

Level of Achievement Motivation, Neuropsychological Profile and Impact of Neuropsychological Rehabilitation on Children with Specific Learning Disability (SLD)

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ABSTRACT

The present study is aimed to investigate the Level of achievement motivation, Neuropsychological profile and impact of Neuropsychological Rehabilitation on children with Specific Learning Disability (SLD). The participants of the study were children who are studying in 4th to 7th standard (9 years to 12 years) who are diagnosed with mixed disorder of scholastic skills from Suddhananda Vidyalaya, Chennai. Ten children (N=10, n (Male) = 7, n (Female) = 3) have participated in the study. Experimental research design was used in the research. Independent 't' – test and paired 't' – test were done as the part of statistical analysis. This study assessed the neuropsychological functions and achievement motivation of children and provided 12 hours of Neuropsychological Rehabilitation (NR) package for 4 weeks, consisting of activities for attention. The study results shows that, most of the children with LD have inadequate scores in motor speed, executive function, sustained attention, verbal working memory, Visuo-conceptual ability and visual learning and memory and have moderate to high level of achievement motivation. Study concluded that, there is significant improvement in the neuropsychological functioning such as sustained attention ($p < 0.05$) and focused attention ($p < 0.05$) in children with Specific Learning Disability (SLD) after providing the neuropsychological intervention.

Keywords: Neuropsychological Profile, Achievement Motivation, Neuropsychological Intervention, Specific Learning Disability

“Specific Learning Disabilities means a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, which may manifest itself in an imperfect ability to listen, speak, read, spell or to do mathematical calculations. The term includes such conditions as perceptual handicaps, brain injury, minimal brain dysfunction, dyslexia and developmental aphasia. The term does not include children who have learning problems which are primarily the result of visual, hearing or

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Received: August 18, 2019; Revision Received: September 29, 2019; Accepted: September 30, 2019

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motor handicaps, or mental retardation, emotional disturbance or environmental, cultural or economic disadvantages.” (*Federal Register, 1977, p. 65083*) (Karanth, 2002).

Causes of Learning Disabilities

Neurological factors According to the neurological theories, learning disabilities are the reflection of structural damage or improper development of the nervous system. It can occur during prenatal or postnatal period, as the nervous system is developing. On the other hand, head injury, lack of oxygen, exposure to toxins, seizures and nutritional deficiencies may contribute to central nervous system damage. Visuospatial perception, auditory perception, semantic memory and phonemic discrimination are the various neuropsychological deficits that are associated with learning disabilities. Left hemisphere deficits are prominent in children with reading disorders and in other hand, children with mathematical disorders have deficits in the right hemisphere (Rao, 2003).

Achievement Motivation and Learning Disability

Achievement motivation, is a person’s desire or passion to achieve success and participate in activities in which success depends on the person’s ability and efforts (Kalantari F. Parental, 2006). It includes both cognitive and non-cognitive aspects. Najafi and Foladjang (2008) and Abolghasemi (2011) found a positive relationship between achievement motivation and children’s learning, which means high level of achievement motivation leads to better performance in learning process.

Children with learning disability anticipate failure whenever they have chronic difficulties with academic assignments and they are seeing success as an unattainable goal no matter how hard they try. Seligman (1992) identifies this outlook as learned helplessness. Children with this attitude will not even try to complete the task and frequently give up. As a result, the individual no longer tries because she has the outlook that failure is inevitable even when success is possible.

Attention and Learning Disability

Attention is awareness of the here and now in a focal and perceptive way. For early psychologists, such as Edward Bradford Titchener, attention determined the content of consciousness and influenced the quality of conscious experience. Attention is a critical skill in learning.

Sustained attention is the ability to focus on an activity or stimulus over a long period of time. Even if there are other distracting stimuli present, it is what makes it possible to concentrate on an activity for as long as it takes to finish.

Focused attention is the brain's ability to concentrate its attention on a target stimulus for any period of time. It is the type of attention that makes it possible to quickly detect relevant and important stimuli.

Neuropsychological Rehabilitation and Learning Disability

Neuropsychological Rehabilitation (NR) is concerned with the improvement of cognitive, emotional, psychosocial, and behavioral deficits caused by an insult to the brain. The two complementary activities constituting neuropsychological rehabilitation: namely, cognitive retraining (CR) and psychotherapy (Prigatano et al. 1986). Neuropsychological rehabilitation leads to improvement in the child’s overall life especially, learning experiences by focusing

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on the enhancement of neuropsychological function-attention, which is the crucial factor for learning.

It is evident that children with LD are truly a heterogeneous group. They exhibit different characteristics from one another. Neuropsychological evaluation can assess functions such as attention or motor and sensory abilities that either enhance or detract from the individual's overall performance. It allows a broad assessment and helps in the identification of strengths and weaknesses, which are both critical for determining areas of intervention. Identifying them at the correct time and helping them in appropriate ways will definitely make changes in their lives.

Various researches done across the world in the past 4 decades will help to understand the neuropsychological functions, achievement motivation and neuropsychological intervention on learning disability children. These studies pointed out deficits in the cognitive functions such as attention, cognitive control, and verbal and visuospatial memory in LD children. They have also proved effectiveness of cognitive retraining in the areas of attention, visuo-spatial ability, visual perception, and working memory. Several study results showed that scores of children with learning disabilities in self-efficacy, achievement motivation, and academic progress were significantly lower than the matched groups.

METHODOLOGY

Objectives of the study

1. To identify the neuropsychological functioning/profile of the children with SLD.
2. To find out the effect of neuropsychological intervention on the neuropsychological deficits of children with Specific Learning Disability (SLD).
3. To find out the effect of level of achievement motivation on the intervention of SLD children.

Sample

The sample comprised of children who are studying in 4th to 7th standard (9 years to 12 years) including both boys and girls and who are diagnosed with mixed disorder of scholastic skills from Suddhananda Vidyalaya, Chennai

Inclusion criteria:

1. Both gender
2. Children with IQ above 85 and diagnosed with SLD.
3. Children who are studying in 4th standard to 7th standard.
4. Children who are between 9 years to 12 years of age.

Exclusion criteria:

1. Children with sensory deficits.
2. Children with psychiatric conditions, ID, seizure disorder, neurological disorders, and major medical illnesses.
3. Children who are undergoing other modes of interventions.
4. Children who are not willing to take part in the study.

Sample design

Purposive sampling technique

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Study design

Experimental design

Instruments

- 1. Socio-demographic sheet** was used to capture demographic details, type of marriage of parents, maternal illness during pregnancy period, history of paternal substance abuse, type of delivery, whether the child was premature, any birth complications, birth weight of the child, history of neonatal and post natal diseases, any incubatory period after delivery, immunization, history of school refusal, regularity to school, medications, whether the child is receiving any special intervention for scholastic backwardness.
- 2. Malin's Intelligence Scale for Indian Children (Dr.Arthur J. Malin)** used to measure both verbal and performance intelligence of the children. It contains 11 subtests; 6 in verbal (Information Test, General Comprehension Test, Arithmetic Test, Analogies and Similarities, Vocabulary Test & Digit Span Test) and 5 in performance (Picture Completion, Maze Test, Coding, Object Assembly & Block Design). The test-retest reliability of the tool is .91 and validity is .63
- 3. NIMHANS index for SLD (Kapur et al, 1992)** comprises of 9 tests. They are Attention, Reading, Writing, Comprehension, Spelling, Bender Gestalt Test, Visual Memory, Auditory Memory & Diagnostic Arithmetic Test. The reliability of the test was found to be 0.53 and criterion validity with teacher's and clinician's assessment was found to be 0.75 and 0.61 respectively.
- 4. NIMHANS neuropsychological battery for children (Kar, B.R et al , 2004)** consist of 21 tests which assess each of the specific neuropsychological functions. The tests are, Finger Tapping Test, Tests For Expressive Speech, Color Cancellation Test, Color Trail Test, FAS Phonemic Fluency Test, Design Fluency Test, N Back Task For Verbal Working Memory, N Back Task For Visuo Spatial Working Memory, Visuo Spatial Working Memory Span Task, Porteus Maze Test, Wisconsin Card Sorting Test, Motor Free Visual Perception Test, Picture Completion Test, Reading, Writing, Calculation, Visual Recognition of Pictured Objects, Tactile Finger Localization, Tactile Object Recognition, Block Design Test, Token Test, Auditory Verbal Learning Test & Memory for Design Test. The test-retest reliability of the battery ranged from 0.53 to 0.92 indicates a good reliability. Validity of the battery established in terms of localization and lateralization of brain dysfunction. The following subtests from the battery were administered for the purpose of current study: Finger Tapping Test, Color Cancellation Test, Color Trail Test, Design Fluency Test, N Back Task For Verbal Working Memory, Visuo Spatial Working Memory Span Task, Motor Free Visual Perception Test, Picture Completion Test , Block Design Test, Auditory Verbal Learning Test, Memory for Design Test.
- 5. Achievement Motivation Inventory (Muthee & Thomas, 2009)** is intended to assess the achievement motivation among learners. It has 32 items in which 18 were positively worded and 14 were negatively worded. It measures 4 dimensions and they are, motivation for achievement, inner resources, inter personal strengths and work habits. The responses were marked using a five point Likert scale (completely agree, mostly agree, agree to some extent, mostly disagree, completely disagree). The reliability of the scale has been computed using Cronbach's alpha, which was found to be 0.749. Validity of the scale is claimed on the basis of the systematic methodology followed by the tool developer during the development and standardization of the test.

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Procedure

The protocol of the study was presented to the ethics committee of the parent organization and got approval. Informed consent forms were used containing information about the study, the purpose, the procedure, the benefits, intervention and its procedure & duration, the consequences, voluntary participation, withdrawal from the study, confidentiality, and contact information of the researchers. The informed consent was taken in Tamil and/or English depending upon the convenience of the participants.

Sample was selected from the Suddhananda Vidyalaya, Chennai. Based on the opinion from Principal and class teachers, few students were selected and screening was done by checking their notebooks. All the parents of selected students attended an awareness program in the school. The program was conducted by the researcher regarding LD, its nature, etiology and the interventions. IQ assessment was done and those children who obtained an IQ above 85 underwent NIMHANS index for SLD. After confirming LD, achievement motivation inventory to obtain their level of achievement motivation and NIMHANS neuro battery to obtain their neuropsychological profile was administered.

NIMHANS neuro battery was conducted in 2 days for each child, each session lasted for 2 hours with breaks in between. After completing the assessments, neuropsychological rehabilitation has been started which specifically focused on their attention. A total of 16 sessions, has been done for all the children in group setting. Each session lasted for 30 to 45 minutes. The activities given were the following:

1. Coloring
2. Object cancellation
3. Connecting dots
4. Mazes
5. Word search

Frequency of the sessions: weekly 4 days

After 16 sessions, children were reassessed by using Color cancellation and color trial tests of NIMHANS neuro battery in order to find out the changes in the scores before and after the intervention.

RESULTS AND DISCUSSIONS

Table 1 Frequency distribution of age, gender and class

Demographic Variable n (10)	Frequency (%)
Age (in years)	9 (10)
	10 (20)
	12 (50)
	13 (20)
Gender	Male (70)
	Female (30)
Class	4 th std (10)
	5 th std (20)
	6 th std (50)
	7 th std (20)

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Table 1 shows the frequency distribution of age, gender and class of 10 children who are participated in the study. 50% of children participated in the study were 12 years of age and 70% of children were males. 50% of children participated in the study were studying in 6th standard.

Table 2 Frequency distribution of type of marriage of parents, type of birth, incubatory period, childhood disease, birth weight and maternal illness of LD children

Demographic Variable	n (10)	Frequency (%)
Type of marriage of parents	Consanguineous	3 (30)
	Non-consanguineous	7 (70)
Type of birth	Normal	5 (50)
	C-section	5 (50)
Incubatory period	5 days	1 (10)
Childhood diseases	Hypoxia	2 (20)
	Developmental delay	3 (30)
Birth weight	2 to 2.900 kg	6 (60)
	3 to 3.900 kg	4 (40)
Maternal illness	Thyroid	1 (10)
	Blood pressure	1 (10)

Test	MS-RH	MS-LH	DF	C	CT-A	C	VN	VN	VS	MF	P	BD	M	M	AV	AVLT
				C	-A	T-B	B-1	B-2	W	VP	C		D	D-DR	LT	-DR
Performance ↓																
Inadequate	10	9	10	10	1	1	6	6	5	1	6	1	0	10	4	4
Adequate	0	1	0	0	9	9	4	4	5	9	4	9	10	0	6	6

Table 2 shows the type of marriage of parents, type of birth, incubatory period, childhood disease, birth weight and maternal illness of LD children. 70 % of the children participated in the study were born out of non-consanguineous marriage and 60% of them had birth weight between 2 to 2.900 Kilograms. 50% of children were delivered through normal delivery and the remaining 50% were through c-section.

Table 3 Neuropsychological profile of LD children – number of children and their performance in each sub tests of neuropsychological functioning

MS-RH- Motor Speed Right Hand, MS-LH- Motor Speed Left Hand , DF- Design Fluency , CC- Color Cancellation, CT-A- Color Trials A, CT-B- Color Trials B , VNB-1- Verbal N Back 1 , VNB-2- Verbal N Back 2 , VSWM- Visuo Spatial Working Memory, MFVP- Motor Free Visuo- Perception, PC- Picture Completion , BD- Block Design , MD- Memory for Design, MD-DR- Memory for Design Delayed Recall, AVLT- Auditory Verbal Learning Test , AVLT-DR- Auditory Verbal Learning Test Delayed Recall

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Table 3 shows the neuropsychological profile of LD children. Most of the children have inadequate scores in motor speed, executive function (design fluency test), sustained attention (color cancellation test), verbal working memory (N back task), Visuo-conceptual ability (picture completion) and visual learning and memory (memory for designs test). On the other hand, most of them obtained adequate scores in focused attention (color trial A &B), visuo-perceptual ability (motor free visuo-perception test), visual learning & memory (memory for designs) and verbal learning & memory (Rey's auditory verbal learning test). On visuo-spatial working memory span task, assessed for the visuo-spatial working memory, 50% of them performed adequately and the remaining performed inadequately.

Numerous studies have already established the neuropsychological aspects of learning disability. Previous study findings show the presence of cognitive deficits in areas such as attention, cognitive control, and verbal and visuo-spatial memory (A. Sadasivan, 2013).

These can be due to the developmental anomaly of the left and right hemispheres or due to a deficit in the corpus callosum, so information is transferred less efficiently between the two hemispheres.

Table 4 Pre and post test comparison of color cancellation test

Paired Statistics	Samples	Mean (Time taken in seconds)	N	Std. Deviation (S.D)	Std. Error Mean	t	df	p value
Pre test cancellation	color	77.40	10	32.025	10.127	2.36	9	0.043*
post test cancellation	color	66.80	10	21.601	6.831			

***p Value Significant at the level <0.05**

Table 4 shows the changes in the color cancellation test (sustained attention) scores after the neuropsychological intervention. Significant reduction in the time taken can be seen. The mean time taken for pre test color cancellation was 77.40 seconds and for post test color cancellation was 66.80 seconds. Sustained attention is the ability to focus on an activity or stimulus over a long period of time. It is what makes it possible to concentrate on an activity for as long as it takes to finish, even if there are other distracting stimuli present. It is the major factor of learning and it determines the quality of learning experience. Children has difficulty in sustained attention in the classroom setting will definitely have poor learning experience which further leads to poor academic performance. Improvements in the sustained attention will definitely improve the learning experience and further academic performance. Previous study findings show, significant improvement in sustained attention (time taken & errors) after cognitive retraining (Malhotra, S., Rajender, G., Sharma, V., & Singh, T. B., 2009).

Table 5 Pre and post test comparison of color trial A test

Paired Samples Statistics	Mean (Time taken in seconds)	N	S. D	Std. Error Mean	t	d f	p value
Pre test color trial A	75	10	31.85	10.072	1.85	9	0.097
Post Test color trial A	69.4	10	25.979	8.215			

***p Value Significant at the level <0.05**

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Table 5 shows the effect of neuropsychological intervention in the color trial A test (focused attention) scores. The mean time taken for pre test color trial A was 75 seconds and for post test color trial A was 69.4 seconds. There is no statistically significant change in the scores after the intervention. But slight decrease in the time taken can be seen, which denotes improvements in focused attention.

Table 6 Pre and post-test comparison of color trial B test

Paired Samples Statistics	Mean (Time taken in seconds)	N	S. D	Std. Error Mean	t	d f	p value
Pre test color trial B	145.3	10	41.775	13.21	2.62		
Post test color trial B	137.1	10	36.522	11.549	9	9	0.027*

***p Value Significant at the level <0.05**

Table 6 shows changes in the color trail B test (focused attention) after the neuropsychological intervention. There is significant reduction in the time taken. In the pre-test the mean time taken to complete the task was 145 seconds and in the post test it is 137 seconds. Focused attention is the ability to concentrate on one stimulus rather than the other. For good academic performance children should have adequate amount of focused attention. Result in the current study shows the effectiveness of intervention that was given to improve the attention. This result was similar to the findings other studies done among LD children. One study results showed that, cognitive training led to improvements in processing attention (Ng N., Sternberg. D., Katz .B., Hardy. K., & Scanlon. M. 2013). Another study by Shahzadi Malhotra et al (2005), shows significant improvements in the attention and various other neuropsychological functions after cognitive retraining.

Table 7 Levels of achievement motivation of LD children

Achievement motivation score	N	Mean	S. D	Minimum	Maximum
76 to 118 (Moderate)	8	109.25	6.319	102	118
119 to 160 (High)	2	129	1.414	128	130
Total	10	113.2	10.031	102	130

Table 7 shows the levels of achievement motivation of LD children. The mean score of achievement motivation is 113.2, indicating moderate level of achievement motivation. 8 children out of 10 have a mean achievement motivation score of 109.5 indicating moderate level of achievement motivation and 2 out of 10 have 129 indicating high level of achievement motivation. The minimum level of achievement motivation is 102 and the maximum is 130.

But previous studies shows that, children with learning disabilities scores low in self-efficacy, achievement motivation, and academic progress than those of matched controls (Seyed.S., Salmani,M., Nezhad,F.M., & Noruzi,R. 2017).

Another study findings shows that, students with learning disabilities displayed lower levels of metacognitive knowledge and tend to attribute success and failure to external causes more often than the students without learning disabilities (Pintrich,P.R., Anderman,E.M., & Klobucar,C., 1994). Studies also proved that, children with LD are lower in perceived

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cognitive competence and academic self-regulation (Wendy S. Grolnick & Richard M. Ryan, 1990). The present study findings can be attributed to the student's need for social approval.

Table 8 *Difference in the intervention outcome across various levels of achievement motivation*

Achievement motivation		no of samples	Mean	S. D	Std. Error Mean	t	df	p value
Post test color cancellation	76 to 118	8	69.88	23.363	8.260	0.890	8	0.400
	119 to 160	2	54.50	0.707	0.500			
Post Test color trial A	76 to 118	8	67.38	19.964	7.058	-0.471	8	0.650
	119 to 160	2	77.50	55.861	39.500			
Post Test color trial B	76 to 118	8	141.63	38.928	13.763	0.765	8	0.466
	119 to 160	2	119.00	24.042	17.000			

***p Value Significant at the level <0.05**

Table 8 shows the difference in the intervention outcome across various levels of achievement motivation. From the table it is clear that, there is no significant difference in the intervention outcome across various levels of achievement motivation. Studies proved that students with high level of achievement motivation have more need for success and their outcome will be more successful than people with low level of achievement motivation. In contrast to previous studies in LD children, present study found moderate to high level of achievement motivation in children with LD and this may be the reason for their improvement in the neuropsychological functions; sustained attention and focused attention. But this study could not find any difference in the intervention outcome across various levels of achievement motivation since most of the children fall under single category and no children had low level of achievement motivation.

CONCLUSION

Present study concluded that, most of the LD children have obtained adequate scores in the areas of focused attention, motor free visuo-perception, visual memory, verbal learning & memory and inadequate scores in the areas of motor speed, executive function, sustained attention, verbal working memory, Visuo-conceptual ability and visual learning & memory. Neuropsychological rehabilitation can improve the cognitive functioning especially attention of the children with LD.

This study have the limitations such as, limited sample size, lack of control group, lack of equal distribution of male and females in the study, duration of the intervention was comparatively less and intervention was provided in only one aspect of the neuropsychological functioning i.e., attention.

This study findings can be used while assessing LD children and include neuropsychological assessments as part of the assessment and to provide neuropsychological rehabilitation to improve neuropsychological functions of LD children, which inturn enhances their learning experiences.

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Suggestions for the future researches are, similar study can be done using large number of samples and comparing the results with a control group. Also, effect of neuropsychological rehabilitation in LD children can be studied by providing intervention to improve all the neuropsychological functions.

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Acknowledgements

The author appreciates all those who participated in the study and helped to facilitate the research process.

Conflict of Interest

The author declared no conflict of interests.

How to cite this article: Joseph. S.E. & Karthikeyan. S. (2019). Level of Achievement Motivation, Neuropsychological Profile and Impact of Neuropsychological Rehabilitation on Children with Specific Learning Disability (SLD). *International Journal of Indian Psychology*, 7(3), 483-494. DIP:18.01.052/20190703, DOI:10.25215/0703.052