

Attention deficit hyperactive disorder- As a determinant of learning disability

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■ **ABSTRACT :** Children with ADHD have been found to have weaknesses with their working memory leading to difficulty with problems involving the manipulation of verbal and non-verbal information that way effecting their learning processes (Martinussen *et al.*, 2006). This study was aimed to find the role of Attention Deficit Hyperactive Disorder (ADHD) as one of the determinant for learning disabilities among primary school children. A methodical process was followed for drawing the sample that comprised of 120 first and second grade children. The sample was equally divided into learning disabled (n=60) and learning abled (n=60) children. The results of the present study have highlighted the role of learning disabilities, displayed a higher degree of attention deficit disorders. They were more impulsive, hyperactive, day dreamers and were having poor concentration.

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A disability is any restriction or a serious limitation to perform an activity in the manner or within the range considered normal for a human being in his physical and social environment (Rattan, 1997). When the term 'disability' is used, most people automatically think of physical or developmental disabilities. These are the disabilities that tend to be more visible to others. But learning disabilities on the other hand, are not as apparent to the outside observer and are frequently overlooked when initiatives are undertaken for people with disabilities (Johnson, 1995). It is estimated that millions of children around the world have been labeled as learning disabled. These children are years behind their classmates in developing academic skills,

which can lead to their dropping out of school (Vijaygopal and Atal, 2004).

Researches have also indicated high relationship between learning disabilities and ADHD in children. Nearly 25 per cent to 50 per cent of people with ADHD also have learning disabilities (Barkley, 1994). While prevalence rates vary, it is generally accepted that between 4 and 7 per cent of children will be diagnosed with attention-deficit-disorders, with boys being at least three times more likely than girls to be diagnosed with the disorder (Barkley, 1998). Although ADHD is not considered a learning disability, research indicates that from 30-50 per cent of children with ADHD also have a specific learning disability, and that the two conditions

can interact to make learning extremely challenging (National Institute of mental health, 2003).

Research suggests that neither attention nor long-term memory are the critical cognitive correlates of ADHD or LD. Rather, encoding processes, particularly working memory, are identified as deficiencies for children with these conditions. Furthermore, intention and inhibition appear to be particularly impaired in children with ADHD, who exhibit broader deficits in so-called executive function (Journal of behaviour and developmental pediatrics, 1996). Barkley (1997) assessed that attention-deficit/hyperactivity disorder involves a core central deficit in inhibition. Working memory and abilities of self-regulation like internalization of speech are underdeveloped by these children. These children have good inhibitory mechanisms in the brain, if they are doing things they are interested in. He concluded that it cannot be assumed that there is a deficit of inhibitory control rather than an alteration in the ways decisions about inhibition are made in different motivational contexts.

Studies indicate that between 4-7 per cent of the school age population experiences some form of math difficulty (Fuchs *et al.*, 2005). 26 per cent of children with ADHD have a specific math disability (Mayes and Calhoun, 2006). Children with ADHD have been found to have weaknesses with their working memory leading to difficulty with problems involving the manipulation of verbal and non-verbal information (Martinussen *et al.*, 2006).

Recent research has looked at the connection between working memory weakness and math difficulty, specifically, arithmetic, algorithm knowledge and problem solving. According to Swanson and Beebe (2004) working memory weaknesses contributed to difficulty in mathematical word problem solving and that of phonological processing. However, working memory is not the only cognitive factor that has been correlated with learning disabilities and ADHD. Attention is a significant predictor of poor arithmetic, phonological loop, visual and auditory processing, algorithms and mathematical problem solving skills. Learning disabled child with inattention will be struggling to appropriately process and organize information because of attention difficulties. They might process too little or too much information and not be able to distinguish between what is important and what isn't. They may have problems

shifting focus from one subject or activity to another, by Dr. Mel Levine in his book developmental variation and learning disorders.

Children with an arithmetic disability do not have a generalized language deficit but have a specific working memory deficit in relation to processing numerical information (Siegel and Ryan, 1989). Richards *et al.* (1990) have reported that children with learning disabilities made more errors than controls on a selective attention task when letter distractors were adjacent to the target letter but not when they were distant, and more correct responses than controls when facilitating letters were adjacent to the target, suggesting that students with learning disabilities are less able to narrow the focus of their attention. Longer response time by students with learning disabilities indicate that they have slower information-processing skills than controls.

Keeping in view the above framework, the present study was designed to investigate into the role of ADHD as a determinant of learning disabilities.

■ RESEARCH METHODS

Sample :

The study was conducted in Government Primary Schools of Ludhiana city. The sample for the present study comprised of 120 children between the age of 6 to 8 years studying in 1st and IInd grade. It consists of children who possessed at least average level of intellectual abilities.

Instruments :

The following tests were used for identification of learning difficulties among children. Scale of Reading-Writing Skills (R-W-S test).

The scale has been designed by Singh (1993) to identify learning difficulties among children from 5 years of age. It measures the learning difficulties in children through their performance in reading writing skills like vocabulary, visual perception, auditory discrimination and copying.

Coloured progressive matrices :

The coloured progressive matrices developed by Raven (1962) was used to assess the intellectual abilities of children. It is widely used test in this area of research on the age group of 5 to 11 years. The test-retest reliability of the test among 6½ and 9½ children has been

found to be 0.6 and 0.8, respectively.

Selection procedure :

Class teachers of the Ist and IInd grades in the selected schools were approached after the first term examination to get the list of low and high achievers falling in the age range of 6 to 8 years. All enlisted low achievers were examined for their intellectual abilities and reading writing skills *i.e.* vocabulary, visual perception, auditory discrimination and copying. The children who performed below average in any four of the reading writing skills but average and above on intellectual tasks were designated as learning disabled group. Then equal number of top high achievers from the same grade were purposively drawn and tested on the same tasks to find their learning skills and intellectual abilities. Children performing at average and above range on all types of learning skills as well as intelligence test constituted the group of learning able children. Therefore, children performing at average and above average level of intelligence but free from any visible handicap were included in the group others were excluded from the sample. The number of learning able children was equal to the number of learning disabled children from a particular grade in a particular school and the total sample comprised of 120 children.

RESEARCH FINDINGS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Distribution of sample as per various levels of attention problems :

Table 1 gives the percentage distribution of the primary school children on various levels of attention problems. It was observed that the most of the respondents in overall samples (76.67 %) exhibited attention problems within the normal range, while 15.83 per cent had problems at borderline range and only 7.50 per cent subjects had attention deficit disorders at clinical level. The differences in distribution of learning able and learning disabled children on attention problems revealed that higher percentage of learning disabled children (10 %) were in clinical range as compared to 5 per cent learning able children. On the other hand borderline cases were more (18.33 %) in learning able than learning disabled (13.33 %).

It means attention problems like impulsivity, hyperactivity, day dreaming and poor concentration were common in learning disabled children, though the differences between the two frequencies of two groups was non-significant.

Table 2 presents the attention problem scores of subjects who were learning disabled or learning able on various learning skills. It shows that children with difficulties in vocabulary, visual perception, copying and total abilities achieved higher attention mean scores than learning able children. Differences were significant at 1 per cent level for vocabulary, visual perception disability, copying disability and total abilities but not for auditory discrimination disabilities. It means learning disabled children had more attention problem as compared to learning able children. Thus learning disabled had poor

Table 1 : Distribution of learning able and learning disabled children as per the various levels of attention problems

Attention problem level	Total sample n (%)	Learning able n (%)	Learning disabled n(%)
Normal	92(76.67)	46(76.67)	46(76.67)
Borderline	19(15.83)	11(18.33)	8(13.33)
Clinical	9(7.50)	3(5.00)	6(10.00)
Total sample	120(100)	60(100)	60(100)

Table 2 : Attention problems (mean scores) of learning able and learning disabled children on different learning abilities

Learning abilities	n	Attention problems score		t- value
		Learning able MS±SD	Learning disabled MS±SD	
Vocabulary	28	57.21±3.78	61.65 ±7.49	2.86*
Visual perception	19	54.50±3.58	61.45 ±7.08	3.48*
Auditory discrimination	08	61.50±5.01	60.15±8.45	1.04
Copying	05	55.69±3.79	61.54±7.20	3.27*
Total abilities	60	55.69±3.79	59.38±4.41	3.27*

* indicate significance of value at P=0.01

concentration, higher impulsivity, hyperactivity and more day dreaming behaviour.

Attention deficit disorder (mean scores) of learning abled and learning disabled as per age and gender:

Table 3 shows the age and gender wise comparison of mean scores in attention deficit disorders of learning abled and learning disabled children. The analysis reveals that learning disabled children had significantly more attention deficit disorders (hyperactivity, distractibility etc.) as compared to learning abled children at both the age groups. The differences in attention problems of learning abled and disabled children were significant ($P < 0.01$) at 6 to 7 years as well as 7 to 8 years. Moreover, there was high dispersion in data in all the groups except at 6 to 7 years old learning abled children.

The data further displays that there were significant age differences within the learning abled as well as learning disabled children. The older group children learning abled as well as learning disabled had greater number of attention problem as compared to their younger counterparts. Moreover, the younger learning abled children exhibited least attention disorder than the three groups.

The gender wise mean scores presented in the Table 3 revealed that learning disabled males and females demonstrated more attention problems as compared to

learning abled males and females. But the differences were significant ($P < 0.01$) in the male children only. The learning disabled children were assessed to be more impulsive, hyperactive, day dreamers, showed poorer concentration and could not follow instructions as well. When the attention problems of two genders were compared with each other, the female children in learning abled as well as learning disabled groups manifested more attention deficit disorders than the males in the two groups. The learning abled males exhibited least attention disorders among all the four groups. It may be summarized that the older disabled children and learning disabled girls displayed maximum problems in this data whereas younger learning abled children and learning abled males exhibited minimum attention problems. findings of the present study are in line with the earlier study conducted by Gaub and Carlson (1997) which found that attention deficit disorders are three to nine more among boys than girls. However, many girls with attention deficit/ hyperactivity disorders may be overlooked because their symptoms are usually flagrant.

Correlation between attention problems and learning abilities :

Table 4 correlates attention problem and learning abilities of the primary school children. Various forms of reading–writing skills as well as total abilities of the 1st

Table 3 : Attention- deficit-disorders (mean scores SD) of learning abled and learning disabled children as per age and gender			
Respondents category	Attention problems mean score		t- value
	Learning abled	Learning disabled	
Age group			
6-7 years	51.57 ± 1.62	59.79 ± 4.25	9.75*
7-8 years	65.22 ± 4.59	69.39 ± 3.31	3.38*
t- value	14.93*	8.52*	
Gender			
Male	54.41 ± 4.69	59.38 ± 4.41	5.03*
Female	68.42 ± 2.09	68.76 ± 3.43	0.38
t-value	12.97*	8.59*	

* indicate significance of value at $P=0.01$

Table 4 : Correlation between attention problems and learning abilities				
Learning abilities	n	Total sample	Learning abled	Learning disabled
Vocabulary	28	-0.131	-0.073	0.094
Visual Perception	19	-0.317***	-0.210*	-0.282***
Auditory Discrimination	08	-0.287***	-0.171	-0.051
Copying	05	-0.166	0.052	-0.056
Total abilities	60	-0.294***	-0.183	-0.141

* and *** indicate significance of values at $P=0.01$ and $P=0.1$, respectively

and IInd grade children had inverse correlation with attention problems. Correlation co-efficient value was found to be negatively significant with visual perception, auditory discrimination and total abilities at 1 per cent level, whereas, 10 per cent level for copying abilities. The relationship was negative though it was non-significant for vocabulary skills. It showed that, as attention problems among primary school children increased their visual perception, auditory discrimination, copying as well as total abilities decreased.

The study aimed to investigate whether ADHD-is one of the determinants of learning disability. Results revealed that learning disabled children had more attention problems as compared to learning abled children. Thus indicating that learning disabled children had poor concentration, higher impulsivity, hyperactivity and more day dreaming. Correlation analysis also indicated that various forms of reading writing skills as well as total abilities had inverse correlation with attention problems. It showed that, as attention problems among primary school children increased their visual perception, auditory discrimination, copying as well as total abilities decreased. These findings are consistent with those of earlier research; Patnaik (2002) assessed the selective attention capacities of normal and learning disabled children. The sample consisted of 90 normal children from grades III, V and VII and equal number of learning disabled children from grades V and VII. The results showed that the learning disabled performed at lower level on all the measures of selective attention at both receptive and expressive stage. Moreover, with increasing grade the learning disabled-normal difference on physical match and interference measures of selective attention had decreased, indicating a developmental trend. The learning disabled were found to significantly lag behind their normal grade-mates in their general selective attention capacity. The results make it clear that attention problems are common in children with learning disability, which directly or indirectly hampers their academic achievements. One of the academic success barriers for learning disables is concentration *i.e.* paying attention to one single thought and ruling out others, so while they are indulged in a task where they have to concentrate *i.e.* trying to pay full attention, they tend to get disoriented due to their defective articulations which ultimately results in inattention. Attention is a significant predictor of poor arithmetic, phonological loop, visual and auditory

processing, algorithms and mathematical problem solving skills. A learning disabled child with inattention will be struggling to appropriately process and organize information because of attention difficulties (Swanson and Beebe, 2004).

Besides attention problem learning disabled children also struggle to process information through working memory, Recent research has looked at the connection between working memory weakness and learning difficulty, specifically, arithmetic, algorithm knowledge, phonological loop and problem solving Working memory is an executive function. This means it is used to help make momentary decisions as well as longer term plans. Working memory is the area in which phonological or visual information is temporarily stored for the purpose of processing and manipulating information (Swanson and Beebe, 2004; Martinussen *et al.*, 2006). Children with ADHD and learning disability have been found to have weaknesses with their working memory. This leads to difficulty with problems involving the manipulation of verbal and non-verbal information (Martinussen *et al.* 2006). Recent research has looked at the connection between working memory weakness and learning difficulty, specifically in the areas like arithmetic, algorithm knowledge and problem solving. Swanson and Beebe (2004) found that working memory weaknesses contributed to difficulty in mathematical word problem solving and that of phonological processing. This attention difficulty is highly correlated with ADHD and has also been seen to contribute significantly to math disabilities (Martinussen *et al.*, 2006 and Fuchs *et al.*, 2006).

Siegel and Ryan (1989) studied development of working memory in normally achieving and subtypes of learning disabled children. The performance of reading disabled, arithmetic disabled and attentional- deficit-disordered children, age 7-13 was compared to normal achievers on two working memory tasks. They found that the reading disabled children had significantly lower scores on both tasks. The arithmetic disabled had significantly lower scores only on the working memory-counting task, and the attention deficit disordered group had scores similar to the normally achieving children except at the youngest age level in the working memory-sentences task. Children with an arithmetic disability do not have a generalized language deficit but have a specific working memory deficit in relation to processing numerical information.

In another study, Fuchs *et al.* (2006) suggested that working memory has appeared to be a critical factor in mathematical difficulties, there is strong evidence to suggest that working memory and inattention both play a role in learning difficulties in children. These two cognitive factors are also cognitive correlates of ADHD.

Conclusion :

It is thus, concluded that learning disabled displayed higher degree of attention deficit disorders. They were more impulsive, hyperactive, day dreamers and were having poor concentration. The older group of learning disabled children and learning disabled girls displayed maximum number of attention problems.

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