

THE DEVELOPMENT OF LANGUAGE AND COGNITIVE ABILITIES OF HEARING IMPAIRED CHILDREN

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Abstract: The purpose of this paper is to analyze the nature and pattern of language development related to different aspects of cognitive abilities of hearing impaired children as well as to classify them according to test scores. A Bengali language test belonging to class VI has been applied to 20 hearing impaired children of class VI standard of Helen Keller Badhir Vidyalaya, Mukundapur, Kolkata. Different aspects of language along with cognitive abilities have been analyzed. The major findings have been found that language development of the class VI students is poor and variable also although their average age is 15.5 years, but comparatively their cognitive abilities in to some extent is not bad. They have lack of sentence construction ability, vocabulary ability, grammar ability, divergent thinking ability etc.

Index Terms: Language Development, Cognitive Abilities, Hearing Impaired Children.

I. INTRODUCTION: Our hearing apparatus that helps us in understanding the spoken language and speech consists of our ears, the auditory message carrying nerves to and from the brain and the brain that helps in the interpretation of the hearing sensation. So, hearing impairment depends upon the conditions, health and functioning of all these organs comprising our hearing apparatus. Various defects in the structure and functioning of our hearing apparatus may give birth to a number of hearing impairments. (Mangal, S.K. -2011)

Impairment in hearing capacity is defined in terms of degree of hearing loss. Total inability to hear is deafness. Deaf individuals have hearing problems that are so severe that speech cannot be understood when it is transmitted through the ear. Deafness might occur before the child acquires language or afterwards due to certain environmental problems. But those whose sense of hearing is defective but who manage with or without hearing aids are called hard of hearing. The hard of hearing are those in whom the sense of hearing although defective is functional with or without a hearing aid. Hard of hearing individuals can still use the auditory channel as their major avenue for speech and language development. . (Mangal, S.K. -2011)

According to The Individual with Disabilities Education Act, USAA (1990), Hearing impairment means impairment in hearing, whether permanent or fluctuating, that adversely affects a child's educational performance but that is not included under the definition of deafness.

According to Brill, Mac Neil and Newman (1986) : A hard of hearing person is the one who generally with the use of a hearing aid, has residual hearing sufficient to enable successful processing of linguistic information through audition.

1.1 Range of Hearing Impairment:

Generally we take the help of characteristics of one's sound known as intensity of sound for determining the severity of one's hearing impairment or losses. Intensity of sound is expressed in decibel. We typically classify degrees of hearing disabilities as follows:

Slight: 27–39 dB of hearing loss

Mild: 40-54 dB of loss

Moderate: 55–70 dB of loss

Severe: 71–89 dB of loss

Profound: more than 90 dB of loss. (Mangal, S.K. -2011)

1.2 Language Problems of Hearing Impaired Children:

Language development of the deaf children differs markedly from that of the normal. Actually, the normal children learn language. The deaf children are taught language. They process language and linguistic utterances visually. Whether the child is pre-lingual deaf or post lingual deaf they behave like deaf children in communication skills. The deaf child as well as hard of hearing experienced a lag in vocabulary skills compared to non-hearing impaired students. The deaf have a much greater lag. The vocabulary development get worse as the hearing impaired child grow older. This eventually affects syntax, morphology development. . (Mangal, S.K. -2011)

The hearing impaired children have limited vocabulary and inability to internalize and comprehend meaning, concepts, abstract feelings, complex structure of a language. In written language they often find problems associated with sentence construction, knowledge about words –sentences & so on, gender understanding, tense, appropriate use of verbs, adjectives, nouns, idioms etc. Reading performances are deficient in hearing impaired children. They always make mistakes in writing or speaking a simple sentence. The speech of a hearing impaired child is generally unintelligible to a new listener because of tone, pronunciation, use of prolonged vowels etc. (Panda, K. C. -1997).

1.3 Cognitive Abilities of Hearing Impaired Children: Cognition is multi-faceted and it is reflected in the coordinated performance of numerous language and non-language activities such as perception, memory, mental imagery, concept formation, problem solving, language learning, academic achievement and navigating everyday life. Hearing impaired children face deficits in understanding abstract concepts. Actually, they are not intellectually low as compared to the normal children but deafness affects the child's cognitive development across several domains. Deficiency in cognition among hearing impaired children is occurred due to inadequate development of a conventional language system.

II. REVIEW OF RELATED LITERATURE:

Mayberry found out that children who are born deaf frequently experience severely delayed and impoverished language development regardless of mode of expression, that is, spoken language or sign language. The delayed and depressed language development of deaf children, as a group, is not caused by, and does not cause, general intellectual deficiencies in cognitive domains that function independent of language. Deaf children also show normal performance on nonverbal IQ tests. Deaf children and adults who use sign language often show above average performance on several kinds of visuospatial tasks. Deaf children's significantly delayed language development, in sign or speech, leads to poor reading achievement; on average it is lower than literate levels. Deaf children's incomplete language development also delays their ability to understand the motivations and actions of other people. When language is unavailable, the child's mind invents one (home sign). When groups of people are cut off from auditory language, they spontaneously use a visual one (sign language). **Schick, Villiers, Hoffmeister et al** found out that for the deaf child, the delay in acquiring a Theory of Mind is caused by lack of access to language, not by any fundamental cognitive problems. Children who are deaf have significant delays in their understanding of a Theory of Mind. Deaf children have some access to conversations, and, for the most part, they are socially competent, even when their language delays are severe. They do acquire a great deal of information about the world through visual means. However, it wasn't the children's general language skills but rather vocabulary skills and the specific ability to comprehend syntactic complements that predicted Theory of Mind skills. The language delays that are typically observed in children who are deaf are causally related to delays in major aspects of cognitive development. . The findings made by **Bergeson-Dana, Tonya R.** show us that the children ages 5-15 years old who use cochlear implants can tell apart their own mother's voice from other men, children, and even other women, although their performance is not as good as that of children with typical hearing. Mothers use similar sentence boundary cues when interacting with their infants who are profoundly deaf and use cochlear implants. According to the study done by **Sharmista**, it has been found that there was no significant difference in cognitive development and intelligence between deaf children and normal children. There was significant difference in achievement between deaf children and normal children. There was significant relationship among intelligence, achievement and cognitive development among deaf Children and among normal children. 4% of the deaf children were at the average level in cognitive development, 96% were above average. Similarly normal children were 100% above the average level. **Huysmans, Jong, Goverts, et al** conducted a study where we find out that Moderate to severe congenital hearing impaired may lead to a persisting lower level of mastery of nominal determiners, bound morphemes, and adverbs. Importantly, morph syntactic correctness is related to degree of congenital hearing impairment and not to age. As such the data indicate that language impairment which is triggered by severely reduced access during the sensitive period for language development is probably irreversible.

III. OBJECTIVES OF THE STUDY: The present study is intended to analyze the cognitive abilities respective to language development of hearing impaired children. At this, SMART objectives have been set up to conduct the study fruitfully.

1. To assess the nature and pattern of language development of hearing impaired children belonged to a particular standard of a deaf school.
2. To analyze different aspects of cognitive abilities along with language development of hearing impaired children belonged to a particular class of a deaf school.
3. To classify students according to the scores of language and cognitive abilities.

IV. RESEARCH METHODOLOGY:

4.1 Sample Size and description of samples: Sample size was twenty hearing impaired children belonged to the deaf and dumb school, Helen Keller Badhir Vidyalaya situated at Mukundapur, Kolkata. The students are of class six standards. Average age of them is, however, 15.5 years. Their degree of Impairment ranges between severe to profound.

| | | |
|-----------------------------|---|--------------------------------------|
| Sample Size | : | 20 |
| Class | : | 6 Standards |
| Age Range | : | 10 years to 18 years |
| Mean Age of Samples | : | 15.5 years |
| Degree of Impairment | : | Severe to Profound |
| Area | : | Mukundapur, Kolkata |
| Institute | : | Helen Keller Badhir Vidyalaya |

4.2 Sampling Techniques: Random sampling techniques have been employed to select the samples.

4.3 Tools used for the study: An open book language test (based on seen passage) reflecting both language and cognitive abilities prepared by the investigator was administered on the samples mentioned above to find out their nature of language development along with cognitive abilities.

The test was an open book Bengali language test or seen passage test based on a part of a text namely 'Morshumar Dina' written by Subhas Mukhapadhaya extracted from class six standards' Bengali language text book under the WBBSE. The test consists of 6 items such as Multiple Choice, Odd One out, Sentence Construction, Fill in the blanks, Matching

and Grammar. Each item carries 5 marks and under each items 5 questions were given and each question stands for 1 marks so that the full marks of the test was 30 (6 items× 5question of 1 marks). The test was of an hour. The subject matter of the text given in the test was related with two seasons (summer and autumn) along with their respective natural rural scenarios and local rural vows belonging to distinctive rituals.

4.4 Administration of Tools: The test was administered on 17th March, 2015. On that day, at first the investigator was introduced to the hearing impaired children of class six standards by a special teacher who instructed the students about the rules, regulation and other instructions regarding the test. After that, the test was started at 12.15pm and was ended at 1.15pm. During the test period different behavioral activities of the students were observed.

V. DATA ANALYSIS: The responses made by the respondents were evaluated and it has been shown in the following table-1.

| Serial number | Name of the Respondents | Marks | % of Marks |
|---------------|-------------------------|-------|------------|
| 1 | Rajjak Hossain | 11 | 36.67 |
| 2 | Bristi Naskar | 1 | 3.33 |
| 3 | Rupa Roy | 10 | 33.33 |
| 4 | Dilnawaz Khatun | 14 | 46.67 |
| 5 | Asif Rana | 12 | 40 |
| 6 | Ujwal Pramanik | 0 | 0 |
| 7 | Himtiaaz Anand | 0 | 0 |
| 8 | Laxmi Bauli | 12 | 40 |
| 9 | Samir Sardar | 4 | 13.33 |
| 10 | Suman Adhikari | 9 | 30 |
| 11 | Marina Khatun | 8 | 26.67 |
| 12 | Susmita Naskar | 6 | 20 |
| 13 | Srabanti Dhara | 12 | 40 |
| 14 | Swagata Chowdhury | 0 | 0 |
| 15 | Susmita Biswas | 1 | 3.33 |
| 16 | Mamun Miah | 8 | 26.67 |
| 17 | Debasish Mahapatra | 8 | 26.67 |
| 18 | Jahanara Khatun | 13 | 43.33 |
| 19 | Mita Paul | 8 | 26.67 |
| 20 | Ayush Saha | 10 | 33.33 |

*Minimum 40% marks are required to be declared as pass.

From the table it is cleared that the overall test results are very poor. Only 25% students crossed the line of pass mark. But rest 75% students failed to do so. The students declared pass did not score well at all. They passed marginally. Only 10% students just touched the line of pass mark and only 15% crossed it but did not go very extent. No one crossed 50% marks level. 15% students did not answer any question. They just left their answer sheets in virgin condition. They scored nothing. Again 15% students were stopped just at the door of pass mark line. They failed for only 1 or 2 marks. This is only the scenario of test results.

5.1 Item wise Test Results Analysis: Overall test results are not satisfactory. They performed better in multiple Choice type test items followed by fill in the blanks type test items. But they performed worst at sentence construction followed by grammar items. It is also not satisfactory in the case of matching type items and odd one out type items.

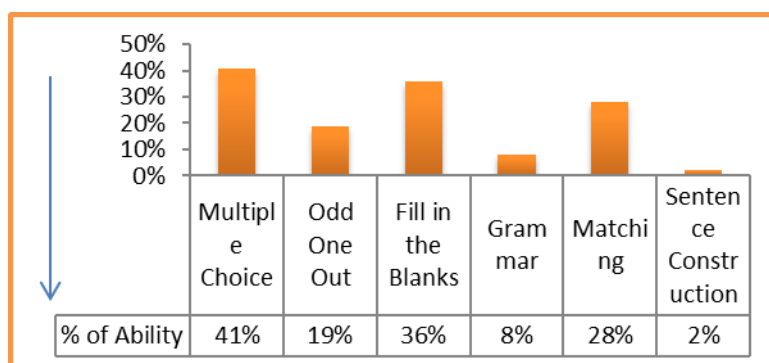


Fig.1 Graphical Representation of Test Results

Source: Primary Survey, March, 2015

1. Multiple Choice Type Test Items:

41% correct answers have been found regarding multiple Choice type test items. Each question was supported by four options and it was comparatively easy to them to choose correct one. That is why maximum correct responses were found here. 41% correct answer is not satisfactory but if we look at the total item wise test results, 41% is better among all.

2. Odd One out Type Test Items:

Only 19% correct answers have been found in this item. It was quite uneasy to the respondents to strike out incorrect one. That is why no satisfactory results have been found here.

3. Fill in the Blanks Type Test Items:

36 % correct answers were found in this item. One thing must be mentioned here that at the time of answering these items students asked their teacher again and again because extracted sentences were changed and these made them confuse.

4. Grammar Items:

Only 8 % correct answers have been found in grammatical part. They are very much poor in this part.

5. Matching Type Test Items: Similarly, no satisfactory responses were found here also. The respondents corrected only 28% matching items. At the time of answering the items, the respondents demanded frequent instruction was also provided to. Simple items they matched but tricky items they omitted.

6. Sentence Construction Items: Very worst condition has been noticed here. Only 2% correct answers have been found. So it can be said that they cannot construct sentences at their own.

5.2 Analysis of Cognitive Abilities:

5.2.1 Analysis of Cognitive Abilities in Multiple Choice Type Items: From the above discussion it is cleared that the respondents performed better in multiple Choice type test items where questions were ornamented with different types of cognitive abilities. But, there is variability in performance in different questions under multiple Choice type items. There are of four types of cognitive abilities such as Meaning Finding Out, counting, Identification and Application. Variability of feedback in different cognitive abilities has been found.

i. Meaning Finding Out (MFO):

A dual meaning oriented word was presented to the respondents to find out its dual meaning from the text. In the given text the dual meaning of the word was described in successive two lines and that is why most of the student was able to identify its dual meaning. In this case 70% correct response has been recorded.

ii. Counting (C):

How many trees are there in the given text was asked the respondents and 40% correct response has been found. In the text, number of trees was included in group form. Three groups were there but only one name of tree (paddy) was in isolated form. Thus, most of the respondents counted only the number of trees which were in group without considering paddy. One more thing must be mentioned here that the name of one tree was repeated in two group and a few students counted it double time. In this way total response of counting was affected.

iii. Identification (I):

Two seasons were described in the given text and just only the name of another season was put. Students were instructed to find out the number of seasons described in the text. In this case satisfactory responses have been found i.e. 60% correct response has been recorded. On the other hand, a few students identified three seasons so that in this case it can be said that these students did not have the clear concept how many seasons were actually described.

iv. Application (A):

Two application based questions were included to find out their general knowledge. Only 35% correct responses have been recorded and obviously this is not satisfactory. But one thing must be mentioned that what is the economy of the India was asked and a few gave correct responses. So, it can be said that in this case transfer of learning might be occurred and this is appreciable.

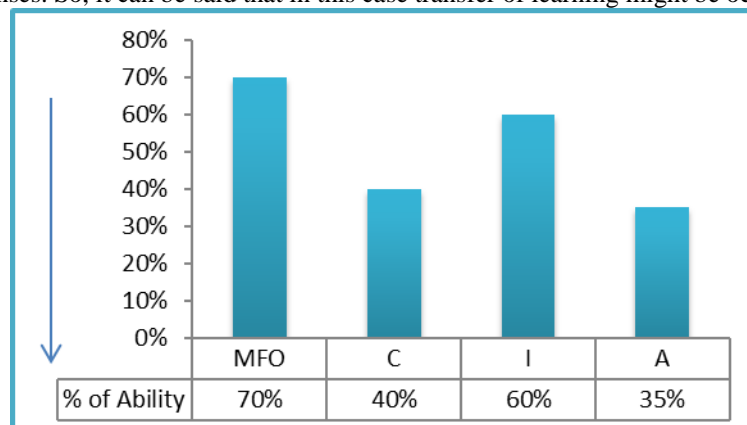


Fig. 2 Cognitive Abilities in Multiple Choice Type Items

Source: Primary Survey, March, 2015.

5.2.2 Analysis of Cognitive Abilities in Odd One Out type Items:

Only 19% correct responses have been recorded in this domain. But variability of feedback in different questions has been found.

i. Odd Vow Strike out (OVS): Three vowels were mentioned in the given text and these three names along with an outer popular vowel name were presented to the students. But only 15% students gave the correct answer.

ii. Odd Floor Decoration Strike Out (OFDS):

Two vowels were described very elaborately in the given text and in the one vowel distinctive floor decoration is practiced and in the other, typical religious rituals is performed such as drawing of structural image of idol with vermilion liquid on the small pot. Students were asked to strike out this image among the items of floor decoration of that vowel. In this case only 25% correct responses have been found. So, it can be said that it is quite hard to this type of children to differentiate each and every associated features among different types of objects/phenomena/circumstances.

iii. Odd Food Item Strike Out (OFS):

In the given text, a vowel is characterized by distinctive food having rituals. In the list of those food items, one odd food item was added and students were asked to strike out it. In this case comparatively satisfactory corrected responses (45%) have been found. So, it can be said that the students are quite familiar with the name of food items and they are able to distinguish between the food items.

iv. Odd Grammatical Word Strike Out (OGWS):

Some simple grammatical words with an odd one were presented to the respondents, but most of them did not identify the odd one. In other words, it can be said that they neither have the clear concept about the structural form of words nor have the ability to distinguish between grammatical words. Only 10% correct responses have been found and it reveals their poor condition in language development.

v. Odd Tree Strike Out (OTS):

No correct responses have been found in this micro item. Names of Some fruit trees with a wooden one were presented to the respondents but they did not strike out the odd one. So, it can be said that the respondents at least have the ideas about some trees but they don't have clear idea how to differentiate among them.

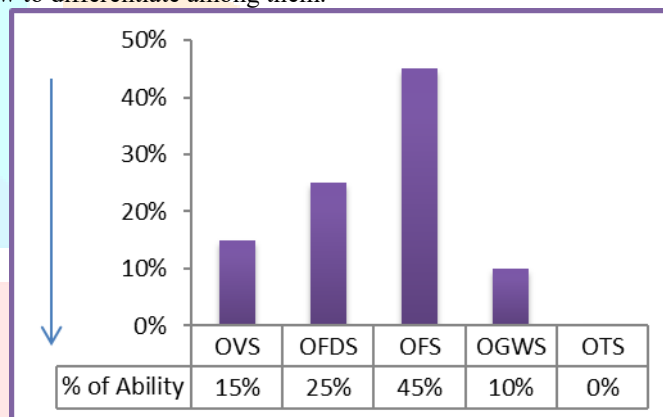


Fig. 3 Cognitive Abilities in Odd One out Type Items

Source: Primary Survey, March, 2015

5.2.3 Analysis Of Cognitive Abilities In Fill in the Blanks Items:

36% correct feedback has been found in this domain. One thing must be mentioned here that at the time of answering the items under this domain, students asked their teacher again and again because extracted sentences were changed either structurally or linking between sentences were done and these made them confuse.

i. Sentence Change (SC): A sentence was changed structurally but its meaning was not changed. As the structure of the sentence was changed, they confused what to do because they did not match the sentence with the given text. 50% correct feedback has been recorded and more or less this is quite satisfactory. One thing has been revealed that so many instructions are needed to provide them when sentences are changed structurally without hampering their real meaning.

ii. Linking between two Lines (LBTL):

Two sentences were joined and the respondents were asked to fill the blank. Again instructions were provided to them and 55% correct feedback which is more or less satisfactory has been recorded. It can be said that they can process information coded in only simple sentences.

iii. Linking between more than two Lines (LBMTL):

More than two sentences were joined and the respondents were asked to fill the blank with correct words. Again instructions were provided to them, but the result was not satisfactory here because they did not able to link the sentences with appropriate words. Only 22% correct feedback has been recorded. Again, it is revealed that they cannot process a number of information from complex sentences.

iv. Application (AP):

An application based question was put before the respondents to know whether they are familiar or not about when Bengalese's calendar is started. But no correct answer has been pointed out.

v. Work after Vow (WV):

A particular agriculture related work is done after performing a specific vow. In the text, it was given. The respondents were asked to point out the specific vow where the particular agriculture related work is done. 55% correct feedback which is satisfactory has been taken.

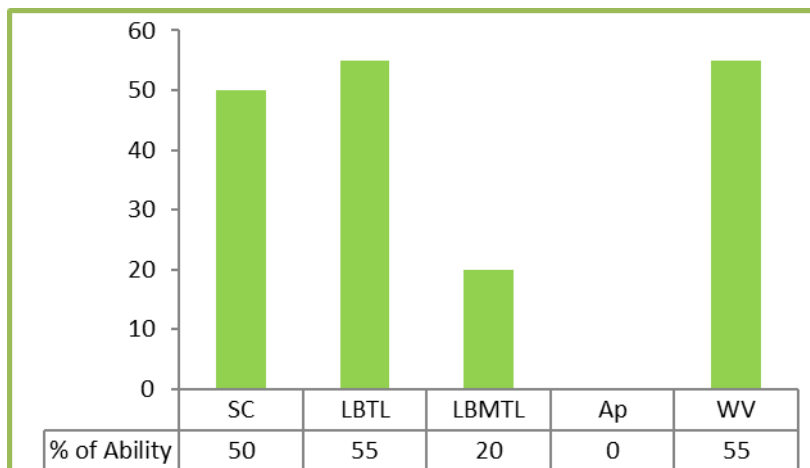


Fig. 4 Cognitive Abilities in Fill in the Blanks Items

Source: Primary Survey, March, 2015

5.2.4. Analysis of Cognitive Abilities in Grammar:

The respondents are very poor in grammar. Only 8% correct feedback has been found. They responded correctly only for one question under this domain.

i. Disjoining Of Sandhi (DS):

The respondents did not know about this item and that is why they omitted it and no correct answer was recorded.

ii. Antonym (AN):

Two words (safe and starting in Bengali) were put before the respondents to give their antonyms. Most correct responses have been taken in reference to the word, 'starting' and a few students gave the correct antonym in reference to the word, 'safe'. 40% correct response has been recorded only from this question under the grammar domain.

iii. Gender Change (GC):

The respondents did not have the ability to change the gender form of words. That is why no correct response has been found.

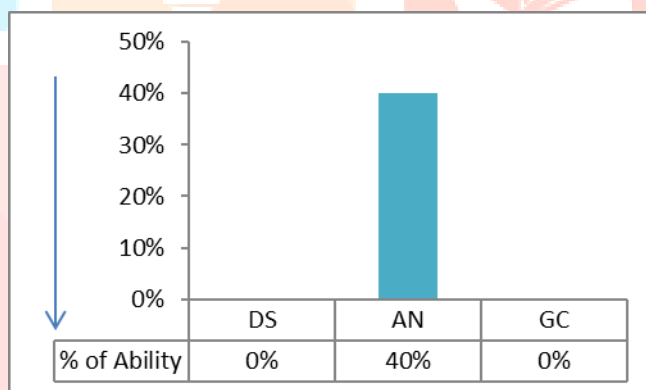


Fig. 5 Cognitive Abilities in Grammar

Source: Primary Survey, March, 2015

5.2.5 Analysis of Cognitive Abilities in Matching Items:

Only 28% correct responses have been recorded in this domain. The respondents asked frequent instructions from the teacher to answer the questions under this domain because the test format under this domain was not familiar to them. Match item test format had two divisions i.e. left and right sides. Left side of the format was shown by giving full matching which indicated how the corresponding right side blank would be matched up.

i. Metaphor Matching (MM):

An object has been compared with distinctive colour- metaphor. In this way corresponding item (another object) was directed to match with another distinctive colour- metaphor. But the respondents were failed to do so. No correct response has been found here.

ii. Bird –Colour Matching (BCM):

A very common bird crane was left to the respondents to match its body colour. Crow and its colour were already given to the left side to give hints to the respondents. 70% correct response which is satisfactory has been pointed out. So, it can be said that the respondents are able to distinguish between common birds by their body colour.

iii. Person & Its Weapon Matching (PWM):

Cowherds always carry sticks with them. So the sticks are supposed to weapons of the cowherds. Plough was given and the respondents were asked to find out the person who belonged to Plough. They failed to give the correct responses. So, it can be said that the respondents are neither familiar to match the weapon corresponding to the particular person nor have the clear concept about farmers and cowherds.

iv. Vow & Its Timing Matching (VTM):

In the given text, two vows have different seasons for celebration. The respondents were asked to match a vow with its season of celebration. 60% correct response which is satisfactory has been recorded.

v. Birds & Its Habitat Matching (BHM):

We know different birds choose different sites for their habitation. Weaver-birds reside at palm trees (which was given in the given text). The respondents were asked to find out appropriate bird belongs to bay-window. Only 10% correct response has been recorded. So, it can be said that the respondents are not well informed about the habitations of the birds.

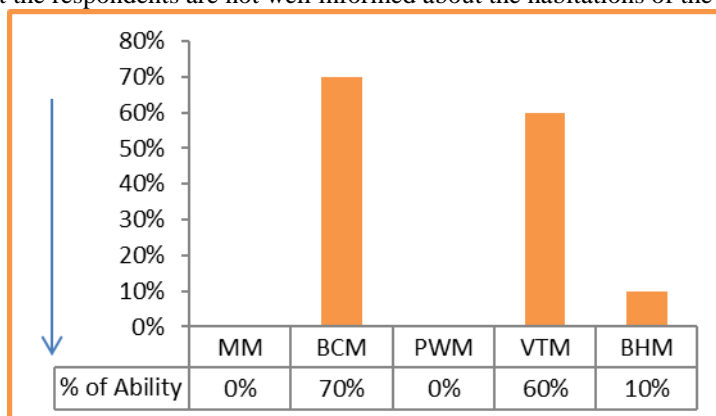


Fig. 6 Cognitive Abilities in Matching Items

Source: Primary Survey, March, 2015

5.2.6. Analysis of Cognitive Abilities in Sentence Construction Items:

The respondents performed very worst in this domain. Only 2% correct response has been recorded. Five words were given and the respondents were free to construct sentences at their own. But they were not able to construct new sentences. One interesting matter has been observed here that most of the respondents attained this domain. They just wrote the sentences partly (which are belonged to the given words) from the given text. But, these partly written sentences were meaningless. No new sentence construction has been found. Only two respondents wrote sentences partly (obviously from the text) which were at least meaningful and that is why the investigator was compelled to give them marks. So, it can be said that the respondents are unable to construct new sentences at their own as well as they are not concerned about meaningful sentences, in other words they are not concerned about the meanings what they write.

5.3. Classification of Respondents According to the Scores of Language and Cognitive Abilities:

The respondents have been categorized into different language and cognitive ability levels according to the marks scored by the respondents and it has been shown at the following table no 2.

| Ability level | Ability Group | Number of Students | % of Students |
|---------------|-----------------------|--------------------|---------------|
| Low | 0-5 | 6 | 30 |
| Medium | 6-11 | 9 | 45 |
| High | 12-17 (Pass Group) | 5 | 25 |

According to the test scores, three language and cognitive ability levels such as low, medium and high have been formed to categorize the students group wise. But, one thing must be remembered that high ability level does not mean very high achievement in language and cognitive abilities than others because most of the students are not deviated widely in reference to language and cognitive abilities.

Only 25% students are under the pass group. From the table it is cleared that most of the students i.e. 45% students have been included in medium language and cognitive ability level. On the other hand, initial and final ability levels are characterized by comparatively low number of students i.e. 30% and 25% respectively. So, it is following normal distribution.

VI. RESULTS AND DISCUSSION:

From the analysis and interpretation of the data, it is revealed that

6.1 Nature of language development: The development of language in reference to the said samples (i.e. the hearing impaired children) is not satisfactory at all. We know there are different components of a language. They can identify the phonemes of their language. More or less they can understand different morphs in their known field. But they have lack of vocabulary which resists further development of morphemes. In the case of semantics, moderate to low growth have been found. They are very much familiar with simple and short sentences in their known field. But when they face complex and long sentences, they feel difficulty to find out the meaning of those at a time as well as to build linking between those. One thing must be mentioned here that if they are instructed properly, they can understand the meaning of the given sentences. They have lack of grammatical ability. It is hard to them to solve even simple grammatical items. It reflects that there is poor development of syntax among them. Further, they cannot construct sentences at their own. There is no development in the sector of pragmatics among.

6.2 Nature of development of cognitive abilities:

They possess a number of cognitive abilities such as meaning finding out of things, matching between things, identification of circumstances, counting of something, odd one out, understanding of something etc. in lower level simple forms. They cannot hold the things even slightly deviated from simple forms. They are familiar with concrete things; not with abstract things or meaning or ideas.

They are as intelligent as hearing children, but they cannot get sufficient exposure to nurture their abilities due to lack of verbal information or stimulus. They are not frequently exposed to our daily verbal language oriented world. That is why it is quite hard to them to build complex cognitive abilities.

But the magnitude of the development of cognitive abilities does not follow the same level of language development. They use other senses greatly to develop their cognitive abilities. If they are directed /guided properly, they are able to increase the level of their cognitive abilities to some extent.

Primarily the development of cognitive abilities of human beings depends upon the multitude of senses such as ophthamoception, audioception, gustaoception, olfaoception and tactioception. The lack of growth in audioception (hearing) of the samples resists the development of cognitive abilities.

6.3 Grouping of respondents according to the scores of their language and cognitive abilities:

Our world is full of varieties in terms of everything. Here, we also found variety of responses. It suggests that there is variety in the hearing impaired children in terms of their language and cognitive abilities. They do not possess same level of impairment as well as the abilities. That is why three language and cognitive ability levels such as low, medium and high have been formed. Most of them are in medium group followed by lower group. And obviously higher level indicates lowest number of frequency. It follows the nature of normal probability curve.

VII. CONCLUSION:

The present world is dealing with inclusion in respect of everything which is either deviated from the major group or is situated at the marginal level. At the present time there is no scope of feeling insecurity if any person is disabled in any respect. In the case of hearing impairment, a number of research works was done in past and so many research works are needed further special reference to the development of language and cognitive abilities of hearing impairment children. The research works do facilitate hearing impaired person to cope very well with our daily verbal language oriented world. Extensive studies can be done in this field.

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