AN INVESTIGATION INTO ATTRIBUTE IDENTIFICATION AND CLASSIFICATION ACT AMONG THE HEARING IMPAIRED

A DISSERTATION SUBMITTED
IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR
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AN INVESTIGATION INTO ATTRIBUTE IDENTIFICATION AND CLASSIFICATION ACT AMONG THE HEARING IMPAIRED

during the session 1986-87 in part-fulfilment of M.Phil Degree Examination, 1987 of the University of Delhi under the regular guidance and supervision of

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This is to certify that Shri K.Rajaguru has successfully completed the Report himself under my guidance and supervision. The report may be submitted in part-fulfilment of M.Phil Degree Examination, 1987 of the University of Delhi.

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Further more, without the ready consent of the Head-masters of the schools for the hearing impaired and the normal, without the cooperation of the teachers from these schools and without the participation of the children with great zest, this investigation has not been possibly completed; so they all deserve my heart felt thanks, and I am grateful to them for their coop-eration.

Finally a mention must be made here the role of a few libraries in Delhi, such as CIE Library, University Library and University Reference Library, National Medical Library and in other nlaces like Christian Medical College Hospital Library, Vellore and Library of University of Madras, Madras, for acquainting with the subject-matter, content and philosophy of this investigation.

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CHAPTER I

INTRODUCTION : CONCEPTUAL FRAME WORK

1.1 Thinking And Concept Formation

Thinking is a subject of common interest to philosophers, logicians, psychologists, and many specialists, too. Aristotle selected rationality the capacity to think as the defining attribute of man. Descartes sought to distinguish mind from matter by characterising the former as "that which thinks". Many scholars in the West quote eastern thought or wisdom to refer to Indian and Chinese classical products of thinking. One of the most distinctive human capacity for all these scholars is thinking and thought process.

Thinking however becomes an ambiguous concept attaining different connotations in different situations. Thinking according to the conventional usage indicates different kinds of activity (Thomson, 1971):

1. Imaginative expression of underlying wishes, needs, and wants.
2. Remembering
3. Imagination
4. Manner or style of behaviour as thinking what one is doing (Ryle, 1953)
5. Relieving, and
6. Reasoning and Reflecting.

Even in the sixth connotation, thinking is highly polymorphous concept (Ryle, 1953). It may be that 'thought' is a disjunctive as well as polymorphous concept; 'x' is a disjunctive concept if any value has the attribute 'a' or the attribute 'b' or the

attribute 'c', etc., so that xl has 'a' and therefore is categorized as an 'x'y x2 has 'b' and is therefore categorized as an 'x'y x3 has 'c', x4 has 'd' and so on.

Thinking reflectively, an activity be defined as the attempt to solve a problem which Dewey (1933) ascertains in his book 'How We Think'. He means problems as wide range of dissimilar situations that involve logical steps. The aspects of thinking are formation, retention, and use of basic concepts in terms of which experiences are interpreted. In other words, cognitive abilities are short term memory, long term memory, concept development, problem solving, etc. that corns under thinking. Implicitly the purpose of education is to inculcate in the minds of the children constructive and functional thinking process at personal, social, national, international and interrelational levels for the betterment and welfare of the self, individual, society, nation and the world at large.

Of these cognitive abilities that thinking comprises, concept formation and classification act are the basis for the development of higher level of thinking process. Bruner et al (1956) add the importance of categorization, category being equivalent to concept, and categorizing for an organism particularly in human in the stand point of cognitive psychology a natural process. Environment is so diverse and we humans are able to discriminate so many objects and aspects of objects that "were we to utilize fully our capacity for registering the

registering the difference in things and respond to each even encountered as unique, we would soon be overwhelmed by the complexity of our environment... We engage in the process of categorizing which means that we render discriminately different things equivalent . . . . . responding them in terms of their class membership rather than their uniqueness". Categorizing enables us to "reduce the complexity of the environment". Categorizing as the "principal means by which a growing member is socialized, tor the categories that one is taught and comes to use habitually reflect the culture in which he arises".

Vinacke (1952) summaries the meaning of concept in psychology in the stand point of associationism: A concept is basically a system of learned responses, the purpose of which is to organize and interpret the data provided by sense perception. Past experience is automatically applied to present contingencies through the use of concepts. Usually concepts are associated with specific words or phrases. He further suggests a few criteria to define concepts:

1. Concepts are not themselves sensory data but system which are the products of our past responses to characteristic situation stimuli.

2. Using concept is simply applying past learning to a present situation.

3. Concepts relate discrete sensory data.

4. In human beings words or the other symbols are the means of linking discrete items of experience.
5. Concepts have at least two ways of functioning: the extensional use and intensional use.
6. Not all concepts are rational and even meaningful; and
7. Concepts need not be consciously formulated.

The chief functions of concepts are:

1. To relate previous learning to current situation arising within the subjects' present situations; and
2. To influence and organize each other.

Tennyson, et al outline (1980): " A concept is assumed to be a set of specific objects, symbols or events which share common characteristics (Critical attributes) and can be referenced by a particular name or symbol. Concept learning is thus regarded as the identification of concept attributes which can be generalized to newly encountered examples and discriminate examples from non examples. Klausmeier adds that concepts can be thought of as information about objects, events and processes that allow us to

(i) differentiate various things or classes,
(ii) know the relationships between objects and
(iii) generalize about events, things and processes.

Moreover all concepts posses at least four components:

attributes, examples, definition and hierardical relation.

James (1890), Binet and Simon (1905), Hull (1920) and Bruner et al (1956), not avoiding Piaget, have started studying seriously in depth categorization process. Ever since Bruner et al have published their seminal work ' A Study of Thinking' in which concepts, concept attaintment and strategies are studied and attributes have been out-lined much work in the categorization and classification act has been pursued (Rosch, et al, 1978; Reed, 1982; Bourne, et al, 1979; Medin et al, 1984). An understanding has resulted as the part of anxiety to frame a general theory of categorization in 1960's using natural categories, pattern recognition, ethnobiological classes, semantic categories, sign language, medical diagnostic categories, etc,(Rosch, et al, 1978; Reed, 1982; Berlin, 1978; New-port and Bellugi, 1978; Bruner et al, 1956.).

On human concepts and human concept formation, four functions seem, particularly important: Simple categoriz - ation (e.g., boy), complex categorization (e.g., rich boy), lingristic meaning (relation of a term that explains syno hymv, antinomy and semantic implications) and components or cognitive styles (components of beliefs, preferences, and other cognitive states). On the object concepts, parti-cularly natural kinds (e.g., bird) and artifacts (e.g., hammer) 3 views have culminated: "Classical", "probabilistic" and "exemplar" views (Mealn, et al,1984).

The classical view holds that all instances of a concept share common properties that are necessary and

sufficient conditions for defining the concept. The probabistic view denies that there are defining properties and instead argues that concepts are represented in terms ot properties that are only charactristic or probable of class members. Membership in a category can thus be graded rather than all-or-none. Where the better members have more characteristic properties than the poorer ones. The exemplar view agrees with the claim that concepts need not contain defining properties but further claims that categories may be represented by their individual exemplars and that assignment ot a new instance to a category is determined by whether the instance is sufficiently similar to one or more of the category's known exemplars, (p.115).

Bruner and his associates (1956) define a concept as a category distinguishing two types of classes, viz.) identity classes and equivalent classes. They do suggest discriminating certain readily identificable attributes and using them as the basis for classification as categorizing set. SR associationists explain in terms of sense data-stimulus and the response without the involvement of and participation of the organism.

Further they explains categorization process in simple and mechanical way which is not always realistic. Gestalt theorists emphasize structuring and restructuring without revealing how it is achieved. Whorfian Linguistic

Relativism stresses the linguistic imperativeness and dependence of a culture as the deciding factors in the development of concepts in that culture and different modes differ from one culture to the other. All these latter adherants do however emphasize the importance of the organizm which is making the concepts rather than the world and the environment do. Piaget (1958) Constructs categorization as the active interaction between environment and the particupants. Cognitive psychologist in the main exphasize actively engaging organizm in the process of concept development.

Two basic principles areproposed for the development of categories by Rosch, et al (1978): cognitive economy and perceivd world structure. It can be deduced from these that category systems have a vertical and a horizontal, dimension. The vertical dimension of categories has the basic level category as the anchorage and starting noint from which higher level, such a superordinate cate - gory, lower level as subordinate category and equivalent level as coordinate category forming an ordered arrangement called taxonomy on four converging operational definition of basic level abstraction such as (i) attribute in common (ii) motor movement in common (iii) objective similarity in shape and size and (iv) identificability of averaged shape, can be constructed. The implication of this approach has been tested in the study of imagery, perception,

metaphors and similes and language (Rosch, et al, 1978). It is thus claimed that basic level at which objects are most usefully and naturally categorized is cognitively economical (Newport and Bellugi, 1978 ; Mervis, 1982).

Harris et al (1973) presented three levels of concept mastery:

l(a) differentiating characteristics of correct instances

1(b) discriminating examples from non-examples.

2(a) identifying relevant attributes

2(b) defining the concept

2(c) understanding hierarchical concept relations.

3(a) identifying irrelevant attributes

3(b) understanding principles Bruner et al (1971) outlined two levels of concept attainment: behavioural and verbal, that is ability to use a concept contrasted with ability to explain a concept. Klausmeier and his associ- hold that concept attainment occurs in an invariant seq- uence of 4 levels: Concrete, identity, Classificatory and formal (Mc Murray, et al, 1977). Concerete level has 3 essential onerations: attending, discriminating and remembering. Identity level has recalling and generali- zation o± equivalence of formsrclassificatory concept att- ainment takes place when learner can classify examples and non-examples but not on the basis of attributes; nor define the concept; here generating equivalence of instances

has been carried out. In formed level, besides other operations, evaluating hypotheses about relevant and criterion related attributes in the cognitive function needed for concent attainment (Klausmeier, 1977).

The horizontal dimension as internal structuring of categories has nrototypc as a psychological and cognitive realty. It means clearest case of category membership defined operationally by peoples' judgement of goodness of membership in the category. Prototypes appear to be just members of category that most reflect the redundancy structure of category as a whole (Rosch, et al, 1978). Further prototype categories are related to major dependent variables such as

(i) speed of processing or reaction time

(ii) speed of learning artifial categories and order of development in children.

(iii) order and probability of item input

(iv) effects of advance information on performance such as set and criming and

(v) logic of natural language use of category terms such as hedges, substitutability into sentences and productive sunerordinates as in AMESLAH (American Sign Language).

Prototypes, in summary, are simply a convenient grammatical fiction; they do not constitute any particular processing model for categories. They though must be learned, they do not constitute any theory of category learning (Rosch, et al, 1970).

1.2 NATURE OF ATTRIBUTES:

In British empiricism, attributes correspond to elementary sensations. In cognitive psychology anything has been used as an attribute at one time or other; what is considered a category and what are labelled its attributes depend on the level one is decribing it (Medin,et al,1984). However the controversy of feature versus dimensional aspects of attributes in representing the categories may not be solved in recent future. Moreover two types of attributes and their combinations seem to be possible; those that are separable such as form and size and those that are integral such as brightness and saturaticn. In the former, similarity of two objects in a category or two categories is decoded on the basis of shared properties and their convergence but in the latter it is done holistically. Children perceive even separable properties as integral ones. This would be effected by two ways: those which seem be mandatorily perceived holistically and those they prefer to process holistically; however children prefer second alternative simply (Shepp,1978). In this context, Piaget's classical study on children in number concept reveals that children-nonconservers-perceive the number in terms of length of representing beads. This shows further the decom-possibility of a concept into an attribute and vice versa too possible.

In general four types of attributes are used in the classification act: (1) parts (ii) physical characteristics

such as colour, shape, form etc., (iii) relational concepts as taller, and (iv) functional concept (Rosch, et al 1978). These types of attributes themselves are concepts. Developmentally Piaget (1950) reveals the rudimentary form of a category in terms of even ' kicking motor act. This means that even looking at the faces, mouthing by others and many other motor activities for children become rudimentary categories. Empirical studies further establish categories as internally structured by gradient of responses; category boundaries are not necessarily definite; and there is a close relationship between attribute clusters and structure and formation of categories (Medin, et al, 1984).

Bruner et al (1963) in their experimental studies with children have shown the features of classification act as (i) intrinsic functional (ii) extrinsic functional (iii)intrinsic perceptible (iv) extrinsic perceptible (v) affective (vi) linguistic convention and (vii)fiat equivalence under language framework. (e.g.: They make noise; You can turn them on; They are_____; They are in _____; you like them; They are fruits and they are not they are not fruits; A is like B and A is not like B). Kagan et al (1963) have done the same in terms of egocentric-stimulus centered and conceptual classes such as (i) analytic descriptive (ii) inferential-categorical, and (iii) rational. Abkarian (1986) with normal adults in a

study has brought out that common features of classification act are of (i) perceptual factor (ikonic) (ii)semantic-functional factor (iii) experiential factor (iv) idiosyncratic-affective factor, and (v) mixed one.

1.3. CATEGORIZATION STRATEGIES:

The studies started by Bruner et al (1956) have resulted in the culmination of six basic strategies that humans use during classification act leading to concept attainment on the basis of hypothesis testing procedures. They are two reception strategies and four selection strategies, and of latter, two are focussing strategies and two are scanning strategies. In later studies, they (1963) have framed two broad types of models comprising two superordinate strategies and five complex strategies. The two are;itemized strategy and general strategy; the five are!- key ring association, collection strategy, edge matching strategy, multiple group strategy, and confusion or no response. This work has been done under 'free classification paradigm'. Further hypothesis testing procedure has culminated into Levine's greater contribution theoratically and resulting three more strategies namely, attribute checking, hypothesis checking and global focussing.

Even though Piaget and neo-Piagetians reveal the developmental aspect of concept formation of concept as earliest as seven months of age of a child, Bruner et al

hold that the process of formation of strategies as how is not definitely known or worked out.

1.4 CLASSIFICATION ACT AND THE HEARING IMPAIRED:

Most of the works concerning classification act and attribute identification and the strategies have been pursued and developed using normal children and adults. The absence of language and hearing are naturally occuring 'controls' that offer a unique opportunity to examine learning theories; language acquisition, language therories, and cognitive development. In the area of concept attainment in the hearing impaired, many scholars held a position that it has led to controversial issue to be settled down for a general theoretical framework. James (1890) states that it matters little in which medium thinking was going on and that thought processes are developed in a deaf person before English has been learned. Later Binet and Simon (1905) made the same assertion. Piaget asserts concept development in absence of language, concept devlopment in children at sensori-motor stage before well settled onset of language and primitive class act in in children of seven month old, too. He adds that logical thinking is primarily nonlinguisitic, first imitating action followed by performing actions...

Vygotsky (1962) add " the true directive, of thinking is not from the individual to socialized as predicted by Piaget, but from the social to the individual.

Lenneberg (1967) in his species specific behavioural notion of humans draws assertion to Piaget using nonlinguistic children: Language is species specific derived from biologically determined cognitive capacities peculiar to man and it presupposes congnitive function to be a more basic and primary process than language.

Anziano, et al (1985) conducting 2 experiments concluded that abstract category structure is within the repertoire of younger children but perceptual similarity may be compelling basis of early categorization.

Another stance advocated by 'Vygotsky (1962) is that cognitive abilities and conceptual abilities are deficient in the hearing impaired, for thought process is dependent on the language performance. Mussen supplements to this (1963) that skill in concept formation is closely linked with the acquisition of language particularly of labelling.

Thought and speech development are believed to follow different lines independent of each other until a certain noj.nt when these lines meet. At this point in development, thought becomes verbal and speech rational. Jensen (1964) reviewing Vygotsky draws that he concludes that a concept is formed, not through an interplay of association but through an intellectual operation which is guided by the use of words as the means of actively centering attention of abstrart or certain traits, synthesizing then and symbolizing them by a sign. Further, in the last Chapter Vygotsky (1962)

quotes " I have forgotten the word I intended to say and my thought, un-embodied, returns to the realm of shadows", to assert his stance of imperativeness of language in thinking.

Following the footsetps of foregoing debate, Furth (1961), Kates (1960) and Rosenstein (1959) empirically hsve brought out evidences that thought process is possible without language and only language related concepts and tasks are difficult to the hearing impaired. Furth(1964) asserts that any difficulty that those children have on conceptual tasks are due not only to poor language ability itself but rather to inadequate communication with those around them. This clarification has been effected when a few doubts have been raised as whether the hearing impaired have linguistic ability or not, for the school children Furth used do have some language and symbol system to operate on. Furth (1971) further adds that no adequate parental stimulation or educational aspects are found to be encouraging them to be proficient to manipulate varigated attribute population. Experience in daily life which they do not get in interaction is the intervening variable between language and cognition (Meadow, 1980). All these lead to a controversial issue of the imperativeness of language and linguistic ability for the development of cognitive abilities in general and concept development in particular. Contradicting evidences force to conclude interms of O'Connor (1966), who supports importance of speech in thinking, as quoted by Furth

(1971) findings..... force on me that some what unwelcome conclusion as far as I am concerned that whatever effect auditory deprivation may have on speech, if cannot be said to have strong effect on reasoning capacity (p.38)"

Another issue relevant to the present study is the intellectual ability of the hearing impaired. The children with hearing impairment are thought to be intellectually low and poor and in cognitive abilities never achieve the level of normal peers. (Myklebust, et al, 1953, Oléron, 1953; Templin, 1957; Mussen, 1963). This misunderstanding seeped into for the fact that norm referenced language loaded tests meant for the normal have been used and cross handicap and other variables that affect and lower the intellectual performance of the hearing impaired have not been taken care of. If appropriate tests without much or any language bias at input and output level is used, the real finding that the hearing impaired would be in oar with the normal hearing peers would be obvious (Meadow, 1980, Furth, 1961; Kates et al, 1964; Rosenstein, 1961). In this context, UNESCO - Monograph is pertinent to quote: "Concept formation and the acquisition of knowledge constitute the foremost processes of the child's intellectural development",(1973).

1.5. THE PRESENT STUDY:

The present study to this effect tries to investigate into attribute identification and classification act among school going children with hearing impairment prelingually,

using different types of tasks utilized hiterto in psychological tests and concept attainment experiments. This study tries to extend to a matching group of normal children on age, intelligence and free from visual motor percentual and cerebral dyafuction. As this investigation in the area of cognitive abilities is a new venture to be carried out on the hearing impaired, the number of subjects would not be large, because they at a particular age level would be less than that would be speculated and a school for these children impart education only in a less number in a classroom. For the same reason the investigation is of across sectional study that would require much corroboration with a longitudual study in future to confidently confirm the findings. So this small attempt is given title.

" AN INVESTIGATION INTO ATTRIBUTE IDENTIFICATION AND CLASSIFICATION ACT AMONG THE HEARING IMPAIRED'!

Chapter 2 starts from Page No. 17(a)and continues 18, 19....
For odd pagination, the investigator regrets.

CHAPTER 2

REVIEW OF THE LITERATURE

2.1. RESEARCH ZEITGEIST:

During the past, early fiftes and before, the studies published on concept development and formation in conjunction with hearing impairment are too meagre to list. Even though the interest has gained momemtum in 1960's, it would be very difficult to find any relevant study in Indian situation except one in 1950's on the intellectual ability of the hearing impaired (Das, 1954). But in the west particularly in the States the impetus and interest in the area brough out many studies during and after 1950's, on the concept development and intellectual ability using the population of hearing impaired. Regarding the assessment of intelligence and intellectual ability of the hearing impaired only a few tests that arc normal with the hearing normals are found to be inapplicable to the hearing impaired in limited contexts, for a few limitations to use the tests are to be kept in mind before one takes the task of evaluation seriously (Vernon, 1964).

Of Social Maturity, Vaneland Social Maturity Scale is equally valid and applicable and is used extensively Doll 1935-53). Of intelligence tests, Wechsler's Scale and its revisions (1944; 1947) has priority over others; of non-verbal tests, Raven's Progressive Matrices (1948) has been used widely; of assessment of visual motor ability in which 20-40% hearing impaired show deficiency (Meadow, 1980) a few tests appears to have potential utility; they are Bender Visual Cestalt Motor Test (Bender, 1938; pascal, et al, 1951),Benton

Visual Retention Test (Benton, 1949), Graham Kendall Memory for Designs Test (Graham and Kendall, 1960), Draw-a-Person Test (Coodenough,l926), Oseretsky Motor Perceptual Scale (Doll, 1946; Sloan, 1955), Frostig Visual Development Scale (Frostig, 1961). Of Organicity and brain damage that express in visual perceptual and motor abilities, Goldstein-Scheerer object Sorting Test (1947; 1968) 3ender Visual Gestalt Test and Graham Kendall Test have more potentiality to recognize brain dysfuction. With due standardization these tests would become culture fair even in Indian situations to be useful for the hearing impaired.

Ever since psychological testing movement gained impetus, since Binet, not a single complete battery of tests on concept formation and categorization has been devised except some to be used as intelligence tests such as Columbia Mental Maturity Scale (Surge meister et al, 1959), Goldsiein sorting test (Goldstein, et al 1949), Hanf mann-Kasanin Concept Formation Test (Hanfmann, et al, 1946), Cattells Culture Fair Test (1944) and Ravens progressive Matrices (1940). However, similarity, classification, association, difference and analogy have been incorporated either as items (3inet, 1905) or as a subtest (Wechsler, 1944; Pintner, et al,1945).

The tests for concept attainment without linguistic input and output formats are not available as whole even in the West. However, Snijders and Oomans Nonverbal Test that his been standardized for the normal and the hearing impaired appeared in the scene during late 1970's. The standardization

has been carried out with the Dutch children by the authors (Buros, 1967). Other nonverbal tests used have bean Vygotsky Hanfmann Concept Formation Test, Goldstein-Scheerer Test, Bruner's Sorting Tast and many subtests of various Scales like Jenkins' Nonverbal Intelligence Test, Cattell's Nonverbal Intellegence Test, Cattell's Culture Fair Tent, Columbia Mental Maturity Scale, Wechsler's Scale, etc., to measure some aspect of Concept Formation in the hearing impaired.

The earliest studies in cognitive abilities using German deaf children has been quoted to be of Hoetler in 1927 (Furth, 1964). The momentum gained in this area of interest during 1960's has to wait till the publication of doctoral studies by Furth, Kates and by Rosenstcin (1959). In the reviews/are lined (Furth, 1964; 1971; Kates et al 1964; Ottem, 1980) on deaf children and adults, more of cognitive abilities beside classification act, sorting task and categorization have been involved, namely concent attainment, transfer of concept, memeory, visual perception, Piaget-type studies, perception, rule learning, formal thinking and discrimination studies. In the line of present study only a few studies along with allied studies be given in the following lines.

2-2. STUDIES CONDUCTED ABROAD:

Professional journals and medical journals particularly of the United States not only show the reference from other western countries but also do publish variegated educational studies on the children of that country. In this

respect the quantum of publshed works is much more than any other western country. The studies reviewed herein obviously are from the United States and further they do deal with concept attainment, classification act and the hearing impaired as well as those closely connected with them such as learning strategies.

1. AKBARIAH (1985):

Eighty normal adult subjects took Muma Ikonic Symbolic Subtest. The subjects demonstrated an overwhelming preference for the formation of toxonomic class rather than for schematic based object groupings. (a) Adult subjects show a range of classification strategies (b) Those strategies are best described by using something other than an ikonic-symbolic dichotomy and (c) Classification tasks devoid of a rational component may foster incomplete and potentially distorted conclusions concerning grouping abilities and underlying processes.

2. BEST (1976):

The study examined sensori-motor development in sixteen deaf children between the age of 23 to 38 months using Infant Psychological Development Scale. Experimental subjects were compared with control subjects matched on age and sex on the IPDS and with normative data on the home stimulation measure. Results showed the younger hearing impaired children to be progressing normally through the period of sensori-motor development except in the area of vocal stimulation. Finally strong correlation existed between certain subscales of home stimulations measure and early cognitive development.

3* BLANK (1965):

A reply to Furths writeup has been given in this article. The author argues that (a)the deaf through special training from three years of age often possesses a verbal system (b) the conclusion in the review can never be disproven since any deficient performance by the deaf can always almost be attributed to numerous environmental factors rather than a language handicap and (c) many tasks were arbitrarily assumed to require symbolic activity without recognizing that this assumption is still open to investigation.

4. BLANK,ET AL,: (1966):

Deaf and hearing subjects were compared in two studies on their ability to transfer a concept across sensory modalites. In the first experiment Ss in the 3- to 5- year range were tested on a series of problems involving the concepts of 'something' versus 'nothing'. In the second experiment using the successive discrimination technique, 5- and 6-year-old Ss were compared on their use of the number concept 'one' and 'two' in solving problems in the visual and tactile modalities. The results indicated that deaf 3s although deficient on general language, possessed number symbols and used them as efficiently as hearing Ss. In both experiments, deaf Ss were more proficient in using tactile cues, suggesting that the tactile modality may not afford equivalent stimuli to deaf and hearing Ss.

5. BORNSTEIN,ET AL, (1973):

A comment to Furth's article(1971). They argue that (a) the achievement test was normative referenced and does not provide evidence for an inability to handle English sentences, and (b) there exists still other evidence of deaf student mean achievement at fourth and fifth grade equivalence. They contend that deaf subjects cannot be regarded as language deficient without explicit demonstration to that effect. Failing this the reviewed studies cannot be said to contribute evidence for or against the hypothesis that language is not related to or required for cognitive development.

6. BRUNER, ET AL (1963):

Using two sets of nine-word lists, 30 children, each 10 at first grade, fourth grade and sixth grade were asked the similarity between first 2 words, first 3 words, first 4 words and so on until they arrive last word when the difference between ninth word and the rest was elicited. The results showed types of grouping strategies, namely two kinds of superordinate concept formation and five kinds of complex formation. The analysis showed developmental trend towards a particular strategy with increase in age. They stated from the results developmental theorem. Then they deduced on the basis of language framework of the strategies used by the children and elicited verbally to carry out grouping; it came to 7 language framework strategies;

7. DiCARLC (1959):

This publication reviews whatever published during 5 year- period from 1954 to 1959 on various aspects of the deaf and hard of hearing, of 141 publications. Of intelligence, no tests exist for the deaf which permit prediction of verbal performance level, as there was disagreement about intelligent measurement of deaf children concerned with the verbal than nonverbal. Of visuo-motor and conceptual processes, contrary to Hyklebust and Brutten (1953), Larr (1956) findings suppor - ted superior performance of deaf children on Marble Board I and equal performance on Marble Board II to that of hear- ing children.

S. Furth (1961):.

Using sameness task, symmetry task and opposite task on 180 deaf and 180 hearing subjects, 30 for each age-group of 7 to 12 years this study suggested that the influence of language on concept formation is extrinsic and specific, contrary to widely accepted conclusions that deaf people are inferior in conceptual thinking and to theories proposed to conceptual inferiority and language retardation. According to thir view language experience may increase the efficiency of concent formation in a certain situation but is not a necessary prerequisite for the development of the basic capa- city to abstract and to generalize.

9. FURTH (1962):

180 deaf pupils aged 7 to 12 performed on three non-verbal learning tasks, two concept formation problems and one paired associate task. Each pupil obtained a pass or fail score for each task and a combined learning battery score according to the number of successes. The pupils were grouped into five categories of scholastic ability by judges who rated the overall academic . standing of a child in comparision with an average deaf child of same age.

A high degree of association between performance on learning tasks and scholastic ability rating was obtained. The possibility of using nonverbal learning tasks for assessing the cognitive ability of a deaf child and predicting academic performance was suggested.

10. FURTH (1963):

Four groups of hearing and deaf college students attained four classes in the form of two separate concepts and one disjunctive concept which combined two separate classes. In subsequent transfer tasks in which classes were differently combined, the hearing apparently utilized implicit verbal principles to a greater advantage than deaf students on three tasks, The fourth group with no benefit from the principle as major training factor had a level of concept attainment as in task I. This group was equal in performance to the deaf group. Deficit in verbal training apparently influenced formation and utilization of principles of sorting but not level oi; concept attainment as such. The basic logical operation of class formation was thus seen as relatively independent from verbal language.

11. FURTH (1964 a): -

Do deaf children develop cognitive abilities without being impeded by their lack of verbal language? Eight-year-old deaf children from a state school were tested on a ono-verbal weight conservation problem. Hearing Ss whose performance was comparable to the deaf with 45 per cent success were a 6½ year-old group. However, behavioural criteria of discomfort at giving wrong answers were evident in a much higher percentage of deaf than of hearing Ss. The 1½- year lag in discovering the principle of this experiment between deaf and hearing children was interpreted a s a manifestation of restricted experience in deaf children rather than a general retardation in cognitive ability to understand the principle.

12. FURTH (1964 b):

Deaf people who are deprived of linguistic experience during the formative years seem to provide a unique opportunity to psychologists concerned with the language-cognition relationship. Expirical studies of deaf people's performance on nonverbal cognitive tasks were reviewed. Deaf were found to perform similarly to hearing persons on tasks where verbal knowledge would have been assumed a priori bo benefit the hearing. Such evidence appears to weaken a theoretical position which attributes to language a direct, general or decisive influence on intellective development. The poorer performance of the deaf on some tasks is parsimoniously

attributing to either lack of general experience which is no longer manifest by adulthood or to specific task conditions which favour linguistic habits.

13. FURTH (1964 c):

Noncollege deaf adults were compared with hearing controls on a series of a nonverbal learning and transfer or shift tasks which were designed to test on Ss ability to combine previously discovered elements into new disjunctive and conjuntive groupings. In terms of total errors, successes, and trials to criterion, performance on these tasks was found to differntiate high from low IQ normal Ss and Deaf, Ss performed similar to hearing Ss_on all tasks except one. These results would seem to refute the hypothesis that deaf people are generally inferior to hearing people in conceptual ability or that deaf children's experiential deficiency would leave a permanent lack in their conceptual development. The need for clarifying the role of language in cognition was stress.

14. FURTH (1971):

Recent studies with deaf Ss are reviewed, grouped into subareas of rule learning, logical symbols, Piaget-type, memory and perception. Comparative results on hearing controls are reported with a view to isolate the potential effects of linguistic deficiency on cognitive performance. The general conclusion of a previous review are confirmed that the thinking processes of deaf children and adolescents arc found to be similar to hearing Ss. It is pointed out that

with few exceptions persons profoundly deaf from birth are severely deficient in linguistic skills in spite of many years of schooling; verbal processes could therefore not account for the emergence of cognitive skills even where developmental lags were noted. Occasional failures on certain logical tasks could be parsimoniously attributed to an unfavourable environment such as is observed in culturally different groups. The reviewed data challenge existing theories that base intellectual development largely upon linguistic learning; on the other hand, they confirm Piagct's operative theory.

15. FURTH (1973):

This is a reply given to Bornstein,et al,(1971) who put forward critical points to Furth's stance. Deaf children are characterized as deficient, that is, limited, in their competence in handing linguistic rules, not necessarily in knowing simple words or signs. It is suggested that Bornstein and Roy's theoretical preconditions for studying the language-thinking hypothesis ire experimentally untestaable. An adequate interpretation of their tasks on reading and language confirms rather than weakens the claim of limited linguistic competence in deaf children.

16. FURTH, ET. AL, (1963):

To test for the influence of age and language on some Gestalt laws in visual perception, seven different figures were presented each in a serial arrangement with successive drawings gradually accentuating the Gestalt principle in question.

Two groups of hearing Ss with a mean age of 9 and 16, respectively, were compared with two similar groups of deaf Ss, hence language deficient youngsters. Results in general revealed that age wan a discriminating variable, while verbal experience was not. These findings were interpreted as suggesting that Gestalt principles were formed and developed relatively independently from the acquistion of language.

17. HEIDER, ET AL (1940):

Using Goldstein-Schcerer Object Sorting Test on the deaf children, in comparison with equal number of normals, aphasics, and mentally retarded,the authors arrived a conclusion that in sorting and categorization tasks, though the deaf children were concrete and perceptually oriented than that of hearing children, resembles more closely the behaviour of younger children than that of the aphasics and mentally retarded. In tasks involving sorting of colours deaf children corresponded much more closely to a group of younger children than to a group of mentally defective children.

18. KATES,ET AL, (1961):

This study has investigated the categorization and verbalization processes of 24 adolescents, 8 of whom were profoundly deaf. The remaining Ss comprised two hearing groups, one group matched with the deaf Ss on age and IQ and other matched on Stanford Achievement and IQ. The Goldstein-Scheerer Object Sorting Test was administered and deaf Ss were separately compared with each of two control groups.

(1) Deaf Ss categorize on the task as adequately as the hearing Ss.

(2) Deaf Ss have more inadequate verbalizations than hearing Ss and more adequate categorization accompanied by inadequate verbalizations that in hearing Ss matched on age and IQ. It in proposed that deafness retards learning of the correct relation between the proper verbal attribute and the nonverbal category but that this retardation lies along a normal developmental progression. (3) Deaf is do not differ from hearing Ss in the type of verbalization or in the developmental level of the verbalizations used, or in their spontaneous changes of categorization throughout the test. (4) Deaf Ss have narrower categories than hearing adolescents of their own age and IQ though they do not differ from hearing 3s of the same achievement and IQ. (5) There were no differences found between deaf and hearing Ss that indicated a definite shift in categorization ability distinct from the effects of age and achievement.

19. KATES,ET AL, (1962 a):

The purpose was to investigate concept atainment by denf and hearing adolescents. There were 30 deaf Ss matched first with 30 hearing Ss on sex, age, and IQ and then with 30 hearing Ss on sex,school achievement and IQ. All Ss were tested individually on 6 concepts Problems, using Bruner Card Sorting Task. The conclusions were: (a) Deaf Ss manifest capability equal to hearing Ss in tying together sensory impressions and in making use of these integrated sensory impressions to classify new objects. (b) Deaf Ss show greater cautiousness in taking the initial step in

problem solving, and (c) Deaf and hearing Ss proceed in concept atainment tasks by the use of similar strategies.

20. KATES, ET AL, (1962 b):

Using Goldstein-Scheerer Object Sorting Test, Kates Gewitrtz word List, Webb List of Word Pairs, Wechsler subtest, and 2 questionnaires like Hoppock Job Satisfaction Questionnaire and Bruce-Clark Social Participation Questionnaire, the series of experiments study aspects of thinking processes in deaf and hearing adolescents and adults, and reveal few differences between the groups. Those found were shown to fall along a normal developmental line and were amenable the effects of increased age and experience and education. These results are relevant to a wider sample of thinking processes and are valid indicator of thinking processes in deaf and hearing subjects.

21. LEVINE (1963):

A sampling is reviewed here under the headings, intelligence, Personality, and Studies in Progress. The bulk of the studies reported deals with enumerative-descriptive surveys of deaf groups and is more accurately termed investigation rather than research. There is a dearth of causal-interpretive research and of theory testing. The current critical needs in psychological research of the deaf are for trained researchers and for maticulosuly designed investigations of key problems units, using replicative studies to broaden the base of inquiry, sequential studies to carry us forward in knowledge, and the integrated operations of all the disciplines and techniques required to provide global coverage at each stage of investigation.

22. Mc ANDREW (1946):

Three types of experiments have been carried out on 3 sets of 25 children each with hearing impairment, visual impairment and normal in satiation, level of aspiration and restructuring by classification. The results bring out that deaf children are more rigid in their responses than the normal and the visual impaired, for they are more isolated in their life than the others; consequently, they fail to achieve the level in concept and intelligence.

23. MEADOW (1980):

In this comprehensive study, the author provides a rational, informed and balanced aoproach. Individualchapters survey the central work done on the linguisitic, cognitive, social, and psychological effects of prodound deafness in children and offer practical discussions with abundant concrete examples. The result is a book that provides a context for understanding research in childhood deafness and ways to apply its finds, Of particular interest to professional who work with deaf children the concluding Chapter analyses unresolved matters of policy.

24. MICHAEL, ET AL (1965):

This investigation studied concept attainment of deaf and hearing Ss on social materials to discover whether the deaf lean more heavily and hence more rigidly, upon familiar social cues in solving conceptual problems. There were no difference between 20 deaf Ss and 2 groups each of 20 hearing Ss first group matched on age and IQ and the other

matched on school achievement and IQ in efficiency or strategies except for the greater number of guesses by the hearing groups. Just as with the more abstract conceptual materials of geometric designs, the deaf did not show any less of a categorical attitude with the social materials than the hearing Ss,

25. NASS (1964):

In studying some aspects of conscience development in deaf and hearing children, it was found that (a) deaf children mature earlier than hearing children, or at a level comparable to them in response to situations involving independence from adults and peer reciprocity; (b) in situations involving recognition of the distinction between motivation and results of a action, hearing children score significantly higher; (c) by the age 12 years there are no measurable differences in conscience development as determined by the present date.

26. OTTEM (1980):

54 articles from English, French German and Russian in toto on the analysis of cognitive studies have been reviewed and presented; these articles are classified under six major captions; discrimination studies, associating 2 stimuli, memory tasks, rule learning, Piaget-type tasks and Sorting and classification tasks. The studies conducted by Furth, Kites, et al, and Rosenstein account for 23 and in the opposite camp, those of Oleron and others are only 6. In conclusion deaf people perform equal to hearing people; only in 8 studies deaf deviate from the normal.

27. QUIGLEY (1969):

Reviewing the publications during 1964-68 on the deaf and the hard of hearing of various aspects of deaf population from birth to adulthood, cognitive functioning and perceptual and motor skils are brought under psychological studies. The major workr that arc evaluated arc of Furth's and Kates; et al, that has been given elsewhere in this section. The controversy over the language primacy in thinking and cognitive functioning for the deaf still continues.

28. ROSENSTEIN (1966):

The publications from 1963 to 1965 in the States on the deaf and the hard of hearing have been reviewed in this article. Under cognitive functions, two camps of supporters have been discussed. One side Furth and on the other side Vygotsky and his supporters are diagonally opposite, trying to empirically prove their stance. Such a work would leave the readers in a 'mess' doubting even his own findings without any supportive studies, particularly in India.

29. STAFFORD (1962):

In this experiment congenitally deaf children matched with hearing children according to age, IQ and sex and their performance on a problem box were compared. It was found that the performance of the hearing children was better except in one comparison namely, that in which the deaf in the high - er.t third of the chronological age, mental age range solved the same problems more readily. Results were explained in terms of differences in symbol systems of the two groups.

30. SUCHMAN (1966):

Given choices between stimuli in the colour, forms, and size dimensions, most elementary school children with hearing prefer form, and most deaf elementary school children prefer colour. Pairs of deaf and hearing Ss were matched on age, sex and IQ arc compared, first, on ability to discriminate accurately in the colour and in the form dimensions and second on a successive discrimination learning task. Hearing Ss discriminated among forms more accurately than deaf Ss; deaf Ss discriminated among colours more accurately than hearing Ss. Hearing Ss learned the form discrimination task with fewer errors than deaf Ss. There was no difference in learning between deaf and hearing Ss on the colour discrimination task. The discussion centers on preference response characteristics and how preference relates to nerceptual discrimination and learning behaviours. Suggestions for future research are made, based on a possible source of colour and form preference.

31. UNESCO (1973):

This monograph reviews the present status, hopes anxieties, insights, failures, controversies from the angle of progress and advancement in the field of speech education in four countries, namely USA, Sweden, USSR and Philipines, A specific aspect that it contributes to the present study is the controversy that exists on the primacy of language in thinking and thereby retardation in the implementation of educational planning and policy as desired.

32. YOUNISS (1964):

Hearing and deaf children age 7 and 13 were tested in three successive sorting tasks. On stage 2, half the Ss performed intradimensional (IN) nnd other half extradimensional (EX) shift. The data indicated that in were easier than EX shifts in both stages except when EX shift was made to a previously relevant dimension. Neither age nor deafness was found to effect shift difficulty; while shift differences were in agreement with mediating response principles, lack of reliable age and deafness effects suggested that minimal language experience was necessary for mediating response utilization in this task.

2.3. STUDY CONDUCTED IN INDIA:

Only one study has been traced in the area of intelligence done during 1954 at Calcutta using normal and the hearing impaired children. As there has been no journal exclusively devoted to this disability and nor other professional journals have shown any interest in the publication on the hearing impaired, there is lack of knowledge generally on evaluation, education and rehabilitation of the hearing impaired.

1. DAS (1954):

Using Koh's Block Design Test, Cube Construction Test and Dearborn Formboard on the normal and the deaf children of 9 to 11 years, both sexes, 15 at each age level, it was found that no- significant difference appeared between two groups at each age level in all three tasks.

2.4. SUMMARY:

The foregoing review of the literature reveal the preponderance of support to categorization process, classification and concept formation in absence of well formed linguistic ability in the prelingual hearing impaired. However, the milie in which the hearing impaired grow and develop cither in home or at school or in the Society, Cast much doubt on the validity of the findings at the higher level of concept formation; these milien, elaborately, discussed by Meadow, et, al, (1981) do not support equivocally the a bility of the hearing impaired in the concept formation and categorization process of a younger age, compared to the normal peers. The absence of any study in India in this line, besides the evidence given above, necessities and opens an opportunity to under take the present investigation.

CHAPTER 3

METHODOLOGY OF DATA COLLECTION

3.1: INTRODUCTION:

In this Chapter are outlined the objectives framed for this study, hypotheses to be verified with the empirical data and design of the investigation consisting sample selection on which the tasks to be administered, the selection criterion tasks to be used for the selection of the sample, and the procedure adopted to administer selection criterion tasks and investigation tasks and mode of data colection. In all, this chapter gives a detail plan of actual investigation carried out to collect empirical data from the hearing impaired primarily and from the normal for comparative study.

.3.2. OBJECTIVES OF THE STUDY:

The objectives that ate given below are required as a general guideline not only in framing the hypotheses that have direct link with the tasks and data collection thereby adding the relevance to the study but also a backbone to the investigation. The objectives that pinpoint the areas and aspects that the hypothese represent are:

1. To investigate the qualitative and quantitative characteristics of the attributes to be identified in the classification tasks.

2. To study the mode of attribute identification in the formation of categories and underlying concepts.

3. To outline the strategies used in the classification act as how and what way children use them.

4. To investigate the effect and efficacy of pantamime using during sample selection phase and instruction phase as a nonverbal mode equating input mode both for the normal and hearing impaired.

5. To evaluate the difference between the normal and the hearing impaired if at all it exists, in attribute identification and strategics used and categories formed.

3.3. HYPOTHESES:

Based on these five objectives, a few hypotheses are framed to verify the cognitive behaviour of the normal and the hearing impaired in a limited number of tasks such as attribute identification and classification act. They are as follows:

1. There is no difference between the hearing impaired and the normal in the performance of similarity task.
2. Both groups of subjects show no difference in ability of correctly performing classification task.
3. In identifying the attributes both groups have same level of performance.
4. The attribute identification tasks are equally easier to both groups.
5. Both groups of subjects exibit the same and equal level of performance in Heidbreder's task.
6. There is no difference between both groups on 2 x 2 sorting task.

7. Equal level of ability is shown by both groups in 3 x 3 sorting task.
8. No difference emerges significantly of both groups on Burner's sorting task.
9. Both groups equally show in their ability in classfication tasks.
10. The strategies used by both groups in classification task are same.

The lines given below deal with sampling, method, criterion tasks used in the selection of the sample and sample size of the hearing impaired and the normal matched on age, IQ and visual motor and visual perceptual tasks. Secondly they outline and eleborate the tasks used on the sample thus selected. Thirdly the procedure adopted to administer the the tasks for data collection on the hearing impaired and the normal is given. The criterion tasks and the investigatory tasks are also given in each section.

3.4. SELECTION OF SAMPLE:

At the outset it is decided to carry out this investigation on two sets of populations for comparative and contrastive study in attribute identification and classification act leading to concept attainment. The primary population is school going prelingual hearing impaired children of 12-13 years who have been exposed to linguistic symbols in the school cnvironment; their functional hearing to be useful for language learning naturally is minimal, lost well before the onset of productive language. The number of hearing impaired children selected using criterion tasks that outlined below and number

of normal children are equal matched on age, IQ, visual motor and visual perceptual skills. The normal children have had their linguistic development inadequate sequence, nrofic-ient appropriately to their age and functional in personal and social areas. 30th sets of children have been selected from the local schools intended for -hem in providing teach-ing and learning situations. The selection of criterion tasks and investigatory tasks administered would be the same on both groups. In th main, the children selected would be free from particularly cerebral dysfunction, motor visual perceptual dysfunction and having appropriate IQ level to their age level.

3.4.1. THE CRITERION TASKS AND SELECTION OF SAMPLE (APPENDICE 'A' AND 'B').

Even though it is difficult to satisfy all the factors in the decision of selecting criterion tasks, considering (1) the linguistic-biased-tasks available generally (2) inappro-priate standization found to be suitable for a particular culture and its population and (3) lack of extensive Indian standardization available on the tasks and tests to be useful to the hearing impaired and (4) prevalence of cross handicap or multiple handicap that interfere with the cognitive, motor, visual and perceptual abilities of the hearing impaired upto 20-40% (Meadow, 1980) and (5) the need for noverbal tasks investigating the hearing impaired and equally the normal, three tasks are found & used most often in the West and those, using nonverbal stimuli, become culture fair to Indian

situations. They are (1) Good-enough, Draw-a-man Test, (1926) to assess intelligent level of the children (2) Bender Gestalt Visual Motor Test with Kopitz's norm(1960) for children to find out brain dysfunction and (3) Graham-Kendall Memory-for-Designs Test (1946) to diagnose memory and perceptual deficit in the children. By and large these tests take into consideration the developmental stages in the behavioural and psychological expression at the age well before 11 years.

The characteristcs of these selected criterion tests are that (i) they are simple in construction (ii) they are readily available (iii) instruction mode, scoring method, and normative study are simple for administration(iv) they are to a high degree culture fair, for they are non-verbal (v) for the same reason they are equally applicable to the hearing impaired, too(vi) the instruction is easily given in general, social gestural mode to the hearing impaired as well as to the normal(vii) they are well proved of their effeciency in the West and finally,(viii) no other potential test are available to substitute them to be applicable to the present purpose.

1. DRAW-A-MAN TEST (GOODENOUGH),1926):

This test has been divised as a simple device to assess the developmental appropriateness of the children and subsequently the intellectual level. Later it has been widely used in many areas of psychiatric and clinical aspects such as attainment and development of self image, neurological disturbances, learing disability, psychological affliction,therapeutic

evaluation, homo-sexuality, sex inversion attitude and so on. In the present study, it is primarily used as a tool to assess the appropriate development in terms of intelligent level, comparing to the chronological age.

Numerous studies have been published on reliability and validity of this tool in different aspects of its diagnostic use. The scoring method used in the present study is of Goodenough. The test is administered to the potential group of children in the age range of 12-13 years, first the hearing impaired, in order to arrive at a selection of a group consisting of atleast 30 children in both sexes. The instruction given to them is in pantamine using all real examples, until they understand what they have to do with the tasks. The instruction is simple: "You are given a sheet of paper on which you have to draw a figure of a man, a boy, a girl or a woman. Think with concentration and draw it using a pencil only". This instruction is given in pantamime pointing all concrete objects to be used such as paper, pencil, student, experimenter, rubber (eraser), etc. The same instruction in pantamime is used with the normal to in a small group. As soon as each one completes his drawing he is asked to write his name on the top of the paper, instruction being given in pantamime here too. Each one of the drawings has been scored using the manual and evaluated for age appropriate intelligence and those children show normalcy in their intellectual development have been retained for the administration of second criterion test. On the whole this test becomes first phase of sample selection for both the hearing impaired and the normal.

2. BENDER.GESTALT VISUAL MOTOR TEST: (BENDER 1938; KOPPITZ,1960;1962):

In 1938 Bender has come out with nine cards of simple geometrical designs taken from Wortheimer's work, validating them to the clinical applications of cerebral dysfuction and psychological illnesses and mental retardation (developmental handicap). From time to time again this tool is found much reliable and valid in diagnosing cerebral dysfunction in children and adults. The scoring method used is of Koppitz on the children taking into account their developmental stages, idiosyncracy. For the present purpose, the scoring method devised by Pascal and Suttell (1951) has not used for it has been again revised by Kopoitz (1963) and Fuller, et al, (1976). Like the case of Draw-a-man test this becomes an indispensable tool with wider publications on reliablity and validity studies in professional journals.

The instructions are given individually to those selected by Draw-a-Man test using pentamime: "You are shown these cards and designs one after other. You are to draw using pencil and eraser each design on the sheet of paper supplied to you". The same instructions in pantamime are given individually to the normal children too. After comp-lection of 9 designs each one is asked to write his name on the top of the sheet. Because the efficacy of the tool is well proved from time to time and it is widely used, this tool in the present study becomes second phase of selec-tion criterion, thus finding out only those children without any cerebral dysfunction or organicity.

3. GRAHAM - KENDALL MEMORY-FOR-DESIGNS TEST (GRAHAM, KENDALL 1946):

This tool has a long history of development, initially incorporated in Stanford Achievement Test with only 2 figures which have grown into 10 figures in Ellis' modification and extended to 15 figures by Graham- Kendall. This tool is a test for short-term memory and visual perceptual and motor skill. After each design is exposed to the subject for 5 seconds and 10 second-lapse of time, the subject is expected to draw each one correctly from his memory. This tool in conjunction with Beder Gestalt test has been used to find out brain dysfuction though alone not as efficaciously as the former one. In the present study this tool is used a test of visual perceptual skill assessment, in the third phase of selection.

The scoring method is of Graham-Kendall method elsewhere given. Each figure depending on the quality of reproduction is scored from 0 to 3, 0 being correct production and 3 being most erroraneous reporduction without any rembalance to the original. The higher the total score the severe is the visual-motor dysfuction in the subject.

The test is administered individually using pantamine with the hearing impaired and the normal. The instruction given to the subject is a literary translation of the one in sign language: " We have 15 cards; on each card is drawn a geometrical figure, the figure is shown to you only 5 seconds; you have to take a good look at it; after 5 seconds it is removed; you have to wait 10 seconds and then the figure as

you have seen is to be drawn on the given sheet of paper correctly". The instruction for the hearing impaired and the normal is same only in pantamime. This test becomes the last phase in the selection of the subjects, the hearing impaired and the normal. The subjects who achieve to his age level in all these three tests would be retained in the study sample to a maximum of 30 in each group.

3.5. TEST TOOLS (APPENDICES 'C' TO 'H')

In the present study, 7 tasks are selected from various sources; of them 3 are for attribute identification and other 4 for classification act. The criteria of selection of these tasks are based on (1) the availability of the formats in the professional journals and at Central Institute of Educations Delhi; two tasks are adopted from Jenkins nonverbal Test and one from Cattell Intelligence Test; two tasks are adopted from Heidbreder's and Bruner et al's Studies; and two tasks are contrived to suit the purpose by the investigator; 2 are group administered and 5 are individually administered. 3 tasks are subject oriented answerable types and 4 experimenter-oriented schedule types.

3.5.1. TASKS FOR ATTRIBUTE IDENTIFICATION:

The principle on which the tasks are included is to find out the attribute that becomes criterial in the formation of a concept already given and the attributes that are redundant and nonneceessary (noise) to the subjects; however sometimes the noise attributes become prominent in the error concept perceived by them. Secondly it is to find out and to eleicit semantic value of the attributes that would be identified, if possible. Thirdly it is to elicit the difference in the strategies used by two groups of subjects.

1. JENKINS' SIMILARITY TASK (JENKINS.1965):

This task, a subtest of Jenkins Nonverbal Test, has 20 items with the workout-examples; only 15 items are selected for the present study based on the experts' judgement of suitability to the age group and the types of subjects. The judgement index ranges from 96-99%. Each item has 3 figures on the left and 5 figures on the right in a row. The figures on the left are somehow similar in nature on one or more criterial attributes and one figures out of 5 on the right is identical with the three and other four have inter-veing (noise) attributes. For example, 3 figures on the left arc square of various size; on the right 5 figures are given, one is square, other 4 are of different shapes. From these 5 if square is selected then the subject understands the under-lying concept.

The instruction is given to a group of subjects in pantamime working with an example. It is given as follows: "Sec on each row number of figures; take this row (example); in this row on the left you see three figures and they are similar; on the right you have 5 figures; out of these 5, this figures is similar to the three; this figure is not similar; that is not similar; and the next two are not similar. So the figure similar to left is to be underlined. By this way you have to do with all 15 items given". Scoring is not difficult in this test, but each item depending upon the correctness would reveal the criterial attribute or the noise each subject has attended to. In the sane manner, other groups of subjects be administered. There is no time limit imposed on to complete the task.

2. JENKINS NONVERBAL CLASSIFICATION TEST(JENKINS,1965):

This is a subtest of Jenkins Nonverbal Test, the standardised at Central Institute of Education, Delhi, known as classification Test. It has 20 items including the work-out examples; only 15 are selected based on 5 experts' judge-ment regarding the suitability for the present investigation. The agreement index between these 5 experts is 95 to 100%? the experts are 3 teachers for the deaf and 2 teaching staffs for the normal.

Each item has 5 figures in a row, of which 4 can be grouped into group based on the shared attributes and one is different from other 4 in some critical attributes. For example, 4 rectangular figures with a triangle is given in an item; the size of the rectangeles varies; but on the base of shape 4 rectangeles are grouped together and the triangle is the reponse actually required for the subject to point out. 2 items that are not included in 15 items are worked out with the subjects in a group of 15 at a time using pantamime and the instruction given in pantamime is as follows: " See 5 figures in a row here; out of these 5, 4 belong together, because such and such attributes present in all these but in only one no such attribute is present and so it; is alone; now you have to underline the one that does not go with the figures". Scoring is not cumbersome for the test is intended for 12-13 years age group only. After completion each one is asked to write his won name on the top of the test format. Ho time limit is imposed on to. complete the task.

3. CATTELL'S ALWAYS HAS' TEST:(CATTELL,1960):

This test is a subtest in the whole battery of Catell Intelligence Test. Of 24 items available totally, 15 arc retained for the present purpose, based on the expert's judgement that ranges from 92-98% ? one or two remaining items are reserved as work-out examples. Each item has on the left a complete figure and on the right 5 figures which would be the parts of the left figures and 2 or 3 are no way connected with the left figure. The attributes of a figure are already listed except 2 or 3, and the subject has to identify all the attributes or as much attributes as he can.

The instruction given to each group of 15 subjects is in pantamime, working with an example. "See this figure on the left and on the right 5 of them; of these 5 on the right a few would be in the figure on the left? these are such and such;. The figures that are parts of the left figure are to be underlined. So you have to do with all 15 items". The same instruction is given to all the groups in pantamime. The scoring is not difficult. Depending upon the subject's response it would be possible to find out the extent with which each subject identifies the attributes visually presented.

3.5.2. TASKS FOR CLASSIFICATION ACT:

The tasks for classification act are different from those of attribute identification given in the foregoing lines, in that there is no attribute directly and conspi-couly involved and elicited, rather particularly given number of stimuli are grouped into different ways and in a few ways.

All the tasks arc individually administered to each one of the subjects. These basks are Heidbreder's task (1946-47) taken from his study, Bruner's Card 'Sorting Task (l956) from his work and other two have contrived for the present study. In each task the different modes of classifying by each subject is noted in order towork out the strategy with which he arrives the classification; however the subjects are not asked to narrate how they arrive at the classification, for this part is not covered by the present work. By and large in these tasks the experim ntar notes the manipulation of the cards, after giving due instruction in pantamime both for the hearing impaired and the normal.

1. HEIDBREDER'S TASK (HEIDBREDER, l946) :

This task has been used by Heidbreder in his early work on concept formation. It consists of 25 picture cards taken from 144 cards. As all the cards are not readily available only 25 are selected. These 25 can be sorted out into 5 groups, based on the similarity of each 5 figures, such as human profiles, houses of various types, different birds, different types of hats and different trees. The instruction given to each subject is in pantamime irrespective of whether he is hearing impaired or the normal. " You can see 25 cards; on each there is a figure; look at each card when all are given to you and sort out into 5 groups or heaps". The example given is from real situation using boys and girls, so that minimum learning and maximum understanding takes place.

This task is of monochotomous dimension of different objects, pertaining to one way classification only. No time

limit is imposed for the completion of the classification until the subject volunteers that he has -done.

2. FOUR-CARD SORTING TASK (CONTRIVED)(2 x 2 TACK):

This task is similar to Heidbreder's but with only 4 cards, each consisting of a picture of a animal or 2 animals or a bird or 2 birds. The difference from Heidbreder's is that it is based of dichotomous dimension of animal type and number of animals. These 4 cards can be sorted into 2 classes into two different ways rationally, whereas in the Heidbreder's, 25 cards can be sorted out into 5 groups in only one way rationally, The instruction is given in pantamime individually to each subject and while he is sorting out his mode is noted to work out the strategy he has used. The instruction given is, "see 4 cards; sort out them into two groups". After first sort out again "Sort out these 4 cards in another way". The scoring method is based on whether the subject sorts out 4 cards in 2 ways or not the moves he uses. This taks is based on dichotomous way of classification.

3. 27 CARD-SORTING TASK (CONTRIVED) (3 x 3 TASK):

This task is also similar to Heidbreder's except that it consists of 27 cards, each having one feature of 3 geometrical figures, of number of figures and of the three colours of the figures, Besides, this task is based on trichotomous dimension of these three category features, shape, number and colour. Using all cards, a subject can classify them in to minimum 3 groups thro' 9 groups to many groups upto 81 ways

The instruction given to the subject irrespective of whether he is hearing impaired or the normal is thro' pantamime and signs individually: "See all these 27 cards; in each card you would find a geometrical figure, may be one, two or three in different colours with different shapes like this and this, Using all 27, sort them into 3 groups as you can after thinking. There is no wrong or right". While the subject does sorting his mode of classifying is observed and noted by the experimenter so that the strategy adopted by the subject could be worked out. After first sorting is completed, the subject is asked to sort out in different way: "Do it again another way". An example or two have been worked out before the start of actual task, using different types of rubber and rubber bands or bo ks and notebooks. As there would be possible to sort out the cards into different groups from time to time, no time limit is imposed in total so that it can be estimated as how many times the subject differentially group them correctly and with errors. Not only the correct way of grouping and classification act would reveal the strategy used by the subjects, but the errors too would expose whether they really know the grouping in a way that would contribute to their knowledge of cognitive ability, and classification act.

4. BRUNER'S CARD SORTING TASK (BRUNER,ET AL, 1956):

Bruner et al used this taks with 81 cards, each consisting of different shape of figures, different number of figures, different colours of the figures and different number of borders, in their seminal work to find out the strategies

used by the normal subjects in concept attainment. In the present study, a light modification from Bruner et al is carried out to suit legibly the purpose, in that instead of number of borders, 3 different borders are used. Using all these cards, one can sort them into at maximum 256 ways and so, in this study 3 ways of groupings would be carried out. The instruction given is thro' pantamime to both sets of subjects the hearing impairment and the normal. The instruction and the observation recording by the experimenter would be similar to the two previous tasks as outlined in the foregoing lines.

3.6 STATISTICAL TOOLS USED:

The data obtained from individual subject on each task would be uncontrollable and so on all 7 tasks and of two groups of subjects, not only to arrive at a meaningful results but also is difficult to compare. As the subjects have been grouped into two from the first phase of this investigation, so the individual data are grouped only into two sets in order to infer the group behaviour. Consequently the results would be presented in terms of range, mean and standard deviation under descriptive statistics. Using these analyses, inference be made by means of t-ratio and t-test to find difference in the performance of both groups. The following formulae are found relevant, (Garrett, 1958) and so they are applied to raw ungrouped data, feeding into a programmable calculater-computer of 1 k Byte capacity.

$$\text{Mean} = M = \frac{Ex}{N}$$

$$\text{S.D.} = \sqrt{\frac{Ex^2}{N} - \left(\frac{Ex}{N}\right)^2}$$ for a larger sample more than 30.

$$\text{S.D.} = \sqrt{\frac{Ex^2}{N-1} - \left(\frac{Ex}{N-1}\right)^2}$$ for a smaller sample of less than 30.

$$SE_D = \sqrt{\frac{(SD)_1^2}{N1} + \frac{(S.D.)_2^2}{N2}}$$ for a larger sample.

$$S.D_{\text{pooled}} = \sqrt{\frac{(SD)_1^2}{N_1-1} + \frac{(SD)_2^2}{N_2-1}}$$ for a asmaller Sample.

$$SE_D = SD_{\text{pooled}} \sqrt{\frac{(N_1-1) + (N_2-1)}{(N-1)(N-2)}}$$ for Smaller Sample.

$$C.R. = \frac{D}{SE_D} \quad \text{or} \quad \frac{M_1 - M_2}{SE_D}$$

3.7. DELIMITATIONS:

Because of many factors that are not controlled in an investigation like this and because many restrictions imposed on the subject selection, sample size, tasks selection, etc there are a few delimitations seep in that would influence generalizability the findings to a larger population. These delimitations are given below:

1. The sample for investigation is fixed to a maximum of 30 hearing impaired and correspondingly 30 normal children.
2. The ago group of the sample would be only from 12 to 13 years old in both sets of subjects.
3. The two sets of samples are matched on a few variables such as age, IQ, visual perceptual motor skill only, The other variables that need to be controlled are achievement and teachers' rating, etc.
4. The camples are taken from one geographical region in India and that too, from urban setup only.
5. The sex of the sample is not controlled in both sets.
6. The influence of home environment, parents' and siblings' participation particularly with the hearing impaired, school environment, and socio-economic level are not taken into for the sample selection.

Likewise there would be a number of aspects that can be listed. As this present study is an investigation to be undertaken first in India on attribute identification and classification act leading to concept attainment with the hearing impaired, this study comes under explorative cross sectional investigation which in future would be refined with appropriate controls, and on longitudinal scale.

* * *

CHAPTER 4

ANALYSIS OF DATA AND RESULTS

4.1 GENERAL:

In the present investigation two kinds of materials have been used: i) for the selection of the subjects- the hearing impaired and the normal and ii) for investigating the ability of these subject in attribute identification and class act. The purpose of the selection is to have homogeneous samples, through the use of three tests such as i) Goodenough's Draw_a_man test, ii) Bender Gestalt visual Motor test, and iii) Graham-Kendall Memory-for-Designs test-all three labelled as criterion tests. The tasks used in the investigation have been 7, 3 for attribute identification and 4 for class act, described in the previous Chapter. These 10 tasks could have generated a large quantum of data that have to be collated and analysed and the results are presented in this Chapter. The results to be obtained through criterion tests, starting with considerably a large number of subjects would reveal the mode of final selection of both groups to administer the *investigatory* tasks.

In section 2, the criterion tests, the performance of the subjects on these tests, the type of data, the statistical information and mode of arriving the final quantum of both groups of subjects with a view to equalizing them on C.A., N.A., and Visual motor ability are outlined. In next section the analysis of data from all 3 attribute identification tasks and statistical results would be discussed. In section 4, the

analysis and result of the performance of 2 groups of subjects on 4 class act tasks would be presented. Finally in the last section, to bring out the salient features of analysis and results, a summary of findings based on earlier sections be added as a conclusion of the Chapter.

4.2. SELECTION OF SUBJECTS RPPLYING CRITERION TASKS:

At the very outset the head of a local school for the deaf at Madurai has been approached to get approval for the investigation, explaining it, its purpose and time taken in total to complete it. This approach has facilitated the investigator to establish an over all rapport with the teachers and the subjects. Since, not more than 50 subjects have been available in the age of 12-13 years in this school, another school at Tirunelveli has becn approached and investigation has becn conducted. In the same way, after completing the investigation in both schools for the deaf, a local school for the normal has been approached and the subjects selected from it* The teachers, concerned would become responsible to select all the subjects only in the age group of 12-13 years.

The first crterion test, Draw-a-man test: has becn administered in groups of the hearing impaired approximately 20, each in a session and 3 groups of 30 of the normal. All 3 criterion tests have been administered to first the hearing impaired and later to the normal, after completing investgation tasks too in each group. The time period spent with the subjects at each school has been 5 days to complete all

tasks. The age of each subject has been estimated taking more than 15 days upto the day of first criterion test as one month and less than 15 days as no increase in age.

Table 4.2.1. reveals, 75 hearing impaired and 90 normal aviilable within the age range of 12 to 13 years and 11.75 to 12.75 years respectively, with an exception of 5 normal being only 11.75 years old ; mean age is 12.92 and

TABLE 4.2.1.

NO. OF SUBJECTS TESTED IN DRAW-A- MAN TEST

Subjects	N	Chronological Age[1] Range	Mean	SD
Hearing Impaired	75	1200-13.00	12.92	0.4505
Normal	90	11.75 - 12.75	12.68	0.4248

t- value is 3.4966 for d f , 165, significant beyond 0.01 level.

1 Months are converted into decimal

12.68, and 3D is 0.4505 and 0.4248. t-value obtained for a df of 165 is 3.4966 which is significant beyond 0.01 level, s owing that both hearing impaired and the normal groups are heterogenous as far as the composition of subjects are concered. It mean the selected subjects randomly remain so in their chronological age until they are proved otherwise.

The hearing impaired thus selected though are not equivalent to the normal in the range, mean and SD, their achievement in school is 2 to 3 years less to the normal because the hearing impaired have been brought to the school much late in age and they would have to prepare 2 to 3 years in the Preparatory before to be admitted in the first Std.

The results concerning the selected subjects in both groups using Draw-a-man test arc given in Table 4.2.2.

TABLE 4.2.2.

NO. OF SUBJECTS SELECTED FROM DRAW-A-MAN TEST

Subjects	N	C A.		Goodenough Age		
		Range	Mean	Range	Mean	SD
Hearing Impaired	25	12.00 -13.00	12.45	1-4	12.16	0.5916
Normal	30	12.00- 12.75	12.24	0-4	12.10	0.5812

t-value is 1.2928, for df = 53 not significant at 0.10 level.

The selection has been made on the basis that a subject should achieve an age equivalence in Draw-a-man test, atleast $\pm$3months to his chronological age estimated. The means of 25 hearing impaired and 30 normal, selected are 12.45 and 12.24, respectively with a difference of 3 months in C.A., however, Goodenough's age means are 12.16 and 12.10 respectively with a

difference of less than 1 month. The t-value on SD's of 0.5916 and 0.5862 in 1.2928 for a df of 53, showing no significance even at 0.10 level, and implying that both groups are homogeneous in mental age as depicted in Draw-a-man test. The difference in chronological age has not been subjected to t-test, for 3 month-difference in upper range with 2.5 month difference in M.A. would not account for larger discrepancy. However Draw-a-man test have been potential enough to tap out the subjects in equivalent M.A., thus achieving the purpose intended for.

The second criterion test Bender Gestall visual Motor test has been then administered to those subjects selected in Draw-a-man test, viz., 25 and 30 respectively of the hearing impaired and the normal. The method of scoring is of Koppitz (1960&1961) whose normative studies show 30 potential Bender Gestalt signs that account for brain dysfunction. In the present sample, 3 hearing impaired abnormally have shown more number of signs than others; thus the total number of the hearing impaired has been brought to 22. However, no normal subject has shown any larger quantum of Bender Gestall signs than the mean plus SD of the group; so 22 normal subjects from 30 have been randomly selected to equate with 22 hearing impaired, and Table 4.2.3. indicates the statistics concerning the test. In range of C.A., lower range of both groups is equal but in higher range, there is a month difference, the normal being younger to the hearing impaired.

TABLE 4.2.3

NO.OF SUBJECTS SELECTED USING BENDER-GESTALT TEST

	C.A.			Koppitz Score	
Subjects	N	Range	Mean	Mean	SD
Hearing Impaired	22	12.00-12.75	12.45	2.0926	1.2185
Normal	22	12.00-12.67	12.32	1.9364	0.9021
	t-value is 0.4721 for df = 42, not significant at 0.10 level				

In C.A. mean difference, of two groups is 1.5 months. With a difference is mean Koppitz signs and in SD's, t-ratio estimated as 0.4721 that does reveal no significant difference. This means both groups have exibited the homogeneity in the Bender Gestall performance, too, implying free from any cerebral malfunction that would affect it.

Analysing the types and frequency of Koppitz signs, found in both groups of 22 subjects each, Table 4.2.4 shows that the hearing impaired in total have expressed 13 types with overall 56 times whereas the normal 12 types with 36 times out of 30 signs. 3esides, the hearing impaired have expressed the Koppitz signs in all designs excent in A, 4 and 8 and the normal except in A and 4. This mode of analysis requires a

TABLE 4.2.4

SUBJECTWISE KOPPITZ SIGNS

Subjects	N	Range	Frequency	No.of Signs
Hearing Impaired	22	1.4	56	13
Normal	22	0-4	36	12

larger number of subjects in order to validate the significant difference betwen both groups. Moreover, the performance of both groups on criterion tests has given sufficient proof for the homogeneity of the Samples, to fulfill the purpose.

TABLE 4.2.5.

SUDJECTWISE VISUAL-MOTOR SCORES (GRAHAM-KENDALL'S ERRORS)

Subjects	N	Range	Mean	SD
Hearing Impaired	22	1-8	4.9167	2.3484
Normal	22	1-7	4.6364	2.3206

t- value is 0.3891 for df = 42, not significant at 0.10 level

Reading Table 4.2.5., the range, means and SD's on Visual-Motor scores for errors in Graham-Kenntall Hemory-for-Designs Test show the closeness of these results in both groups.

The significant difference by t-ratio 0.3891 in not tenable, revealing the homogeneity of both groups in the Graham-Kendall test. Even though the authors claim its usefulness in diagnosing brain malfunction of the subjects, of course not exclusively, the higher V-M score does not reliably reveal it in the normals. The normative study done with a small sample by the authors (1946) does not suggest the significance in the present study.

All together, it has been found that 3 criterion tents used could enable the investigator to obtain a small sample of the hearing impaired and of the normal, 22 each, homogeneous in performance on these tests, thus achieving a satisfactory selection of samples; these 2 groups would become pertinent for further investigation, using attribute identification tasks and classification act tasks to test the hypotheses framed.

4.3. ATTRIBUTE IDENTIFICATION TASKS:

TABLE 4.3.1.

SUBJECTWISE SCORES ON SMILARITY TASK

Subjects	N	Range	Mean	SD
Hearing Impaired	22	3-15	7.364	3.93
Normal	22	7-15	10.364	2.247

t-value is 4.3808 for df = 42, significant beyond 0.01 level

Administering first two tasks of attribute identification as group tasks and third as individual one, the data

collated have been analysed and the results are presented.

In Table 4.3.1. arc given range means, and SD's of raw scores of the performance of the hearing impaired and the normal on similarity task, The upper range is at maximum for both groups; the lower range, 4 Score of difference, places the normal in favour of higher achievement? so is the mean difference, 3 and the SD's show higher variance in the hearing impaired than in the normal. The t-value, 3.0368 for df, 42 does indicate the significant difference between the performance of both groups beyond 0.01 level. This result reveals that two homogeneous groups on C.A., M.A., and Visual-Motor ability emerge differently in one of cognitive tasks used; the higher level of ability is found in favour of the normal.

The second task is Jenkins classification task with 15 items administered in group session. The analysis of the data and the result as given in Table 4.3.2 presents that

TABLE 4.3.2.

SUDJECTWISE SCORES ON CLASSIFICATION TASK

Subjects	N	Range	Mean	SD
Hearing Impaired	22	1-15	6.18	4.6
normal	22	7-15	11.14	2.4

t-value is 4.3808 for df = 42, significant beyond 0.01 level

TABLE 4.3.3.

SUBJECTWISE SCORES IN THREE CATEGORIES OF "ALWAYS HAS" TASK

Subjects		NO.OF ITEMS AND ATTRIBUTES IDENTIFIED					
		All Identified		Partially Identified		Partially Identified with errors	
		Mean	SD	Mean	SD	Mean	SD
Hearing Impaired	22	4.5	1	4	1.4142	6.5	2.0817
Normal	22	3.9	2.4008	2.2	2.1432	8.9	2.999
t-Value =		1.0572		= 3.2124		= 3.0126	

df = 42

Significance is beyond 0.01 level in 3 categories.

TABLE 4.4.1

No.OF SUBJECTS AND PERCENT SUCCESS IN HEIDBREDER'S TASK

Subjects	N	Pass		Failure	
		No.	Percentage	No.	Percentage
Hearing Impaired	22	16	72.7	6	27.3
Normal	22	19	86.4	3	13.5

though the upper range is found to be maximum in both group, the longer range is in favour of the normal with 6 more scores and even a vast gap of more than 5 scores in means is found to be supporting the higher level of performance of the normal. SD's shows the variance is more in the hearing impaired than in the normal. The t-ratio 4.3808 is highly significant beyond 0.01 level in favour of the normal in their performance, indicating the hearing impaired are inferior in this task of classification.

In Table 4.3.3. are reported the result of third task of attribute identification, 15 items in all, in terms of three categories such as items whose all attributes identified, items whose not-all attribute identified, and items whose identified attributes not only relevant but non-necessary,too; in this last category, almost all subjects have items with one error. In later two categories the responses in both groups differ significantly but not in first category responses, secondly, there is a preponderance in third category responses in both groups; thirdly the hearing Impaired have shown better performance than they have done in other two tasks given earlier. The t-value in all three categories are 1.057 2, 3.2124 and 3.0.126 for df 42. The significance in favour of the hearing impaired may be explained in terms of perceptibly discerning attributes prenented. rather than deduced from the concepts, as in found earlier 2 tasks.

4.4. CLASSIFICATION ACT TASKS:

In this section the results of 4 tasks of classification act, namely (i) Heidbreder's sorting Task (ii) 2 x 2 Card Sorting Task (ii) 3 x 3 Design Sorting Task and (iv) Bruner's Card Sorting Task would be presented in the same sequence as they have been administered, for the tasks increase in difficulty, not in the nature of attributes available to the subjects but in the increase of attribute dimensions and modes available differentially with critical atributes. Looking at Tables 4.4.1 to 4.4.4, it would be evident that the Scores obtained by both groups in terms of success of the task are much closer, however the major difference between both groups arethat the hearing impaired have taken more time to arrive at desire class act than the normal; that they "beat about the bush" before arriving at the end-product, of correct class act* and that with increase in number of members and with decrease in number of strategy, they have "muddled on". Further, it is these tasks by which the strategies chosen by subjects are to arrive the class act successfully; they are not presented in the formal mode but they would be discussed in the next chapter.

Neidbreder's task with 25 picture Cards arranged in 5 categories on similarity basis of the profiles, is the easiest class act, for categorization in this is possible by using only one available strategy for most discernible members. Table 4.4.1 gives number of subjects in both groups success-fully done the classification and the number of them have failed to do. Totally 3 more normal have done successfully

than to hearing impaired. The cause of failure is that, besides those mentioned in the foregoing lines, they used to defferentiate very slightly different members in features, too with discerning mind and thus to end in more categories than required or in less categories using "muddle on" strategy. However, a larger group of subjects might reveal the signi-fincance of this findings.

The next task, contrived, consistsof 4 figures which can be grouped either birds V animals or one 'animal' V 'two animals'. So the category features are animal, bird and number of 'animal' in a general sense, and two strategies are available, with equal probability to the subject. In Table 4.4.2 the results on 2 trials by both groups are categorized for success and the strategy used in each trial. The diff-erence between them is not very much revealing in both trials, thatin both trials they have been equally successful; however, of the normal, some, only 3 have used in their first trial, 'number' as the strategy; all others have done only with figure as the strategy. How these three normal have selected 'number' of animal" as the strategy could not be deduced and also in it so, as why these three have attended the 'number of animal' as the critical attribute at first.

The contrived third task in the classification act consirts of 3 kinds of dimensions on 27 curds discrimated on 3 attributes of any three designs, three colours and three quantities in that the category features are three types of design, numbers of design and colours of design. So the strategies which are avilable be three.Table 4.4.3 presents

TABLE 4.4.2

NO. OF SUBJECTS AND PERCENT SUCCESS IN TRIALS OF 2x2 PORTING TASK .

Subjects	N	Success in I Trial: Total Pass	By Figure	By Number
Hearing Impaired	22	22(100)	22(100)	0(0)
Normal	22	22(100)	19(86.4)	3(13.6)
		Success in II Trial		
		16(72.7)	0(0)	16(72.7)
		16(72.7)	3(13.6)	13(59.1)

the results on 3 trials with number of and percent success in each trial and the strategy used in each trial. In trial 1, all subjects have succeeded with a preponderance in the hearing impaired to select 'by design' strategy; however 3 normal have prefered to go about 'number of design' strategy. In second trial, total number of successful subjects is totally more 3 normal than the in other group; again with preponderance towards " colour" in the hearing impaired, by 4 more; the normal, almost, equally have selected two strates gies " by number" and " by colour". The succcess in third trial in both groups is between n 50-59% ; all hearing impaired have gone about "by colour" strategy. It can be deduced from the results that with available strategies the hearing impaired

TABLE 4.4.3

NO.OF SUBJECTS AND PERCENT SUCCESS IN TRIALS OF 3x3 SORTING TASK

Subjects	N	Total pass	By Design	By Number	By Colour
		Success in I Trial			
Hearing Impaired	22	22(100)	21(100)	0(0)	0(0)
Normal	22	22(100)	19(86.4)	3(13.6)	0(0)
		Success in II Trial			
		16(72.7)	0(0)	5(22.7)	11(50)
		19(86.4)	2(9.1)	9(40.9)	8(36.4)
		Success in III Trial			
		11(50)	0(0)	0(0)	11(50)
		13(59.1)	1(4.5)	4(18.2)	8(36.4)

have preferred to select colour as the basis of categorization than the normal. Secondly, with the increase of trial, the suceecss of subjects in successive trial decreases, thirdly the colour response by the hearing impaired can be correlated with other studies and how extent colour response world reveal a state which must be correlated with the psychological construct, is not known for in the present sample; all hearing impaired have selected one time or other a priori, colour as the critical attribute in their classification act.

TABLE 4.4.4

NO. OF SUBJECTS AND PERCENT SUCCESS IN TRIALS OF BRUNER'S TASK

Subjects	N	Total pass	By Design	By No.Design	3y Border	By Colour
		Succesn in I Trial				
Hearing Impaired	22	22(100)	17(77.3)	1(4.5)	2(9.1)	2(9.1)
Normal	22	22(100)	16(72.7)	3(13.6)	3(13.6)	0(0)
		Success in II Trial				
		22(100)	0(0)	5(22.7)	5(22.7)	12(54.6)
		21(95.5)	3(13.6)	13(59.1)	1(4.5)	4(18.3)
		SUCC:ess in III Trial				
		8(36.4)	0(0)	0(0)	0(0)	8(36.4)
		19(86.4)	1(4.5)	2(9.1)	8(36.4)	8(36.4)

The results of final task, Bruner's Sorting Task with 81 cards, each depicting all 4 dimensions and one attribute of each dimension, are presented in Table 4.4.4. Go the available dimensions are 4, namely, design, number of design, colour of the design, and border used in the cards; the attributes are 3 in each dimension and the strategies avilable are 4; the subjects have been allowed 3 trials for the elicitation of 3 different types of strategies. In first trial, though

all subjects have done classification correctly, the hearing impaired have shown differential choice of the strategy; 17 have chosen design, 2 colour, 2 border and only one number of designs. The normal in majority have done with design followed by number of design by three only. The over all success in second trial is also of maximum level in both groups except one less is the normal; of three strategies avilable to every subject, more of hearing impaired have prefered colour than the normal who have gone about by number of designs; the second preference by the former group is by number of designs, and by border (each 5) but in the normal it is by colour (only 4). In third trial, the number of success has been 8 and 19 respectively, all the former groun preferring colour and latter group, equally by colour and border.

Collating all trials, it can be deduced of the hearing impaired only 17 used the strategy by design whereas all normal have, at one time or other; number of design" has been used by only 6 of former group, but by 18 normal; strategy by border has been used by 7 of former group and more than 11 of the latter group. By colour strategy, all 22 hearing impaired in one or other time have prefered but only 11 of the normal have resorted to it.

With 4 available dimensions which can be used to frame the strategy of classification in 3 trials, all hearing impaired at one time or other have colour strategy more preferentially than design strategy whereas the normal have gone about to design strategy followed by number of designs strategy and lastly colour strategy in order of preference.

Use of border strategy appear to be sparingly utilized by the former group (33.3%) but 50% of the normal. By and large the foregoing argument given under tasks would be applicable in the preference of dimension to work out the strategy and colour based strategy.

4.5 SUMMARY

In this chapter have been presented the results of criterion tasks used in the selection the hearing impaired and the normal and that of attribute identification tasks and classification tasks on them. From a heterogeneous and random sample of population of 75 hearing impaired from 2 schools meant for them and 90 normal, it would have been possible to arrive at a selection of two groups of 22 subjects each, who are homegeneous in C.A. , 1-1.A., and Visual-Motor ability. These 2 homogeneous samples have shown differing in their performance attribute identification and classification act. However the results have not brought out tne rich subjective, experiential and behavioural aspect on these tasks, apart from group difference. The elucidation of the problems -here, the tasks-and the strategics used by the subjects would throw light on the overall cognitive aspects of the subjects generally of all and particularly of the hearing impaired? so those aspects would be of more implicative in the education of the Hearing impaired.

The results on these tasks reveal not only significant difference of the performance of the hearing impaired from that of the normal but signficance on the one hand is in

favour of the normal for higher achievement and on the other hand, not definitely in favour of the hearing impaired. Moreover the findings presented refute partially the theoritical assertion of Piagot, Lenneberg and others and of empirical evidences produced by Furth, Kates and Rosenstein on the equivalence of cognitive abilities of the hearing impaired, particularly in attribute identification and classification act comparing to the normal.

CHAPTER 5

DISCUSSION

5.1. INTRODUCTION:

In the previous chapter analysis of the results has brought out, in the light of the performance of the hearing impaired and the normal on 3 tasks of attribute identification and on 4 tasks of classification act, how extent the mean difference of both are significant to support better achievement of one group over the other disproving the tenability of null hypothesis. It has been found that on the performance in first 3 tasks the null hypothesis has been rejected whereas on the latter 4 tasks it is proved the inapplicability of t-test and thereby the untenability of null hypothesis in any direction, for the strategies thus found out would have to be discussed subjectively in thelight of present investigation and other works available in the literature? further the potentiality of nonnecssary attributes connected with the concepts need to be inferred on the role of their contribution in adopting the classification strategics by the subjects.

To this end, this chapter discusses the data and analysis of data and results taking into account individual's performance and overall performance on these tasks. By doing co, the nature of behaviour of the hearing impaired and the normal is revealed. It also deals with comparatively some studies available in the literature some achieve the extent of generalizability and of contribution towards existing

theories of cognitive abilities and catcgorization. Finally this chapter proposes to find out the relationship between the results, objectives and hypothesis. The sections that follow would reveal these fact under the achievement of the hearing impaired, under the achievement of the normal and under the tenability of objectives and hypotheses. Final section summaries in a nutshell the discussion and the inference.

5.2. ACHIEVEMENT BY THE HEARING IMPAIRED:

Though the hearing impaired have been selected on the equivalent performance to that of the normal on all three criterion tests, exibiting the homogeneous nature with the selected normal Sample in C.A., M.A., and Visual motor ability, their performance in the investigatory tasks has exibited differentially their ability. In similarity task, they have shown difference from the normal with correctly scoring on 50% of the items. The mean has been influenced by individual scores, when range is compared. Taking all individuals in the group and error score on the same items and the items with different score of errors, variance of errors reveal a plausible explanation tothe behaviour of the individuals. So analysis of errors in this tack has shown no basis by which the critical attribute has been attended to; it means the hearing impaired individuals have picked randomly the instances that do not belong to the concept under consideration. There is no rationale found even on visual or perceptual basis. 50% errors do not support any view point of classical,

probabistic or exemplar model; so no rationale on any theory or concept formation would be applicable to account for the error population. Further these individuals have behaved erratically in choosing the critical instances.

In classification task, the selection of non-exampler has been carried by the hearing impaired individually by attending to the instances holistically, by attending on an attribute separably, by adopting identification procedure and sometime by random method. They do differ significantly when the normal are compared en the performance for a lower ability, and when 50% correct mean score is compared 70% correct responses of the normal. However, Furth,(1964) supports and shows the evident that the hearing impaired perform equally with the normal on the classification task.

In the 'Always has' task of attribute identification, as a group, the hearing/impaired scores have shown significantly better than the normal. In the completely identified concept attributes, even though no different has been found between them and the normal, in partially identified concept attributes, they have done much more than the normal, indicating that they do atte nd the problem partially, considering those concepts whose one or two necessary attributes and one non-necessary attribute have been taken in, it appears that the concepts depicted have been associated with those not essential (e.g. door and key) that they have found in the environment. Or, it so occured to subjects the non-necessary attribute has strong associative value to the concept. Even assigning the

attribute to a concept takes the role of non-analytic atratcgy in the form of habit formation or memory (Brooks, 1978).

The majority of the subjects, on Heidbreder's task, almost 14 have tried to spread all the instances on the table before them for simultaneous scanning instead of picking up critical attribute which is used for the classification. Sometime they have clustered two or three without arriving any real classification. Further they have shown an unreal classification. Further they have shown a real 'muddle on of the task. This strategy shows spreading all or majority of the instances, clustering of 2 or 3 instances, decluster-ing them, clustering more than or less than required or avail-able categories, again suffling spreading, getting 4 or 6 . categories before they have gone about 5 categories. They have, by this means, spent more time than actually required instead they would have noted critical attribute. In this 'muddle on' they have failed to note critical attribute most of the time. It seems that classifying process is not in the repertoire of the hearing impaired; so they always attend discernible non-necessary attribute and consequently the speed of classification has been less, too.

The result in toto shows these subjects pick up the wrong line of the start and sustain it a longer than required times in terms of non-attending critical attribute, and attending to non-necessary attribute, using simultaneous scanning and getting overloaded to disseminate, shifting

from holistic approach to component process in fleeting moment, and getting confused. This whole gamut of actions makes more time and less speed.

In the 2 x 2 sorting task during first trial as more critical dimension is available, the most discernible dimension, animals and birds, has been taken as the basis for classification; but how one dimension becomes immediately most discernible to other is not known; though majority of the subjects have gone about the type of animals rather than number of 'animals', they have started with spreading all 4 instances and simultaneously scanning for the search of a critical dimension until success has been achieved. The simultaneous scanning of all instances, in small number, would purports to the identification of critical dimension. 16 subjects finally have gone about the classification act on second trial. When theavailable critical dimension is less than that is available in first trial, have classified wrongly; those who have succeeded have done spreading all instances, sorting all at a time, sometime clustering randomly and finally arriving at the true one. Here the "warm up" period of "incubation" period considerably less than in other tasks; the speed of execution of this trial has been less that of first trial. It may be conectured that simultaneous scanning is neither applicable in more instances, nor is it quick and efficicacious, but with small number of instances, it facilitates the task instantaneously.

In first trial of 3 x 3 task all have done correctly; however the mode and the strategy adopted has been varied from subject to subject; a few have started with many instances snread not only to carry out many instances simultaneous scanning but also to learn the critical dimension; some, realizing that spreading all is not possible, have started with 4 or 5 spread from which learning critical dimension they have gone about slowly to classify and with the rest carefully as if any odd 'thing' would suddently would appear to distort the on-going activity. However all have started with spreading a few instances, until they used to got the practical and critical dimension. Moreover, design appears to be more attention seeking dimension, for it tends to become holistic in nature; some also would go about spreading on one dimension but when they could learn from instances of more critical dimensions, they have shifted to design basis which seems to be 'pragnanz'holistically. Some, imnediately assuming to classify, have landed in more than 3 classes, viz. 9; so resuffling has been done. Use of a dimension or two simultaneously or of two with third prartially intercepting with 1 or 2 attributes have been witnessed.

In second trial 16 successful ones with 50% have gone about " by colour" of the design. Some to get about this, having started with it, but got confused; so resuffled, gone about by design' and finally performed. Some have imnediately plunged into colour dimension or other. Tome have gone about

on other dimension, got confused and then resolved to go about. Some, getting about with dimension of first trial, have resufflcd to succeed. In this trial, with more critical dimension available for classification, the unsuccessful ones, trying various ways to grasp the critical dimension, have classified as in the first trial to give up finally without recognizing the dimension.

In third trial 50% have done on colour dimension but others failed. Many have gone about "Muddle on" strategy as only one dimension is available to them. The failed ones have carried on randomly without noting the dimension available but rather observing only attributes and all dimensional attributes in each instance, finally ending with indecision. The succesful ones have either got to colour immediately or if they have gone about previous dimension, they would revise until colour dimension has been grasped.

While doing Bruner's sorting task, in first trial all have succeeded, majority of them using 'design' dimension (17 subjects). Some, with observing 2 or 3 instances, have gone about sorting any adding another class to end with the classification act; some have spread a few instances to have simultaneous scanning and to get critical dimension, followed by true classification? some have scanned more instance that could be handled, then collated into clusters and without success resuffled and sorted finally; oddly a few have selected colour or border as the critical dimension. It appears that by performing three previous tasks, they would have learnt the

discernible critical dimension, particularly of the design to attain the goal immediately, for the speed with which they have performed this task in first trial have been much more than they do on the other tasks. One can account this learning due to transfer whose effect would be very much found during second trial, too, when a few critical dimension are available, for those 16 who have succeded.

In second trial, for 3 failed ones no critical dimension but dimension combined with other attributes have been available, to lead them to confusion and the failure, for this kind of strategy is too complex to handle simultaneously except in tasks where many categories are required. Some have started with such strategy but later resuffling to higher number of categories. The speed by which the required classes have been achieved, though, has been different from subject to subject, in longer Course ends with "Muddle on" which, when some have recovered from, the speed increases considerably. For a few, until a critical dimension is mentally realized to work on, the 'muddle-on' duration has been much more than the actual sorting duration. For some, the 'muddle on' duration is a fraction of whole time. It appears 'muddle on' duration is a kind of 'Warm-up' phase and also learning phase for many. Once one is engrossed in the process that ends in 'muddle on', then it seems that there is no escape vent available without exercising a great effort which has been found exceptionally in two or three. Those to whom no warm-up time

or 'muddle-on' phase is required, would decide the critical dimension by analysing only 2 or 3 instances as how to go about.

In third trial, those failed ones in majority have classified with the previous dimension-basis even 2 more dimensions would have been available. Those successful ones have done it immediately with 2 to 4 instances scanned; sometime they have changed the choice of the dimension finally to attain 'by colour' only. In this trial, the speed has been increased by both failed and successful ones. It shows when learning takes place and transfer is used, the speed of the act increases and 'Warm-up' period and 'muddle on' duration decrease; these two aspects have been used by those of failed and successful ones.

On the whole, many types of phenomenon are derived from the tasks done by the hearing impaired; in attribute identification the qualitative nature of attributes as how they are assigned values to enter into classification act, too and in classification act as how different kinds of effective and ineffective strategies are used have been found out. In the latter, it is also derived how the process of 'working of mind' contributes differentially in the face of problem situations and how learning: and transfer would be effective to different iate the hearing impaired from other groups.

5.3. ACHIEVEMENT BY THE NORMAL:

In this section is revealed the inference based on the normal, and individual performance of them on all 7 tasks to

deduce the commonality that both groups share in the use of attributes and strategies during classification act and to derive any differentiating phenomenon that set them apart.

In similarity task, the attribute identification and the strategy used by the normal are not different from those of the hearing impaired, in that the normal have also randomly selected the instances that never go with others in the group, except that the number of errors in the normal has been less significantly than in the hearing impaired. The random choice of any instance can be conjectured that all instances have been compared either holistically on the similarity basis to give support to the probabilistic view point. As perception to assess the similarity of instances has not been shown as an invariable function, the threshold of similarity varies from subject to subject whether they are the normal or the hearing impaired. The argument presented herein is not rationalize and nor support the errors as compulling force but to present as a process of probable learning strategy.

In classification task, the normal have not only utilized the relevant critical features either holintically or dimensionally to find a non-member correctly but also they have done so to get a non-member erroneously, in that nonnecennary attributes too have played a greater role. In this respect both groups have more or less same strategies but with a difference that the normal show a significant higher level of attainment than the hearing impaired do.

In 'Always has' task, analysing the partially identified attribute, with nonnecessary ones for the concepts by the normal, it can be deduced that infiltration of nonnecessary attributes is attributed to experiential knowledge available to the subjects but not relevant to the presenting concepts in many natural situations, to the associative value that the attributes have with concepts, to the association with the concepts in their early development and to sometimes hunches" on self-knowledge and to functionally used attributes in case of artifacts to other activity to which the concept is a part, in the case of natural objects. For example, these nonnecessary attributes have become pertinent to the concepts; the concept 'chair' has nonnecessary attribute "arm rest" or " a child" who uses the chair,, a'picture' to a' house', so on. Even though such nonnecessary attributes become part of the concepts at one time or other, it is not an essential aspect when a concept, in sample categorization, or a goal-derived concept as 'foods not to eat on a diet' or person concept such as 'extrovert' or event concept 'script' presented as a task. It has also been found that the Subjects do work for the classification on "core procedure" as a wrong choice besides identification procedure (Medin,et al, 1984).

As soon as Heidbreder's task would have been presented, majority of the subjects have started after spreading and scanning 2 to 4 instances and noting critically to attributes to arrive at the classification. However most of them, after completing the task have not verified whether they have done

correctly or not, except 3 subjects. Of these, a few starting hesitatingly to sort from the beginning even after noting critical dimension, have gained the speed in the middle of the task with certainty and valid verification done during the task period. Theclfferences between the normal and the hearing impaired successful ones are that the former would do the sorting into classes to a great extent instantaneously when they note the critical dimensions in a little "warm up" period with a few instances? they have gone about as if sorting is blind-fold activity? and they have rectified in seconds the wrong attribution of instance into other class. But the latter group has taken care to look at keenly the instances, spreading them, for a fraction of second to a few seconds and with a lapse time got the critical attribute before sorting correctly. In other words the former group have executed the task in a few seconds devoting a fraction of time on each instance whereas the latter group have taken more time about 5 to 30 seconds on each instance even they are successful. Those who failed in the former group, have sorted into 2 to 4 groups, clustering 2 groups in one or clustering one group with other 2 groups unlike the latter who have 'muddled on' generally.

In 2 x 2 task it has been found during first trial, a few normals spread all 4 instances for simultaneous scanning to sort out immediately on a critical dimension they would deduce; Only one has done grouping, regrouping and degrouping a few times to get finally the classes. It reveals that some require simultaneous scanning with a few

instances for sorting and a very few have required learning phase as a 'warm up' period but most of them have compared a pair of instances to do categorization. The difference between 'muddle on' warm-up period and learning phase'warm-up'period is that the former may be a learning phase extended to a very little time duration and is a part of the latter which takes considerably a more duration without getting into the critical attribute or resulting in often confusion due to handling of many number of critical dimensions and attributes at the same time.

During second trial, 6 have failed to achieve by doing wrong classification or the same first classification; they have not pinpointed only one extra available critical attribute in most of the cases. The successful ones have used simultaneous scanning of all 4 instances by spreading then going about correct sorting. In the hearing impaired one can find only "muddle on" phase and manipulating phase predominantly rather than short incbation phase of learning.

In 3 x 3 sorting task during first trial, majority of normal have scanned by spreading 2 or 3 instances to go about sorting into 3 groups after getting the critical dimension. 1 or 2 have been found deviating from the others, in sorting into more groups than required before collating them into 3 groups; one has shown a vicilating mind to decide the choice of critical dimension that he would deal with. During second trial most of the successful ones have carried out categorization immediately as soon as they have

got to the task. From this it can be derived that 2 kinds of learning experiences would account for this reaction: (i)the experience that has been internalized from the immediate preceding tasks or activities is transferred to the present task and (ii) the experience gained from like-task earlier that one has performed to know that a critical dimension or attribute is always available for right categorization; both lead to the state of awareness, observation and activity. In the hearing impaired this kind of immediate resolution or learning aspect by means of transfer is not found conspicuously? however they have exibited transfer of learning from the previous tasks but after a lapse of time as if it bolted 'out of the blue'. One normal starting to compare the difference in the size of cards of instances even though they are of equal size has failed to categorize. So the nonnecessary attributes become sometime critical to the subjects in spite of the fact they are not pertinent; they do discover them too.

It may be conjectured that in underachievers nonnecessary attributes pay a greater role in the concept formation and in general cognitive ability resulting in failure. Further in some normals, self-correction of already existing category to a newer one has been found contrary to the complete absence of it in the hearing impaired.

During third trial it has been observed that with number of critical dimension decreasing, the categorization task has become difficult; but most of the successful normals

have not shown any hurdle in recognizing and carrying out; however some have faced real difficulty some time; for they have observed the instances holistically as they have done on classification task until they could find out the critical dimension. Many could observe all critical dimensions, while they have done in other trials and reserve them for the future use; they carry out the categorization even in all trials immediately. Some have come back to already made categorization but correcting and recalling what is done, they could later succeed. This kind of shifting and fleeting process take place 2 to 4 times in some subjects. When others have not recalled previous categorizations they land in failure of performing the task. The speed is the contri-buting aspect in favour the normal generally during this third trial.

In the final task of Bruner, first trial reveals that the new task is not totally a new stituation and it is where transfer of learning to be anplied instantaneously, observing not more than 3-4 instances. But those who have resuffled the instances have felt the task as a new situation where transfer of learning has no effect until they feelcontrarily. As the transfer of learning taxes place in only a few hearing impaired the role of memory or cortical excitation as non-analytic strategies might ,be not used by them. During second trial, it is found majority of them except one have done immediately wihtout wasting any mement. Some have shown delay in arriving at the end-product thro' 4 to 5 categories;

and they often vary the mode of categorization. When a few critical dimensions are available, the instantaneous categorization may reveal the cortical excitation and general rule of categorization thus recalled. During third trial, all normals except are immediately have succeeded; the one has sorted the instances first into many groups and in the middle collating all has grouped into 3 classes. The speed, attending to critical attribute ordimension immediately and learning them while performing other trials,the number of subjects successful differentiate the normal from the hearing impaired.

5.4. TENABILITY OF OBJECTIVES AND HYPOTHESES:

Having analysed the data and presented the results in the previous chapter and discussion in the previous sections, this part is devoted to the assessment of objectives achieved and hypotheses defended.

OBJECTIVE l:

Quantatively in the attribute identification tasks, both groups differ and the normal significantly achieving higher level. The hearing impaired show a preponderance only in two tasks but the normal do in five tasks. Qualitatively the normal have capacity to learn, to transfer and to apply the critical attribute or dimension and the classification strategies more efficiently and expedicious than the hearing impaired in all tasks.

OBJECTIVE 2:

Besides those mentioned under objective one, the normal show differentially and significantly higher achievement than the hearing impaired in first two tasks. In third task, the latter do.Again the normal show the capacity to generate, use, transfer, disseminate, apply attributes and dimensions more readily than the hearing impaired in the categorization; they do apply more efficacious strategies than the hearing impaired without any bias of choice unlike the latter group which show colour response more readily.

OBJECTIVE 3:

In sections 5.2. and 5.3. the strategies used by both groups have been discussed elaborately; the ability of the normal surpasses that of the hearing impaired, in very many ways.

OBJECTIVE 4:

To investigate the effect and efficacy of pantamime used during sample selection phase and instruction phase.

The pantamime has been used thro' out the selection phase and instruction phase and the results show the higher achievement in majority of tasks (5 out of 7)by the normal than the hearing impaired. However, the effect of pantamime has not been evaluated in comparative situation. Further use of pantamime in terms 'general gestural language' has been often and many times repeated until subjects in both groups would have understood the instructions.

OBJECTIVE 5 :

This has been done first in chapter 4 during analysis of the data and results are presented; the differences are elaborately discussed in this chapter, showing the higher ability of the normal in many ways and many aspects.

Hypothesis 1, on similarity test is not tenable in the light of the result obtained. Though qualitatively no difference is found between both groups, quantatively using t-test technique, the normal achieve higher score, significantly thereby implying their ability in the similarity task is differentiated from that of the hearing impaired.

Hypothesis 2, on classification task is untenable, for the normal quantatively do well in the performance better than the hearing impaired. However, qualitatively no difference identification.

Hypothesis 3 is not defended in favour of the normal, partially; the hearing impaired do show significant difference in separable attribute identification as presented in "Always has" tasks. But qualitatively the behaviour of both groups in this task is not different.

Hypothesis 4 can't be defended completely infavour any group, for the difficulty level has not been estimated? secondly both types tasks have not been compared, for each one has brought out different aspects of attribute identification and classification act. However, even infering from the results of both purposes, they would not give any data for quantative analysis nor reveal the qualitative difficulty level.

Hypothesis 5 cannot be defended in favour the hearing impaired for the higher level achievement but they have achieved lower than the normal, not in quantitative aspect but qualitatively. The qualitative aspect have been discussed extensively in Sections 5.3. and 5.4. of the chapter.

Hypothesis 6, though not nroved qualitatively, be discussed in terms of qualitative aspects of classification strategies available and used under 2 x 2 sorting task in the preceding sections. The normal do show very different aptitude and attitude to that of the hearing impaired, generally.

Hypothesis 7, 8 and 9 cannot be defended; but it should be done in the light of the results and discussion in favour of the normal who show higher, mature and spontaneous strategies quite often and who quantitatively get more store than the hearing impaired.

Hypothesis 10 cannot be defensible in favour of the hearing impaired for they show qualitatively and quantitatively lower score with 'muddle on' strategy, with less speed, with more time duration and with inefficient strategies.

5.5. SUMMARY:

In the preceding sections, results and discussion reveal that the performance of the hearing impaired and the normal on the investigatory tasks, the lower level of achieve- by the former, different strategies adopted by them to arrive at the categorization, the factors that may contribute to the

performance of theirs and the less speed in learning and lack of transfer of learning. All the hypotheses are not tenable to support the equality of performance of both groups. Further this investigation refutes the findings of earlier studies elsewhere done, particularly in the west where it is maintained that the cognitive abilities of the hearing impaired are in par with the normal.

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CHAPTER 6

CONCLUSION

6.1. FINDINGS AND CONCLUSIONS:

The present study of investigating the ability of 22 hearing impaired and 22 normal children of 12 to 13 years in attribute identification and classification tasks has been carried out, framing 5 objectives and 10 hypotheses. Four objectives have been achieved by analysing quantatively and qualitatively the characteristics of attributes, mode of attribute identification in the categorization, strategies used by both groups in classification act and difference in achievement on all tasks. One objective for which the method of investigation, data collected and analysis and results arrived at do not render ample support, and are not substantialized, because it requires a comparative study of both groups in terms of tangible measures of gestural signs used instead of verbal instruction thereby leading to any difference or similarity in the performance of both groups.

All 10 hypotheses have been verified statistically and the results are more in favour of the normal for higher achievement than of the hearing impaired. However, no agreement between the present study and those conducted in the west is shown, in spite of the fact that nature of concept formation and attribute characteristics have been elucidated theortically.

6.2. EDUCATIONAL IMPLICATIONS:

Looking at the curriculum syllabus and teachings methods intended for the normal children and the hearing impaired, it would be found particularly in Indian Educational system, no work has been done in the direction,concept formation and cognitive abilities to be incorporated in the system, nor an effort has been taken . The major aim of education, generally, if one says, is preparing the individuals for vocation and career, then knowledge-based curriculum and syllabus would suffice to attend to and to solve immediate short-term memory. But to inculcate in the mind of the students and individuals proper and better thinking process to achieve long-term goals that would be the wealth of the nation, at least one must start cognitive ability based education from the primary school level and for the handicapped particularly the hearing impaired and mental retarded.

The present investigation though reveals higher achievement in 2 types of tasks of cognitive abilities by the normal children of 12 to 13 years only, to that of the hearing impaired peers, their deficiency in terms of partial achievement and errors in attribute identification and classification act for learning strategies could bring out simple approach to reframe learning-teaching aspects and situations. The concent-based curriculum could be framed, concept—based syllabus could be adopted, concept-based teaching methods would be implemented and concept-based textbooks would be

be produced, though a very dull streak of light, sometime, is found to be appearing in the scene. These direction is to be adopted in each subject at each level in the school for the normal and more emphatically for the hearing impaired. The teaching of the hearing impaired must be carried out on concept-based method instead of what is being done ever since the educational opportunities have been opened for them.

Even though the present investigation is not directly related to curriculum, Syllabus and teaching method, its relevance could be important if sue tasks and methods be extended to the hearing impaired not only to diagonose the level of ability or achievement, but also to implement the better methods for their progress and advancement in thinking and thought process in absence of language operation. The strategies discussed are the revealing part to identify individual need and remediation thereof to the hearing impaired. This approach would facilitate the integrated education of them along with the normal. But a lot of water must flow under the bridge to achieve all these .

5.3. LIMITATIONS:

Though the present investigation has been pursued on the hearing impaired and the normal, children of 12 to 13 years, there are many limitations of this study owing to a small sample selected, particular selection tasks adopted and a few tasks investigated. As no research investigation is exclusive and infallible, so is this.

1. As the samples of the subjects are limited to 22 hearing impaired and equal normal only, the information available in this study may vary if the samples 'have more subjects.

2. The samples are from urban schools not covering the rural set-up for rural children, in spite of the facts that majority of the children, the handicapped come from the rural area, So the study may not unfold the generalizability of the results for they have been selected from one region only.

3. The samples have been subjected to only 3 psychological tests for the purpose of selecting them; if they are to be subjected to other standardized non-verbal intelligence test and others, the selection of samples may vary.

4. The hearing impaired sample has been based on children of prelingual hearing loss of profound level, the variation in auditory level combined with achievement level may reveal different picture of the ability in these tasks.

5. As only two aspects of cognitive abilities have been administered, so other aspects such as anology, short-term memory, long term memory, logical operation might have been used.

6. The difference between the use of pantamime and gestural language and of written language in the instructions may reveal different picture of findings, particularly with the hearing handicapped.

7. The samples have not covered all age groups to get to developmental aspects of cognitive ability.

5.4. SUGGESTIONS FOR FURTHER STUDY:

In the light of delimitations and limitations outlined in the foregoing sections, a few suggestions are given below in order to refine the present study and to facilitate those who are desirous of persuing any investigations either in applied areas or theortical aspects of cognitive abalities.

1. The sample population need to be consisting of more number of individuals in both groups of the hearing imnaired and the normal, of girls and boys of different age-groups, to arrive at a generalizability of the findings.

2. The study could be carried out using different types of tasks on cognitive abilities generally and on concept formation, categorization, logical operations, etc.

3. To have better level of homogeneity of the subjects, many variables with appropriate non-verbal standardized tools, such as SES, achievement level, residual hearing level, intell-igent level, etc., be controlled.

4. With the concept based method incorporated in teaching of the hearing impaired systematically, the different in achieve ment and cognitive abilities can be evaluated.

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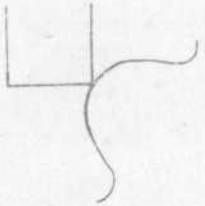
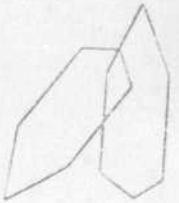
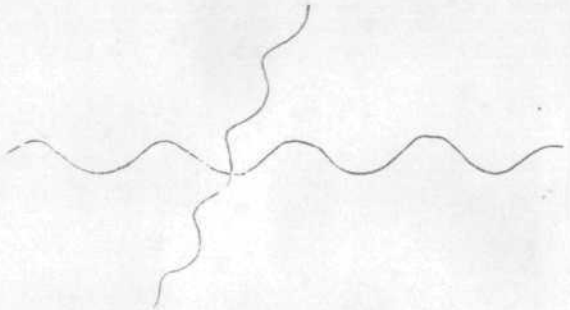
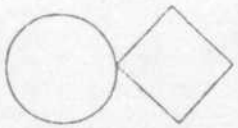
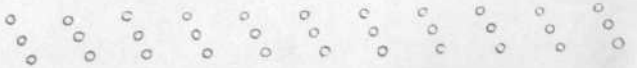
APPENDIX : A

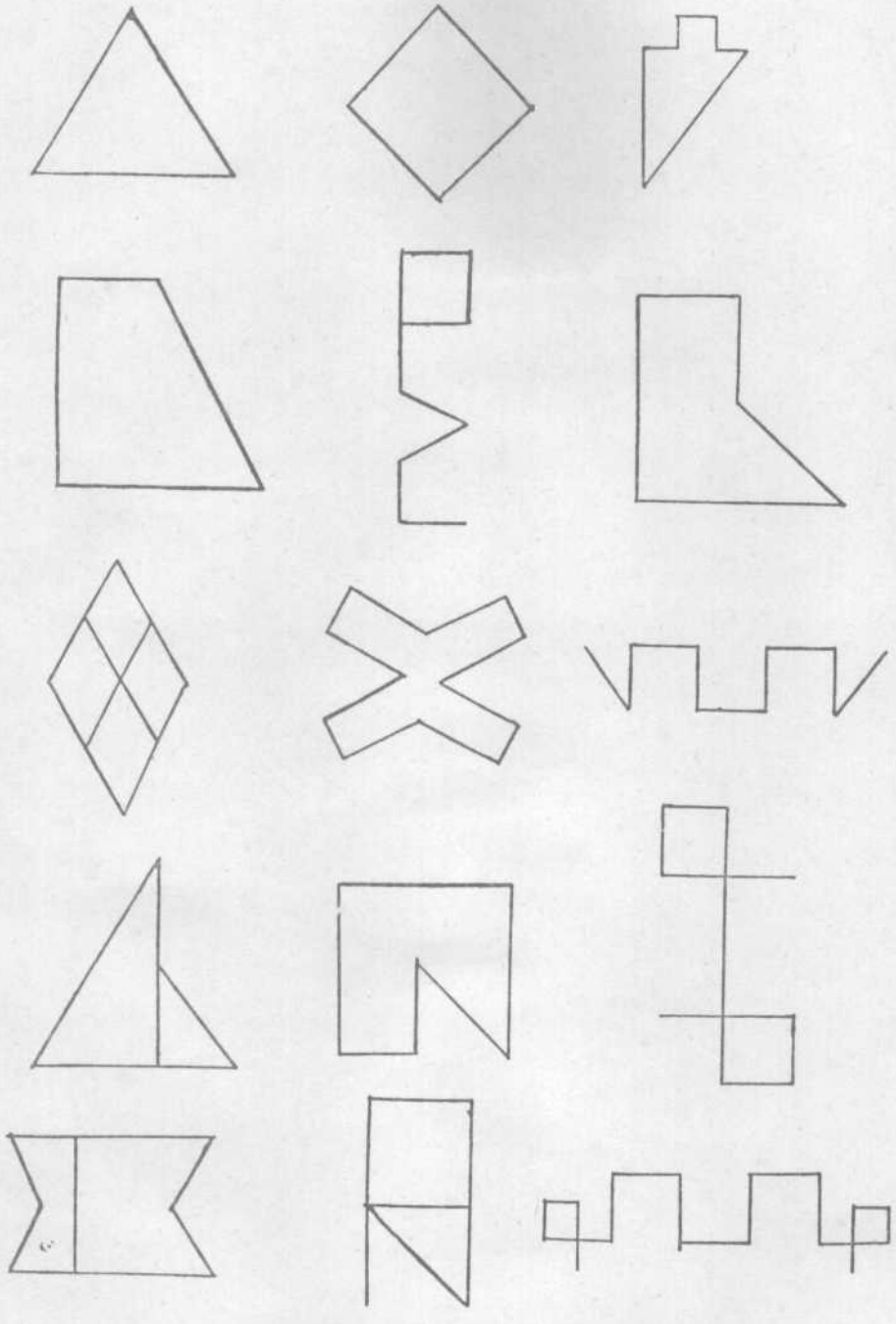












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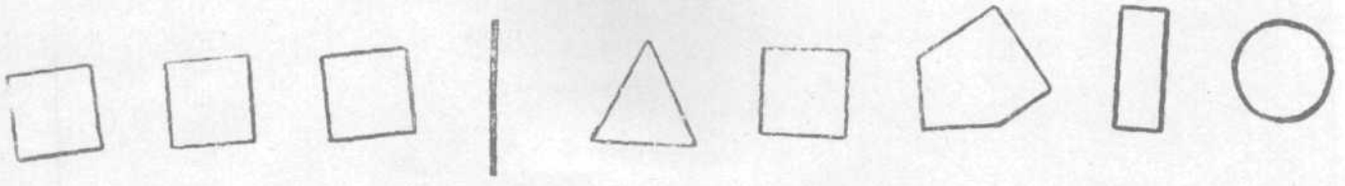

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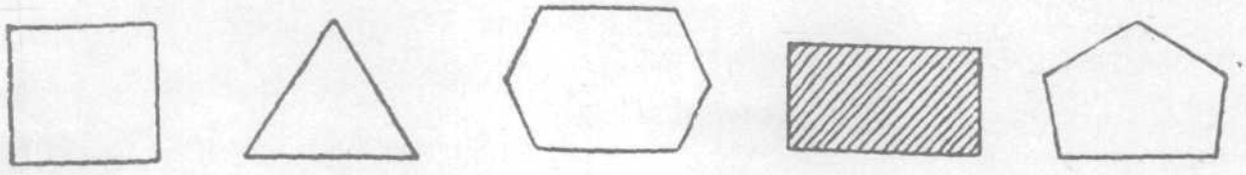

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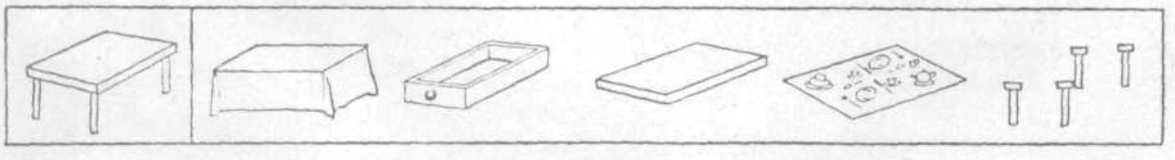
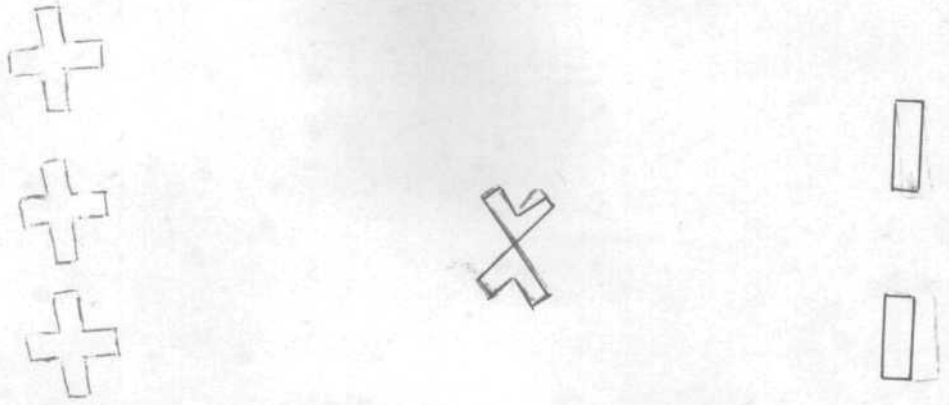


APPENDIX :F

APPENDIX: G



APPENDIX: H