**ISSN 2229-5143** 

JOURNAL OF DISABILITY MANAGEMENT AND SPECIAL EDUCATION

# DM SE ournal



Volume 4

Number 2

July 2014



RAMAKRISHNA MISSION VIVEKANANDA UNIVERSITY

FACULTY OF DISABILITY MANAGEMENT AND SPECIAL EDUCATION

# JOURNAL OF DISABILITY MANAGEMENT AND SPECIAL EDUCATION

ISSN: 2229-5143

| Volume 4  | Number 2 July 2   | 014                 |
|---|---|---------------------|
|   | CONTENTS  |                     |
| Editorial board                                   |   | iii                 |
| Instruction to authors                            |   | iv                  |
| Editorial   | ·   | v                   |
| Impact of Customised Beh<br>Behaviours in Child   | avioural Intervention on Reduction of Problem<br>Iren with Autism :   |                     |
| Kadambari Naniwa                                  | dekar and S. Venkatesan   | 1-15                |
| Deafness, Communication<br>— A Brief Overview     | n and Indian Sign Language<br>w for Professionals : Dr. Madan M. Vasishta   | 16-19               |
| Inclusive Education: Strat<br>Pre-service B.Ed. T | egy for Modification of Attitudes among<br>eacher Trainees : P. Vijetha and Prithi Nair                             | 20-30               |
| India's Deaf: Whither not                         | Wither : Michael W Morgan   | 31-45               |
| Efficacy of Visual Imagina<br>Independency of L   | ry Therapy on Selective Motor Control and Functional<br>ower Extremity in Subacute Stroke Patients : T. Karthikeyan | 46-58               |
| A Study of the Correlation                        | n between Cognitive Capabilities and Pre-arithmetic   |                     |
| P. Rama Krishna ar                                | nd Dr. I.P. Gowramma  | <mark>59-6</mark> 8 |
| Inclusive Education: Study<br>Differently Abled S | y on Peer Group Relationship among<br>itudents : N.R. Prakash and S. Nirmala Devi                                   | 69-77               |
| Indian Sign Language (IS                          | L)  | 78-79               |
| Success Story of Mr. Vasi                         | shta  | 80-82               |

# A Study of the Correlation between Cognitive Capabilities and Pre-arithmetic Skills of Preschool Children with Hearing Impairment

\*P. Rama Krishna and \*\*Dr. I.P. Gowramma

#### Abstract

Development of the cognitive process enables the child to deal with numerical concepts and deductive reasoning of mathematical thinking. The purpose of this study is to study the correlation between the cognitive capabilities and pre-arithmetic skills among preschool children with Hearing Impairment. The sample of the study constituted 40 CWHI from All India Institute of Speech and Hearing Preschool. The data was collected on different aspects of cognitive capabilities and pre-arithmetic skills in a preschool for children with hearing impairment with Padmini Cognitive Capability Test (PCCT) Pre-school Version-1 and Arithmetic Readiness Test (ART) adapted version of Grade Level Assessment Device (GLAD). The scores of PCCT and ART were compared and tested for correlation. Data was analyzed statistically to find out the correlation between PCCT and ART scores and also compared the PCCT scores of Preschool CWHI and hearing children based on the data of Shobha (2002). Pearson correlation r=0.796 was obtained for correlation between PCCT and ART scores are significant at 0.001 level indicates positive correlation between cognitive capabilities and Pre-arithmetic skills. And comparison of PCCT scores of Preschool CWHI and normal hearing children with same age group reveals that there is no difference in the performance of cognitive capabilities in both Preschool CWHI and Children with normal hearing.

Key words: Preschool Children with Hearing Impairment (CWHI), Cognitive Capabilities, Pre arithmetic Skills.

#### Introduction

Preschool education is the most important stage in school education because this is a stage when significant physical, cognitive, emotional and social developments take place. Preschool education is the provision of education for children before the commencement of formal education. Several preschool programs for children with hearing impairment have promoted a cognitive/linguistic approach to learning (Grammatico & Miller 1974; Stone 1980; Moeller and Mc Conkey 1984; Moeller, Obserger and Mordford 1986). In such an approach, language and thinking skills are emphasized in synchrony. Preschool is desirable for all the children, no doubt but it is necessary for disadvantaged and handicapped children. Preschool programs for CWHI strive to provide the child access to communicative competence through comprehensive habilitation, including amplification, parent guidance, perceptual and cognitive skill development and aggressive language intervention. Parents are primarily responsible for the child's integration into the

\* Asst. Professor, Ramakrishna Mission Vivekananda University, Faculty of Disability Management and Special Education, Coimbaore-20. Email: <u>ramkipet@gmail.com</u> \*\* Lecturer, Regional Institute of Education, Bhubaneswar. Email: <u>ipgowri@gmail.com</u>

family, neighborhoods, school and community. The training, that families require, can best come from professionals at an infant or preschool program.

Cognitive development is an important aspect of overall child development. The term cognition or cognitive development is a highly generic term covering almost every aspect of behavior. It is a continuous process that begins at birth and increases when tasks are in child's zone of proximal development level where child can almost accomplish task independently. Thus cognitive development is the development of ways and capabilities of understanding one's world, representing it and dealing with it. Cognition develops through social interaction around problem solving abilities. Cognitive development involves progressive changes in children's perception, knowledge, understanding, reasoning and judgments.

Development of the cognitive process enables the child to deal with numerical concepts and deductive reasoning of mathematical thinking. Children's cognitive development affects how they learn, understand, store knowledge, characterize and interpret information, see relationships between and among ideas retain and retrieve information, use prior knowledge to gain new knowledge, and utilize knowledge in functional contexts.

The mental growth of children with hearing impairment is different in many ways from that of the hearing child; nevertheless, there are also certain points of similarity between them; they have the same intellectual endowment and the same desire to communicate. They

want to be like other people and they also possess the same feelings and emotions. The only difference is that they lack the ability to hear and consequently suffers from language handicap.

Among the developmental pre-requisite are object permanency, seriation, classification and conservation of quantity (Piaget & Inhelder, 1969). The children with hearing impairment are not basically different in their innate psychological potentialities from the hearing child. However, it is essential for the parents and teachers of children with hearing impairment to have an insight in understanding the psychological factors that are intimately related with their academic and communication skills. There is no reason to suspect limited mental ability because of impaired hearing itself, unless it is coupled with some deterioration or malfunctioning of the brain, which may also occur in other disability conditions. Hence, a need was felt to study correlation between cognitive capabilities and pre-arithmetic skills among CWHI.

#### **Objectives of the study**

- To study the cognitive capabilities among preschool children with Hearing Impairment in the age groups 4-6 years in the following specific cognitive capabilities like a) Length seriation b) Shape completion c) Action through signs d) Classification of picture.
- To study the pre-arithmetic skills among preschool children with hearing impairment in the age group of 4 – 6 years.
- 3. To examine the correlation of cognitive capabilities & pre-arithmetic skills of

preschool children with hearing impairment in the age group of 4 - 6 years.

4. To examine the correlation of cognitive capabilities between preschool children with hearing impairment and normal hearing children in the age group of 4-6 years.

# Hypotheses

- 1. There is no significant correlation between cognitive abilities and pre-arithmetic skills of children with hearing impairment in the age group 4-6 Years.
- 2. There is no significant difference between the scores of cognitive abilities of CWHI and normal hearing children.

#### Method

#### Research design

This study employed descriptive research.

#### Sample

Forty children with hearing impairment, age ranging from 4 to 6 years, studying in All India Institute of Speech and Hearing (AIISH) pre-school were selected. Children with any other significant associated disabilities were not included in the study.

# Tools used for the study

To assess the cognitive capability of the pre-school CWHI, Padmini Cognitive Capability Test (PCCT) Pre-school Version-1 (Padmini, 1983) was made use of. The adapted version of Grade Level Assessment Device-GLAD (Narayan, 1997) was used to assess the pre-arithmetic skills. Both these tools were readily available. PCCT is a standardized tool, which is valid and reliable. The standardized tool GLAD was adapted by the Department of Special Education, AIISH to assess the arithmetic readiness of children in the age group of 4-6 years.

# Padmini Cognitive Capability Test (PCCT) Pre-school Version 1

Padmini cognitive capability test has been developed and standardized by Padmini (1983), Department of studies in education, Mysore University. PCCT preschool version-1 consists of four tests as a) Length seriation b) Shape completion c) Action through signs d) Classification of picture. This tool was selected for various reasons. First, it must be based on a wide range of cognitive concepts and operations appropriate to the age level of preprimary pupils. Second, it should facilitate the measurement of cognitive capabilities of each child objectively and reliably yielding a total measure of the overall cognitive capability as an index of cognitive development status with their consideration, among others PCCT was selected for the study. The test covers a wide range of cognitive concepts appropriate to children of four to six years of age.

# Data collection Arithmetic Readiness Test (ART)

The adapted version of Grade Level Assessment Device-GLAD (Narayan, 1997) was used to assess the pre-arithmetic skills. The standardized tool GLAD was adapted by the Department of Special Education, AIISH to assess the arithmetic readiness of Preschool Children with Hearing Impaired in the age group of 4-6 years.

# Administration of PCCT and ART

As the PCCT and ART were individual performance readiness tests without time restriction each child had to be given all the

Journal of Disability Management and Special Education

tasks of the PCCT and ART. The following steps were followed in collecting the data. Administrations of all tasks were carried out in a play way method and each child was given instruction, in his or her own mother tongue to complete the task

#### Result

Data was analyzed statistically to find out the correlation of PCCT and ART scores and the same scores were compared and tested to find out the significant difference, if any. The mean performance of PCCT scores were compared among Preschool CWHI, Montessori, Kindergarten and Anganwadi normal hearing children from an earlier study Shobha (2002) and tested for significance. Table 1 shows correlation between PCCT and ART scores:

### **Table 1: Correlation between PCCT and ART Scores**

| Correlation         | PCCT score out of 70 |                    |  |  |
|---------------------|----------------------|--------------------|--|--|
| ART score out of 16 | Pearson              | × 0 70/**          |  |  |
|                     | Correlation          | $1 = 0.796^{-1.0}$ |  |  |

\*\*. Correlation is significant at the 0.001 level.



Figure 1: Graph Showing the Correlation between PCCT and ART Scores

The correlation r = 0.796 is significant at 0.001 level. This clearly indicates that there is a positive correlation between PCCT scores and ART scores. Hence hypothesis no.1, there is no significant correlation between cognitive abilities and pre-arithmetic skills of children with hearing impairment in the age group 4-6 years is rejected. The graph clearly shows

that as the cognitive scores improve, so does arithmetic scores.

Under PCCT, four subtask were there namely shape completion, length seriation, action through signs and classification of pictures. Table 2 shows the correlation between the scores of PCCT subtasks and ART Ramakrishna P & Gowramma I.P. / Cognitive Capabilities and Pre-arithmetic Skills

| 000103                    |                          |  |   |   |  |  |
|---------------------------|--------------------------|--|---|---|--|--|
| PCCT subtasks Scores      |                          |  |   |   |  |  |
| Pearson Co                | Shape Completion<br>(20) | Length seriation<br>(20)               | Action through signs<br>(12)  | Classification of pictures<br>(18)  |  |  |
| ART score Orrelation (46) | r = 0.817*               | r = 0.735*                             | r = 0.586*  | r = 0.748*  |  |  |
|                           | Pearson Correlation      | Pearson Correlation (20)<br>r = 0.817* | PCCT su<br>PCCT su<br>Shape Completion Length seriation<br>(20) (20)<br>r = 0.817* $r = 0.735*$ | PCCT subtasks ScoresProductShape Completion<br>(20)Length seriation<br>(20)Action through signs<br>(12)Image: Constraint of the seriation<br>(20) $r = 0.817^*$ $r = 0.735^*$ $r = 0.586^*$ |  |  |

# Table 2: Correlation between ART Score and PCCT Subtasks Scores

\* Correlation is significant at the 0.001 level.



# Figure 2 Graph Showing the Correlation between PCCT-Shape Completion and ART Scores

Figure 3

Graph Showing the Correlation between PCCT-Length Seriation and ART Scores





Graph Showing the Correlation between

Figure 5 Graph Showing the Correlation between **PCCT-Classification of Pictures and ART Scores** 



The above mentinoned figures shows the correlations r = 0.817, r = 0.735, r = 0.586, r = 0.748 in Figure 2, 3, 4 and 5 respectively is significant at 0.001 level. This clearly indicates that there is a positive correlation between PCCT subtasks scores (Shape Completion,

Length Seriation, Action through signs and Classification of Pictures) and ART scores. It can be inferred that as the cognitive ability increases, there is improvement in arithmetic skills.

# Comparing PCCT scores of CWHI with normal hearing children

The data collected in the present study was compared with the data collected by

Ramakrishna P & Gowramma I.P. / Cognitive Capabilities and Pre-arithmetic Skills Shobha (2002) for normal hearing children in three different preschool setups. The table 3 as mentioned below gives the details:

| PCCT SCORES                    |       |      |            |         |           |         |               |         |  |
|--------------------------------|-------|------|------------|---------|-----------|---------|---------------|---------|--|
|                                | СМНІ  |      | Montessori |         | Anganwadi |         | Kinder Garten |         |  |
|                                | Mean  | SD   | Mean       | t-ratio | Mean      | t-ratio | Mean          | t-ratio |  |
| 1. Shape Completion            | 15.15 | 3.84 | 15.50      | 0.576   | 4.30      | 17.870* | 10.78         | 7.197*  |  |
| 2. Length Seriation            | 13.95 | 4.01 | 16.80      | 4.499** | 6.50      | 11.762* | 11.75         | 3.473*  |  |
| 3. Action through signs        | 14.73 | 3.23 | 12.50      | 4.351*  | 3.95      | 21.168* | 8.78          | 11.625* |  |
| 4. Classification of Pictures. | 8.50  | 2.47 | 11.30      | 7.169** | 5.05      | 8.833*  | 10.75         | 5.760** |  |

# Table 3: Comparison PCCT Scores of CWHI with Normal Hearing Children

t-value significant at 0.01 level in favor CWHI

\*\* t-value significant at 0.01 level in favor of normal hearing children.

No uniform trend is observed in the above table in favor of either CWHI or normal hearing children. Hence hypothesis no.2, "There is no significant difference between the scores of cognitive abilities of CWHI and normal hearing children" are accepted. However, the following observations are made.

#### Discussion

There is significant correlation between PCCT scores and ART scores of CWHI in the present study, as it is observed that the cognitive abilities improve arithmetic skills. Similar trend is observed by Lauwerier, Chouly & Bailly, (2003); Watson & Kidd, (2003) and Culbertson & Gilbert (1994). It is noticed in the present study that as the four subtasks of the <sup>cognitive</sup> ability assessed in the study improves

arithmetic skills also improves. This is indicated by the significant correlation for PCCT subtask scores and ART scores of CWHI in the present study. No uniform trend is observed in the study in favor of either CWHI or normal hearing children. However, the following observations were made which suggest the importance of enriched environment in preschool training to enhance cognitive abilities.

- 1. In the Shape completion task CWHI performed better than children attending Anganwadi and Kinder Garten.
- 2. In the Length Seriation task CWHI performed better than children attending Anganwadi and Kinder Garten.
- 3. In the Action through sings task CWHI performed better than children attending

Montessori, Anganwadi and Kinder Garten.

 In the task of Classification of Pictures CWHI performed better than children attending Anganwadi.

Several studies Lennenberg (1964), Krivitski (2000), Trybun & Karchmer (1977), Zarfaty et al., (2004), Meadow & Orlans (1980), Swanwick, Oddy & Roper (2005), Schirmer (2000), Padmini (1983) and Tompkins & Horkisson (1991) highlight the need for enriched environment, systematic and organized intervention in preschool, hands on experience to promote better cognitive abilities among children attending preschool. Furth (1966) observed that during the earlier years, CWHI and normal hearing children performed similarly on cognitive tasks, as it does not require the support of linguistic system. Stone (1980) noticed that difficulties of CWHI on certain cognitive tasks could be due to lack of experience.

#### **Educational implications**

The findings of the present study present a detailed picture of the current status of cognitive abilities and pre-arithmetic skills of CWHI. Hence, there is an enormous scope to identify the strengths and weakness of preschool CWHI. Educational implications of the study are as follows:

- 1. This study gives an insight into relationship between cognitive abilities of CWHI and its correlation in learning maths, which can be utilized in teaching of mathematics.
- 2. The findings indicate the need to include activities to foster cognitive development in the pre-school curriculum for children with hearing impairment.

- The findings suggest that cognitive development must be deliberately taken up for children with or without disabilities.
- 4. Curriculum is a tool to help teachers to focus on child development. So special attention should be given to develop cognitive abilities in the preschool curriculum.
- 5. Specific activities can be suggested for teachers and parents to enhance cognitive development in the early years of development.
- With the help of the knowledge of cognitive development stages given by Piaget, the teacher can organize his/her teaching learning activities.
- 7. Social interactions have a great educational value for cognitive development. When children interact socially with peers they can know the right answer of a problem, hence they should be encouraged to interact with their age mates.
- 8. The children should be allowed to discover things on their own.

#### Conclusion

In the light of the above findings it is concluded that if enriched environment, systematic organized intervention in preschool and hands on experience are provided to CWHI, their cognitive abilities can be stimulated and promoted which in turn can benefit in other areas of development. These experiences help all the children irrespective of their disability to perform better academically. Preschool children with significant hearing loss should be given special preliminary instruction. It gives the CWHI a chance to gain valuable school experience before undertaking a full school curriculum. Ramakrishna P & Gowramma I.P. / Cognitive Capabilities and Pre-arithmetic Skills

# References

- Culbertson, J. L. & Gilbert, L. E (1994, 2003). 'Children with unilateral sensori neural hearing loss: cognitive, academic, and social development', Journal of American Annals of the Deaf, 139(4): 430-7 & Arch Pediatrics, 10(2): 140-6.
- Donald, B. B. Jr, & Wolery, M. (1989). 'Assessment of Cognitive skills in the preschool-Aged child', Assessing infants and pre-schoolers with handicaps, Columbus, Merrill publishing company.
- Downing, P. (1972). As cited in Valletuttu, P.J. & Dunnett. L. (1992). 'Cognitive Development; Cognitive Development a functional approach', California, Singular publishing group.
- Flexer, A. & Carol, M. (1999). 'Facilitating hearing and listening in young children'. San Diego, CA: Singular.
- Fuchs, L. S. & Fuchs, D. (2005). 'Enhancing Mathematical problem solving for students with disabilities', The journal of Special Education, Volume-39.
- Furth, H. G. (1964). 'Research with the deaf: Implications for language and cognition'. Psychological Bulletin, 62, 145–164.
- Furth, H. G. (1966). 'Thinking without language: Psychological implications of deafness'. New York: Free Press.
- Grammatico, L. F. & Miller (1974). 'Curriculum for the Preschool Deaf Child', Volta Review, 76, 5, 280-9.
- Gowramma, I.P. (2005). 'Development of remedial instruction program for children with Dyscalculia in primary school', Mysore, Chetan book house.
- Hitch. S. (1983). 'Mathematics and deaf children'. As cited in Swanwick, R, Oddy,

A, and Roper, T. (2005). 'Mathematics and Deaf Children: an explor barrier to successes. Deafness and Education International, 7(1).

- Internet source, Retrieved from http://www. audiblox2000.com/early\_childhood/ early\_education.htm, on dated 21.01.08.
- Kidd, G.R., Connell, P.J. & Lowther, A. (2003). 'Sensory, Cognitive, and Linguistic Factors in the Early Academic Performance of Elementary School Children', Journal of Learning Disabilities, Vol. 36, No. 2, 165-197.
- Kingma, J. (1984). 'Traditional intelligence, Piagetian task, and initial arithmetic in Kindergarten and primary school grade 'I', Journal of psychology, 145, 49-60.
- Krivitski, E. C. (2000). 'Profile Analysis of Deaf Children Using the UNIT', Dissertation Abstracts International, 61(7-A), 2593.
- Lauwerier, L., Chouly, M.B. & Bailly, D. (2003). 'Hearing impairment and cognitive development', Archives de Pediatrie, Volume 10, Number 2, pp. 140-146(7).
- Meadow, K. P. & Orlans, S. (1980). 'Deafness and child development', Berkely, CA: University of California press.
- Moeller, S & McConkey. (1984). As cited in Bess, F. H. (Edited, 1988). 'Hearing impairment in children, Management of pre-school hearing impaired children', A cognitive-linguistic approach, Maryland, York Press.
- Moeller, S., Obserger, V. & Mordford, S. (1986). As cited in Bess, F. H. (Edited, 1988). 'Hearing impairment in children, Management of pre-school hearing impaired children', A cognitive-linguistic approach, Maryland, York Press.

- Narayan, J. (1997). 'Grade Level Assessment Device', Secunderabad, NIMH.
- Nunes, T. & Moreno, C. (1998). 'Is hearing impaired a cause of difficulties in learning mathematics?', In C.Donalan (Ed). The development of mathematical skills.
- Padmini, T. (1983). 'Fostering cognitive development in Primary school entrants', New Delhi, Bahri publication private ltd.
- Pau, S. C. (1995). 'The deaf child and solving problems of arithmetic, The importance of comprehensive reading, education and Deafness'.
- Piaget, J. (1964). 'The early growth of logic in child, classification & seriation', by E.A, Lunzer & D.Papert, London, Routledge and Kegan Paul.
- Rittenhouse, R. (1977). 'Horizontal decalage: The development of conservation in deaf students and the effect of the task instructions on their performance', Champaign – Urbana, University of Illinois.
- Schirmer, B. R. (1989). 'Relationship between imaginative play and language development in hearing impaired children'. American Annals of the Deaf, 134-3), 219-222.
- Sen, A. (1988). 'Psychosocial integration of the handicapped- A challenge to the Society', Delhi, Mittal publications.
- Shobha, B.N. (2002). 'Cognitive capabilities among Pre-school children of three Different setting – Montessori, Kindergarten & Anganwadi Centers in Mysore', Mysore, University of Mysore.

- Stone, P. (1980). 'Developing thinking skills in young hearing impaired children', Volta Review, 82.
- Swanwick, R., Oddy, A. & Roper, T. (2005). 'Mathematics and Deaf Children: an exploration of barriers to success'. Deafness and Education International, 7(1).
- Tompkins, G. E. & Hoskisson, K. (1991). 'Language arts: Content and teaching strategies', New York: Macmillan.
- Valletuttu, P. J. & Dunnett, L. (1992). 'Cognitive Development; Cognitive Development a functional approach', California, Singular publishing group.
- Watson, C. S.& Kidd, G. R.(2003). 'Sensory, Cognitive, and Linguistic Factors in the Early Academic Performance of Elementary School Children', Journal of Learning Disabilities, Volume 36, Number 2, pp. 165-197(33).
- Wood, D., Wood, H., Griffith, A. & Howarth, I. (1993). 'Teaching and talking with deaf Children', New York: Wiley.
- Yang, X. & Shaftel, J. (2005). 'Latent Class Analysis of Mathematical Ability for Special Education Students' (Qualitative or Quantitative Differences?), The Journal of Special Education, Vol. 38, No. 4, 194-207.
- Zarfaty, Y., Nunes, T. & Bryant, P. (2004). 'The Performance of Young Deaf Children in Spatial and Temporal Number Tasks', Journal of Deaf Studies and Deaf Education, 9:3.