Effectiveness of perceptual exercises on the cognitive development of children with learning difficulties

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Visual Motor Coordination, Figure Ground, Perceptual Constancy, Position in Space, Spatial Relationships, Auditory Perception.

Abstract

Perception is one of the most important areas in the cognitive development of the children, which starts developing along with the skills of comprehension. It is the process of organization, interpretation and response to all impressions passing through the sensory channels mainly visual, aural, tactile and motor. This perception is much more than mere seeing, hearing, touching and moving. It is considered a base to any learning. Children acquire the skills of perception through three processes – Input, Processing and Output. Problems in any of these areas would lead to problems in academics especially in Reading, Writing and Arithmetic. Remedial Education and Intensive Training through exercises in any of the areas of perception like Visual- Motor Coordination, Figure Ground Perception, Perceptual Constancy, Position in space, Spatial Relationships and Auditory Perception would prove useful as one of the coping strategies in learning 3 R's – Reading, Writing and Arithmetic. This research paper attempts to find out and study the significance of exercises on the areas of perception in order to enhance efficient learning in children.

1. Introduction

Perception means to become aware of something especially through sense. It is our primary source of knowledge. We can know about the world through our five senses – touch, vision, smell, taste and hearing. Once the child gets information through his sensory organs, he begins to find out relations between two or more information. When a different aspect of one object is discovered, the information becomes more meaningful and the child gets "organized meaningful sensations". This is called perception. For example, a child first sees an apple, and then it is cut into half and further pieces to feed him. Child gets the sensation of visual, taste, smell and then he understands the use of it. Researches reveal that during preschool stage, child develops the perception of colour, size, taste, animals, birds etc. As the perception of form and shape gets developed, a child is able to fix jigsaw puzzles, and picture blocks.

According to various studies made so far, children exhibits learning problems, academically, in the areas of Reading, Writing and Arithmetic due to the problems in perception. Strevens (1977) argues that possessing the ability to identify and understand students' difficulties is a necessary condition for becoming the ideal language teacher. If this were indeed true, it would be incumbent upon all teachers to investigate their students' difficulties so they could aid their students and develop themselves as teachers. Strevens (1980) comments:

"… The best teachers know their pupils, encourage them, show concern for them, find out their interests, discover their learning preferences, monitor their progress with a sympathetic eye, unravel their difficulties – cherish them as a human being engaged in a collaboration of learning."

Various strategies and stimulations have been tried out by different researchers through training, to overcome learning difficulties in children, the result of which has sometimes shown both, positive as well as negative responses. The negative factors are observed to be due to the result of circumstances, environmental conditions and teaching learning process. Specialists and teachers have reported that they find children who aren't successful in education as they have related psychological disabilities. This has been approved by several studies. Learning disabilities teachers believe that researches will approve their personal experiences that developmental learning disabilities should be considered in children with educational disabilities. Same Siahklerody et al determined in their research the visual perception skills will improve reading skills of reading disabled children. Also improving visual perception skills can improve abilities of reading disabled

student in reading perception and word recognition. Most of these researches have considered relation between developmental learning and reading learning process.

Yet, today, children face lot of learning problems due to lack of basic understanding (perception), leading to the accumulation of the piles of unsolved difficulties, further leading to infinite academic problems in the areas of Reading, Writing and Arithmetic. This paper studies the effect of various exercises in strengthening children's perception which in turn would help overcome their weaknesses in academics to the maximum possible extent.

1.1 Objectives

This paper includes the following objectives:

1. To develop the skills of comprehending various simple instructions in children.
2. To guide parents and teachers analyze different problem perspectives in different areas of perception.
3. To understand different areas of perception that correlates with learning problems.
4. To provide intensive training to children in the areas of perception to help them understand concepts better.
5. To study the effectiveness of exercises for strengthening the weaker areas of perception and in turn academics.

1.2 Various areas of perception leading to academic difficulties:

1. Visual Motor Coordination *referred to as eye hand coordination, is an ability to control hand movement guided by vision. The child having weak visual motor coordination will lead to writing and hand writing problems.*

2. Figure Ground Perception *holds that we tend to separate images into figure, or object, and ground, or background. This is also known as selective attention. The child with poor figure-ground perception may present difficulties like finding a place on a page, finding details in a picture, reading graphs, charts or diagrams, attention and organization. Children with these difficulties may appear careless, clumsy and uncontrolled.*

3. Perceptual Constancy *refers to the tendency to perceive an object you are familiar with as having a constant shape, size, and brightness despite the stimuli changes that occur. It is also called figure constancy. The child poor at this area will not perceive details of the picture or figure which is important, thus leading to Reading – Writing problems. He will fail to recognize figure, when changed in size or direction. He will generalize all information, not concentrating at its details thus leading to a poor formation of concepts.*

4. Position in Space *is the ability to see the relationship between the observer and the object in space. In other words it directs to the prepositions in space like on, over, inside, around, behind, in front etc. A child with problems in position in space will exhibit deficiency in Spelling, Arithmetic and Writing. He is unable to concentrate on directions or follow instructions.*

5. Spatial Relationships *is the ability to observe relationship between two or more objects in relation to self and each other. It gives child an understanding of directions and laterality. Deficiency in spatial relations will lead to problems in Reading, Writing, Measuring and Geometry.*

6. Auditory Perception *is the ability to provide meaning to auditory stimuli. To gain understanding, the child's listening skills need to be developed. Difficulty in Auditory processing problems would lead to low academic performance with difficulty in Reading, Comprehension, Spelling and Vocabulary.*

In order to overcome the above stated difficulties in each areas of perception, it becomes inevitable to provide intensive and remedial education to children, through various exercises in each area. More than 30 exercises have been designed for each area of perception in order to help children overcome such difficulties.

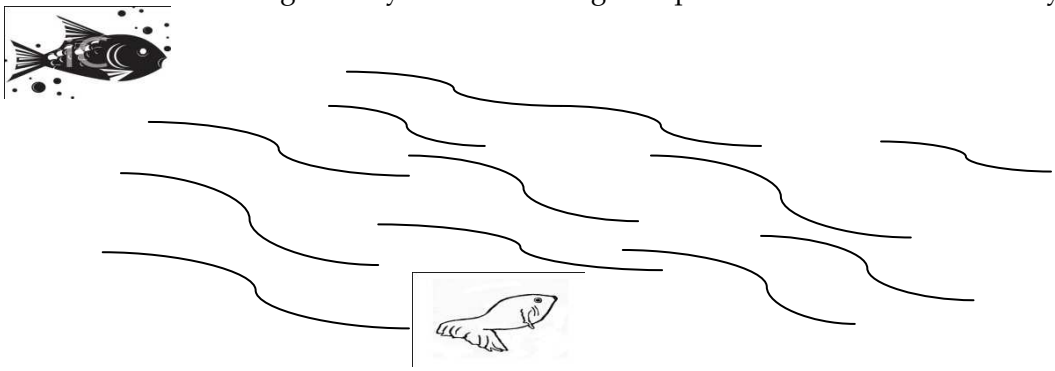
1.3 Examples of the Exercises for different perceptual problems: (From Concrete to Abstract)

1. Visual Motor Coordination:

a. Exercise 1. - Visual Tracking-

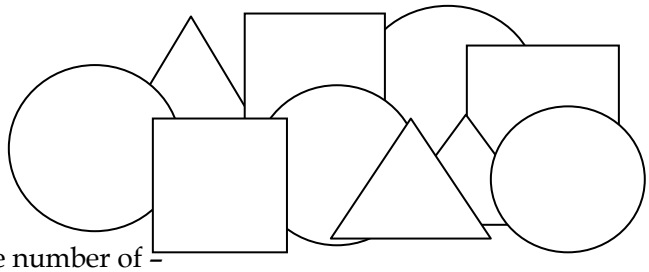
Help the bee reach the flower without lifting a pencil or touching the border line.


b. Exercise 2. – Finding the way- Visual tracking - Help mother fish to reach her baby.



2. Figure Ground Perception:

a. Exercise 1. Classify circles, Squares and Triangles.



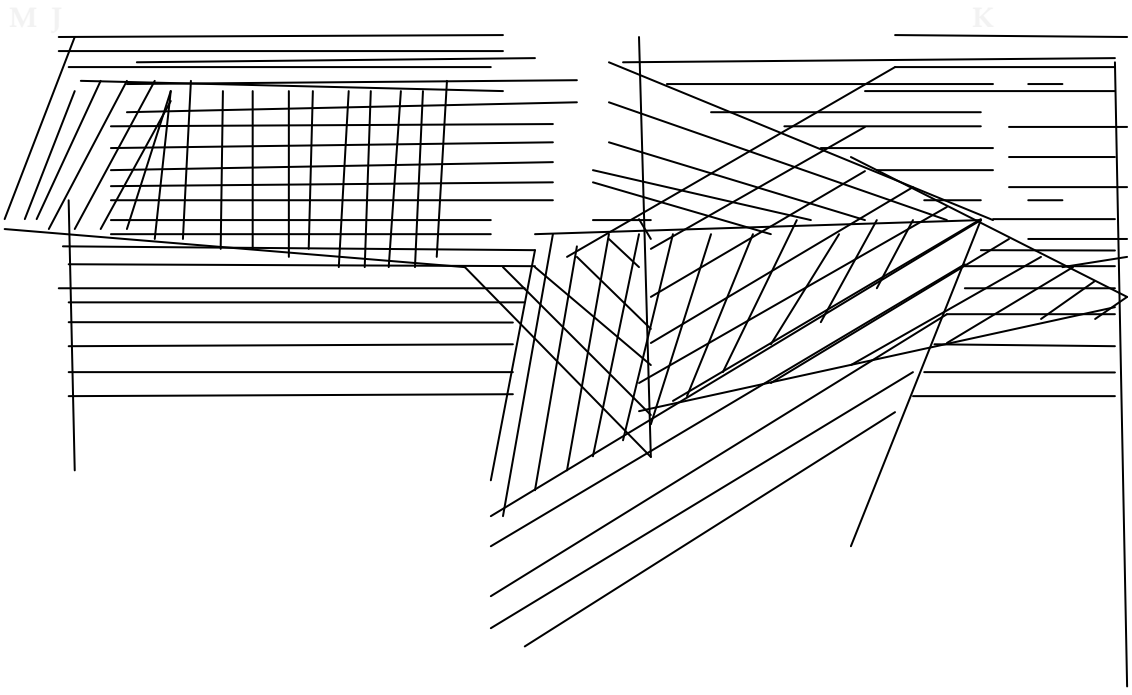
Count the number of –

a. Circles- _____

b. Squares- _____

C.Triangles- _____

b. Exercise 2. Find J K L M N O and colour it.

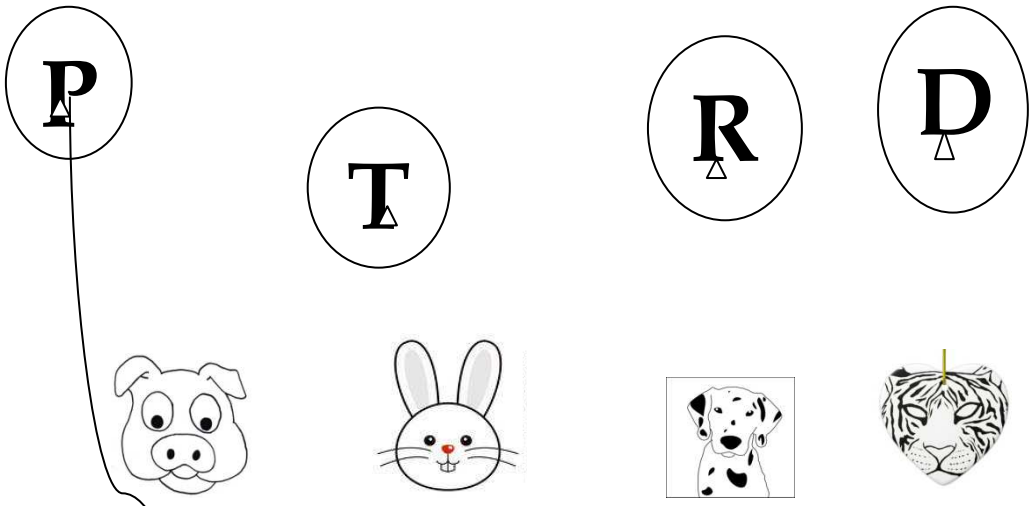


3. Perceptual Constancy:

a. Exercise 1. Circle and count the number of 'B'.

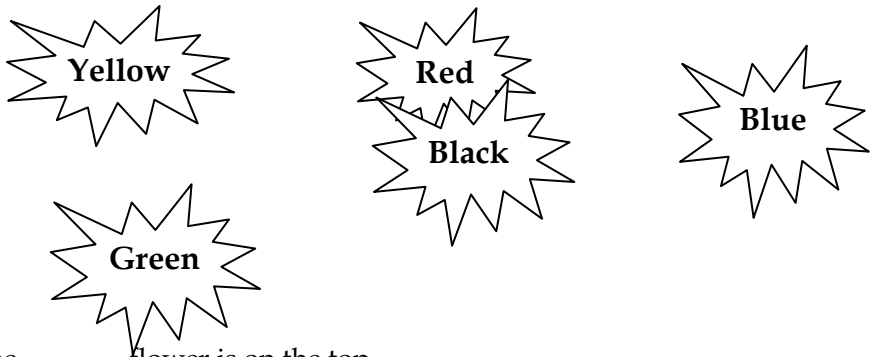
B R B H b
A f U
V b Z g E
s K
B m O b L

b. Exercise 2. Draw the line to match the letter of an animal



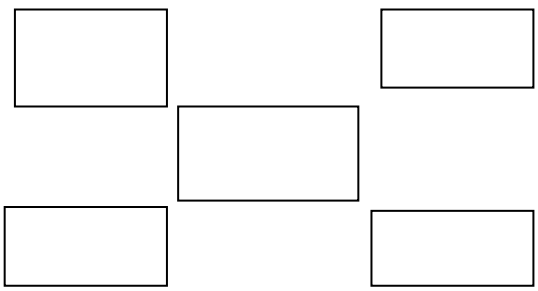
4. Position in space:

a. Exercise 1. Fill in the given blanks



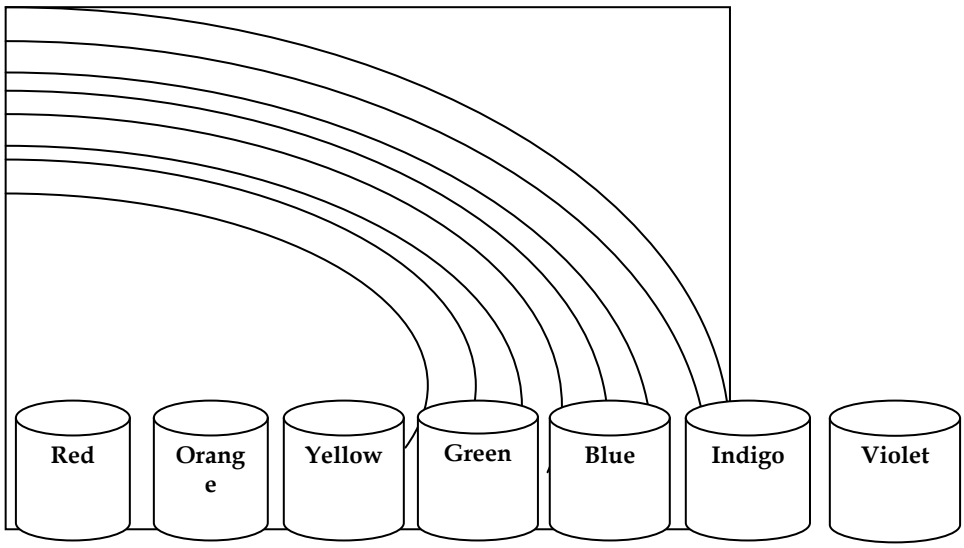
1. The _____ flower is on the top.
2. The _____ flower is to the right of Black flower.
3. The _____ flower is at the bottom.
4. The _____ flower is above Green flower.
5. The _____ flower is below Red flower.

b. Exercise 2. Divide each square in 4 equal parts in 5 different ways.

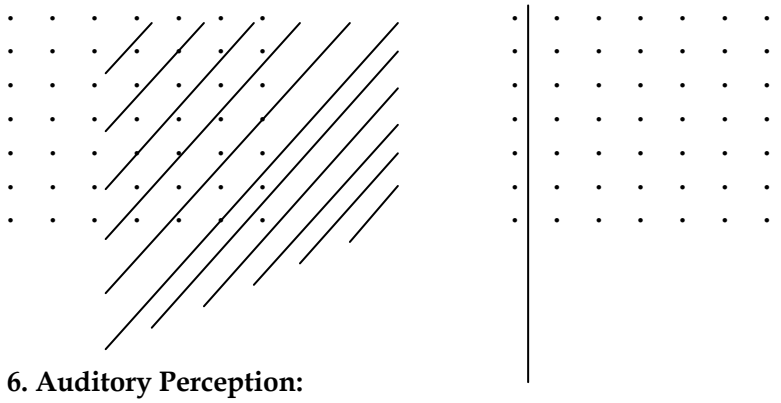


5 Spatial Relationships:

a. Exercise 1. Colour the Rainbow as directed



b. Exercise 2. Join Dots as shown on Left Hand Side.



6. Auditory Perception:

a. Exercise 1.

A number of objects are placed on the table. Each object starts with different initial alphabetic sound. The child has to identify the object hearing only its initial sound. e.g. D and Duck.

b. Exercise 2.

Stories can be read to children. The child then reproduces these in their own words, recalling as much details as possible.

2. A brief survey of Literature

Links between Reading and Handwriting: As beginning readers and writers, students in kindergarten must learn the names of the letters, the sounds of the letters, and how to write the letters. Phonemic awareness, defined as ―conscious attention to phonemes‖ (Richgels, 2003, p. 144), which includes understanding and manipulating speech sounds, is critical to both the reading and writing processes. A phone is an individual speech sound; phonemes are the smallest units of sounds that can differentiate meaning. Similar words may have different sounds (phonemes) due to one letter (phone) difference (e.g., cat, hat). If students do not develop phonemic awareness, they may have difficulty learning the phoneme-spelling correspondences required to spell and write (Berninger, 2000).

Visual-Motor Integration (VMI) and Graphomotor (Handwriting) Problems as a Barrier to Learning by Julie Wiid states that Difficulty in producing legible handwriting is so visible and yet is often overlooked and poorly understood. Students who are reluctant to produce written work are often dismissed as „lazy", „unmotivated, or „oppositional" (Thorne, n.d). Mental, social and emotional inadequacies are also often inferred from poor handwriting (Beery, 1997), yet for children with graphomotor problems: "neat handwriting at a reasonable pace is often not a choice" (Thorne,

n.d). "Handwriting is the natural vehicle of teaching" (Beery, 1997). A child who can neither capture work content adequately in written form nor produce written outputs that reflect her understanding or verbal abilities therefore experiences significant barriers to learning.

The study of Dr. Mary Peterson, Department of Psychology, University of Arizona, Tucson, AZ and Ms. Elizabeth Salvagio, University of Arizona, 2010, on Figure Ground Perception states that for two contiguous regions in the visual field, the common perceptual outcome is that the edge between them appears to be a boundary for only one of them, and that region—the figure—appears to have a definite shape. The contiguous region—the ground—appears shapeless near the edge it shares with the figure, and is perceived to continue behind it. Thus, in addition to being shaped, the figure appears nearer than the ground part, involving depth perception, and the ground appears to be occluded by the figure. This perceptual experience is labeled **figure-ground perception.**

In the study, Size Constancy at Birth: Newborn infants' Responses to Retinal and Real Size Alan Slater, Anne Mattock, and Elizabeth Brown Washington Singer Laboratories, University of Exeter, Journal Of Experimental Child Psychology 49, 314-322 (1990), Two experiments are described whose aim was to investigate whether perception of size at birth is determined solely by proximal (retinal) stimulation, or whether newborn babies have the ability to perceive an object's real size across changes in distance. In Experiment 1, preferential looking between pairs of stimuli which varied in real size and viewing distance was found to be solely determined by retinal size, suggesting that changes to proximal stimulation can have profound effects on newborns' looking behaviour. However, in Experiment 2 newborns were desensitized to changes in distance (and retinal size) during familiarization trials, and subsequently strongly preferred a different sized object to the familiar one, suggesting that the real size had been perceived as constant across the familiarization trials. These results confirm Granrud's (1987) findings that size constancy is present at birth.

Selective Attention Warps Spatial Representation: Parallel but Opposing Effects on Attended Versus Inhibited Objects by Brandon M. Liverence and Brian J. Scholl, Yale University, 2011, states that Selective attention not only influences which objects in a display are perceived, but also directly changes the character of how they are perceived—for example, making attended objects appear larger or sharper. In studies of multiple-object tracking and probe detection, they explored the influence of sustained selective attention on where objects were seen to be in relation to each other in dynamic multi-object displays. It was found that sustained attention can warp the representation of space in a way that is object-specific: In immediate recall of the positions of objects that have just disappeared, space between targets was compressed, whereas space between distracters expanded. These effects suggest that sustained attention can warp spatial representation in unexpected ways.
The relationship between spatial awareness and mathematic disorders in elementary school students with learning mathematic disorder, by Ahmad Yarmohammadian University of Isfahan, Isfahan, Iran, Psychology and Behavioural Sciences 2014; 3(1): 33-40 Published online February 20, 2014 revealed that stimulus of child in environment and pre-school programs especially in spatial awareness, can be progress mathematic ability of students in elementary school. The most important finding from these analyses is that mathematic performance relates with spatial awareness as well as intelligence.

Research Article - Influence of spatial perception abilities on reading in school-age children, by Arnaud Saj & Koviljka Barisnikov Stefan Elmer from Cogent Psychology Volume 2, Issue 1, 2015, emphasizes that the groups of older children, from the age of nine, improved significantly on the bisection and visual search tasks with respect to all visual fields, while the groups of younger children showed more errors in the left visual field (LVF). Performances on these tasks were correlated with reading level and age. Older children with a low reading score showed a LVF bias, similar to the youngest children. These results demonstrate how abnormal space perception might distort space representation and in turn affect reading and learning processes.

Nature of Auditory Processing Disorder in Children by David R. Moore, PhD, Melanie A. Ferguson, MSc, A. Mark Edmondson-Jones, MSc, Sonia Ratib, MSc, Alison Riley, MSc, 2010 by the American Academy of Paediatrics concluded that AP improved with age. Poor-for-age AP was significantly related to poor cognitive, communication, and speech-in-noise performance. Response

variability and cognitive performance were the best predictors of poor communication and listening. We suggest that APD is primarily an attention problem and that clinical diagnosis and management, as well as further research, should be based on that premise.

3. Discussions and Conclusions:

This research paper emphasizes on the effective use of exercises, given to children with problems in perception through intensive training and remedial education in order to overcome academic problems. The study was conducted for children diagnosed to acquiring learning difficulties in a Special school, Malti centre for Integrated Education, Mumbai. The sample of total 32 students between the ages 6 to 12 years were selected. All students were given exercises based on perception depending on their potentiality to perform (starting from concrete to abstract). The students were divided according to their ages in groups. The age wise division was as follows- Group A - 6 to 8 years, Group B - 8 to 10 years and Group C - 10 to 12 years respectively. They were all given exercises in form of activities from the start in each area, every alternate day (Monday to Friday). The threshold of each activity for each child was recorded.

The exercise that the child could not cope up with was repeated again with demonstration and given practice until he became comfortable to perform the similar types of exercises. In each area of perception, more than 30 exercises (from concrete to abstract) depending upon the potentialities of children has been created in order to cope up with their academic difficulties. The younger children between the ages 6 to 8 years took some time to get the grip over exercises. With one to one training and hand over hand prompts, were they able to perform the same. Although each child was different in abilities, levels, interests, behaviour and learning difficulties, they more or less exhibited problems such as poor eye hand coordination, low attention span, weak muscle development and lack of basic understanding. An intensive training, positive reinforcement and individual attention, along with simple instructions, each child tried hard to perform the tasks.

The children between the ages 8 to 10 years enjoyed doing the exercises. They too were given simplified, clear instructions. Each child tried to follow directions of the teacher as per their levels of understanding. These children showed lot of enthusiasm in performing something new each session. It was only due to individual attention and constant supervision; each one completed the given task with or without help.

Children between the ages 10 to 12 years required proper guidance and directions to perform exercises. They on their own tried to attempt the task after the explanations or demonstrations of the teacher. Each individual child although had varied difficulties, some tried to get constant attention where as few managed to complete the task on their own. These children, obviously gained confidence to handle an activity, when given intensive, individualized training and practice. Five out of thirteen children started reading the instructions to the exercises, word by word with or without any prompts. Besides, nearly 50% children showed improvements in their concentration and attention span in performing the given tasks although they were unable to develop complete skills towards task completion. Nearly, all children required further trainings to master a said skill. Given an intensive and individual training in each session, children tried hard to complete the exercises with or without help of the teacher. They did show marked improvement at each level. Thus, this study shows a significant impact of perception based exercises on the cognitive development of children having learning difficulties.

4. Research Limitations & Directions for further research:

This study was conducted only in the vicinity of Mumbai and on special school children taking limited sample of 32, between the ages 6 to 12 years. Although age wise division was made, it was only, for the convenience of working in a smaller group. Each child exhibited a unique problem in different areas of perception. Besides, the children were provided intensive training, through practice, in the exercises which they could not cope up with, which covered nearly five months period. The training continued until the Diwali vacations for the school students. Thus, training special children is an ongoing and a lengthy process. It requires continuous, intensive training and practice to master a simple skill. Children enjoy working on these exercises and at the same time, they learn to overcome their weaknesses in academics. These exercises can be given at school or at home on a continuous basis to children with learning problems.

Table 1.

Concrete Exercises			Skillsets											
			Visual Motor Co-ordination		Figure Ground		Perceptual Constancy		Position in Space		Spatial Relationships		Auditory Perception	
Sr No.	Name	Age	# of Attempts	Time in Months	# of Attempts	Time in Months	# of Attempts	Time in Months	# of Attempts	Time in Months	# of Attempts	Time in Months	# of Attempts	Time in Months
1	Sonal P	6.6	9	10 sessions	20	3	10	12 sessions	12	1.3	23	3.1	0	0
2	Pratik T	7.5	0	0	10	1	8	10 sessions	9	12 sessions	17	2.6	0	0
3	Kushal M	7.7	7	6 sessions	18	2.5	13	1.5	14	1.8	13	1.5	0	0
4	Maitri S	7.8	0	0	8	10 sessions	9	9 sessions	0	0	19	2.1	0	0
5	Nayan L	7.9	0	0	20	2.7	10	14 sessions	0	0	0	0	0	0
6	Aditi J	7.9	0	0	16	2	11	10 sessions	10	12 sessions	9	11 sessions	0	0
7	Niraj p	7.11	0	0	0	0	0	0	15	1.8	16	2.9	0	0
8	Kapil M	7.11	0	0	13	1.5	8	9 sessions	13	1.4	18	3.2	0	0
9	Anup M	8.4	7	8 sessions	9	11 sessions	12	1.4	14	1.6	10	10 session	0	0
10	Kiran A	8.5	0	0	4	5 sessions	12	1.3	10	14 sessions	0	0	0	0
11	Juhi N	8.11	0	0	0	0	0	0	20	2.9	13	12 session	0	0
12	Mona P	9.1	0	0	0	0	0	0	16	2.2	0	0	12	1.1
13	Arjit B	9.3	0	0	11	15 sessions	9	10 sessions	13	1.2	9	11 sessions	0	0
14	Bella P	9.5	6	7 sessions	9	10 sessions	11	10 sessions	9	14 sessions	18	3.1	0	0
15	Avni J	9.7	0	0	13	1.7	13	1.8	16	2.6	0	0	0	0
16	Tumpa	9.7	0	0	0	0	0	0	11	11 sessions	0	0	14	15 sessions
17	Vina G	9.8	0	0	11	13 sessions	12	1.5	13	1.2	14	2.1	0	0
18	Sagar A	9.9	0	0	0	0	0	0	17	1.9	0	0	0	0
19	Pihu S	9.1	0	0	9	8 sessions	15	2	14	1.4	0	0	0	0
20	Punya D	10.2	10	10 sessions	14	1.8	12	1.4	14	2	16	1.9	0	0
21	Geeta R	10.3	0	0	12	1.5	8	9 sessions	15	1.6	14	1.6	0	0
22	Jay S	10.3	0	0	0	0	0	0	0	0	0	0	10	12 sessions
23	Priya R	10.8	8	9 sessions	0	0	0	0	0	0	0	0	0	0
24	Milind S	10.1	0	0	10	12 sessions	17	2.3	10	11 sessions	20	3.6	0	0
25	Shiny P	11.1	0	0	9	13 sessions	14	1.8	0	0	0	0	0	0
26	Ojus W	11.4	0	0	0	0	0	0	11	15 sessions	18	2.9	0	0
27	TarpanP	11.5	0	0	0	0	0	0	9	12 sessions	12	12 sessions	0	0
28	Jay L	11.7	0	0	10	11 sessions	16	2.2	15	1.8	17	1.6	0	0
29	MananD	11.7	0	0	14	2.5	12	14 sessions	18	2.4	0	0	0	0
30	Kunj S	11.9	0	0	15	2.8	11	1.2	0	0	0	0	0	0
31	Pankti G	11.1	0	0	0	0	0	0	0	0	0	0	16	2.7
32	Farhan S	11.11	8	8 sessions	10	12 sessions	8	12 sessions	9	12 sessions	18	2.9	0	0

Children's performance on concrete Exercises

Average of 10 sessions = one month

Table 2.

Semi Abstract Exercises			Skillsets											
			Visual Motor Co-ordination		Figure Ground		Perceptual Constancy		Position in Space		Spatial Relationships		Auditory Perception	
Sr No.	Name	Age	# of Attempts	Time in Months	# of Attempts	Time in Months	# of Attempts	Time in Months	# of Attempts	Time in Months	# of Attempts	Time in Months	# of Attempts	Time in Months
1	Sonal P	6.6	0	0	26	*	19	2.7	19	2.1	20	*	0	0
2	Pratik T	7.5	0	0	21	3.2	18	2.2	17	1.6	24	*	0	0
3	Kushal M	7.7	16	2.8	23	3.4	21	2.9	20	*	22	2.9	0	0
4	Maitri S	7.8	0	0	19	2.5	19	2.6	0	0	24	*	0	0
5	Nayan L	7.9	0	0	23	*	22	*	0	0	0	0	0	0
6	Aditi J	7.9	0	0	21	*	21	2.4	18	2.4	19	2.4	0	0
7	Niraj p	7.11	0	0	0	0	0	0	22	3.2	22	3.1	0	0
8	Kapil M	7.11	0	0	24	2.9	19	2.3	19	2.9	21	*	0	0
9	Anup M	8.4	18	2.7	17	1.8	20	2.1	21	*	21	2.9	0	0
10	Kiran A	8.5	0	0	16	1.6	19	2	0	0	0	0	0	0
11	Juhi N	8.11	0	0	0	0	0	0	22	*	22	3.8	0	0
12	Mona P	9.1	0	0	0	0	0	0	0	0	0	0	32	4.6
13	Arjit B	9.3	0	0	19	2.1	20	3.1	20	2.8	19	2.8	0	0
14	Bella P	9.5	13	1.9	18	2.4	21	2.6	18	1.9	22	*	0	0
15	Avni J	9.7	0	0	23	3.7	22	2.4	0	0	0	0	0	0
16	Tumpa	9.7	0	0	0	0	0	0	0	0	0	0	23	3.5
17	Vina G	9.8	0	0	22	3.4	19	2.8	20	*	19	*	0	0
18	Sagar A	9.9	0	0	0	0	0	0	0	0	0	0	0	0
19	Pihu S	9.1	0	0	18	2.3	22	*	21	2.7	0	0	0	0
20	Punya D	10.2	20	2.9	23	*	23	3.1	22	*	21	*	0	0
21	Geeta R	10.3	0	0	22	3.1	19	1.9	20	*	21	2.9	0	0
22	Jay S	10.3	0	0	0	0	0	0	0	0	0	0	19	2.6
23	Priya R	10.8	22	3.2	0	0	0	0	0	0	0	0	0	0
24	Milind S	10.1	0	0	19	2.6	21	*	18	2.3	21	*	0	0
25	Shiny P	11.1	0	0	19	2.7	20	*	0	0	0	0	0	0
26	Ojus W	11.4	0	0	0	0	0	0	21	2	22	4.4	0	0
27	TarpanP	11.5	0	0	0	0	0	0	20	2.1	21	3.2	0	0
28	Jay L	11.7	0	0	18	2.4	22	*	20	*	21	*	0	0
29	MananD	11.7	0	0	21	*	21	3.1	22	*	0	0	0	0
30	Kunj S	11.9	0	0	20	*	19	2.9	0	0	0	0	0	0
31	Pankti G	11.1	0	0	0	0	0	0	0	0	22	*	30	3.9
32	Farhan S	11.11	19	1.8	19	2.4	18	2,6	17	1.8	0	0	0	0

Children's performance on Semi Abstract Exercises

*** signifies the child requires further training**

Table 3.

Abstract Exercises			Skillsets											
			Visual Motor		Figure Ground		Perceptual		Position in Space		Spatial		Auditory Perception	
Sr No.	Name	Age	# of Attempts	Time in Months	# of Attempts	Time in Months	# of Attempts	Time in Months	# of Attempts	Time in Months	# of Attempts	Time in Months	# of Attempts	Time in Months
1	Sonal P	6.6	NA	NA	NA	NA	17	*	20	*	NA	NA	NA	NA
2	Pratik T	7.5	NA	NA	19	*	20	*	17	*	NA	NA	NA	NA
3	Kushal M	7.7	20	*	18	*	17	*	NA	NA	17	*	NA	NA
4	Maitri S	7.8	NA	NA	15	*	19	*	NA	NA	NA	NA	NA	NA
5	Nayan L	7.9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
6	Aditi J	7.9	NA	NA	NA	NA	21	*	18	*	17	*	NA	NA
7	Niraj p	7.11	NA	NA	18	*	NA	NA	16	*	17	*	NA	NA
8	Kapil M	7.11	NA	NA	21	*	19	*	19	*	NA	NA	NA	NA
9	Anup M	8.4	17	*	17	*	16	*	NA	NA	19	*	NA	NA
10	Kiran A	8.5	NA	NA	16	*	17	*	NA	NA	NA	NA	NA	NA
11	Juhi N	8.11	NA	NA	NA	NA	NA	NA	NA	NA	17	*	NA	NA
12	Mona P	9.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	21	*
13	Arjit B	9.3	NA	NA	19	*	18	*	19	*	18	*	NA	NA
14	Bella P	9.5	21	*	20	*	20	*	17	*	NA	NA	NA	NA
15	Avni J	9.7	NA	NA	18	*	19	*	NA	NA	NA	NA	NA	NA
16	Tumpa	9.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	18	*
17	Vina G	9.8	NA	NA	18	*	19	*	NA	NA	NA	NA	NA	NA
18	Sagar A	9.9	NA	NA	17	*	NA	NA	NA	NA	NA	NA	NA	NA
19	Pihu S	9.1	NA	NA	18	*	NA	NA	16	*	NA	NA	NA	NA
20	Punya D	10.2	16	*	NA	NA	16	*	NA	NA	NA	NA	NA	NA
21	Geeta R	10.3	NA	NA	20	*	18	*	NA	NA	17	*	NA	NA
22	Jay S	10.3	NA	NA	NA	NA	21	*	NA	NA	NA	NA	19	*
23	Priya R	10.8	19	*	NA	NA	19	*	NA	NA	NA	NA	NA	NA
24	Milind S	10.1	NA	NA	15	*	NA	NA	18	*	NA	NA	NA	NA
25	Shiny P	11.1	NA	NA	17	*	NA	NA	NA	NA	NA	NA	NA	NA
26	Ojus W	11.4	NA	NA	NA	NA	NA	NA	19	*	19	*	NA	NA
27	TarpanP	11.5	NA	NA	NA	NA	NA	NA	18	*	18	*	NA	NA
28	Jay L	11.7	NA	NA	19	*	NA	NA	NA	NA	NA	NA	NA	NA
29	MananD	11.7	NA	NA	NA	NA	21	*	NA	NA	NA	NA	NA	NA
30	Kunj S	11.9	NA	NA	NA	NA	19	*	NA	NA	NA	NA	NA	NA
31	Pankti G	11.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	18	*
32	Farhan S	11.11	17	*	21	*	17	*	20	*	NA	NA	NA	NA

Children's performance on Abstract Exercises

* ***Signifies the child requires further training.***

NA Signifies 'Not Applicable' as children required continuous training at semi - abstract levels and thus were not given exercises to perform at abstract level.

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