April 1998 Carol Rosen,C, A. Cate Miller, MA)

First, the trans-disciplinary model underscores team communication and coordination of care. Team meetings are required, particularly to promote staff communication. Team meetings are coordinated by a facilitator who fosters development of a holistic treatment plan based on the child's needs.

Second, in trans-disciplinary teamwork, there is a high degree of collaboration among team members in conducting assessments. Also team members collectively plan and implement the assessment. Results are then discussed and integrated treatment goals are developed during the team meetings.

Third, in the trans-disciplinary approach, discipline-specific assessments are supplemented by a global, environment-referenced measure. This assessment specifically measures the child's adaptation to environmental demands in daily activities.

Advantages (Levinton, L 2014)

- Efficient service making more effective use of the primary intervention. The team of experts makes it possible to build a more consistent and coherent intervention program.
- Professional development of the professional team through the acquisition of additional skills.
- Contribution of the parent's unique knowledge of their child to the process.
- Service adapted to the needs and priorities of the family.
- Reducing the burden on the family which does not need to approach each professional separately.

Disadvantages (Levinton, L 2014)

This approach requires an investment of time (budget for: meetings, joint evaluation, follow-up, intensive contacts, investment in accompanying and supporting the process.

5.4 Role of various stakeholders: professionals, personnel, parent and the child

A stakeholder is an individual, group or organization who is impacted by the outcome of a project. They have an interest in the success of the project, and can be within or outside the organization that is sponsoring the project. Stakeholders can have a positive or negative influence on the project. In the field of special education especially children with hearing impairment Stakeholders to build goodwill partnerships and to create shared purpose and understanding that will support delivery of key responsibilities

5.4.1-Objective

According to National Academy of Sciences (2019) the objectives of stakeholder are

- It is a call-in system. Because child care providers can contact a central location to report their status when it needed.
- It is based on Age-specific exercise. Where any lack it should provide useful content for young children with hearing impairment who have been traumatized.
- Up-to-date information from parents e.g., how to reach them in an emergency, medications the child may need to have if evacuated.

5.4.2.-Role of professional

There are many professional approach are available for hearing impairment learner. These are:

Sl.No	Approach	Role
1	ENT Doctor	An ENT doctor is able to examine the ear and if any suspected to diagnosis or detect to the what the actual cause of hearing loss then suggested to recommend suitable treatment and refer to Audiologist and to know about depth information about the whether the hearing mechanism is normal and abnormal.
2	Case History	Before completing any diagnostic audiometric test, it is important to carefully complete a case history. The case history should always be completed face-to- face with the patient, rather than having the patient complete a case history

Sl.No	Approach	Role
		checklist or questionnaire in the waiting room. During the taking of the case history, your job is to find out if the patient has recently experienced any of the common symptoms of hearing problem. Given that these symptoms occasionally are an indication of a more threatening medical problem, they are important to know and understand.
3	Responsibilities of Audiologists	Audiologists play a central role in the identification, assessment, diagnosis and re/habilitation of patients with permanent childhood hearing loss. Professional roles and activities in audiology include clinical/education services, prevention and advocacy also advocate in education, administration and research.
4	Roles Speech Language pathologists	Speech-language pathologists (SLPs) play a role in the screening, assessment, and re/habilitation of children with permanent childhood hearing loss. Professional roles and activities in speech-language pathology include are Critical Roles, Range of Responsibilities, Collaboration and Leadership.
5	Roles Auditory Verbal Therapist	• A key element of this approach is teaching children to make effective use of their residual hearing either via hearing aids or a cochlear implant. • Therapists work one-on-one with the child to teach him or her to rely only on listening skills. Because parent involvement is an important part of the auditory-verbal approach, therapists also partner with parents and caregivers to provide them with the skills they need to help the child become an auditory communicator. • In this approach, neither speech reading nor the use of sign language is taught.

5.4.3 Role of Personnel

Role of personal approach main approach main consider in primary ear and hearing care requires specialists, grassroots health personnel community workers to join together in a working pairment and Phase II: Running the early intervention programs in children with hearing impairment.

Examples of role of personnel are:

- The educational impact of hearing loss
- Audiometry and hearing loss simulation
- The use of technology to enhance student learning
- Behavior intervention skills
- Services for students who are deaf and hard of hearing with special needs
- Communication skills (e.g., sign language, listening and spoken language)
- Differentiated instruction
- Curricular adaptations and teaching strategies known to benefit children/youth who are deaf and hard of hearing (e.g., use of visual aids, multi sensory teaching)
- Use and maintenance of equipment. Example Hearing aid.
- Facilities requirements/acoustical accommodations

5.4.4.-Role of Parents

Family is the primary unit in the life of an individual where as parents are the pillars of an individual. So parents and family need to fulfill certain responsibilities in order to function. A family must generate income, protect and maintain its members and home, nurture and love one where as parents taught children social norms and educated. Especially a child is hearing impairment; these responsibilities become more essential part about parents. Because this is time bounded, expensive and more energy oriented and every ordinary tasks becomes more difficult and more stressful. Besides this there is the difficulty of helping the hearing impaired child develop a good self-image and social skills as well as learn the problems solving exercising which is foster to safety his/her life. In this regard parents of children with hearing impairment take on multiple roles. These are:

5.4.4.1.-Parents as Implementers of Professional Advice: If a child was not making satisfactory progress in the special education program, it was often assumed

that the parents were not assuming their responsibility for implementing the program at home. But recent age therapists and educators have accepted the potential of parents. Also parents are now active partners in not only implementing of professional advice but also plan out and carry out the same at home.

5.4.4.2.-Parents as Service Providers: Parents groups serve as a mechanism through which parents give each other mutual support and share information. Parents initiated and supported efforts often at great personal expense has won the legal right to free and appropriate public education in the least restrictive environment, better conditions in residential facilities and integrated vocational, residential and recreational services in the community, provisions for better financial security.

5.4.4.3.-Parents as Teachers: Role of parents as teachers and members of the multidisciplinary team. Here parents are provided training to make them more resourceful and for better involvement.

5.4.4.4.-Parents as Political Advocates: The development of parents' organizations evolved from small, local support groups of parents to national professional organizations. The primary function of many parent organizations has changed from providing direct services to advocating for political, legal, economic and social change.

5.4.4.5.-Parents as Family Members

Professionals are becoming more aware of the necessity to consider the needs and roles played by all members of the family with a child with hearing impairment. It has been recognized that family has a value in developing and implementing programs for the children. It is also realized that family members have much to offer professionals. They often have unique insights gleaned from their day-to-day experiences living with the children.

5.4.5.-Role of Child

- In classroom instruction children with hearing impairment should always focus teachers face what teacher talking about study and instruction.
- Children with hearing impairment shouldsit close and have all visual barriersremoved including other students.
- Child should be placed appropriatelyduring circle time so that everyonecan be seen
- Deaf and hearing children shouldrole-play interactions so they canlearn how to do things appropriately.

- Children need to know to wave a handor tap a deaf/hard-of-hearing childand wait for them to look up.
- Teachers may need to repeatdirections and/or show visuals of theactivities included in center time
- A classroom aid, parent, or volunteermay need to be paired with the deaf,hard-of-hearing child at each centerto give more detailed instructionsand use visuals
- Individuals around the schoolincluding recess aids, volunteers,lunch aids, office staff, nurse, etc.need to be aware of the deaf/hardof-hearing child. They may need tobe aware of the device and how tofix it if problems arise, how tohandle the child's feelings, and tohelp the child become sociallyinvolved with other children

5.5 Constitution of team with respect to CWHI: Consideration on child's age, Severity and associated conditions

Team constitution is a most important factor in children with hearing impairment. Because team exercise should be to secure good outcomes and a positive future for children and young people with hearing impairment. The main aim of the team in children/young with hearing impairment should make good progress, achieve well and enjoy school, family and community life.

5.5.1.-Function of the constitution team

- Provide family-focused support from the confirmation of hearing impairment.
- Support, advise and empower staff in schools and settings to understand the needs of children and young people with hearing impairment.
- Provide assessment and advice in relation to the child / young person's hearing impairment.
- Ensure that the views, wishes, perspectives and experiences of the children and young people are fully reflected in their provision.
- Support children and young people to develop a positive understanding of their own hearing impairment.
- Carry out assessments in relation to specialist equipment.
- Make specialist provision for children with particular needs in a number of specialist resources bases attached to mainstream schools.

5.5.2.- Member of constitution team

Certainly, parents need these experts. But, as important as these team members will be, parents are the only ones who can be the team manager. It doesn't really matter how much professionals know, parents should never let them become a replacement for their involvement with their own child's education and development. (Professionals in Hearing Loss,2019)

Parents will probably meet the constitution team members of the team in the following order:

- Health professional
- Audiologist
- ENT doctor
- Service coordinator
- Speech and language pathologist
- Teacher of the deaf or hard of hearing
- Regular classroom

Sl. No	Member of Constitution Team	Role
1	Health professional	The health professional is paediatrician and family doctor. The health professional on whom parents depend for the general health care of parent's child, is probably a paediatrician, who treats only children, or a family practice physician, who treats adults as well as children in the family. The professional treat inflammations and infections of the ear and upper respiratory system that can affect hearing, as well as other conditions that children may encounter
2	Audiologist	The audiologist has must specialize in the study of hearing disorders. An audiologist identifies the hearing loss, measures it, and aids in the habilitation of the deaf and/or hard of hearing person, by recommending appropriate hearing aids.
3	ENT doctor	An ENT doctor is a physician who specializes in diseases of the ear, nose, and throat. He/she must examine a child to rule out any medical complications before parents purchase a hearing aid. An ENT should check every child periodically assessment.
4	Service coordinator	The service coordinator is responsible for coordinating all services for the child and will serve as the person for parents to contact when seeking to obtain necessary services and assistance. The service

Sl. No	Member of Constitution Team	Role
		coordinator is also required to assist parents in identifying and locating available services and service providers, and to inform parents (and families) of the availability of advocacy services.
5	Speech and language pathologist	A speech and language pathologist specializes in the diagnosis and habilitation of speech and language problems. This team member may meet with a child on a regular basis to work on the fine points of speech and language development and speech correction. He/she will explain how parents can help with the child's speech and language development.
6	Teacher of the deaf or hard of hearing	The teacher of the deaf or hard of hearing should be certified by the State Department of Education to teach students who are deaf or hard of hearing. Parents should begin talking to these special teachers, from programs in their area, even if the child is only an infant. This person can help parents get started immediately with communication and language development, even if the hearing aids have not yet arrived. Most areas have programs for infants and toddlers and their parents. Teachers in these programs will become one of the most valuable members of the team, providing home visits and one-on-one early intervention for parents and children.
7	Regular classroom	Another choice commonly made for children with hearing loss is mainstream placement. The term mainstreaming is used to refer to the placement of regular education classes based on their skill level. Mainstream education does seek to educate the "whole child" and provide exposure to many preschool programme. However, many schools turn to more directive teaching models by kindergarten wherein children sit at desks, teachers instruct, and children acquire facts, skills, and concepts through drill and practice.

5.5.3.-Respect to children with hearing impairment

Man is a social animal, without society human just being is like animal. So human interaction with society with the help of verbal interaction and that involves speech, language and communication. In that sense speech, language and communication depend upon our hearing ability which is to perceive the sound about nature. But when child/ person suffering from hearing impairment he/she has difficulty in perceiving or identifying sound clearly due to auditory problems and it affects verbal interaction which is speech, language and communication. Due to this problem child can face early development of language, cognition, and social-emotional. So

constitutional team should respect about child to develop his/her personal-social, cognitive and academic aspect in different dimension about social context and foster how developspeech, language and communication.

Sl. No	*Components of respect*	*Role of Constitution Team*
1	**Language**	Due to delayed language development with unclear speech and incorrect pronunciation constitution team should be encourage child in speech correction.
2	**Emotion and behavior**	Due to lack of verbal expressing child should have problem in emotional and behavioral. So constitution team should be reduced the problem behavior regard various social/academic aspect and develops the normal peer acceptance in mainstream in regular class room it develops the normal peer acceptance and reduces the problem in emotional and behavioral.
3	**Self-confidence**	Due to lack of verbal communications children with hearing impairment face on lack of self-confidence and its effects on social inter action. That is why children with hearing impairment live in a world of isolation poor self-image for being always mistaken to be slow in response and they form a group of their own, an association of the deaf for their common interest and interaction. So in that case constitution team should be develop on adjustment in social inter-action with the normal peers in regular and mainstream class.
4	**Social interaction**	Due to poor comprehension and expression, or actively avoid social contact and communication children with hearing impairment socially left-out by normal peers. So constitution team should be placement of regular education classes based on their skill level in mainstream education and exposure social interaction to hearing peers who can model age-appropriate language and social development.
5	**Academic performance**	Hearing impaired children are frequently handicapped in various degree of hearing loss and it affects to difficulty in receiving the correct messages. Regarding this affects child should be delay in academic performance and particularly reading which relies heavily upon language skill. So Constitution team should be developing the academic performance specially in cognitive abilities and develop verbal intelligence

5.5.4.-Consideration on child's age

For the purpose of Consideration on child's age in children with hearing impairment it's based on school age children.For school-aged children, learning problems related to hearing loss typically manifest as poor performance in language-based subjects, class tests, class participation, and verbal interaction with peers and teachers. When summed, the impact of these difficulties leads to reduced academic achievement and often to school failure, especially in the lower grades.

Concept: -

To best serve the needs of a child with hearing impairment, all persons who provide services to the child should work as a team. This team includes the child's parents, primary care physicians, audiologists, educators, and speech–language pathologists. After the members of an assessment team determine the impact of the child's hearing loss in various domains, the focus of intervention should be to provide optimal support services to the child. The team also should commit to long-term monitoring to assess the effects of the hearing impairment on academic achievement and the effectiveness of the intervention plan according to age level of the child. According to The Phoenix Society,2019 the role of constitution team consideration on child's age in children with hearing impairment it should base on three phages. These are Pre-school level, School age and Adolescent.

SL. No	Consideration on child's age Level	Year	Role of constitution team
1	Pre-school level	4 years and younger	• Develop toilet training, bed wetting, clinging behaviour's etc. • Allowing parents and primary caregivers to stay with the child while he/she is hospitalized in order to prevent damage. • Holding, rocking and offering physical as well as verbal support that the child will be taken care of helps the small child to re-establish a sense of security in the world.

SL. No	Consideration on child's age Level	Year	Role of constitution team
2	School age	5-12 years	• Child has an increasing capacity to grasp reality of the permanence of loss. • It is important to determine the child's perception relevant to the cause of the loss and to correct and clarify misconceptions. • May have difficulty focusing and concentrating in school.
3	Adolescent.	13-18 years	• Grief may be masked by: substance abuse, truancy, social isolation and withdrawal from family and/or peer group, impulsivity, sexual acting out and promiscuity, reckless, risk-taking or self-defeating behaviour's. • Grief may also be masked in over achieving for underachieving. The child who is trapped in perfectionism demands as much concern as the child who is apathetic, cynical, and underachieving. • Mood swings are common in adolescence and in all likelihood this will be intensified by the loss. • Often adolescents seek emotional support more readily from peers than adults and age appropriate support groups can be very helpful. • May have difficulty focusing and concentrating on studies or may become lost in intellectual pursuits such as reading, and computer related activities.

5.4.5.-Severity

dB level	Type of Impairment	Impact		
		Ability to perceive sound	Speech discrimination	Communication
0 to 25 dB HL	Normal Hearing	Normal	Normal	Speech is normal and normal pattern of development with good auditory perceptive skills.
26-40 dB HL	Mild Hearing Loss	Difficult to identify soft sound such as whispering and others.	100% better ear	Speech and language developments are within normal limits. May exhibit occasional auditory perception problems some educational retardation likely.
41-55 dB HL	Moderate Hearing Loss	Unable to hear clearly what others are saying during conversation. Hearing aids are necessary.	50% to 80% better ear	Language development and speech are mildly affected. Difficulty with rarely used words, minor differences in meaning of words and idioms, defective articulation but still intelligible speech loss quality and inflection almost normal. Reading and writing delayed. Vocabulary training, reading and writing to be special attended train addition to schooling.
56-70 dB HL	Moderately-Severe Hearing	Unable to clearly hear loud noises such as telephone ring Severe	40% to 50% better ear	Grammar, vocabulary, articulation and voice are affected understand in loud speech. Early speech is unintelligible. Even with hearing aids show difficulty in understanding. Reading and writing need special assistance.
71-90 dB HL	Severe Hearing Loss	Can only hear very loud noises and sounds such as shouting or vacuum cleaner noise.	No discrimination	Speech and language don't developments spontaneously. Sound produced very loudly at a distance of 1ft. and near of the ear. The voice will be high-pitched and articulation distorted.
>90 dB HL	Profound Hearing Loss	Difficult to perceive any sound	No discrimination	They don't rely on hearing for their communication. Language and speech develop only by training and they are educationally deaf. Communicate mostly through gestures, voice, inflection, articulation greatly affected. Required regular speech and language training regarding subject's expert.

5.5.6.-Associated condition

The constitution team Learner with hearing impairment who face other associated or multiple condition that disability category combination of those learners who have physical, cognitive and communicative impairments (Multiple disabilities,2017). The team member should provide in appropriate accommodations and adaptations strategies for the purpose of successful classroom activities of the learner with hearing impairment who face other associated or multiple condition.

New Teacher Induction Program.2011, suggest the follows constitution team regard Accommodation& Adaptation Strategies for Learner withhearing impairment who face other associated or multiple condition are:

- Curriculum should be learners need based. That is why curriculum should have more emphasis on long and short-term planning.
- Selecting and using effective strategies to improve learners 'self-monitoring, self-assessment, and goal-setting for their own learning.
- For the purpose of better achievement of the learner's classroom assessment and evaluation strategies should be ongoing and continuous.
- To assess and evaluate learners' work simple achievement charts should be used.
- Informing and helping learners and parents to understand the assessment and evaluation strategies to be used and giving them meaningful feedback for improvement.

5.6-Team's role before, during and after assessment; Identifying and addressing the need and planning IEP / IFSP

For the purpose of the assessment team is the main unit of work in children with hearing impairment. Because with the help of team diagnose the problem and solve it through the team assessments specifically the line provides information about different types of hearing problem, diagnosis and intervention strategies of therapy, educational opportunities, vocational training and job opportunities, special employment exchanges, Government Schemes and facilities, Organizations working for PWDs and Prevention and management of disabilities in specially in hearing impairment.

5.6.1-Team Role before Assessment:

According to Tame side local offer for children and young people with hearing impairment/deafness (nd) team role should be before assessments in hearing impairment are:

1. Information to parents about child impairment.
2. Understanding the child's type and degree of hearing loss
3. Communication options those are available for the purpose of communication
4. Inform about how use and maintenance of hearing aids, cochlear implants, FM systems

6. Inform about how the professionals are available and their roles.
7. Inform about what the services available are and how to access them. These are Opportunities to meet other parents, Offering joint visits for hearing aid fitting and cochlear implant appointments and offering and supporting an informed choice etc.
8. Supporting parents with advice about the development of their child and providing suitable individual programmes of need. These are interaction and communication skills and developing language and listening skills
9. Supporting transition from home to nursery or early years setting and then from there into school.

5.6.2-Team role during Assessment

According to Boys Town National Research Hospital, 2019 team role in hearing impaired children during assessment are:

5.6.2.1-Role of Audiologist

- Keeps track of the amount of hearing.
- Uses special technology and knowledge to fit hearing aids.
- Monitors and programs cochlear implants.
- This is the person to contact if you have any questions or concerns about how your child is hearing or how listening devices are working.

5.6.2.2-Role of Services Coordinator

- A services coordinator is one of your first contacts with the early intervention program.
- Your services coordinator becomes a central point of contact between you and the early intervention program and/or other professionals.
- This professional will work with you to identify and meet the child's needs by coordinating both formal and informal supports.
- Sometimes many professionals become involved in your team. It can be crushing to keep up with all the contacts to keep things running smoothly. The services coordinator can assist with this and many other needs.

5.6.2.3-Role of Family-Infant Teacher

- The Family-Infant Teacher may have a background in a **variety of disciplines** (e.g., teacher of the deaf, speech-language pathologist; audiologist, special education teacher, early childhood specialist).
- Be sure to know the professional background of your teacher.
- It is important that your teacher have **special expertise** in working with infants who are deaf or hard of hearing and their families.

5.6.2.4-Role of Speech/Language Pathologist (SLP)

- Sometimes, your family-infant teacher is a speech language pathologist (SLP), who has special training in working with young children who are DHH.
- An SLP is skilled at promoting spoken language development; guiding you through the development of listen, talking, and learning words and concepts.
- Some SLPs are skilled in sign language, and can help the family learn to sign, if that is the family's chosen approach.
- An SLP is also skilled in promoting communication through alternate approaches (pictures, communication boards) for children with additional special needs.

5.6.2.5-Role of Teacher of the Deaf/Hard of hearing

- This professional has specialized training in educating children who are deaf or hard of hearing.
- These teachers may be endorsed to work with young children, or they may work in classrooms with school age children.
- A teacher of the deaf/hard of hearing has in-depth understanding of the ways in which hearing loss affects learning, and knows strategies to promote listening, language, learning and communication access.

5.6.2.6-Role of ENT Physician

- The ENT physician specializes in evaluating and diagnosing the cause of your child's hearing loss and makes recommendations for your child's medical treatment options.
- Your child's ENT physician will take care of your child's medical hearing and other ENT needs throughout their childhood and adulthood.
- The ENT doctor will examine your child and provide medical clearance for obtaining hearing aids.

- Your ENT doctor may be involved with a Cochlear Implant (CI) team or will help you link with a Cochlear Implant team, if you desire such services and they are indicated for your child.
- The ENT doctor's recommendations are sent to your child's general physician regard other medical services are well coordinated.

5.6.2.7-Role of General Physician

- Child needs to see the family practitioner or pediatrician regularly in order to grow up to be healthy and strong.
- Physician will be asked to approve and sign the Individualized Family Services Plan (IFSP) developed by your baby's team.
- Your team will work to ensure that educational and medical services are communicating with each other and coordinating care. This is in everyone's best interest.

5.6.3.- Team role after Assessment

According to National Deaf Children's Society, April 2017 the team roles after assessment of children with hearing impairment are:

- Get to know the child's parents so that you can share knowledge and develop a support plan with them for purpose of future development.
- Meet with the Teacher of the Deaf to identify the deaf child's individual needs and learning priorities also plan the necessary adaptations required within the early years setting and in any learning experiences
- Undergo training in identified areas of need, with advice from the Teacher of the Deaf
- Make need based adaptations to the environment.
- Arrange opportunities for the child to visit and familiarize themselves with staff and the environment.
- Tell other children about deafness and what they can do to help their peer communicate and socialize.
- Attend multidisciplinary meetings and individual meetings with the agencies who have supported the deaf child and their family to date in order to gather information and advice to support their specific needs

5.6.4.- Identifying and addressing the need and planning IEP / IFSP

Individualized education program (IEP) planning and individualized family service plan (IFSP) planning are the processes of determining, based on assessment data, a child's or student's educational needs and then completing a written statement, such as an IEP or IFSP, that is developed, reviewed, and revised by a team of individuals. An IEP is an education document for children ages 3 to 21. It focuses on special education and related services in schools. An IFSP is much broader. It is used for children from infancy through age 2, involves the family more, and may include professionals from several disciplines in planning for the child. An IFSP is based on an in-depth assessment of the child's needs and the needs and concerns of the family. It contains 1) information on the child's present level of development in all areas; 2) outcomes for the child and family; and 3) services the child and family will receive to help them achieve the outcomes.

5.6.4.1- Need and planning IEP / IFSP:

According to Pennsylvania, (n.d.) Need and planning IEP / IFSP are:

- The IFSP and IEP are plans that identify services and supports so that family members and early education programs are actively engaged in promoting the child's learning and development.
- The IFSP/IEP team determines the skills/abilities and appropriate supports and services either in the natural environment or the least restrictive environment to accomplish the established goals and outcomes.
- These decisions are not made by matching the child's areas of delay with a particular early intervention discipline. Rather, supports and strategies are individualized and build on the strengths and skills the child demonstrates in all areas of development.
- The IFSP and IEP are plans that consider: the strengths of the child; concerns of the parent/guardian; most recent evaluation results; academic, developmental and functional needs of the child; communication needs of the child; and will incorporate revisions to the plan to address lack of progress.

5.6.4.2- Difference between an IFSP and an IEP.

According to PACER Center, (2011) there are some significant deference's between an IFSP and an IEP. These are

IFSP	IEP
Used in early intervention for children ages birth through 2 and their families	Used in special education for children ages 3 to 21
Includes information about the child's present levels of development	Includes information about the child's present levels of educational performance and participation in developmentally appropriate activities
With the family's approval, it may also include information regarding the family's resources, priorities, and concerns related to the development of their child	Includes information about the family's concerns for enhancing the child's education
After the team determines a list of priorities and concerns, the family determines which outcomes will be included on the IFSP	The IEP team, including the parents or guardians and related service providers who work with the child, determines the goals
Includes the major outcomes desired for the child and family, as well as the methods, timelines, and a plan to measure progress	Includes measurable annual goals, academic and functionally, designed to: • Enable the child to be involved in and make progress in the general curriculum; • Describe how progress will be measured and how often • Describe how progress will be reported to the family
Includes the natural environments where services will be provided	Describes services provided in the least restrictive environments (LREs) and an explanation of the extent, if any, that the child will not participate with typically developing children
Includes the early intervention services and supports necessary to meet the unique needs of the child and family in order to achieve the identified outcomes	Includes the special education, related services, supplemental aides and services, modifications, and supports to be provided to help the child make progress and participate in developmentally appropriate activities
Team membership includes: • A parent or parents of the child • Other family members as requested by the parent • An advocate or person outside the family, if parent requests that the person participate • Service coordinator • A person or persons involved in conducting evaluations and assessments	Team membership includes: • A parent or parents of the child • Regular education teacher • Special education teacher • A representative of the school district who can commit resources • A person who can interpret results of the evaluations • Others who have knowledge or special expertise about the child

5.7 Team's role in outcome measures: Periodic assessment and evaluation; review of performance against previously set goals

Children with hearing loss can have a major impact on other aspects of a child's development – particularly on communication and social interaction skills. The child may use sign language, speech or a combination of the two. Unless steps are taken to help the child feel confident in social situations, they are likely to be withdrawn – remaining on the edge of groups of children or preferring a one-to-one activity with an adult.

5.7.1.-Concept- Outcome measures are tools that can be used to measure a variety of aspects of children with hearing impairment and wellbeing. Outcome measures often take the form of questionnaires about how hearing impairment individual feels or functions. These would generally be filled in by a child or young person, or by a parent, peer, clinician, teacher or similar professional. Outcome measures have a continuous research process that process are the extent to which a particular outcome measure. This outcome measure is 'valid' – whether it actually measures what it claims to measure and 'reliable' – whether the measure would produce similar scores in the same conditions if used again.

5.7.2.-Team Role of outcome measures- There are four important roles in outcome measure in children with hearing impairment. These are Cognitive abilities, Linguistic and Commutation abilities, Self-directed movement and Process of activity.

5.7.2.1.-Cognitive abilities: The intelligence of Children with hearing impairment is differing on the basis of degree and type of disabilities. Cognitive competence encompasses the skills and capacities needed at each age and stage of development to succeed in school and in the world at large. Also cognitive competence is defined by skills in language and communication, as well as reading, writing, mathematics, and problem solving. So team should be providing stimulating, challenging and supportive environments in which to develop these skills healthy self-regulatory practices and modes of persistence required for academic success.(Gottfried, 2013).

5.7.2.2.-Linguistic and Commutation abilities: Linguistic and Communication is frequently a high priority outcome, as well as high need area for children with hearing impairment. Communication has been defined as expressing one's needs and wants, developing social closeness, sharing information, and fulfilling social

etiquette responsibilities. (Schlosser &Sigafoos, 2006).It is most important factor that team should be providing guidance on constructing home and school environments that affect normal language acquisition. As language is essential for making good educational progress and social development, any language delay should be addressed by the school. It is important to monitor the learner's language and refer them to the Teacher of the Learner with hearing impaired for assessment if it is felt they do not have age-appropriate language or are starting to fall behind. The Teacher Learner with hearing impairment will monitor a pupil's language, listening, speech and communication development using a number of specific tests. Where language delay is identified, specific programs of work will need to be put in place which target individual learning needs.

5.7.2.3.-Self-directed movement

For most children, movement in daily life activities is automatic and requires little thought and simple movement is based on a complex interaction of sensory, motor and cognitive components. But children with hearing impairment frequently experience limitations in their abilities due to auditory clue. That is why they limited in their ability to engage in social interaction, initiate intentional communication and explore and manipulate their environment. The sensory, social, and language input they receive may be drastically reduced or altered compared with their typically developing peers. Despite the fundamental importance of early motor development, research aimed at specifying effective and efficient early motor interventions has been hindered by a variety of conceptual and methodological problems.

5.7.2.4.-Process of activity: It agrees that "active participation in life tasks". (Diener, Lucas, &Oishi, 2002, p. 66) Therefore, the subjective well-being depends on the changes that occur on people's lives when they are involved in activities or achieve their goals (Diener, Lucas, &Oishi, 2002). Halpern (1993) as well as Ruble and Dalrymple (1996), suggests that success in children with hearing impairment in particular is the achievement of a balance between subjective and objective goals, or finding a "person-environment fit." While objective societal values such as competitive employment and independent living are important, they do not capture the complete picture of what it means to become an adult. With the person-environment fit perspective, these goals are evaluated and adjusted within the individual's unique context. A balance between objective goals and the individual's subjective experience results in the person's optimal well-being in adulthood. For example, not only is it important whether an individual with special needs is employed, but also how

well the job fits his or her interests and provides a level of support adequate for success.

5.7.3.-Periodic assessment and evaluation

Periodic assessment is specific assessments which focus on especially in subject's current level. Periodic assessment helps identify strengths and weaknesses in both individuals and groups and enables teachers to priorities the next steps in teaching and learning. According to Passport Health Plan (nd) Periodic Assessment is a federally mandated Medicaid program for children with hearing impairment. This assessment required providing comprehensive services and furnishing all Medicaid coverable, appropriate, and medically necessary services needed to correct health conditions.

5.7.3.1.-Effective periodic assessment: It

- requires evidence from a wide range of contexts, for example observation of group work, oral responses and homework
- can be based on individual or group activities
- will have most impact where outcomes can feed directly into medium- and short-term planning
- requires a structured, consistent approach to the review of evidence
- depends on good subject knowledge and a clear understanding of progression in key concepts and skills within the subject.

5.7.3.2.-Periodic assessment evaluation: It

- does not require special assessment activities but involves making use of the opportunities provided by planned teaching and learning
- provides a broad picture of achievement, giving a better view of pupils who may have progressed unevenly in different aspects of the curriculum
- draws on a wide enough range of evidence to link pupils' achievement to national standards in a meaningful way, as well as indicating next steps for learning and longer term targets.
- reveals aspects of the curriculum that need to be strengthened
- supports evaluation of progress and the setting of appropriate learning targets at both individual and group level.

5.7.4.-Review of performance against previously set goals

Performance based goal can be controlled by the person who set the goals when possible. This goal focus on person based. According to Performance or previously set goals helps managers (2019), review of performance against previously set goals are:

- Performance and previously set goals, helps the team member identify problems in children with hearing impairment in the workplace.
- After identifying a problem, the team member should select appropriate decision criteria. These criteria reflect the factors which the team member thinks are relevant in a decision. Because all criteria are not equally important, the team member must prioritize each one by allocating weights to the decision criteria
- This criterion indicating the relative importance of the relevant criteria by assigning a weight to each.
- Problem must list, but not evaluate, feasible problem-solving alternatives. Then, he or she must analyze each one.
- As each alternative is evaluated against the criteria, the strengths and weakness of each alternative will become evident.
- Most of the time team member take decisions about contain judgments which are reflected in the criteria chosen, the weights assigned to them, and the evaluation of the alternatives.
- The decision-making process can fail if the chosen alternative is not implemented properly.
- Successful decision implementation includes identifying those who will be affected by the decision and gaining their commitment to the decision.

5.8.-Let us sum up

In this unit, we discussed the concept and type of team approach in children with hearing Impairment. Also discussed about role of various stakeholders as well as constitution team with respect to children with hearing impairment especially in child's age, severity and associated condition. Hence, we have further discussed about identifying and addressing the need and planning IEP / IFSP and major discussed in difference between an IFSP and an IEP. The unit end with a discussion on the team role in outcome measures especially in periodic assessment and evaluation children with hearing impairment.

5.9.-Unit end exercise

1. Write in details about types of team approach in CWHI and it advantage disadvantage.
2. What do you mean by stakeholder? Discuss in details about Role of Professional and parents approach in CWHI.
3. What do you mean by IEP and IFSP? Discuss in details about IEP and IFSP and it difference.
4. What do mean by outcome measure in CWHI? What are the role of team member about outcome measure?
5. Discuss in shortly about periodic assessment and Evaluation in CWHI.

5.10.- References

1. A resource guide: Mainstreaming a child with a hearing impairment: What teachers need to know,2006 Retrieve on 08.11.2019 from https:// digitalcommons.wustl.edu/cgi/viewcontent.cgi?article= 1103& context= pacs_capstones
2. BBA,2018 The Advantages of an Interdisciplinary ApproachRetrieve on 13.11.2019 from https://www.apmhealth.com/news-updates/apm-blog/item/130-the-advantages-of-an- interdisciplinary-approach
3. Beginnings Professionals in Hearing Loss,2019 Retrieve on 17.11.2019 from https://ncbegin.org/professionals-in-hearing-loss/
4. Boys Town National Research Hospital, 2019 Retrieve on 17.11.2019 from https://www.babyhearing.org/language-learning/early-intervention-team
5. Carol Rosen, A. Cate Miller, MA 1998, Retrieve On 13.11.2019 from https:// www.archives-pmr.org/article/S0003-9993(98)90145-9/pdf
6. Community-Based Rehabilitation Promoting ear and hearing care through CBR, World Health Organization 2012 Retrieve on 08.11.2019 from https://www.who.int/pbd/ deafness/news/CBREarHearingCare.pdf
7. Considerations In The Education Of Children With Hearing LOSS,(1999) Retrieve on 17.11.19 from https://www.pediatric.theclinics.com/article/S0031-3955(05)70087-0/fulltext

8. Developmental Disorders Series Hearing Impairment Child Assessment Service, Department of Health, HKSAR 2008,Retrieve on 17.11.2019 from https://www.dhcas.gov.hk/english/public_edu/files/SeriesI_HearingImpairment_Eng.pdf

9. Diener, E., Lucas, R. E., &Oishi, S. 2002, Subjective well-being: The science of happiness and life satisfaction. In C. R. Snyber, & S. J. Lopez (Eds.), Handbook of positive psychology (pp. 65-73). New York: Oxford University Press

10. Early, Periodic, Screening, Diagnosis & Treatment Retrieve on 08.11.2019 from http://passporthealthplan.com/wpcontent/uploads/2014/11/EPSDT_revisedWomensHealth.pdf

11. Gaille, B.2018, 11 Multidisciplinary Team Advantages and Disadvantages Retrieved on 13.11.2019 fromhttps://brandongaille.com/11-multidisciplinary-team-advantages-and disadvantages

12. Gottfried AW. Home Environment and Early Cognitive Development: Longitudinal Research. London, UK: Academic Press; 2013.

13. Happy Stakeholders in Special Education Communicating with All the Parties with Claims on Special Education, n.d. Retrieve on 08.11.2019 from https://www.thoughtco.com/happy-stakeholders-in-special-education-3110477

14. Hearing Impairment (HI) Team Retrieve on 17.11.2019 from https://schools.oxfordshire.gov.uk/cms/content/hearing-impairment-hi-team

15. Halpern Quality of life as a conceptual framework for evaluating transition outcomes. Exceptional Children. 1993; 59:486–498

16. Lorena Cassady (nd)The Disadvantages of Interdisciplinary Teams in the Classroom Retrieve on 13.11.2019 from https://classroom.synonym.com/disadvantages-interdisciplinary-teams-classroom-7721082.html

17. Multiple disabilities Retrieved on 23/11/2019 from https://en.wikipedia. org/wiki/Multiple_ disabilities

18. National Academy of Sciences 2019 Retrieved on 11.11.2019 from https://www.nap.edu/read/18550/chapter/7 Retrieved on 11.11.2019

19. New Teacher Induction Program, 2011. Planning, Assessment and Evaluation, Retrieved on 23/11/2019, from http://www.bgcdsb.org/ User Files/ Servers/Server_5912063/File /NTIP/ Ministry%20docs/Plan_assess_evaluate.pdf

20. National Deaf Children's Society April 2017 Retrieve on 17.11.2019 from http://www.essexlocaloffer.org.uk/wp-content/uploads/2016/05/Supporting-the-achievement-of-hearing-impaired-children-in-early-years-settings.pdf

21. Project Management 101, 2019 Retrieve on 8.11.2019 from https://www.projectmanager.com/blog/what-is-a-stakeholder

22. PACER Center, 2011 Retrieve on 17.11.2019 from https://www.pacer.org/parent/php/PHP-c59.pdf

23. Pennsylvania Office of Child Development and Early Learning, n.d. Retrieve to 17.11.2019 from http://www.eita-pa.org/assets/IFSP.IEP-annotated.pdf

24. Performance or previously set goals helps managers, 2019 Retrieve on 18.11.2019 from https://www.coursehero.com/file/p2t2dr/performance-or-previously-set-goals-helps managers-identify-problems-in-the/

25. Passport Health plan, nd Retrieve on 18.11.2019http://passporthealthplan.com/wp-content/uploads/2014/11/EPSDT_revisedWomensHealth.pdf

26. Role of Parents in care of hearing impaired, nd Retrieved on 8.11.2019 from http://vikaspedia.in/education/parents-corner/guide-to-parents-their-role/role-of-parents#section

27. The Peak performance Centre, nd Retrieve on 08.11.2019 from http://thepeakperformancecenter.com/development-series/skill-builder/personal-effectiveness/goal-setting/setting-goals/performance/

28. Schlosser RW, Sigafoos J. AAC interventions for persons with developmental disabilities: Narrative review of comparative single subject experimental studies. Research in Developmental Disabilities. 2006; 27:1–29

29. The Phoenix Society, 2019. Retrieve on 17.11.19 from https://www.phoenixsociety.org/resources/entry/developmental-considerations

30. Tame side local offer for children and young people with hearing impairment/deafness(nd) Retrieve on 17.11.2019 from https://www.tameside.gov.uk/localoffer/Deaf-Provision.pdf

মানুষের জ্ঞান ও ভাবকে বইয়ের মধ্যে সঞ্চিত করিবার যে একটা প্রচুর সুবিধা আছে, সে কথা কেহই অস্বীকার করিতে পারে না। কিন্তু সেই সুবিধার দ্বারা মনের স্বাভাবিক শক্তিকে একেবারে আচ্ছন্ন করিয়া ফেলিলে বুদ্ধিকে বাবু করিয়া তোলা হয়।

— রবীন্দ্রনাথ ঠাকুর

ভারতের একটা mission আছে, একটা গৌরবময় ভবিষ্যৎ আছে, সেই ভবিষ্যৎ ভারতের উত্তরাধিকারী আমরাই। নূতন ভারতের মুক্তির ইতিহাস আমরাই রচনা করছি এবং করব। এই বিশ্বাস আছে বলেই আমরা সব দুঃখ কষ্ট সহ্য করতে পারি, অন্ধকারময় বর্তমানকে অগ্রাহ্য করতে পারি, বাস্তবের নিষ্ঠুর সত্যগুলি আদর্শের কঠিন আঘাতে ধূলিসাৎ করতে পারি।

— সুভাষচন্দ্র বসু

Any system of education which ignores Indian conditions, requirements, history and sociology is too unscientific to commend itself to any rational support.

— Subhas Chandra Bose

Published by : Netaji Subhas Open University, DD-26, Sector-I, Salt Lake, Kolkata-700 064 &
Printed at : The Saraswati Printing Works, 2, Guru Prosad Chowdhury Lane, Kolkata 700 006