LANGUAGE IMPAIRMENTS IN HEARING IMPAIRED & ASSESSMENT OF HEARING IMPAIRED

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Introduction:

Definition: Hearing loss (HL) can be defined medically, educationally and culturally. When defined medically, HL is categorized at levels from slight to profound. When defined educationally, HL is described in relation to the child's ability to learn language via audition and to perform academically. For example: the Individuals with Disabilities Education ACT (IDEA) uses hearing impairment as the category labels and defines it as a loss that serve enough to adversely affect a child's educational performance. When defined culturally, hearing loss is described in terms of a shared cultural identity among individuals who are deaf or hard of hearing (Schiermer, 2000).

Keith, 1996 - Table: Degree of HL and Impact on communication

Hearing Level	Descriptor	Impact on communication
-10 to 15dB	Normal	No impact on communication
16 to 25dB	Slight	In quiet environments the individual has no difficulty, recognizing speech, but in noisy environments faint speech is difficult to understand
26 to 40dB	Mild	In quiet conversational environment in which the topic is known and vocabulary is limited, the individual has no difficulty in communicating. Faint or distant speech is difficult to hear even if the environment is quiet. Classroom discussions are challenging to follow.
41 to 55dB	Moderate	The individual can hear conversational speech only at a close distance. Group activities, such as classroom discussions, present a communicating challenge.
56 to 70dB	Moderate	The individual can hear only loud, clear conversational

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	severe	speech and has much difficulty in-group situations. Often, the individual's speech is noticeably impaired through intelligible.
71 to 90dB	Severe	The individual cannot hear conversational speech unless it is loud and even then cannot recognize many of words. Environmental sounds can be detected, though not always identified. The individual's speech is not altogether intelligible.
91dB+	Profound	The individual may hear loud sounds but cannot hear conversational speech at all. Vision is the primary modality for communication. The individual's own speech, if developed at all, is not easy to understand.

Hearing and Language:

A strong relation between normal hearing and normal oral language acquisition is well established. Normal hearing is essential for oral language acquisition and production because of two important reasons. First, normal hearing makes the child aware of the spoken language. Second, normal hearing makes it possible to self monitor language production. The child can listen not only to the speech of other persons, but also to his or her own speech and modify it to match the adult model.

Speech comprehension precedes speech production in the process of first language acquisition, even though certain structures may be produced before they are fully comprehended.

Perception of speech is noticeable in children, in some manner, very early, say, at six months. From the absence of speech perception ability in the early months, the child progresses towards the adult level of speech perception ability in the early months, the child progresses towards the adult level of speech perception ability as his age increases. From early reflexive perception of perceiving one's own sounds, the child begins to

acquire perceptual skills of attending to and localizing the sounds emitted by other sources.

Communicative behavior in later life is closely linked with auditory competence in early life. With the absence of hearing, or the presence of distorted hearing in the hearing impaired child, the speech perception of the child is also distorted. As a result, the expressive aspect of speech and language of the child is distorted. With hearing impairment, the children have problems with short-term memory (Manning, et al., 1977). Child has difficulty in acquiring language efficiently and in an appropriate manner for successful communication. Auditory deprivation from birth leads to higher level processing problems, both linguistic and psychological. Word order difficulties, difficulties with discrimination of phonemes, delayed and devaint phonological development are some of the problems that are readily attested. The deaf speech has a temporal form distinct from the speech of the normal hearing. Also note that the deaf children do not develop the same hemispheric specialization for language processing just as normal hearing children do.

In order to compensate for his inability to accurately perceive speech through the ears, the child supplements the use of vision along with audition, or uses vision alone as the primary modality for speech reception. Thus, both the motor movement patterns and acoustic patterns made by the speaker during speech production are utilized by the hearing impaired child for speech perception. Normal hearing children differ from one another in several ways with regard to the frequency of use of vision independent of audition and in aid of audition; there is also difference noticed in the functions of audition and vision in communicative acts between the two. The qualities of audition and vision and of the dependence on vision for audition are some other factors that distinguish the two.

Speech perception begins with the recognition that what is heard is speech and not noise. This recognition is based on the recognition that what is heard is patterned, that what is heard is uttered in a communicative environment, and that what is heard is a specific language (based generally on the comprehension possibilities), and that what is heard is

addressed to someone (facial expressions, face to face communication, physical direction of speech, etc.).

In the absence of normal hearing, the child is not fully aware of what needs to be learned, and whatever is learned and produced is not fully self – monitored. These two problems create the variety of communicative disorders exhibited by persons with hearing impairment. Hearing impairment causes not only language acquisition problems, but also problems of speech production (articulation), voice, resonance, fluency, rate and rhythm. Finally, hearing impairment makes it difficult to comprehend spoken language.

Factors that affect the communicative behaviors:

Hearing impairment produces varied effects across children. Factors that contribute to such individual differences include the following:

1. **The age of onset:** Generally, the earlier the onset, the greater the negative effects on language acquisition and production. Congenital hearing impairment produces the greatest effects. Hearing loss acquired after learning language is completed produces less severe effects.
2. **The degree of loss:** Generally, the greater the loss, the more profound the effects on communicative skills. It was believed that a mild hearing loss that often accompanies middle ear infection does not produce much of an effect on speech and language acquisition. Recent research suggests that even a loss in the range of 15-25dB may be sufficient to cause delay in speech and language acquisition.
3. **Age of detection of hearing loss:** The sooner the hearing loss is detected, the better it is for the child because early intervention becomes possible. The earlier the intervention, the greater the chances for better communicative skills. Generally, it is the mild and moderate degrees of hearing losses that go unnoticed until school age. Severe to profound losses are most readily detected at an early age.

4. **The presence of other handicapping conditions:** When hearing loss is associated with mental retardation, neurological impairment, and visual problems, the negative effects on communicative skills are greater.
5. **The types of auditory pathology and hearing loss:** Conductive hearing loss produces less severe effects than sensory neural hearing loss. This is so because conductive hearing losses are less severe and more readily managed with amplification and medical means than are SN losses.
6. **The age at which intervention is started:** the earlier the onset of language intervention, the greater the oral language skills of a child who is hearing impaired.

[B] Developmental Sequence in Language Acquisition of Children Who Are Deaf or Hearing Impaired

A number of researchers have examined the language development of children who are deaf along dimensions of syntax, semantics, and pragmatics. They have found stages and sequences of language development in oral and signing deaf children comparable to those found in hearing children (Crowson, 1994; Schirmer, 1985; Robin Shaw, 1996 and others).

[1] PRELINGUISTIC STAGE IN INFANTS WHO ARE DEAF OR HARD OF HEARING:

Infants who are deaf or HOH respond to their environment in much the same way hearing infants do. They eat, sleep and cry when they are hungry or uncomfortable. The difference between the two infants is in how each responds to environmental stimuli Infants with hearing loss do not usually respond to loud noise unless it is accompanied by vibration. In addition to vibration, they are sensitive to other environmental stimuli such as light, shadows and smells. As the infants mature, there is little difference in the way each responds. Both will reach early developmental milestone at approximately the same time; however, the infant with a hearing loss often misses a critical precursor to language development, sharing linguistic inputs with caregiver.

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During the baby's first year, sensory input shapes the brain's organization and the baby becomes sensitive to the idiosyncrasies of her particular language (Hendricks, 1998). Hearing infants are particularly sensitive to sounds of a language in the first few months of life and by eighteen months they can detect sentences with grammatical inconsistencies (Jusczyk, 1997). Infants with hearing losses are sensitive to visual input and touch. All infants, however, participate in early visual interactions with caregivers.

(i) Gestures:

Research that helps us understand pre linguistic development in deaf children centers on how pre linguistic children use gestures symbolically to represent functions and meanings and how gestural development is related to language acquisition. An example of a symbolic gesture is the young child pointing to an object that is out of reach while looking at his or her mother.

- Feldman (1975) found that deictic gestures were the most commonly used and the first acquired of the two categories of gestures used by young hearing impaired children. Deictic gestures functioned in a manner similar to the words 'this' and 'that' in spoken language and consisted usually of pointing to an object, tapping the object, or performing a swinging motion toward the object.
- In an investigation of the semantic relations expressed by young deaf children, Goldin-Meadow and Feldman (1975) classified the observed gestures into two basic classes of propositions: actions and attributes. Action propositions were produced at earlier ages and more frequently than attribute propositions.

  An action proposition was usually used to request or to comment on an action.

  An attribute proposition was used to comment on the perceptual characteristics of an object.

They also found that deictic gestures always preceded characterizing gestures-that is, the subjects always pointed to objects before using more symbol-like gestures in a descriptive manner.

- Skarakis & Prutting (1977) described the semantic pragmatic component of the spontaneous communication acts of four preschool HI children. Communication acts

were defined as gestures and descriptions of facial expressions and actions as well as vocalizations and verbalizations. The communication acts were analyzed for semantic function and communicative intents and were compared to communication acts of the same developmental level but in younger hearing children. They concluded that, although the deaf subjects were older, they were exhibiting communicative intents and semantic functions that usually are considered prerequisite to mature communicative competence. The HI children apparently were following the same continuum of language development, as hearing children but at the delayed rate of language development; there were no indications that their development was divergent from normal patterns of language development.

- At this point, conclusions from the research on the expression of communicative intent through the symbolic use of gesture in children who are hearing and deaf (Acredolo and Goodwyn, 1988; Bates et al., 1980; Bretherton et al., 1981; Carroll and Gibson, 1986; Golddin-meadow and Morford, 1985; Volterra and Erting, 1990) suppor the following views:
  - Both infants who are deaf and normal hearing use symbolic gestures to communicate.
  - Symbolic gestures appear approximately at the same time as spoken words in hearing children.
  - Symbolic gestures seem to be used for requesting before they are used for labeling.
  - Gestures and words are both used first in reutilized activities.
  - Gestural communication is an important stage in the acquisition of language.

Gesture has also been an important area of study for researchers focusing on deaf children who do not have either a spoken or sign language. This type of communication is sometimes called 'home sign systems' or 'self-styled communication system'.

(ii) Communication through the sense of touch:

Studies of tactile contact with infants have presented interesting information regarding the role of touch in communication. Koester, Brooks, and Traci (2000) stated that 'touch

plays an important role in the development of interactive dialogues between caregiver and child'.

(iii) Motherese:

When hearing adults communicates with hearing infants they alter their speech patterns in order to maintain the child's attention. This form of modified speech is referred to as motherese. Cross-linguistic studies conducted in several languages have found that motherese may have universal linguistic and prosodic features.

Characteristics of motherese:

- Sentences simplified semantically and syntactically.
- Sentences well-formed (syntactically 'correct')
- Short sentences
- Redundant (i.e., more repetitious)
- About the 'here and now' (i.e., talk is about shared perceptions)
- Refer to concrete objects
- Exaggerated stress and intonation
- Clear pauses between utterances.
- Sentences simplified phonologically
- Higher pitch
- Greater imperatives
- Selective use of content words and fewer function words
- Slow rate
- Highly intelligible.

Erting, prezioso and O'grady-Hynes (1999) studied motherese used by deaf mothers for whom ASL was their first language to identify attributes of mothers in ASL. They found that deaf mothers placed the signs closer to the infant, oriented the palm so that the full hand was visible to the infant, maintained full-face visibility, directed eye gaze to the infant, and lengthened sign by repeating the same movement. The conclusion of the study was that parents use special articulatory features when communicating with infants including parents who use a signed language for communication.

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(iv) Babbling:

It is well accepted that during the first year of life, hearing or auditory perception has a tremendous influence on speech production. The table below provides a comparison of deaf and hearing infants based on the stages of vocal development during the first few months of life (Oller, 1978)

Stage	Age	Comparison of Deaf Infants with Hearing Infants
Phonation	0-1months	No significant differences between the infants
GOO	2-3months	No significant differences between the infants
Expansion Marginal babbling	4-6months	At approximately 6 months of age both infants produce vocalizations characterized by rhythmic vocal play, some with familiar sounds (eg: mama, dada). Both infants vocalizations have slow, but well-formed consonants and vowel production
Canonical babbling	6-7months	Hearing infants begin producing rapid consonant-vowel production; however, the deaf infant's babbling decreases dramatically

Clement and Konpmansvan Beinum (1996) found that deaf infants showed a dramatic decrease in babbling during the later stage. Infact, marginal babbling disappears quickly because of lack of auditory feed back.

Another phenomenon that occurs at the onset of marginal babbling is rhythmic manual activity. Ejiri (1998) found that 75% of marginal babbling was accompanied by rhythmic manual activity in hearing babies, but as the hearing infant proceeds to canonical babbling, the rhythmic manual activity decreases dramatically. He further found that deaf infants marginal babbling frequently co-occurs with rhythmic manual activity.

Of significant interest to researchers has been question of whether deaf children of deaf adults babble in sign language. Petito and Marentette (1991) analyzed manual

babbling in deaf and hearing children and concluded that deaf children produce many more **"manual babble**" than hearing children.

Marschark (1997) referred to this as manual babbling or **'mabbling'**. He stated that manual babbling consists of simple production or repetitions of the basic components of a sign, such as isolated hand shapes or movements. One example; provided by him was the hand movements for sign "MILK", made by opening and closing the hand into a fist. Deaf parents respond to these mabbling attempts in the same way as hearing parents respond to babbling, thus reinforcing the production, mabbling changes in to meaningful signed communication in the same way as babbling changes into spoken words.

[2] SEMANTICS:

Definition: Semantics is defined as the meaning or content of language. As children learn the content of language they are discovering the rules that govern the meaning of words, phrase and sentences.

- Research has focused on the semantic properties of words and morpheme and on the semantic role that each word plays in a phrase or sentence so that they can examine hearing and deaf children's development of meaning (Bloom & Lahey, 1978; Brown, 1873; Leutke-Stachlman, 1988; marvin and Kosal, 1996).

(i) Vocabulary Development:

- Even though some deaf children of hearing parents acquire first words at the same rate as hearing children, they typically fall progressively behind their peers in vocabulary growth (Spencer and Ledneberg, 1997).
- Schafer & Lanch (1980) observed four prelingually deaf children during the period when expressive language emerged. The children were 15 to 84 months of old, had hearing parents. Results showed an obvious difference in the speed of language development compared with hearing children. This delay was most obvious in the onset of two-word utterances. The MLU of hearing subjects in the Bloom, Lightbown, and Hood (1975) study was 1.0 to 2.0 at a chronological age of 19 to 24

months. They found their subjects to be about 8 months delayed in acquiring language.

- Lederberg, Prezbindowski and Spencer (2000) provided a unique look into deaf and HOH children's development of vocabulary, based on the research of novel (meaningful word) mapping strategies (Merriman, Marazila and Jarris, 1995)

In their study, non signs (nonsensical invented signs that follow phonological rules but have no legitimate referent) were presented to deaf and HOH children attending special school for the deaf. They examined novel mapping and rapid word-learning strategies of 19 subjects between the ages of 3 year 2month to 6 year 10months. They refer to the two categories of novel mapping and word-learning strategies as "fast mapping". They found that 12 of the 19 children (called novel mappers) used a novel word-learning strategy to learn the label for a novel object. 16 of the 19 children were successful in learning new words during the rapid word learning task. The researchers postulated that 'there appears to be three levels of word learning abilities: i)novel mappers, ii)rapid word learners and iii)slow word learners (Lederberg et al., 2000).

(ii) Later vocabulary Achievement:

- The vocabularies of deaf students usually contain far fewer lexical items than those of hearing peers (Odom et al., 1967 and Walter, 1978)
- Their knowledge of common content words is deficient (Walter, 1978)
- They have a great deal of difficulty with English function words (Odom et al., 1967).
- DiFrancesca (1972) stated that most deaf students 18 years old and younger score at or below a fourth grade level on vocabulary achievement tests.
- Cooper and Rosenstein (1966) found that the average vocabulary level of deaf 18 years old person was comparable to that of 9 year old hearing child

(iii) Development of semantic structure:

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- Deaf students have some understanding of the gross distributional properties of English lexical items (Odom, Blanton et al., 1967 and Macginite 1964). However, their functional knowledge of semantic information and of finer syntactic properties of lexical items is extremely limited (Odom et al., 1967; Walter, 1978).
- They appear to exhibit knowledge of category membership but lack of knowledge necessary to make appropriate judgments of semantic information involving finer syntactic properties of words (Bochner, 1982).
- Marshall (1970) found that contextual support somewhat improved deaf children's performance on close procedures although even when maximum contextual support was provided, performance was still inferior to that of their hearing peers.[Many of the studies used Close procedure (deleting a word at specified intervals) to determine knowledge of words and word classes and results indicated that deaf students frequently select words from appropriate syntactic categories to complete sentence but either often choose inappropriate words with in those categories]
- Green and Shephard (1975) used a semantic differential procedure in an attempt to describe the semantic structure of languages in deaf students. The results indicated that the semantic system of deaf children contained dimensions evident in semantic systems of hearing children 2-5 years younger.
- Vocabulary production and comprehension problems include difficulty understanding and using concept words, figurative meanings of words and phrases, and multiple-meaning words. Comprehension problems also extend to connected discourse in both oral and written modalities and they persist as children advance in age (Moeller et al., 1986; Robbins, 1986).

[3] SYNTAX & MORPHOLOGY

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Stages of syntactic development have been well documented (Brown, 1973;DeVelliers and Brown, 1979; Tager-Flusberg, 1997) and have been used to examine deaf children acquisition of spoken English and ASL language (Schimet, 1985; Wilbur, 1987).

(i) Stage I:

Many investigators when comparing children with various handicapping conditions to non-handicapping children use MLU rather than chronological age as the basis for comparison (miller and Chapman, 1981).

The difference between visual and auditory processing of languages has not yet been determined, and it is not known whether comparable MLU's indicate comparable language levels. The problem of how to determine MLU in sign language further complicates the issue. For example: if a child signs 'look at me' using a directional sign, only one sign is made (look, pointing at own face). This sign utterance could be counted as one morpheme because only one sign was made, or as three morphemes, if the English interpretation of the sign utterance "look at me", is used. An additional problem that is encountered if the match between hearing and deaf children is based on MLU concerns the ages of the two groups of children. In most cases the hearing impaired children would be considerably presenting additional confounding factors, such as different cognitive levels and home or school experiences. Despite these problems, because of an absence of other language measures and a lack of empirical data concerning deaf children and MLU indices, the MLU may yield the best information obtainable at this time.

- Most hearing children acquire a vocabulary of 20 to 50 words (Lenneberg, 1966; Nelson, 1973) before they produce two-word utterances which usually occurs at approximately 18 months of age. Schafer and lynch (1980), in their study of deaf children of hearing parents found that at 18 months of age their subjects had vocabularies consisting of 0 to 9 words and did not begin to combine words or signs until approximately 26months of age and older.
- Results of other studies indicated that deaf subjects began to combine words 17 or 18 months of age (Caselli, 1983; Gardner and Zorfass, 1983 and others).

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- When they began to use two word utterances, some of the deaf children were reported to have vocabularies of 20 to 30 words (Caselli 1983) or 100 and more words (Gardner and Zorgass, 1983 and others).
- Few studies are available that describe the characteristics of multiword or multi sign utterances of deaf children. Layton, Holmes and Bradley (1979) examined the multi sign communicative units of young deaf children of hearing parents and compared the results with those for the hearing children. The results indicated that the deaf children used proportionately different semantic-syntactic categories than did the hearing children when they were functioning at equivalent linguistic levels.
- Several observations has been made:
    - For all of the children, the 'action' category had the highest ranking, while action + place had the lowest.
    - The deaf subjects used more state, 'negation' and 'notice' units and fewer 'attribution', 'location action' and existence units than did the hearing children.
    - The categories of 'place', dative', 'intonation', 'instrument' and 'recurrence' were not productive for any of the deaf children.

(ii) Stage II:

During this stage, hearing children begin to produce 3-word utterance and a few inflectional endings and function words begin to appear between and upon the nouns and verbs spoken by the child. Hearing impaired children exhibit similar characteristics at stage II of language development, which usually occurs at a later age than it does for hearing children.

- Hess (1972) studied the language patterns of a HI child and a hearing child whom she had matched on the basis of language levels. She collected spontaneous language samples during mother-child play sessions. Data analysis revealed very few differences between the deaf subject and the hearing subject in the development of syntactic structures. She concluded that the deaf child exhibited a sequence of acquisition similar to that of the hearing child, with two exceptions:

a) The deaf child showed less differentiation in the subject from class, and

b) The deaf child was slightly advanced in the acquisition of structures leading to a negative sentence structure.

- Geffner and Freeman (1980) assessed the language comprehension of 6 year old deaf children, of whom 95% were in Total Communication programs. The results of the study indicated that although the 6 year old prelingually deaf children in this study were past the one word and two word utterances stage of language development and appeared to be in the process of acquiring syntax, they were doing it at a slower rate than their normally hearing peers.
- Kluwin (1982) investigated the probable sequence of the comprehension of written English prepositions. He used Clark's scheme (1973) for predicting the acquisition of prepositions by normally hearing children. According to this scheme, hearing children first acquire locative (place) prepositions, then temporal (time) and finally manner (telling how or to what degree) prepositions. In general the deaf adolescents in Kluwin's study followed the same sequence of acquisition, as did the hearing children.

In summary, the few studies regarding English morphological development in deaf children indicated that the order of acquisition was similar to that of hearing children, although much delayed. The results also suggested that classroom-teaching procedures might influence this sequence.

(iii) Beyond Stage II:

 # Negatives

Hoffmeister and Wilbur (1980) reviewed studies examining the acquisition of negation in deaf children who used ASL. In early stages, deaf children seem to use the sign for no and the negative headshake. The emergence of the signs 'can't' and 'not' characterizes the later stage of acquisition. The deaf children used the sign for "can't" before they produced 'can'; this name sequence of production is common in hearing children. Hoffmeister and Wilbur (1980) concluded that these developmental stages were comparable to those of hearing children (Brown, 1973).

The investigators found that the order of difficulty of the syntactic structures was similar, but not identical, for deaf and hearing children. Progressing from least to most difficult, negation, conjunction and question formation were the easiest structures for deaf children to acquire. These same structures were the three easiest for hearing children to master, but in reverse order.

For deaf children, more difficult structures were pronominalization the verb system, complementation (e.g., I lost the watch that you gave me), and relativization (e.g.,The boy who hit the girl ran away). Hearing children also found this group of structures more difficult than the first group, although the order of increasing difficulty for them was pronominalization, complementation, relativization and verbs. Transformational generative grammar would predict that the recursive process or relativization and complementation, would be difficult for deaf children, partly because of the departure from the subject verb object surface order that deaf students tend to impose on sentences (Quigely, Power and Steinkamp, 1977).

Deaf students found the disjunction (John went to the party, but Susie stayed home) and alteration (You can have chocolate cake or pumpkin pie) structures to be the most difficult, whereas hearing students had much less difficulty with them.

The results of this group of studies indicated that deaf students frequently impose a subject-verb-object pattern on sentences even when it is inappropriate. Given a sentence such as "The boy who hit the girl ran away", a deaf student is quite likely to comprehend that it was the girl who ran away.

A second question that the studies by Quigley and colleagues addressed concerned the establishment of syntactic rules of Standard English in the language of deaf children from 10 to 18 years of age. The results indicated that most of the structures were not well established even among the 18-year-old students. Only simple transformations such as negation, question formation, and conjunction, had been mastered to any significant degree. In contrast, hearing students had mastered all but the most difficult structures by 10 years of age.

Although hearing and deaf children appeared to be similar in several aspects of language development, one important difference in syntactic development between these

two groups should be noted. Deaf children frequently imposed a subject-verb-object pattern on comprehension of English sentences, including sentences in which this order did not apply (e.g., the passive voice and in some forms of relativization). They also tended to connect the nearest noun phrase and the verb phrase, which led to misinterpretation of many sentences, such as those containing embedded relatives (the boy who hit the girl ran away). These two factors, which suggest that the deaf subjects were processing English as a linear rather than a hierarchical structure, probably account for a large part of the deaf children's difficulty with English language (Russel, Quigley and Power, 1976).

 # Questions

Quigley, Wilbur and Montanelli (1974) found in their study investigating English syntactic structures in deaf students that the developmental stages in the acquisition of question forms were similar to those for hearing children. The comprehension of yes-no question forms was easier than the comprehension of wh-questions, and tag questions (We'll go, won't we?) were most difficult to understand. This is the same order of emergence found by Klima and Bellugi (1966) and Grown and Hanlon (1970) in their studies of young hearing children. The deaf children seemed to differ from the hearing children mostly in rate rather than in order of acquisition

 # Coordination

Taylor (1969) found that deaf students frequently attempted to use the conjunction transformation between the ages of 10.5 to 16.5 years. Her students generally did fairly well; however, even the older students still made errors. Common errors observed omissions (e.g., Susie bought a skirt sweater), misplacement (e.g., Susie went to the shopping center and met a friend ate lunch), or over application (e.g., Susie ate a hamburger and French fries and pie and drank milk). The deaf students seemed to make steady progress in constructing sentences using the conjunction and from age 10 through 18 years and found conjunction rules to be among the easiest to acquire. However, other

forms of conjoining, such as using but and or, were more difficult, and little improvement was seen over the age range tested.

 # Complementation

Of the three recursive progress in English (complementation, relativization, and conjunction), Quigley, Wilbur, and Montanelli (1975) found that complementation was the most difficult and conjunction was the least difficult for deaf students. They also found that there were some forms of complementation that deaf students did not even attempt.

Summary

The current body of research concerning syntactic development of deaf students is not large. Possibly the most crucial contribution to emerge from these studies is the evidence that deaf children acquire syntactic structures in sequence similar to hearing children, that they follow similar within-stage sequences, and that they acquire rule governed structures that differ from English syntactic structures.

[3] PRAGMATICS

Traditionally, analysis of the language of children with impaired hearing focused on deficits in lexical, syntactic and in the lesser extent, phonological development. The perspective has now broadened to include the ways in which hearing impaired children put language to use in pragmatics to attain specific goals, as in posing to questions to obtain information, describing events making promises and cracking jokes (Pien, 1985).

(i) Pragmatic or communicative intent:

The study of pragmatic intent is a relatively new field that places linguistics with in a social context (Mey, 1998a). Little research has been conducted relative to deaf and hard of hearing students and pragmatic intent but pragmatic intent in spoken language has common features that cut across all languages, whether signed or spoken.

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Relationship among communication component

Communication Act

↑

Mode of the Act: Speech or Sign

↑

Structure of the Act: ASL or English grammar (syntax / morphology)

↑

Context or meaning of the Act: Semantics

↑

Purpose or Pragmatic intent of the communication Act.

According to May (1998a), there are three broad divisions of pragmatics:

- Micro Pragmatics: It is the study of intention, especially at the word and sentence level.
- Macro Pragmatics: Looks beyond the purpose of a language act to the social context or setting of the conversation.
- Meta Pragmatics: Involves understanding micro and macro pragmatic issues and manipulating them appropriately.

- HI children have difficulties in introducing a topic of conversation or in shifting from one topic to another during conversation, because they do not sufficiently consider the needs of the listener (Moeller et al., 1983).
- According to Krestschmer and Kreshtchmer (1980) there is a problem for HI children in the development of communication repair strategies, which required skills in pragmatics to restore a broken conversation by seeking clarification or by repeating what is said for confirmation, or by offering additional information.

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LANGUAGE IMPAIRMENTS IN HEARING IMPAIRED & ASSESSMENT OF HEARING IMPAIRED

- According to Hegde, persons who are hearing impaired may not know how to use the learned language in natural social situations. The following pragmatic communication problems are likely:

  a) Reluctance to speak.

  b) Limited communication:- A person with HI may not say enough answer strictly to the point and elaborate on what they say. They may not give sufficient background information on what they say.

c) Inappropriate speech:- Speech of some persons with HI also may be inappropriate to the situation or topic of discussion.

In conversational interaction, preschool deaf children may show a narrow range of complexity when they act as initiators and may be less likely to respond to partner's initiations, particularly when utterances are in form of comments (Mckirdy and Blank, 1982).

- The communicative strategies used by deaf infants and their parents differed little from those hearing infants. Vocalizations were not the major factor in conversations, which may explain why the auditory component does not, at this stage of development, cause serious disruptions to communication and also why deafness in infants is not easily suspected by parents at early developmental stages.
- In order to determine conversational aspects of pragmatic skills development in deaf students Jeans, Neienheigs and Rickards (2000) studied students from 8 to 17 years of age. The students were deaf and either used oral communication or English based signs. Their results were compared to hearing students in the same age groups.
- The ability to request clarification is a fundamental skill in effective face to face interaction these researchers found that oral deaf students made request for clarification more often than did hearing students or deaf students who sign. They may have used this strategy, however, to gain additional information because their ability to receive clear communication was less precise. They also investigated the ability to make specific requests for clarification during communication and found that hearing students made far more specific requests than did deaf students as a group, with the signing students making the fewest. When required to respond to a

specific request for clarification all three groups responded appropriately and at the same rate.

(iii) Communication patterns in classrooms:

- Flanders Interactive Scale (Flanders, 1965), which contained several interactive categories, in direct observation of classroom communication. Overall results for categories of interaction showed that in the structured area of teaching, teachers markedly dominated classroom communication in all schools and for all ages of students. 'Questioning' and 'informing' were the categories used most frequently by teachers and students in language dependent and specialized classes in initiating communication, though the teachers used them much more than the students. The second finding was that a higher proportion of behavior in the student 'response' category was observed when teacher 'questioning' comprised a high proportion of teacher initiated behavior. The very small 1% of 'confusions' showed that the extent of teacher dominance. Thirdly, 'no communication' generally predominated when teacher initiated interaction was relatively low.
- Lawson (1978) conducted a study to assess whether deaf students spend more classroom time on complaint, rather than self-directive communication. The results showed that both student-directive and student-complaint communicative behaviors occurred. The most frequent student directive communication was 'informing', with 'following directions' being the most frequent student complaint communication act. Students communicated during 64% of the observation period, with over half of this communication being student complaint.

Older children with HI show continued difficulty in using pragmatic rules for entering and engaging in considerations

Indian Studies on language skills of HI:

- Usha (1986) studied the performance of HOH children, ranging in age from 18 to 36 months on the 3D-LAT.

- All the subjects had congenital HI or a hearing impairment acquired before the development of speech and language.
- They had no associated problems and had normal motor development
- They were not undergoing therapy and
- Hearing aid if being used was with in 6 months of data collection.

The language development of the children was assessed along three dimensions: reception, expression and cognition both on the verbal and non-verbal modes. The test had items for each of the dimensions and modes on all age groups. The information required was collected from the parents of the children.

Results indicated that:

- ✓ On the verbal scale both reception and expression was poorer in HOH children than the normal.
- ✓ The linear relationship between performance and age seen in normal children along both those dimensions (reception and expression) were not seen in the HOH children.
- ✓ In the HOH children cognition was better than reception and cognition scores were about equal.
- ✓ For HOH children expression was better reception unlike normal where reception is better than expression.
- ✓ On the non-verbal scale, reception was comparable to cognition and better than expression in hearing impaired children.
- ✓ An approximately linear relationship between performance and age was found on all three dimensions.

➢ Swathi (1993), her study aimed at providing normative data for "scale of early communication skills for HI children" translated from English to Kannada and Telgu.

The subjects of the study were aged between 2 to 8 years and were evaluated on:

a. Receptive language skills
b. Expressive language skills
c. Non-verbal receptive skills
d. Non-verbal expressive skills

The information necessary to evaluate these skills were obtained from the parents or teachers of these children.

Results indicated that:

- Performance on the verbal scale was poorer than that on the non –verbal scale in all the age groups.
- Combined expressive score (both structured and unstructured items) were better than the combined receptive scores on verbal scale.
- This discrepancy was not seen in the non-verbal scale where in the receptive scores were better than the expressive scores. This discrepancy was not seen in normals.
- This finding was attributed to the teaching strategies used where in stress was more on reading and writing skills of the child; resulting in better inner language and also due to inadequate generalization of speech reading abilities.

- Seena (1994), this study aimed at finding the nature of relationship between comprehension and expression in HI children within a particular age group and across different age group.

20 HI children aged between 5 to 9 years participated in the study. They were grouped into 4 age groups (5 to 8; 6 to 7; 7 to 8; 8 to 9 years). Each group had 5 children; all the 20 children met the following criteria.

- They had congenital HI before the development of speech and language.
- The degree of hearing loss ranged between moderate to profound levels
- The children did not have any associated problems and all had normal developmental milestones.
- They had Kannada as their mother tongue.
- All of them wore pseudobinaural or binaural hearing aids.
- All of them had attended speech and language therapy for at least an year.

KLT was administered to 20 HI children. Each child was instructed and tested individually, instructions given varied depending on the task involved and were in Kannada. The responses were recorded on response sheet.

Results indicated that:

- A delay in language reception and expression was found for HI when compared to the normals.
- Reception scores were better than the expression scores on both the semantic and syntax sections.
- On most of the sub divisions in the syntax and semantic section, reception was better than expression.
- On a few subdivisions expression scores were better than reception.
- Results obtained were in agreement with the traditional view.

[C] SPEECH OF HI:

Children who are born severely or profoundly hearing impaired or become deafened soon after birth difficulties in acquiring speech. Such children not only hear the speech of others very imperfectly, even if aided, they also have problems in monitoring the sounds of their own voices through auditory feedback. Thus differences in babbling have been found between hearing and hearing impaired infants as early as the second 6 months of life (Oller et al., 1985).

(i) Deaf speech:

The speech of hearing impaired individuals tends to be characterized by featеous which set it apart from the speech of others, though the speech of a given deaf person does not necessarily show all of them.

(ii) Articulation:

- The classic study in the area of articulation is that of that Hudgins and Numbers (1942), who found five types of vowel error and seven types of consonant error in the speech of 192 mildly to profoundly deaf children aged between 8 and 20 years. The vowel errors consisted of substitution, vowel neutralizations creation of two

syllables from one vowel, simplification of diphthongs by splitting them into two separate vowels or omitting some component and vowel nasalisation. The consonant errors consisted of initial deletions, devoicing of stops, insertions and deletions final consonant deletions, denasalisation, substitutions, and vowel insertions.

- Deaf people learning to speak can develop a different kind of articularotry coordination from that of hearing speakers. For example, their jaw and tongue positions in vowel production following consonants may not vary consistently (Tye-Murray, 1987), although deaf speakers tend to move the body of their tongue in a similar way for all vowels (Tye-Murray, 1991). Further, the speech of deaf individuals is characterized by prolongations of vowels, even in multi syllabic words (Tye-Murray and Woodworth, 1989) associated with vowel neutralization which involves over lapping of F_1 and F_2 formants (Anael occi et al., 1964; Monsen, 1976; Osberger, 1987).
- Vowels are particularly difficult for prelingually profounding deaf children to learn, probably because the articulators rarely come into contact in vowel production, preventing tactile feedback (Povel and Wanrink, 1986).
- F_2 is associated with forward and backward movements of the tongue (Fant, 1962), which are difficult for hearing impaired speakers to perceive. Distorted articulation in the speech of hearing impaired children is also defined by prolonged articulatory contacts (Angelocci, 1962) slow articulatory movements (Monsen, 1978), and slow articulation of syllables (Stevens et al., 1978; Osberger and Mcbarr, 1982).
- Consonant omissions at the end of words phrases and sentences, which are the result of misplacing the tongue and of poor control of the aerodynamic flow (Markides, 1970; Smith, 1975a; Mencki et al.,1985).
- Smith (1975) additionally noted interposed sounds in the speech of deaf children. She observed recurring patterns of excrescent or interjected sounds associated with movements of the articulators, and attributed them to slowness of movement, overshoot resulting in a great than normal degree of constriction to yield affricate like rehabilitations or glides mistimed laryngeal action and mistimed velar action.

(iii) Voice pitch and Quality:

- Measurement of speech fundamental frequency (F_0) in hearing impaired people, however have presented mixed and conflicting results. Horis (1982) reported higher than normal F_0 values for 12 hearing impaired girls aged 16-19years.
- Leder et al., (1987) found more recently that F_0 was significantly higher in profoundly postlingually deaf than in hearing men, but not all studies have found voice pitch to be higher in higher impaired people.
- Hearing impaired people may also have unusual voice quality, characterized by over aspiration, spectral noise and so on. A frequent problem in deaf speakers is over aspiration of initial voiceless stop and fricative consonants (Huthinson and Smith, 1976; Whitehead and Barefoot, 1980). The over aspiration, which may increase the tactile feed back for the speaker, gives a breathy quality to the speech and changes the temporal pattern.
- Harshness of voice, related to spectral noise, in hearing impaired children has been investigated byThomas-Kersting and Casteel (1989). They compared spectral noise levels and ratings of perceived vocal effort in the voices of severely to profoundly deaf children in relation to hearing children in the age range of 6-11 years. The result showed that the hearing impaired children appeared to expend more effort than the hearing children, which generated noisy speech.

Prosody" otherwise termed "suprasegmental" features of speech is defined as the intonation and stress patterns in speech which are superimposed upon the smaller speech sound segments combined in words, phrases and sentences. The melody of speech is conveyed through the prosodic features. Both intonation and stress contribute to the intelligibility of contextual speech. Intonation (variations in vocal pitch) is used to mark the ending of a phrase, to differentiate a question and sometimes to change meaning. Stress is created by subtle changes in pitch, duration and intensity of a syllable or word. It can show feelings and can change the meaning of a word.

The 'prosodic' aspects of speech are more poorly than the segmental aspects. Knowledge of the speech production abilities of a hearing impaired child is in many ways of

potentially greater value to educators and speech pathologists than knowledge of the child's hearing ability.

Several methods have been employed to study speech production in hearing impaired (HI). These include:

1) Physiological (Mek et al., 1985)
2) Acoustic (Mosen, 1976a, 1976b, 1978; Angelocc, et al., 1964; Gulbert, 1975; Sheela, 1988;Rashma, 1994; Manjula, 1997).
3) Perceptual methods (Levitt et al., 1976; Stevens et al., 1983; Hudgins and numbers, 1992; Markides, 1970; Geffner, 1980; Manjula, 1997 etc.)

Use of acoustic analysis of speech for studying the speech production skills, offer several advantages as they are non-invasive, need relatively simple instrumentation, can be used routinely to depict changes in the physical characteristics of frequency, intensity, and duration of speech segments (Leeper, et al., 1987). It provides objective description of speech of the hearing impaired.

Importance of supra segmental aspects of in intelligibility of speech:

- The term 'speech intelligibility' refers to how much of what a speaker says can be understood by a listener. On the average, the intelligibility of profoundly HI children's speech is very poor. Only about one in five word they say can be understood by a listener who is unfamiliar with the speech of this group. (Brannow, 1966; John and Howarth, 1965; markides, 1970; McGarr, 1978; Smith, 1975).
- Various factors have been found to affect intelligibility. In these factors hearing level, segmental and suprasegmental aspects play a role. Several investigators have observed that more than prosodic deviations segmental deviations are primarily responsible for reducing the intelligibility of the speech of deaf.
- The role of supra segmental features of speech in the intelligible discourse has been well documented by several investigators (Fiserson, 1971; Lieberman, 1972; Geers, 1978). The supra segmental errors that are studied in relation to speech intelligibility are timing, pitch, intonation and nasality errors.

LANGUAGE IMPAIRMENTS IN HEARING IMPAIRED & ASSESSMENT OF HEARING IMPAIRED

- Another noted characteristics of the hearing impaired speech is an abnormal control over duration and fundamental frequency (Ardo and Canter, 1969; Brannon, 1966; Hudgins, 1960). In a particular duration of words or sentences often seem excessively long and the pitch contour over individual words is either too high, too monotonus, or simply 'inappropriate'.
- Higher intelligibility scores for severely HI (91%) and less for profoundly HI (78%%) were reported by Monsen (1968). Though hearing loss is an important variable, this measure alone cannot reliably predict the intelligibility of a child's speech (Smith, 1975).

Intelligibility and respiratory control:

- Deaf speakers have poor breath control they use too much of air per syllable and have difficulty in controlling respiration for speech.
- Whitehead (1983) investigated the respiratory patterns during speech of 10 deaf male adults with a pure tone average loss of 105dB. He found that:

  a) Some deaf speakers don't inhale while speaking, as the volume of air in the lungs decreases

  b) Most of the subjects spoken on low lung volume

  c) Some even initiated reading and conversation below the residual air capacity without inspiration.

[I] FUNDAMENTAL FREQUENCY PATTERNS:

The difficulties that the deaf speaker has with frequency patterns are of two general types:

(i) Inappropriate average fundamental frequency (Pitch)

(ii) Improper intonation.

1. Fundamental Frequency / Pitch:

Among the most noticeable speech disorders of HI are those involving fundamental frequency (F_0).

- Monsen (1979) found that the types of contours appeared to be an important characteristics separating the better from poorer hearing impaired speaker. He observed four types of fundamental frequency contour in the speech of the HI children of 3-6 years age. Using a spectrographic techniques:
    - A falling contour: Smooth decline in F_0 at an average rate greater than 10Hz / 100msec
    - Short falling contour: Occurs on words of shorted duration. The F_0 change may be more than 10Hz / 100msec, but the total change may be small.
    - Falling flat contour: Characterized by a rapid change in frequency at the beginning of a word, followed by a relatively unchanging flat portion.
    - Changing contour: Characterized by a change in frequency, the duration of which appears uncontrolled, and extends over relatively large segments.

Boone (1966) found a higher average F_0 for 17-18 years old males than females.

Gold (1980) found that mean F_0 of deaf people's voices is higher than that of hearing speakers of similar years.

Osterger (1981) found that the difference in F_0 between hearing and HI speakers in the 13-15 years age range was greater for females than for males.

[2] Intonation:

- HI speakers often tend to vary the pitch much less than the normal hearing speakers and the resulting speech has been described as flat or monotone (Calvert, 1962; Hood, 1966; Martony, 1968).
- A terminal pitch rise such as that occurring at the end of some questions may be even difficult for a deaf child to produce than a terminal fall (Phillips, Remillard, Bass and Pronorost, 1968).
- Some HI speakers may demonstrate an intonation problem in the form of excessive and inappropriate changes in F_0 100Hz or more within same utterance. Often after a sharp rise in fundamental frequency, the HI speakers lose phonatory control and leading to complete cessation of phonation (Monsen, 1979; Smith, 1975; Steven et al., 1978).

- Frank, Bergmen and Tobin (1987) described the difficulties encountered by children with HI in producing orally read sentences with correct intonation contour. According to their findings, during attempts to form sentences, some of the children read each of the words separately as if the word comprises a list of unrelated vocabulary. The children failed to employ a look ahead strategy that includes planning the production of the whole sentence while considering the intonation as well.
- Rubin, Spitz and McGarr (1990) showed that HI children in their study were able to produce declarative sentences correctly with a falling contour. However, they don't produce non-declarative sentences with a rising contour, rather with a terminal fall.
- The study by Most and Frank (1991) indicated that severely and profoundly HI children are able to perceive and produce intonation contours.

From the above studies it is clear that pitch deviation is present in the speech of the HI. The abnormal pitch variations have been considered to be the major cause of faulty intonation in the HI. Poor control of F_0 can result in conditions such as:

(i) Average pitch level too high
(ii) Intonation with insufficient variability
(iii) Intonation with excessive variability.

[II] STRESS:

Amplitude modulation is manifested in language by what is most commonly termed 'stress' (Allem, 1975). Stress may be defined as the perception of some linguistic units as emphasized or prominent in contrast to surrounding units (Freeman, 1982). The studies on stress, indicate that the HI children are very poor in the production of stress.

- Speech produced by persons with severe to profound hearing loss, has been described as 'staccato like' suggesting a failure to differentiate stressed and unstressed syllables. Another common description is 'flat and devoid of melody' suggesting a failure to vary F_0.
- The HI speakers fail to make the difference between the durations of stressed and unstressed syllable sufficiently large (Nickerson et al.,1974)

- The HI speakers tend to increase the duration of the unstressed syllable. They produce unstressed syllables twice longer than the normals (Boothroyd et al.,1974).
- The HI children produced the temporal feature of pause better than stress (Levitt and stark, 1974).
- Sarumathi (1993) 'studied production of stress in HI children' and found that the production of stress increased from 2-8 years. Males performed better than females almost in all the age group, although the difference at significant. Even at the age of 8 years HI children did not achieve even 60% score. In general, when the noun was stressed, the HI children did better in the adjective than on the adverb. Also acquisition of stress was delayed in the HI. A common error was production of stress in an inappropriate word. She said this could be attributed to poor control over the laryngeal and articualtory system, which are required for production of stress pattern. All these studies indicate that the production of stress among the HI children is severely affected.

III] TEMPORAL PATTERN / FACTORS:

[1] Rate:

- Physical measures of speaking rate have shown that profoundly hearing impaired speakers on the average take 1.5 to 20 times longer to produce the same utterances as do normal hearing speakers (Boone, 1966; Hood, 1966; Howarch, 1965; Voelkar, 1935).
- Hearing impaired speakers have been found to speak more slowly than even the slowest speakers with normal hearing when both group studied under similar conditions. Lhekerson et al., (1974) studied deaf and control groups on reading rate and found large differences between the groups although the mean rate of speech for the deaf was as high as 108 words / min.

The problem of reduced rate of speaking in the deaf speaker seems to be related to two separate problems:

(a) Increased duration of phonemes and

(b) Improper and often prolonged pauses within utterances (Gold, 1980)

[2] Duration:

- There is a general tendency towards lengthening of vowel and consonants in the deaf (Angelocci, 1962; Sheela, 1988; Rastha, 1994). Calvert (1961) was among the first to obtain objective measurements of phonemic duration in the speech of HI by spectrographic analysis of bisyllabic words. This study showed that HI speakers extend the duration of vowels, fricatives, and closure period of plosives up to five times the average duration for normal speakers.

[3] Pause / Juncture:

- The speech of the HI often contains a large number of pauses, often between words even syllables and at points judged inappropriate. This combined with vowel lengthening is the major contributor to the slower pace of deaf speech. Pauses have been found to be inserted at syntactically inappropriate boundaries, such as between two syllables in a bisyllabic word or within phrases by the HI speakers (Osberger and McGarr, 1980;Sheela, 1988;Jagdish, 1989).
- Profoundly hearing impaired speakers insert more pauses, and pauses of longer duration than do speakers with normal hearing (Boone, 1966; Boodhroud et al., 1974; Stovens et al., 1978).

[4] Rhythm:

1. It is frequently used to refer to any kind of repetition or periodicity in the physical world, also for any kind of correspondence in aesthetic experience (Allan, 1973).
   - The inappropriate use of pauses along with the timing errors lead to the perception of improper grouping of syllables and contributes to the poor rhythm perceived in the speech of HI (Hungins, 1996; Mickerson et al., 1974).

Besides the major handicaps imposed on oracy by severe and especially profound hearing loss, similar handicaps are encountered by the severely and profoundly hearing impaired child in the skills involved in literacy. Such skills are learned by hearing children following the acquisition of Oracy, most probably by building on inner speech. This inner speech mediates reading by the silent understanding and rehearsal of symbols

or words and recognition of sequential and contextual cues (Conrad, 1979; Wood et al., Hanson et al.,1991). It also assists in the production of symbols or words in writing. Therefore, if children have problems with oracy they are also likely to experience problem with literacy (Vellum, 1979; Hanson, 1986) resulting in over all weak communicative fluency. This is generally also the cause for deaf children.

Both hearing children and children who are deaf begins to develop as readers and writers from the point in early childhood. When they become aware of print in their environment and the uses a print by significant individuals in their lives. Pre school children have been found to demonstrate developmentally appropriate knowledge and understanding of written language and uses of literacy even when language acquisition is delayed in comparison to hearing children (Rottenberg and Seaffolls, 1992; Williams, 1994; Williams and Maclean, 1997).

However, as children who are deaf are engaged in formal reading and writing instruction in school, literacy development typically does not proceed at a pace considered average for hearing students (Holt, 1993; Lasasso and Mobely 1997; Walk and Allen, 1984).

[I] READING:

- Reading provides a deep basis of knowledge about events and concepts which add to the depth and flexibility of our communication. Problem with reading can be experienced by hearing as well as by deaf children:
- Hearing children who are prone to hearing impairment as a result chronic middle ear infections may have difficulties in beginning reading (Webster et al., 1984; Webster et al., 1989).
- Also, young children with only a mild sensorineural hearing loss (20-45dB) may show reduced performance in vocabulary acquisition and reading comprehension (Blair etal.,1985).
- Clerk et al., (1982) reported that there are two main problems for severe to profound deaf child in learning to read:

a) Most of such children are severely deficient in their knowledge of verbal language.

b) There is a problem in perceiving the written words as reflecting the language code.

(ii) Metacogniton & reading:

An important factor in reading ability is metacognition. Metacognition refers to thinking about thinking or reflecting on one's own cognitive processes. Strassman (1997) conducted a review of the research on the linkages between metacognition and reading in children who are deaf. Three issues emerged from this body of research.

1. Instructional practices that emphasize skills and activities such as completing worksheets, answering teaches questions and memorizing vocabulary words amy hinder meta cognition and reading ability.
2. Reading material that is typically given deaf students because it matches their assessed reading levels may actually be low level and may not provide them with opportunity to develop and practice meta cognitive strategies.
3. Deaf learners benefit from instruction on metacognition strategies.

[2] WRITING DEVELOPMENT:

Children write long before they begin to use conventional print symbols. Their writing development is linked to their spoken and sign language development and to their reading development.

- Although there is large difference between good and poor deaf writers in both content and linguistic style (Gormley & Sarchan deily, 1987), the research clearly shows that severely and profoundly deaf children produce grammatical errors in their writing.
- Even partially hearing children have problems in writing grammatically correct sentence, which they can say (Arnold et al., 1982). Children with greater hearing losses tend to omit function words, such as articles auxiliary verbs and preposition ,a characteristics which continues into post secondary years (Mcagec et al., 1990). In addition to these omissions, their sentences tend to be short, because of problems

with some conjunctions, leading to 'jump' from one sentence to another. Many of their sentences are of the SVO type.

- Some have no apparent grammar at all (Webster and Ellwood, 1985), or many be grammatically deviant.
- Overall, the impression of the reader is one of a rigid style of writing, with omissions, sequencing problems and occasional grammatical infelicities ('deafisms') which make it difficult to follow the train of thought (Ivimey, 1977c; Harrison et al., 1991).
- Some of these earlier authors suggested that the writing of hearing-impaired children resembled that of normally developing children of a younger age. Other saw the writing as a tangled collation of words in a disorderly array, without sequencing or inflections reflecting accepted grammar. HI children were seen to have problems with inflections of nouns and verbs and with articles and auxiliary verbs into the teen years.
- Control of verb tenses was weak, and in some cases non-existent (Irimey, 1981), so that the one verb tense could be used to indicate past, present and future, but modified by an external marker ('He came now').Similarly noun modifiers were used to show plurality ('The two cup').Articles were often appropriately used with the subject but were often omitted for the object ('The family go on picnic'), though the use of determiner and noun as subject was often overused.
- It is now generally accepted that the writing of HI children is both linguistically delayed and different or deviant (Webster, 1986). The use of unusual or deviant written grammar is a real problem, because society cannot be expected to cope with ideosyncractic use of grammar. Even in there are consistent patterns of deviancies, across groups of HI children, there will still be a major problem for them in communicating their ideas to hearing individuals. Thus from the communication view point, it is a pressing issue discover the extent of the use of deviant grammar in the writing of HI children.
- Geers and Moog (1989) has shown that some orally educated profoundly dead adolescents aged from 15 to18 years can write at levels much better than the main

thrust of the literature would indicate. They reported that majority of their children could write acceptable essays and business letters with only some mechanical and grammatical errors. Such reports show that caution is needed in generalizing about the abilities of deaf individuals. However, their subjects were a typical of deaf adolescents as whole. Writing skills of HI children are delayed, although the writing improves with age (Mulclebust, 1964; Power and Wilgus, 1983). This improvement is relatively slow, as with improvement in their reading skills.

- Difficulties in both reading and writing can be explained by failure to develop an internal language (Quigley and Kreschmar, 1982).

INDIAN STUDIES:

- Katyayini (1984) prepared a language test in Kannada and recorded the expressions of various grammatical concepts by hard of hearing, mentally retarded and normal children. She found that with regard to the hard of hearing, they did not do as well as normal children in the use of place, number, gender and tense markers. Only in the use of person marker did they given performances equal to the normal children.
- Laxmi jagadish (1990)Aim of this study was to compare the uses of syntax in the writing of HI students with that of normal hearing students matched in terms of level of education. 17 boys who were 8^{th} grade students of the Government school for Deaf. Mysore, were taken for the study. All those students had bil. sensory neural hearing loss with threshold levels greater than 80dB.

  And also 15 students with normal hearing were taken from the Onkarmal Somani College of education, Mysore as control group. Their mean age was 14years 2 months. The same sequence of testing was followed for both the groups. The story narration task was given first, followed by the picture description task and then essay-writing task.

  The samples of both groups were scanned carefully for the types of words used. The number of nouns, verbs and syntax markers used by each subject was recorded. The mean words per sentence (MWS) were computed for each subject.

  The results indicate that:

- The HI group gave a lower output that the normal hearing group as predicted both in terms of the total output as well as the output of nouns verbs and syntax markers considered separately.
- The MWS used by the HI is lower than that used by normal hearing students and also they made a larger number of errors in the usage of the different word classes in terms of sentence construction, context and punctuation.
- The HI also performed poorly on the relatively more abstract tasks of story narration and essay writing than on the more concrete task of picture description.
- One point in their favor that they are able to form short simple sentences of S-O-V structure quite easily especially in task I (story narration).

[F] BEHAVIORAL PROBLEMS:

The relative psychological and social adjustment of deaf children is an area of great theoretical interest and tremendous practical importance. Theoretically, questions revolve around a concern with environmental influences on deaf children that may lead to differences in their emotional development reflected in problematic behavior.

Prevalence:

- Much of the research indicates a substantially higher percentage of emotional and behavioral problems of deaf children when compared to hearing children.
- Hindley (1997) found a prevalence range of 43 to 50.3% among deaf and HOH students.

Causes:

- It is unlikely that one or a set of factors with in the early or later life experience of a deaf individual actually causes emotional or behavioral problems. However, it does appear that particular factors make it more likely that a deaf person will experience emotional or behavioral problems.
- Greenberg, Kushe, and Speltz (1991) found that early parent-child attachment was a critical factor in the deaf child's later emotional stability. Also the child who is able

to use language for problem solving, either English or ASL, is also the child who reflects greater emotional adjustments.

- Kluwin (1985) examined the discipline referral forms at five schools for the deaf in an effort to understand the factors that relate to behavioral problems. He found reading ability to be the factors that most predictive of disruptive behavior in the classroom.
- Cohen (1991) suggested that student alienation and estrangement are at risk factors for behavioral problems during this age because although these factors for behavioral problems during this age because although these factors for behavioral problems during this age because all these factors are common among virtually all adolescents they are exacerbated when the adolescent is deaf, as a result of communication issues.
- It is possible that deaf children do not experience greater behavioral or emotional problems, but are misperceived to do so by teachers and parents who either do not understand the cultural factors underlying the child's behavior or expect certain traits in all deaf people.
- This view was not supported in a study conducted by Murphy-Berman, Stoefen-Fisher, and Mathia (1987). They found that neither deaf nor hearing teachers demonstrated bias towards the behaviors exhibited by deaf children. It also might be expected that language difficulties between teachers and deaf students such as teachers who are not fluent in ASL, would result in communication breakdowns, and miscommunication would lead to behavioral problems.
- However, there appears to be no research specially examining communication as a factor in the behavioral or emotional problems of deaf children.

Types of behavior problems observed in HI children:

- It is common for deaf children and deaf adults to be described as lacking in social and emotional maturity. Lewis (1968) summarized current opinions and finding on the 'personality traits' of deaf children by noting that they are often described as immature in self-awareness, egocentric, locking in self-confidence and initiative and standing to be rigid.

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- According to Lane (1989), a number of precipitating factors have been identified among deaf adolescents and adults.
  - Lack of trust in oneself and others
  - Dependence on the opinion of others
  - Poor impulse control
  - Poor communication skills
  - Depression
  - Immaturity
  - Feelings of isolation
  - Feelings of inferiority

[G] ASSESSMENT OF HI CHILDREN:

AREAS OF ASSESSMENT:

- ✓ Hearing & Audition
- ✓ Communication skills
  - i) Language – Spoken & Sign
  - ii) Speech
- ✓ Literacy skills
  - i) Reading
  - ii) Writing- Visual & Spelling assessment
- ✓ Speech reading skills
- ✓ Intelligence or Cognitive skills
- ✓ Social interaction or Behavioral skills
- ✓ Classroom performance evaluation

[1] ASSESSMENT OF HEARING & AUDITION ABILITIES

It has also been suggested that an auditory test battery contain both informal and formal measures (Moeller et al., 1987) that are question driven.

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One of the most useful auditory assessment taxonomies was developed by Erber (1982). It is a matrix and can be used to guide the evaluation and facilitation of auditory training. Using the matrix, informal but realistic tasks can be organized by team members to determine whether a student can respond auditorily to spoken stimuli as they become phonemically, syllabically and linguistically more complex.

Speech stimuli are listed across the top of the matrix. Along the left-hand side of the matrix are the four basic auditory levels:

- Detection refers to the process of determining whether sound is present or absent.
- Discrimination is the ability to perceive similarities and differences between two or more speech stimuli. To distinguish sound in a discriminating manner, the student is required to understand the concepts of 'same' and 'different'. For example, a teacher might ask (with his or her face not in view), "Are these words the same or different: Kansas Ohio." A student who responds that they are different discriminates between two-syllable and three syllable words.
- Identification refers to the process of demonstrating recognition of what has been said. The student could demonstrate this skill by pointing to a picture, reading a specific word, or retrieving a specific object, as requested.
- Comprehension of speech is the most difficult auditory skill to master. It requires that the student understand an acoustic message and react appropriately. When students who cannot see the speaker's face follow oral-only directions, participate in oral-only conversations or answer oral-only questions, they are demonstrating their ability to comprehend spoken language.

Screening tests:

a) Hearing questionnaire
b) Fisher auditory problem checklist
c) Screening instrument for targeting educational risks (SIFTER)
d) Screening instruments for targeting educational risk (Age – 3 Kindergarten) Preschool SIFTER

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Tests used for assessment:

a) Functional listening evaluation
b) Colorado individual performance profile (CIPP)

[2] COMMUNICATION ASSESSMENT:

(I) LANGUAGE SKILLS:

(A) VERBAL LANGUAGE

When the language abilities of hearing children are assessed, this area is typically referred to as oral language to distinguish it from written language. Given the visual-gestural modality of the language of many deaf individuals, it is more appropriate to refer to this area as face-to-face language.

Assessment of face-to-face language involves the four major components of syntax, semantics, pragmatics and phonology. When the stakeholders are teachers, the assessment is likely to include predominantly informal measures of language. The most common informal measure is language sampling. A language sample is a segment of a deaf child's language performance regarded as representative of his or her linguistic ability, The language sample is obtained from a naturalistic testing, for instance child-child or teacher-child interactions, and analyzed according to protocols such as the Framework of language development (Schirmer, 2000).

Standardized language tests offer several advantages including ease of administration and consistency of usage. However, they measure of deaf child's comprehension or use of de contextualized language (that is, outside of the context of conversation or other natural communication milieu) and most of the tests have limited or poor validity. Informal assessment techniques offer the advantage of providing information and about communicative settings and therefore, have he best potential for providing completeness of information gathered about the child's language abilities depend heavily on the skill of

he teacher. A limitation of both approaches is the lack of currently available instruments for assessing the acquisition of ASL.

Test selection and general procedures:

Many of the assessment tools used to diagnose communicative deficits in normal-hearing children can be employed with hearing-impaired children as well, provided that the examiner understands the limitations imposed by the hearing loss. Perhaps the major factor limiting the applicability of these tools is the need to prevent the peripheral speech perception effects of a hearing loss from contaminating the results. The communicative functioning and thus provides valuable information on the child's functional ability. On the other hand, it is necessary to isolate (as much as possible) the effects of speech perception deficits from the language measures in order to develop an appropriate educational plan based on the child's specific strengths and weaknesses.

The communication assessment is performed not only to develop individual remedial programs and to monitor a child's progress, but also to help regular educators gain insight into the communication problems of hearing-impaired children. By considering the purpose of a communicative assessment, the examiner can evaluate a test's potential usefulness and build a test battery. A specific test battery is not prescribed for all children due to age differences and large variations in spoken language skills. Above all, tests have little value unless their results can be applied to improving the child's communicative performance through a remedial program or through transmission to the classroom teachers.

Regardless of the kind of testing being done, certain procedures should be followed to ensure that the hearing-impaired child is not penalized for not hearing the stimuli:

- The child's amplification should be checked immediately preceding the evaluation to be sure that it is functioning at optimal levels. If the child uses classroom amplification (FM units) that employs a microphone, the examiner should wear it to eliminate any interference from background noise.

- The test environment should be as quiet as possible, located away from obvious noise sources (e.g., band room, cafeteria, gym, playground) and free of visual distractions.
- The test environment should be well lighted from overhead. If the room has a window, the child should be seated opposite the examiner, with his or her back to the window. This seating arrangement eliminates glare, which can interfere with speech reading the examiner's face.
- Instructions should be given while the child watches the examiner's face and accompanied by an explanation or demonstration. Having the child paraphrase the directions ensures comprehension of the task.
- When verbal test stimuli are presented, the child should be watching the examiner's face and repeating back what was heard.
- If the test requires verbal responses, written responses should be allowed when speech intelligibility is a problem.

(i) Speech reception:

Any assessment of hearing –impaired children requires careful description of their speech reception capabilities because the latter impact greatly on further test performance and function. Through the evaluation of these receptive skills it is possible to;

(a) Determine the child's primary channel for receiving speech
(b) Document the negative affect of background noise and speaker distance on speech reception, and
(c) Ascertain the appropriateness of the pattern of misperceived phonemes relative to the child's hearing loss.

The basic component of speech reception testing is a list of familiar words, preferably phonetically balanced, presented live voice under varying listening conditions. The child responds to each word repeating it verbatim (if his or her speech is adequate) or by giving the designated non-verbal response (writing or picture pointing).

(ii) Comprehension of spoken language

The growth of word meaning is slow, often not developing fully until the student begins to expand it through reading.

a) Word level:

To obtain the most accurate information on a child's work knowledge one must verify the appropriate functioning of the child's amplification and then administer the test under optimal listening conditions, preferably face-to-face in a quiet room. The examiner may need to repeat the stimulus item if the child does not look and listen at the initial presentation. The student should be asked to repeat each of the words prior to pointing at the picture. If the word is mispronounced, the examiner should help the child say it correctly or as well as possible, before he or she makes a choice so that the selection is based on receiving the correct word. A sample sequence goes as follows:

Examiner says "paints"

Child repeats "pants" and begins to point to clothing.

Examiner says, "Listen again. Paints."

Child repeats, "Paints" and points to the action picture.

The age –equivalent score used on word level tests facilitates explaining to parents the gap that exists between their child's chronological and receptive vocabulary age.

b) Sentence Level:

Because words rarely occur in isolation, it is important to assess the hearing –impaired child's understanding of words as components of phrases and sentences, with ending attached that transform their meaning.

The sentence level testing may be administered to two different ways:

i. By presenting the morphological markers at a normal rate and intensity, as with a normal hearing child or
ii. By increasing the intensity at which the markers are presented.

Interpretation of results varies according to the mode or presentation. If the test is administered at a normal rate and intensity, the results only suggest the child's functional ability to comprehend the markers in a normal conversational situation. Under these conditions, it is not possible to determine whether the incorrect responses reflect a lack of

knowledge of the grammatical marker or simply that the salient acoustic information was not perceived.

c) Paragraph level:

Paragraph comprehension requires only recently addressed in communication assessments is used to stimulate the linguistic demands made on a hearing-impaired child during a classroom lesion or during an extended conversation. The examiner reads a paragraph to the child, who then must respond by answering content questions or by paraphrasing the main ideas. The paragraphs and questions are read clearly and without special emphasis on content words. To optimize reception, the child should be seared close (3 feet close to the examiner in a quiet room and should maintain visual contact with the speaker's face. If the child's attention wanders during the paragraph reading testing stops until he or she returns to a look-and-listen receptive mode.

The examiner in need of testing material can adapt already existing paragraphs, such as the Test of Auditory Comprehension (TAC:Farrar et al.,1976) subtests 8 and 10, which are equated for vocabulary and syntactical complexity. In this case each paragraph is followed by five questions of the response pictures in order to determine exactly how much the examinee understood. Once the set of possible answers is visible, the child may be able to use partial information to make an educated guess. However, another critical factor to address is receiving and comprehending conversation.

Hearing impaired children have difficulty applying these conversational rules due to poor reception and comprehension skills. At present, however, there are no tests to assess the conversational aspects of communication. The examiner must engage the child in interactive exchanges to determine his or her competency in applying the rules of discourse. However interaction only with adults produces a skewed sample of the child's functional ability. If possible, one should attempt to observe the child interacting with his or her peers and family members.

(iii) Production of spoken language:

While receptive language competence is critical for academic success, a child's expressive ability impacts most profoundly on social interactions.

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In order to parallel the assessment of comprehension skills, the areas of vocabulary, morphology / syntax, and language use at the word, sentence and paragraph level must be sampled during the production portion of the evaluation. Such information helps teachers form realistic expectations regarding a child's ability to ask questions, formulate answers to the questions of others, and in general participate in class discussions. To function successfully in mainstreamed settings, hearing-impaired children require facility in spoken language, to engage peers in social interactions, to take turns in a conversation, and to adapt to listener status.

Few tests:

Structured photographic Elicited Language test – II (SPELT-II)

Grammatical Analysis of Elicited Language (GAEL)

(iv) Language Use:

Finally, some estimate is needed of how effectively children use and understand language in its social context: that is, how well they employ the correct forms to establish contact with others, influence actions, secure desired objects or experience and obtain information. Learning to use language requires sensitivity to both the demands of the social context and the people in it (such as how and when to take turns speaking). This does not come naturally: such skills require a significant amount of linguistic exposure in different situations. Hearing impaired children frequently do not know the latest slang expressions or understand jokes, riddles, or verbal analogies, all of which acts as a barrier to their effective use of language, particularly with their peers in social contexts.

The examiner can gain an insight into these usage deficits by observing the child in natural situations and by interpreting responses to simulated experiences depicted pictorially available tests sample some of these abilities and provide ways to quantify them. Simon (1979) has developed comprehensive checklists to assist the examiner in focusing attention on the myriad factors included under the label 'usage'.

The ISHA Battery (1990).

A close look at the available tests as reported by Indian institutions indicate that they are mainly of two types.

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(1) Original tests designed in Indian Languages and
(2) Tests adapted in Indian Languages from the standardized western tests such as ITPA, BLST etc.

All these tests can be considered to evaluate language in both pre-schoolers (age 0-4 years) and primary-schoolers (4years and above). None of the Indian tests under consideration assesses all the levels of the language at the time. Majority of the tests concentrate on assessing the syntactic knowledge.

ORIGINAL TESTS	ADAPTED TESTS
3D-Language acquisition test	REEL
Modified 3D Language acquisition test	Northwestern syntax screening test
Test of psycholinguistic abilities in kannada	Illiniois test of psycholinguistic abilities
Test of acquisition of syntax in kannada	Bankson's language screening test
Syntax screening test in Tamil	Carrow's test of auditory comprehension
A screening picture vocabulary test in kannada	Utah test of language development
Language test in kannada for expression in children	Pea body picture vocabulary test
Assessing syntax in children-A test in Marathi	

(B) SIGN LANGUAGE ASSESSMENT:

Nancy Hatfield (1978),(Increased understanding of the positive impact of American Sign Language (ASL) and manual codes for English (MCE) need along and in conjunction with speech) on the psychosocial, cognitive, language, communication, and general educational development of deaf and hard-of-hearing persons (Caccamise et al.,1978; Holocomb, 1971; Schlesinger and Meadow, 1972; Siple, 1978; Wernon, 1969; Weiss et al., 1975; Wilbur, 1976). This increased understanding has been a major factor in the trend toward the inclusion of sign language as part of a 'total' approach to the

education of persons with hearing losses (Jordan et al., 1976). This trend in turn has lead to an increased need for the assessment of language and communication skills of deaf and hard-of-hearing persons to include sign language (ASL and MCE) and simultaneous communication.

There may exert group of deaf people for whom English signed form is learned as a first language and ASL as a second language. For other people, ASL may function as the first dominant, language with English in sign form a second language. Finally there are being deaf people equally skilled in ASL as English in signed form as well as deaf person proficient in neither.

(i) Effect of manual communication on other skills:

Much of the sign language research conducted in the past has investigated the effect of manual communication on the development of other skills: speech and speech reading of written English, academic achievement in general and personal-social adjustment such (these studies compared deaf children with parents , who as a group are exposed to sign language from birth) and deaf children of hearing patients (who as a group are exposed to sign language from birth). In general deaf children exposed to manual communication at home and / or in school performed better than children educated by oral methods alone in the skills listed above (Schlesinger and Meadow, 1972, Stickless and Birch, 1966; Vernon and Koh, 1970) Several different hypothesis have been offered to account for these results:

1. Knowledge of 'sign language' provides a linguistic base, which facilitates acquisition of English as a second language (Charrrow and Fletcher).
2. In the case of deaf children deaf parents, greater parental acceptance of deafness result in a less traumatic adjustment to deafness (Corson, 1973; Meadow, 1968a and 1968b) and
3. Richer linguistic, social and cognitive experiences through use of a communication system within family and /or school enhance all aspects of development (Liben, 1978).

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Although as a group deaf children exposed as sign language outperform those not exposed to sign language. They still perform at levels far below their hearing peers in English skills (Brooks, 1978;Furth, 1966) and in general academic achievement (lane, 1976). These facts raise another question: Are the affects of manual communication on other skills different if the proficiency involved is a MCE rather than ASL? The above studies either assumed that deaf children of deaf parents acquired ASL as a native language, or they failed to adequately define, 'sign language' and to differentiate between fluency of ASL and MCE. It may be that knowledge of MCE more readily transfers to other English skills than knowledge of ASL. A study by Brasel and Quigley (1977) pursued this line of research. They compared the performance of four groups of deaf children on the language subtests of the Standard Achievement Test and the Test of Syntactic Ability (Quigley and Power, 1971). Two of the groups had deaf parents; one group reportedly used sign language that more closely approximated English grammatical structure (manual English, or ME, group), and one reportedly used ASL (average manual or AM, group). The other two groups had hearing parents; the children one group were given intensive oral training (intensive oral or IO group) and the others were not (average oral, or AO group). However, the ME group also performed significantly better than the other three groups on almost all measures. Nevertheless, these findings suggested that there might in fact be differential effects of sign language, depending on whether a child is fluent in ASL or MCE, and underscores the need to differentiate between these language skills.

(ii) ASL and MCE as Communication Modes:

Most of these studies compared English alone, various forms of MCE (with and without speech) and finger spelling. The focus here is on those studies, which attempted to differentiate between ASL and MCE skill.

The purpose of Higgins (1973) study was to compare the comprehensibility of faucal information presented in three communication methods, all without voice: finger spelling, American Sign Language (ASL) : 'in its colloquial form' and 'Siglish,' a method of signing "much closer to English than colloquial signing" (Higgins, 197, p.47).

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The performance of the Siglish group was significantly superior to both of the other groups. The terms "Ameslan" and"Siglish" by students are different sign language preferences. The authors defined Ameslan following Fant as ".…….the sign language used by nearly (signing) deaf people in the United States does not follow the English grammar scheme and is a wholly differ language from English." Siglish was defined as, sign language that follows the English grammatical system. It is English presented usually on the hands, rather orally by voice (Fant, 1972).

(iii) Measurement of bilingualism

McNamara (1967) discusses two basic approaches to measuring degree of bilingualism: direct testing and indirect testing. Direct measurement of bilingual proficiency includes tests of reading comprehension, vocabulary, and writing, speaking, and listening. The problems associated with directly testing language skills in one language are numerous and complex, it is to mention trying to measure comparable skills in two languages. These problems include in deciding which dialects to test and developing a valid and reliable tests for a particular population of bilinguals.(since, for example, tests of French standardized on a monolingual French population may be invalid for use on a French-English bilingual population). To avoid these difficulties, researchers have devised indirect methods to measure degree of bilingualism. Most of these measures are based on the premise that bilinguals generally perform the same takes more efficiently in their dominant language. Macnamara classifies four types of indirect measures: rating scales, fluency test and visibility tests, and dominance tests.

a)Rating scales:

Two measures of bilingualism frequently used are language background questionnaires (LBQ) and self-rating scales. Most questionnaires are based on the work of Hoffman (1934) and ask questions about a subject's language usage patterns in the home and community.

b) Fluency Tests:

Numerous measures of bilingualism involve 'fluency', i.e., speech of responding to verbal stimuli or speed of verbal production in two languages.

Lambert et al., (1959) developed a battery of indirect tests which measured;

1. The time taken to recognize words in each language.
2. The relative fluency of giving free assumptions to stimulus words in each language and
3. The relative speed of reading word and translating words from one language to another (knowledge of inter language equivalence).

c) Flexibility Tests:

McNamara's (1967 and 1969) "richness of vocabulary" test, which measures ability to and near-synonymous paraphrasing of a stimulus phrase (e.g., 'the reason I did it' , "He is drunk"), is based on the notion that lingual have more ways of expressing a concept in their strong language than in their speak language.

d) Dominance Tests:

In a dominance test the bilingual reads aloud a list of words which occasionally contains a visually ambiguous word, i.e., one which could belong to either of two languages (e.g., 'pipe' or 'silence' in English and French). In Lambert et al., (1959), subjects dominant in English or French tended to give the ambiguous words an English or French pronunciation, respectively. Balanced bilinguals who presumably were not set to respond in either language, responded about equally often in French and English. The degree and direction of response set was positively correlated with degree of bilingualism. Again, this type of test would be inappropriate for use with ASL-MCE bilingual group, due to the shared lexicons of ASL and MCE.

Rating scales and fluency appear to be most readily adaptable to measurement of bilingual sign language skills.

(iv) Variables Associated with ASL-MCE Proficiency:

A major complication in viewing sign language skills from a bilingual perspective is that many deaf children are not proficient in any language in the preschool years; i.e., a large number of deaf children enter school with essentially no native language. The exceptions are the small number of deaf children with deaf parents who teach ASL, as native language, an unknown number of deaf children with hearing parents who learn

MCE within the home from an early age, and potency in oral-aural English skills. 'By early adulthood, however, the majority of deaf people have developed some degree of proficiency in ASL and/or MCE Rainer et al, (1963). The work of Meadow (1972), Woodword (1973a), and others suggest that sign language bilingualism is probably related to age of acquisition, language learning context (e.g., home versus residential schools for the deaf) and social emotional factors (e.g., attitudes towards ASL and MCE).

(II) SPEECH SKILLS

Speech assessments must describe not only the kinds of errors a child makes but also the intelligibility of his or her speech to listener with varying levels of expertise in listening to hearing impaired children.

The consistency and accuracy of Articulatory productions are influenced by auditory perceptual skills as well as oral motor sequencing abilities. Therefore any analysis must address the relationship between perception and production and the ability to produce sounds in rapidly changing phonetic environments.

Formal Assessment:

Formal speech assessments can be accomplished by using Ling's phonetic Level evaluation and Phonological Level Evaluation (Ling, 1976, 1989). Ling's evaluations are examined in the next two sections. Some team also sue the tests described below:

- Fristoe Test of Articulation (Goldman and Fristoe, 1986)
- CID Picture Speech Intelligibility Evaluation (Geers and Moog, 1988) and
- Assessment of phonological Processes-revised (Hodson, 1986).

i) Phonetic Evaluation:

In Ling's Phonetic Level Evaluation (Ling, 1976) the assessment tasks are sequenced to follow the developmental stages of spoken English acquisition and to represent the abilities needed to produce fluent spoken English (Luetke-Stahlman and Luckner, 1991). As with most formal speech evaluation tools, the adult produces a target sound and asks the student to imitate it. Using ling's process (1976) students are evaluated for their ability to demonstrate the following sequence of skills,

1. Vocalizing on demand

2. Making sound patterns loud or soft, long or short, high or low, once or more often
3. Producing all diphthongs and vowels with control
4. Producing consonant with /u/, /a/and /i/.
5. Producing initial and final consonant blends

ii)Phonological Evaluation:

Phonological skills include the following:

- Using vocalizations as communication
- Using different voice patterns meaningfully
- Using different vowels to approximate real words
- Saying some words clearly with appropriate speech quality control
- Speaking intelligibility and naturally.

Using Ling's Phonological Levels Evaluation (1976, 1989), five discourse demands are evaluated:

- Description
- Conversation
- Questioning
- Explanation
- Narration.

iii) Intelligibility Assessment:

Beyond the detailed analysis of a hearing impaired child's articulatory deficiencies lies the need to gain some overall estimate of the child's intelligibility. Even a child with a severe articulation deficit can produce intelligible speech and children superficially similar speech results can manifest quite a variety of speech intelligibility ratings. Functional assessment of speech intelligibility comprises an important dimension of overall assessment of hearing impaired children.

a)Use the meaningful Use of Speech Scale (MUSS) (Robbins and Osberger,1991). The Muss is a parent –report and clinician observation tool that assesses three components of

speech: Volitional control of vocalization, use of speech alone, and ability to modify speech to increase the listener's comprehension.

b) The National Technical Institute for the Deaf (subtlety, 1975) has developed a 9-point rating scale for speech intelligibility. The Speech Intelligibility Evaluation (SPINE), (Monsen, Moog and Geers, 1988).

[3] LITERACY SKILLS

Assessment of reading involves the four major areas of comprehension word recognition skills, fluency and vocabulary. Emergent readers are assessed on their knowledge of literacy concepts, conventions of written language, recognition of letters and simple words, and phonemic awareness. Assessment of writing involves areas such as writing traits (examples include ideas, organization, word choice, sentence structure and mechanics) writing process (the child's engagement in planning, composing and revision) and kinds of writing (the child's ability to utilize a variety of forms, such as essays, stories and reports).

Given the importance of reading proficiency and the general low reading achievement among deaf students, some educators have recommended the development of deaf norms for current tests and the creation of new tests of reading exclusively designed for deaf children and youth. Conversely many educators have argued that deaf norms and special tests are misleading and potentially damaging because they lead stake holders to believe that deaf individuals are incapable of becoming literate in the written language of the broader society in which they live.

(i) Reading Assessment:

Formal Assessment:

- The test of Early reading Ability Deaf Hard of Hearing (TERA-D.HH) (Reid, Hresko, Hammill, and Wiltshire, 1993).
- Woodcock-Johnson Psycho-Educational Battery-Revised (Woodcock and Johnson, 1989)
- Peabody Individual Achievement Test-Revised (PIAT-R) (Dunn and Markwardt, 1988)

- The Test of Reading Comprehension-3 (TORC-3) (Brown, Hammill, and Weiderholt, 1995)
- Stanford Achievement Test for Hearing Impaired Students (SAT-HI) (Gallaudet University, 1983)
- The Gates-MacGinitie Reading Test (MacGinitie and Macginitie, 1989)
- Curriculum-based assessment

(ii) Writing Assessment:

As with other assessments discussed in this text, instructions to evaluate writing should be based on the questions of team members. A parent may want assurance that the child's ability to write a letter or a creative story is similar to that of hearing peers. The speech language pathologist may wonder if the student can make reasonable guesses about how to write the initial sounds of the phonemes he or she can pronounce. Teachers may be concerned that the student cannot construct a paragraph about what has been learned in social studies or science. Team members may ask, "What strategies can be used to facilitate the writing abilities of students who are D/HH?" Motivated by questions such as these, team members can plan a comprehensive formal and informal battery of question-directed writing assessments to evaluate student's writing.

a) Formal Assessment:

Heefner (1993) noted that examples of formal measures are provided in the:

- Standard Achievement Test (SAT): (Psychological Corporation, 1989)
- The test of Written Language (TOWL): (Mammill and Larsen, 1983)
- The Iowa Tests of Basic Skills (TOBS): (Cantor, 1986) and
- Written Language Cluster of Part Two of the Woodcock-Johnson Psycho education Battery (Woodcock and Johnson, 1977).
- Test of Written Expression (TOWE): (McGhee, Bryant, Laren and Rivera, 1995)
- Test of Early Written Language (TEWL): (Hresko, 1988) may be helpful when assessing emergent writing abilities.

b) Informal Assessment:

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To use informal assessment, a representative writing sample (or samples) must first be collected. Students may or may not be given a specific time limit in which to write the sample. The sample can be analyzed using any of the following:

1) T-unit analysis:- measuring the degree to which students use more complex sentences by counting grammatically complete segments, called terminable units or T-units (as used by Klecan-Aker and Blondeau, 1990)
2) Error analysis
3) Checklists
4) Holistic or analytical scoring

Bourne (1994) suggested a sequence for the informal assessment of early drawing / writing performance.

The Six Trait Method has been used at elementary, middle and high school levels (Buncan and Neuberger, 1987; Slater, 1994; Poggio, Glasnapp, Nielsen, Barry and Sundbye, 1995)

Six traits Assessment Checklist

[1] Ideas and Content Writing is _____ interesting, _____well-focused,_____precise,_____clear.
[2] Organization The passage has _____an introduction, _____effective transitions, ____a strong conclusion, _____appropriate use of details
[3] Voice It is written _____honestly, ____ expressively, _____in a manner that creates interest.
[4] Word Choice Writer uses ____precise vocabulary, _____strong verbs, _____ effective imagery
[5]Sentence Fluency Sentences are _____ coherent, _____grammatically correct, _____easy to read aloud
[6] Conventions Passage is written with correct _____ spelling, _____ punctuation, _____ grammer, _____ capitalization, _____paragraphing.

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c) Spelling Assessment:

The spelling assessment should be driven by relevant questions and can be achievd through both formal and informal techniques. Instruments described by Mercer (1997) and Poll way and Smith (1992) include the following:

Formal Spelling Assessment Instruments:

- ✓ Diagnostic Spelling Potential Test. (Arena, 1981)
- ✓ Gates Russell spelling Diagnostic Test. (Gates and Russel, 1937)
- ✓ Test of written Spelling-2. (Larsen & Hammill, 1986)
- ✓ Peabody Individual Achievement Test-Revised (Dunn & Markwardt, 1989)
- ✓ Wide Range Achievement Test –3 (Wilkinson, 1993)

Informal Spelling Assessments Tools.

- ✓ Dictated tests
- ✓ Informal spelling inventories
- ✓ Curriculum-based assessment
- ✓ Spelling error analysis
- ✓ Cloze procedure
- ✓ Interviews and questionnaires to obtain information from a student perspective
- ✓ Observation.

d) Visual Needs Assessment:

Harris and Smith (1986) cautioned that visual assessment is critical to the reading facilitation process. Young students especially are often farsighted. Because they see well at a distance, they are usually able to pas school vision checks such as the Snellen Chart. They may have difficulty, however, seeing close up. Signs of visual problems (Harris and Smith) include;

- o Complaints of headaches or blurry vision.
- o Squinting
- o Holding books too close or too far away
- o Closing one eye in order to read
- o Tilting the head

- Red or watery eyes.

[4] SPEECH READING ASSESSMENT:

Contemporary thinking is that students do not just watch for visual information in the area of the cheeks, nose, mouth and throat in order to speech read but consider all the variables of gestures, facial expression, and situational cues together as they watch a speaker (Luetkestahlman and Luckher, 1991).

The speech reading performance of children reflects the level of linguistic development much more so than with adults. Thus, both research findings and test results must be considered relative to the language-learning process.

Moellar (1982) suggested that students who are HI would benefit from a speech reading evaluation that assesses abilities in several settings and provides information about strengths and weakness. Speech reading assessment can be:

1. Informal assessment: It requires consideration and control of many variables, these variables include the students ability to integrate auditory and visual information, differences among speakers and the influence of instruction (Montgomery, 1988). The Cummins model (Cummins, 1984) can be use for speech reading assessment.
2. Formal assessment:
    - Speech Perception Instructional Curriculum and Evaluation (SPICE) ((Moog, Davidson and Biedenstein, 1995).
    - Early Speech Perception Test, (Moog and Geers, 1990)-can be used with children as young as 3 years.
    - Cummins model

[5] PSYCHOLOGICAL OR COGNITIVE SKILLS:

Intelligence tests are designed to measure a set of behaviors thought to be part of intelligence.

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When Braden(1992) reviewed the published literature on the intellectual assessment of deaf and hard of hearing people, he found support for the following conclusions:

- Recommended practice is the use of nonverbal tests, or performance subtests. Verbal tests yield substantially lower IQ scores than non-verbal tests and should not be used with deaf and hard of hearing individuals.
- Tests should be administered by psychologists who are proficient in the language systems used by deaf persons. Psychologists should not rely on oral, written or gestural directions, or directions interpreted by a sign language interpreter.
- The question of using deviation IQ based on normative samples from the deaf population is still open, but the research tends to support argument against the use of special norms. In other words, comparing deaf individuals exclusively to the performance of other deaf individuals is not considered best practice.

The research regarding intelligence of deaf and hard of hearing people has shown a slow rate of growth and is isolated from mainstream psychological research.

[6] SOCIAL INTERACTION or BEHAVIORAL SKILLS.

Peer-related social interaction is the ability of students to select and act on interpersonal skills successfully and appropriately (Goralnick, 1980). The home environments of most students who are HI offer a restricted range of inter personal interactions compared to their hearing peers (Marschark, 1993). Many do not share effective communication with their parents, for instance, and therefore have not been taught how to be having socially.

Assessment in social interaction should be conducted before problem arise. Vernon and Andrews (1990) suggested that an accurate social skills evaluation includes:

- A consideration of the student's case history
- The examiner's personal experiences with the student
- Student interviews
- Observations of social behaviors by people knowledge able to deafness.
- Formal testing.

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Formal social skills assessment instruments allow teachers to identify the extent to which students are deficient in social skills and which hearing and deaf students might need social skill facilitation. The following are the examples of formal social adjustment tools used with students who are HI:

(i) The Battled Developmental Inventory (BDI) (Newborg, stock ,Wnek, Gjidibaldo, and Svinick; 1984)

(ii) The Meadow-Kendall social-emotional inventories for deaf and hearing impaired students (Meadow, 1983)

(iii) Social Skills for Daily living (SSDL) (Hazel, Peterson and Schumake, 1990)

(iv) The Vineland Adaptive Behavior Scale: Class room Edition (VABS-CE) (Harrison, 1985)

(v) Direct Observation of Social Behavior Manual (Odom, Silver, Sandler and Strain, 1983)

(vi) The Systematic Anecdotal Assessment of Social Intervention (Odom, Kohler and Strain, 1987).

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- "Language Learning Practice with Deaf Children"- Patrica L. McAnally, Ph.D., Susan Rose, Ph.D., Stephen D.Quigley, Ph.D., (1987) : A College Hill Publication, A division of little Brown company, Bosten, Massachossetts.

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- " Communication Skills in HI children" – R. John Bench (1993) : Whurr Publishers, London.
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- "Syntax in the written language of normal hearing and HI students of the 8th standard: A comparative study". – Laxmi Jagadeesh (1990)
- "Comprehension and Production in HI children" – Seena (1994).

ARTICLES

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1. The grammatical morpheme deficit in moderate hearing impairment

Reference: Maria McGuckian [a]; Alison Henry [a], International Journal of Language & Communication Disorders, Volume 42, Issue S1 March 2007, pages 17 - 36

***Background*:** Much remains unknown about grammatical morpheme (GM) acquisition by children with moderate hearing impairment (HI) acquiring spoken English.
Aims: To investigate how moderate HI impacts on the use of GMs in speech and to provide an explanation for the pattern of findings.
***Methods & Procedures*:** Elicited and spontaneous speech data were collected from children with moderate HI (n = 10; mean age = 7;4 years) and a control group of typically developing children (n = 10; mean age = 3;2 years) with equivalent mean length of utterance (MLU). The data were analyzed to determine the use of ten GMs of English. Comparisons were made between the groups for rates of correct GM production, for types and rates of GM errors, and for order of GM accuracy.
***Outcome & Results*:** The findings revealed significant differences between the HI group and the control group for correct production of five GMs. The differences were not all in the same direction. The HI group produced possessive *-s* and plural *-s* significantly less frequently than the controls (this is not simply explained by the perceptual saliency of *-s*) and produced progressive *-ing*, articles and irregular past tense significantly more frequently than the controls. Moreover, the order of GM accuracy for the HI group did not correlate with that observed for the control group. Various factors were analysed in an attempt to explain order of GM accuracy for the HI group (i.e. perceptual saliency, syntactic category, semantics and frequency of GMs in input). Frequency of GMs in input was the most successful explanation for the overall pattern of GM accuracy. Interestingly, the order of GM accuracy for the HI group (acquiring spoken English as a first language) was characteristic of that reported for individuals learning English as a second language. An explanation for the findings is drawn from a factor that connects

these different groups of language learners, i.e. limited access to spoken English input. ***Conclusions*:** It is argued that, because of hearing factors, the children with HI are below a threshold for intake of spoken language input (a threshold easily reached by the controls). Thus, the children with HI are more input-dependent at the point in development studied and as such are more sensitive to input frequency effects. The findings suggest that optimizing or indeed increasing auditory input of GMs may have a positive impact on GM development for children with moderate HI.

2. Early hearing detection and intervention in children with prelingual deafness, effects on language development.

Reference: **Bubbico L**, **Di Castelbianco FB**, **Tangucci M**, **Salvinelli F**. Minerva Pediatra. 2007 Aug; 59(4):307-13.

AIM: The purpose of this study was to assess the cognitive and receptive language abilities in children with prelingual hearing impairment, in relation to the age of enrollment in the intervention program and examine the related variables.
METHODS: Seventy children with congenital prelingual deafness were divided into 2 groups based on their age at the start of the intervention program: 17 children enrolled between 0-12 months of age, 53 children enrolled after the age of 12 months. The age of intervention is defined as the identification and confirmation of hearing loss, adaptation of hearing aids, and enrollment in the program of special education at the Orthophonological Institute of Rome. Assessments were carried out at 5 years of age. The receptive language abilities were measured using the Peabody picture vocabulary test (PPVT), while the cognitive abilities used the Raven standard progressive matrices test. The material was administered by staff skilled in assessing children with hearing loss. The assessment of language score tests (PPVT and Raven progressive matrix test) of samples of children with hearing loss was compared with normal standardized scores of hearing peers at 5 years of age. Mean group differences were compared using t-tests. The results were considered statistically significant for a P-value less than or equal to 0.05.

RESULTS: A progressive decline in the mean PPVT score with increasing ages of enrollment was present. The mean receptive language score of the children enrolled within the first 12 months was significantly better (P<0.001) compared to those over 13 months. The nonverbal IQ, determined by Raven's standard progressive matrices, showed no statistically significant differences in IQ scores (P = 0.083) between children with early and late age of enrollment. Our data revealed that language abilities are significantly affected by the degree of hearing loss (P<0.001 Children with very severe hearing loss, find it more difficult to achieve adequate language abilities than children with moderate and severe hearing.

CONCLUSION: According to previous studies on the matter, our data suggest that identification of hearing loss at early age associated with early hearing aid fitting, and enrollment in early intervention within the first 12 months of age, may help to obtain good results in the receptive language skills performance. The early identification of prelingual hearing loss at birth through the neonatal screening must therefore be, considered the primary step for accessing a quality intervention.

3.Cochlear implant: hearing and language in pre-lingual deaf children

Moret AL, **Bevilacqua MC**, **Costa OA**. Pro Fono. 2007 Jul-Sep;19(3):295-304.

BACKGROUND: Cochlear implant in children, speech perception and oral language, hearing and oral language performance in children with pre-lingual profound sensory-neural hearing impairment, users of cochlear implant.

AIM: To study the hearing and oral language performance of children with pre-lingual bilateral profound sensory neural hearing impairment, users of multi-channel cochlear implant considering the following aspects: age of the child when the research was carried out, time of hearing sensorial privation, time of cochlear implant use, type of cochlear implant, type of speech coding strategy used, familial permeability level in relation to the therapeutic process and cognitive style of the child.

METHOD: Participants of this study were 60 children who were assessed according to hearing and language categories. All of the variables were statistically analyzed. Psycho-

social aspects, considering the child's cognitive style and the family's permeability level were also assessed.

RESULTS: Regarding the hearing and language performance with the use of cochlear implant, the intermediate and advanced hearing categories were accomplished by more than half of the children. The statistically significant aspects in the performance of hearing and oral language were: the age of the child upon evaluation, time of hearing sensorial privation, time of cochlear implant use, type of implant, speech sounds coding strategy and familial permeability.

CONCLUSION: The cochlear implant as a treatment for children with pre-lingual sensory-neural hearing impairment is highly effective, although complex, owing to the interaction of variables which interfere in the implanted child's performance. Further studies are needed for the understanding of the implantation complexity in young children.

4. Language development and mild-to-moderate hearing loss: does language normalize with age?

Delage H, **Tuller L**. J Speech Lang Hear Res. 2007 Oct;50(5):1300-13.

PURPOSE: The authors' purpose was to explore the nature of the link between hearing loss (HL) and language impairment in adolescents with mild-to-moderate hearing loss (MMHL). Does language performance (generally or in certain areas) normalize at adolescence?

METHOD: The language skills of 19 French-speaking adolescents (ages 11-15) with moderate or mild sensorineural HL were evaluated via a series of tests assessing oral and written language, including an experimental probe, and compared with typically developing adolescents and adolescents with specific language impairment (SLI).

RESULTS: Language disorders were found, notably in the areas of phonology and grammar, in more than half the adolescents with MMHL; affected domains and error patterns were identical to those found in adolescents with SLI. Language scores of the adolescents with MMHL were significantly linked with degree of HL, a correlation not generally found in studies of children with MMHL.

CONCLUSION: Normalization of language performance does not generalize at adolescence in the context of MMHL. The fact that an effect of the severity of HL was found only after childhood might be because linguistic development is basically complete at adolescence. Prior to this time, this effect could be obscured by developmental rhythms that vary from child to child.

5. Development of hearing, speech and language in congenitally deaf infants and children after cochlear implantation

Kaga K, **Shinjo Y**, **Yamasoba T**, **Ito K**, **Akamatsu Y**, **Uchiyama T**, **Tokumitsu H**. No To Hattatsu. 2007 Sep; 39(5):335-45.

In Japan, universal newborn hearing screening has been partly introduced since 2000 in order to discover neonates with congenital deafness, and the average age at discovery was around five months; however, among infants who were not examined by the universal newborn hearing screening, the average age at discovery was around two years. After fitting hearing aids, congenitally deaf infants are educated in a preschool for speech and hearing. If hearing aids are not effective to develop hearing and speech, cochlear implant surgery is performed as modern technology. The outcome of hearing, speech and language after cochlear implantation was excellent. At the age of elementary school enrollment, most of their verbal IQ was considered to be the same as age-matched normal children. Cochlear implant is the most important treatment at present.

6. Speech, language, and reading skills after early cochlear implantation.

Geers AE. Arch Otolaryngol Head Neck Surg. 2004 May;130(5):634-8.

OBJECTIVE: To examine whether age at cochlear implantation or duration of implant use is associated with speech, language, and reading skills exhibited at age 8 to 9 years in children who underwent implantation by age 5 years.

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DESIGN: Performance outcomes in speech perception, speech production, language, and reading were examined in terms of the age at which children first received a cochlear implant (2, 3, or 4 years), the age they received an updated (Spectra) processor, and the duration of use of an implant and an updated processor.

SETTING: Data collection was conducted at summer research camps held over 4 consecutive years to maximize the number of children available at a specific age (8-9 years). Children were tested individually by experienced examiners, and their parents and therapists provided background and educational history information.

PARTICIPANTS: A total of 181 children from 33 different states and 5 Canadian provinces who received a cochlear implant by age 5 years were tested. A subsample of 133 children with performance IQ scores of 80 or greater and onset of deafness at birth were selected for the age-at-implantation analysis. Another subsample of 39 children with deafness acquired by age 3 years was also examined.

OUTCOME MEASURES: A battery of tests of speech perception, speech production, language, and reading was administered to each child and reduced to a single factor score for each skill.

RESULTS: Correlation coefficients between age at implantation and duration of use did not reach significance for any of the outcome skills measured. Age at which the updated speech processor (Spectra) was fitted was significantly related to speech production outcome (earlier use of an updated processor was associated with greater speech intelligibility) but not to any other skill area. However, more of the children who underwent implantation at age 2 years (43%) achieved combined speech and language skills commensurate with their age-matched peers with normal hearing than did children who underwent implantation at age 4 years (16%). Furthermore, normal speech and language skills were documented in 80% of children who lost hearing after birth and who underwent implantation within a year of onset of deafness.

CONCLUSIONS: For children who receive a cochlear implant between the ages of 2 and 4 years, early cochlear implantation does not ensure better speech perception, speech production, language, or reading skills. However, greater speech and language proficiency may be expected from children who exhibit normal hearing for even a brief

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period after birth and receive a cochlear implant shortly after losing their hearing. Further research examining the benefits of cochlear implantation before age 2 years will help families and clinicians better understand the time-sensitive nature of the decision to conduct cochlear implant surgery.

7.Receptive language and speech production in children with auditory neuropathy/dyssynchrony type hearing loss.

Rance G, **Barker EJ**, **Sarant JZ**, **Ching TY**. Ear Hear. 2007 Sep;28(5):694-702.

OBJECTIVE: The purpose of this study was to characterize the receptive language and speech production abilities of school-aged children with auditory neuropathy/dyssynchrony (AN/AD) and to compare those abilities to children with sensorineural (SN) hearing loss of similar age and degree of hearing loss.

DESIGN: Standardized speech and language tests were carried out on 12 AN/AD children, aged between 57 and 167 mo. Each of these subjects was a full-time hearing aid user or had been just before testing. Receptive language skills were assessed using the Peabody Picture Vocabulary Test (PPVT) and speech production ability was measured using the Diagnostic Evaluation of Articulation and Phonology (DEAP) and a Speech Intelligibility Rating Scale. Data from a matched cohort of children with sensorineural hearing loss were also obtained.

RESULTS: Receptive vocabulary and speech production were delayed (to varying degrees) in each of the AN/AD subjects (relative to normally hearing children). The group PPVT Language Quotient score was 0.65 +/- 0.19 and the average number of pronunciation errors was 11 +/- 8.4% higher than expected for age. Results for the AN/AD group were however similar to those obtained for a matched group of children with sensorineural hearing loss on both language and speech production measures.

CONCLUSIONS: The findings of this study indicate that while AN/AD type hearing loss can pose a significant developmental risk, at least some children fit with conventional amplification can develop reasonable speech and language abilities.

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8.Language ability in children with permanent hearing impairment: the influence of early management and family participation.

Watkin P, McCann D, Law C, Mullee M, Petrou S, Stevenson J, Worsfold S, Yuen HM, Kennedy C. Pediatrics. 2007 Sep;120(3):e694-701.

OBJECTIVE: The goal was to examine the relationships between management after confirmation, family participation, and speech and language outcomes in the same group of children with permanent childhood hearing impairment. **METHODS:** Speech, oral language, and nonverbal abilities, expressed as z scores and adjusted in a regression model, and Family Participation Rating Scale scores were assessed at a mean age of 7.9 years for 120 children with bilateral permanent childhood hearing impairment from a 1992-1997 United Kingdom birth cohort. Ages at institution of management and hearing aid fitting were obtained retrospectively from case notes. **RESULTS:** Compared with children managed later (> 9 months), those managed early (< or = 9 months) had higher adjusted mean z scores for both receptive and expressive language, relative to nonverbal ability, but not for speech. Compared with children aided later, a smaller group of more-impaired children aided early did not have significantly higher scores for these outcomes. Family Participation Rating Scale scores showed significant positive correlations with language and speech intelligibility scores only for those with confirmation after 9 months and were highest for those with late confirmed, severe/profound, permanent childhood hearing impairment. **CONCLUSIONS:** Early management of permanent childhood hearing impairment results in improved language. Family participation is also an important factor in cases that are confirmed late, especially for children with severe or profound permanent childhood hearing impairment.

9.Comprehension of abstract words among hearing impaired children.

Kunisue K, Fukushima K, Kawasaki A, Maeda Y, Nagayasu R, Kataoka Y, Kariya S, Fukutomi Y, Takami H, Nishizaki K. Int J Pediatr Otorhinolaryngol. 2007 Nov;71(11):1671-9.

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INTRODUCTION: This study examines the ability and development in the comprehension of abstract words with hearing impaired children. The ability to understand abstract words is quite important for their academic learning and adaptation in their school life. Here, we qualitatively and quantitatively analyzed the development of abstract vocabulary in hearing impaired children using The Standardized Comprehension Test for Abstract Words (SCTAW). SUBJECTS AND METHODS: We examined 75 hearing impaired children (hearing aid users, 61; cochlear implant users, 14; 1st to 10th grade) and 188 children with normal hearing (1st to 6th grade) using the Picture Vocabulary Test (PVT) and SCTAW. RESULTS: The PVT and SCTAW results closely correlated (r=0.87). The SCTAW scores of the hearing impaired group were lower than those of their peers with normal hearing, but the scores improved as their school grade advanced. In particular, their abstract ability began to catch up from the fifth grade. The error trends of abstract vocabulary in the two groups did not significantly differ. CONCLUSIONS: The SCTAW was useful as an abstract lexical evaluation of hearing impaired children. The development of an abstract vocabulary did not qualitatively differ between children with or without a hearing impairment.

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10.Audiovisual spoken word recognition by children with cochlear implants

Authors: **Karen Iler Kirk [ab]; Marcia J. Hay-Mccutcheon [b]; Rachael Frush Holt [c]; Sujuan Gao [d]; Rong Qi [d]; Bethany L. Gerlain [b],** **Audiological Medicine, Volume 5, Issue 4 2007 , pages 250 – 261.**

This study examined how prelingually deafened children with cochlear implants combine visual information from lip-reading with auditory cues in an open-set speech perception task. A secondary aim was to examine lexical effects on the recognition of words in isolation and in sentences. Fifteen children with cochlear implants served as participants in this study. Participants were administered two tests of spoken word recognition. The LNT assessed isolated word recognition in an auditory-only format. The AV-LNST assessed recognition of key words in sentences in a visual-only, auditory-only and audiovisual presentation format. On each test, lexical characteristics of the stimulus items were controlled to assess the effects of lexical competition. The children also were administered a test of receptive vocabulary knowledge. The results revealed that recognition of key words was significantly influenced by presentation format. Audiovisual speech perception was best, followed by auditory-only and visual-only presentation, respectively. Lexical effects on spoken word recognition were evident for isolated words, but not when words were presented in sentences. Finally, there was a significant relationship between auditory-only and audiovisual word recognition and language knowledge. The results demonstrate that children with cochlear implants obtain significant benefit from audiovisual speech integration, and suggest such tests should be included in test batteries intended to evaluate cochlear implant outcomes.

Keywords: hearing impairment; speech perception; assessment; cochlear implant

11.Evaluation of Croatian-speaking children's speech with cochlear implants and comparison with hearing-aid users

Authors: Vesna Mildner [a]; Branka Šindija [b]; Damir Horga [a]

LANGUAGE IMPAIRMENTS IN HEARING IMPAIRED & ASSESSMENT OF HEARING IMPAIRED

Published in: Journal of Multilingual Communication Disorders, Volume 1, Issue 1 March 2003 , pages 63 - 70

Abstract

Twenty-one prelingually deaf children with cochlear implants, aged between 5 and 13 years and all monolingual Croatian speakers were studied. The aim was to evaluate the speech of implanted children, depending on the age at implantation, and the duration of pre- and postoperative rehabilitation. The speech samples were collected by having the children describe a series of cartoons depicting a birthday scene. Speech therapists and university students evaluated the recordings. The listeners had to reconstruct the story based on the heard renditions and to evaluate the speech for voice quality and overall intelligibility on a 1-5 scale. The samples were also analysed in terms of utterance complexity and the prevalence of different word types. Comparison with the matched group of non-implanted deaf children, all hearing-aid users, reveals differences between the two groups of children with respect to both the linguistic and phonetic parameters.

Keywords: Cochlear Implants; Children; Voice Quality; Intelligibility; Language Development

12.Language Acquisition in Children with Cochlear Implant: Individual Developmental Differences and Implications for Conceptions of a "Sensitive Phase"

Author: G. Szagun [a]

Published in: Pediatrics and Related Topics, Volume 41, Issue 6 2002 , pages 545 - 558

LANGUAGE IMPAIRMENTS IN HEARING IMPAIRED & ASSESSMENT OF HEARING IMPAIRED

Abstract

A study including 22 children with cochlear implants showed that these children acquired language more slowly than 22 normally hearing children. However, there were large individual differences amongst cochlear-implanted children. Only three children acquired language as fast as normally hearing children with rapid language development. Seven children learnt language in a time span similar to that of normally hearing children with slow language development. The majority of the cochlear-implanted children - 12 in total - remained well behind. The acquisition of articles was particularly slow in cochlear-implanted children. Furthermore, there was a relation between their progress in language and quality of pre-operative hearing which was stronger than the relation between progress in language and age at implantation. Therefore, the sensitive phase for language acquisition is influenced not only by age but also by experience.

Keywords: Language Acquisition; Cochlear Implantation; Sensitive Phase

13.Acquisition of speech, pre- and post-cochlear implantation: longitudinal studies of a congenitally deaf infant

Author: Helen M. Robinshaw [a]

Published in: International Journal of Language & Communication Disorders, Volume 31, Issue 2 1996 , pages 121 - 139

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Abstract

This paper details the process of speech acquisition by the first British, congenitally deaf infant (without additional handicaps) to be fitted with a multi-channel cochlear implant. The infant's phonologic and phonetic level development using, firstly, acoustic hearing aids and, secondly, a cochlear implant, is thoroughly detailed by use of video- and audio-recorded data, taken at weekly intervals and across a variety of contexts. The paper examines the benefit of early implantation for spoken language development and notes the utility of Ling's model of speech acquisition for the habilitation of young, congenitally deaf implant recipients.

14.The effects of age at implantation on speech intelligibility in pediatric cochlear implant users: Clinical outcomes and sensitive periods

Authors: Mario A. Svirsky [a]; Steven B. Chin [b]; Andrea Jester [b]

Published in: International Journal of Language & Communication Disorders, Volume 5, Issue 4 2007 , pages 293 - 306

Abstract

This study assessed the effects of age at implantation on the speech intelligibility of congenitally, profoundly deaf pediatric cochlear implant users. The children received implants during the first eight years of life and were divided into subgroups based on their age at implantation. The children's tape recordings of standard sentences were digitized and played back to normal-hearing listeners who were unfamiliar with deaf speech. Intelligibility was measured as the number of words correctly identified averaged across all listeners. The data showed that earlier implantation had a positive and significant effect on the speech intelligibility of cochlear implant users. The results also suggested that a gradual decline in the ability to acquire spoken language skills may occur over time and, furthermore, cochlear implantation before the age of two years may yield significantly better speech intelligibility outcomes than later implantation.

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15.Case studies of pronoun development in two hearing-impaired children: normal, delayed or deviant?

Authors: Elizabeth B. Cole [a]; Yuriko Oshima-Takane [a]; Rosalie L. Yaremko [a]

Published in: International Journal of Language & Communication Disorders, Volume 29, Issue 2 1994 , pages 113 - 129

Abstract

This paper is a study of first and second person pronoun development in the spoken language of two young hearing-impaired children. Pronoun development was examined over a period of 11 months, starting at the age of 29 and 28 months, to determine whether the children's acquisition of these pronouns would reflect normal, delayed or deviant patterns of development. Comparison of data from these children with data regarding normally developing children shows the hearing-impaired children's acquisition to be within normal expectations for hearing age and overall linguistic level, and only slightly delayed in terms of chronological age. These results lend support to the view that differences in the hearing-impaired child's language ability are probably the result of a relative lack of auditory and linguistic experience, rather than reorganisation of the hearing-impaired child's psychological and cognitive processing abilities.

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