Study on comparison of effectiveness of cognitive intervention on cognitive development of reading and math disabled children

S RADHIKA

ZP High School, Koppaka, Pedavegi Mandal, West Godavari District 534003
Andhra Pradesh, India
Email for correspondence: drradhikasivvala@gmail.com

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ABSTRACT

The present investigations were carried out to compare the effectiveness of cognitive intervention on cognitive development of reading and math disabled children. Sample consisted of 80 third grade students with 40 in experimental and 40 in control group. Learning disabilities diagnostic inventory, grade level assessment device and educational adjustment inventory for pre-secondary students were used. Significant differences were found in reading and mathematical test score of experimental and control group and f-value was found to be 159.95 and p-value 0.000047. It was concluded that cognitive strategies were effective for cognitive development of reading and math disabled children.

Keywords: Learning disability; intervention programme; reading; mathematics

INTRODUCTION

Learning disability refers to delays, deviations and performances discrepancies in the basic academic subjects eg arithmetic, reading, writing, spelling as well as speech and cannot be attributed to mental retardation, sensory deficits, emotional disturbances or learning disabilities. It is general educational term, an umbrella label that includes a variety of conditions. Unfortunately most of such children are never identified as learning disabled. Due to lack of awareness among teachers, parents and school authorities, these children are usually labeled as slow, behind, incapable and failures. In India around 13-14 per cent of all school children suffer from learning disorders (Arifa and Siraj 2019). It is not that those who have failed are really failed but it is the education system that has failed, failed in recognizing and helping them. As teachers are the link between the children and education system; it is their level of understanding and awareness that sets the path for these children's future. Academic backwardness causes fear of failure and stress not only in the children but also for the parents as academic success reflects secured future of the child. Because of this the family environment of learning-disabled child gets disturbed.

Andersson and Ostergren (2012) studied number magnitude processing and basic cognitive functions in children with mathematical learning disabilities (MLDs) and found that mathematical learning disability group displayed weaknesses with most aspects of number processing (like subitizing, perceive total number without counting symbolic number comparison and number-line estimation) and also visual and spatial working memory. The correlation found among the subitizing measure, the number line estimation task and the number naming tasks suggested that some children had mathematical learning disabilities of cognitive processing.

Iglesias-Sarmiento and Deano (2011) investigated cognitive processing and mathematical achievement. Correlational analyses showed that phonological loop and successive and simultaneous processing were related to mathematical achievement at all three grades. Regression analysis revealed simultaneous processing as a cognitive predictor of mathematical performance.

Nourbakhsh et al (2013) examined the effects of cognitive skills training and multisensory method on perceptual performance and reading ability of dyslexic

students. There was a significant difference on Bender Visual Motor Gestalt Test score of control group, the group receiving developmental intervention (E1), and the group under cognitive intervention (E2). In contrast a significant difference was observed in memory scale Rey-Osterrieth Complex Figure Test among the three dyslexic groups.

Khodamia and Hariri (2013) reported that between the metacognitive testing group and planning testing group there was a remarkable difference and metacognitive training was more effective on the educational function of students with disability in learning math. Both training for the elementary female third graders with math learning disabilities had improved their learning and between the planning training and metacognitive training there was an obvious difference in the same way.

Agaliotis and Teli (2016) studied the effectiveness of two instructional interventions in the context of teaching arithmetic combinations of multiplication and division to students with learning disabilities and mild intellectual disability. The difference between two groups was not statistically significant regarding gender and category of disability, with regard to intervention of cognitive factors and learning parameters of students with learning disability or mild intellectual disability. It was also found that there were statistically significant differences in verbal abilities, processing speed and counting. There were no significant differences in working memory and phonological short-term memory.

Singh and Anshu (2013) carried out an intervention study on children with learning disabilities and found that severity of dyslexia and dyscalculia was reduced significantly after intervention. The boys reflected significant improvement in reduction of learning disabilities after intervention. The children from nuclear families were improved significantly after intervention.

Cognitive strategy instruction (CSI) is an explicit instructional approach that teaches students specific and general cognitive strategies to improve learning and performance by facilitating information processing.

The present study was conducted to help the learning-disabled children to overcome the problem by introducing and implementing the intervention techniques to enhance cognitive development, reading, mathematical skills and classroom adjustments. The study introduced strategies that would help in reading and mathematical comprehension.

METHODOLOGY

Purposive sampling method was used to select schools for the study. A sample of 160 academically low achieving students studying in grade 3 were selected from four large government primary schools belonging to Amberpet and Malakpet divisions of Hyderabad. Students in the age range of 8-10 years from schools that were offering English medium along with state syllabus were selected. From 160 children 80 formed the experimental group and 80 control group. Tools suggested by Hammill and Bryant (1998), Narayan J (1998) and Sinha and Singh (1971) were used.

Intervention programme was planned for a period of 10 months for the learning-disabled students. Phase I from 1-20 sessions included enhancing sentence and paragraph reading skills through cognitive strategies, for mathematics disabled students, Phase I of 1-20 sessions included error analysis, Phase II from 21-40 sessions concentrated on developing conceptual base and Phase III from 41-60 sessions included teaching multiplication and division through use of cognitive strategies. At the end of 10 months intervention and one month of no intervention the subjects were re-administered in all the scales. These scores formed the post-test scores.

RESULTS and DISCUSSION

Table 1 indicates the raw scores and stanine scores for reading and mathematics of the students. Low academic performing students were selected and assessed for learning disability through a diagnostic inventory learning disability diagnostic inventory.

In reading group, 13.75 per cent scored between 16-28 (stanine score 1); 13.75 per cent scored 53-62 (stanine score 4); 12.50 per cent scored 43-52 (stanine score 3), 12.50 per cent scored 63-76 (stanine score 5) and 11.25 scored 29-42 (stanine score 2), all indicating the likelihood of the learning disorder. Stanine score of 6 with corresponding raw score of 77-86 was obtained by 36.25 per cent of the subjects indicating possibility of the learning disorder.

Under mathematics group, 7.50, 10.00, 11.25, 15.00 and 27.50 per cent children scored raw score of

Table 1. Learning disability diagnostic inventory (LDDI) of respondent children (n= 160)

Raw score	Stanine score	Reading		Mathematics		Likelihood of an intrinsic processing disorder
		f	%	f	%	
16-28	1	11	13.75	6	7.50	Likely
29-42	2	9	11.25	8	10.00	Likely
43-52	3	10	12.50	9	11.25	Likely
53-62	4	11	13.75	12	15.00	Likely
63-76	5	10	12.50	22	27.50	Likely
77-86	6	29	36.25	23	28.75	Possibly
87-97	7	-		-		-
98-110	8	-		-		-
>110	9	-		-		-
Total		80	100	80	100	-

Table 2. Comparison of effectiveness of cognitive intervention on cognitive development of reading and math disabled children

Source	SS	df	MS	F	P
Adjusted mean	6,478.97	3	2,159.66	159.95	0.000047*
Adjusted error	2,092.79	155	13.50		
Adjusted total	8,571.76	158			

Table 3. Summary of analysis of covariance for the pre- and post-test scores in classroom adjustments of reading and math in experimental and control groups

Source	SS	df	MS	F	P
Adjusted mean	6062.09	3	2020.70	406.63	0.00073*
Adjusted error	770.26	155	4.97		
Adjusted total	6832.35	158			

16-28, 29-42, 43-52, 53-62 and 63-76 with stanine scores of 1, 2, 3, 4, and 5 respectively indicating thereby that there was likelihood of learning disorder. However 28.75 children scored 77-86 with stanine score of 6 showing that there was possibility of learning disorder.

The scores obtained by both reading and math groups indicated that all the selected subjects were having likelihood or possibility of learning disability.

The general mental ability scores of 160 children of four groups with two experimental and control groups were subjected to ANCOVA (Table 2). The significant ratio for the adjusted post-test score showed that the final mean score of students in the experimental and in control groups differed significantly after they were adjusted for difference in pre-test scores. The f-value was found to be 159.95 and p-value 0.000047. The adjusted mean was found to be significant at 0.01 level of significance. The results of analysis showed cognitive strategies to be effective for cognitive development of reading and math disabled children.

The result of the test of significance of the pre-scores of the experimental and control groups of the total sample indicated that both groups were more or less similar in their initial classroom adjustments (Table 3). After cognitive intervention of the experimental group and normal classes for control group, it was found that the two groups differed significantly (f= 406.63, p <0.01). From the mean

scores obtained, it was clear that the mean of the experimental group was much higher than that of the control group. While comparing the pre-scores and post-scores of the experimental group, it was observed that the post-score of the experimental group was remarkably higher than the pre-score. The effectiveness of cognitive intervention was statistically established through ANCOVA wherein the F-ratio was obtained (Fyx= 406.63) and p-value of the adjusted means of 0.00073 was significant at 0.05 level of significance which implies the better performance of the experimental group. Thus cognitive intervention was found to be effective for cognitive development and classroom adjustment of students with learning disabilities.

CONCLUSION

The study revealed the significant ratio for the adjusted post-test score which showed that the final mean score of students in the experimental group and in control group differed significantly after intervention. Therefore cognitive strategies were effective for cognitive development of dyslexic (reading disabled) and dyscalculia (math disabled) children.

REFERENCES

Agaliotis I and Teli A 2016. Teaching arithmetic combinations of multiplication and division to students with learning disabilities or mild intellectual disability: the impact of alternative fact grouping and the role of cognitive and learning factors. Journal of Education and Learning **5(4):** 90-103.

Andersson U and Ostergren R 2012. Number magnitude processing and basic cognitive functions in children with mathematical learning disabilities. Learning and Individual Differences **22(6):** 701-714.

Arifa S and Siraj SS 2019. A descriptive study to assess the knowledge and attitude of primary school teachers regarding learning disabilities among children in selected schools of district Pulwama, Kashmir. IP Journal of Paediatrics and Nursing Science **2(1):** 19-32.

Hammill DD and Bryant BR 1998. Learning disabilities diagnostic inventory. Pro-Ed, Austin, TX.

Iglesias-Sarmiento V and Deano M 2011. Cognitive processing and mathematical achievement: a study with schoolchildren between fourth and sixth grade of primary education. Journal of Learning Disabilities **44(6):** 570-583.

Khodamia N and Hariri M 2013. Comparing the efficacy of planning training with metacognitive training on improving the educational performance of the Iranian elementary d-graders with math learning disability. Procedia- Social and Behavioural Sciences **84:** 24-28.

Narayan J 1998. Grade level assessment device for children with learning problems in regular schools, National Institute for the Mentally Handicapped, Secundrabad, Hyderabad, Telangana, India.

Nourbakhsh S, Mansor M, Baba M and Madon Z 2013. The effects of multisensory method and cognitive skills training on perceptual performance and reading ability among dyslexic students in Tehran-Iran. International Journal of Psychological Studies **5(2):** 92-99.

Singh B and Anshu 2013. An intervention study on children with learning disabilities and assessed the impact of intervention. Journal of Humanities and Social Science **11(1):** 50-56.

Sinha AKP and Singh RP 1971. Adjustment inventory for school students. National Psychological Corporation, Agra, Uttar Pradesh, India.