

## A Comparison of cognitive profiles of students with Attention Deficit/ Hyperactivity Disorder and Learning Disorder in Wechsler Intelligence Scale for Children-IV

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### Abstract

**Background:** Some disorders begin by early ages and children with normal intelligence have problems that may distort the growth path. Attention deficit hyperactivity disorder (ADHD) and learning disability disorder (LD) are among the most common of these distorted disorders. Investigating the different domains of mentioned childhood disorders' profiles can contribute to the science. So the aim of this research was to compare cognitive profiles of children with attention deficit and hyperactivity disorder (ADHD) and learning disability disorder (LD) in Wechsler scales for children-IV (WISC-IV). **Method:** The sample included 9 ADHD children that did not take medicine at the time of research, 25 LD and 25 normal children. Convenience sampling was chosen as a sampling method. Children were between 7 to 12 years old. Wechsler scales for children-IV (WISC-IV) were used to assess cognitive profiles. **Results:** There were no significant differences between ADHD and LD children in verbal comprehension index and working memory index, however these two indexes were significantly different in ADHD and LD groups and Normal group. Also, in Perceptual reasoning index there was just significant difference between LD and normal groups. And there was no difference between three groups in processing speed index. **Conclusion:** It seems that neuropsychological deficits are very important components in the appearance of ADHD and LD symptoms.

**Key word:** cognitive profile, ADHD, LD, WISC-IV

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### Introduction

Attention Deficit/ Hyperactivity Disorder are the most common psychiatric disorder that becomes apparent in some children in the preschool and early school years. Early symptoms of ADHD are inattention, Academic problems, impulsivity and hyperactivity that are inappropriate with developmental level (Hynd, Semrud-Clikeman, Lorys, Novey, & Eliopoulos, 1990). Children with ADHD may experience academic failure in school (Barkley, 1997). It is estimates that about 80% of these children show academic problems (Cantwell & Baker, 1992). It is clear that ADHD could result in impaired function in school. So, if a child has learning Disability, it is likely to be ADHD too, and Vice versa. The term of learning Disorder refers to a unit structure or a disorder that is characterized with defects in the development of academic skills. In relation to other children, children with ADHD and LD e perform poorer in cognitive tasks and other neuropsychological tests. A cognitive profile refers to individual cognitive functions, including attention, memory; short term memory, judgment, reasoning, problem solving and comprehension. Children with ADHD and LD are at higher risk for cognitive dysfunctional performances. In particular, a significant percentage of children with ADHD and LD show difficulties in problem solving, organizational skills, expressive language abilities, working memory and processing speed (Barkley, 2005). Measurements could aid clinicians in correct cognitive weakness diagnose, so, the use of sensitive instruments to detect cognitive problems and differences between groups is remarkably contributing. There are specific neuropsychological tests that provide accurate information about the cognitive dimensions. For example, some intelligence tests are composed of tasks that measure different dimensions of cognition. For instance, WISC-IV could evaluate children's cognitive performance in a wider range. WISC-IV highlights the role of working memory, reflecting the importance of working memory in the learning and total cognitive function (Friedman, 2006). Studies about children with ADHD and LD are rare and this is true in the field of psychosocial – cognitive, too. Special studies have estimated almost all cognitive deficits in these children. Exact diagnosing and discrimination of a wide range of cognitive deficits could help specialists design the powerful clinical-educational programs for children with ADHD and LD. Present research's aim is to investigate how children with ADHD and LD perform in Verbal Comprehension Index (VCI), Perceptual Reasoning Index (PRI), Working Memory Index (WMI), and Processing Speed Index (PSI) in WISC-IV.

### Method

The statistical population includes all of normal children in Gorgan schools, and all of children with LD that were referred to LD center in Gorgan in the April to August, 2014, and all of children with ADHD that were diagnosed by psychiatrist. Participants were between 7 to 12 old years. Sampling method for all groups was convenient *sampling*. The sample included 9ADHD children that were not taking medicine at the time of research, 25 LD children and 25 normal ones. Furthermore, Informed consent was obtained from children and their parents before doing research. Participants and their parents were assured that their demographic information would be kept secret. They were told they could leave the research whenever they want.

### Measurements

Wechsler scales for children-IV (WISC-IV): Wechsler intelligence scales are one of the common IQ tests that are provided for three age groups: preschool, children and adults. Wechsler scales for children (WISC) are effective tests, because, Wechsler and his colleagues reviewed it more than twice, and till now four forms of the scale have been published. Wechsler scales for children-IV consist of five types of intelligence: verbal comprehension IQ, perceptual reasoning IQ, working memory IQ, processing speed IQ and total IQ (Wechsler, 2003). In the Iranian population norms, retest reliability was 0/65 to 0/95 and split half reliability was 0/71 to 0/86. Also the validity coefficients have been reported to be 0/66 to 0/92 (Sadeghi, 1390).

### Result

The Subtest means and standard deviations of the three groups are listed in Tables 1 and 6.

**Table1:** Index means Score by group

Index Scores	ADHD		LD		Normal	
	N=9		N=25		N=25	
	M	SD	M	SD	M	SD
VCI	99	13.12	99.04	8.90	112.84	14.55
PRI	94.55	17.14	92.64	13.02	104.34	16.10
WMI	87.77	7.42	85.60	10.25	103.44	14.02
PSI	103.22	7.06	102.12	12.34	112.12	15.64

An ANOVA was utilized to compare VCI mean scores of all three groups. The results showed that there were significant differences in VCI mean scores between groups ( $F(2, 56) = 7.80, P = 0.2$ ). See Table 1 for the ANOVA results.

**Table2:** Multivariate Analysis for Index Scores

Index Scores	SS	Df	MS	F	Sig	$\eta^2$
VCI	2747.84	2	1373.92	7.80	.001	0.21
PRI	1835.64	2	917.824	4.06	.02	0.12
WMI	4325.03	2	2162.51	15.75	.000	0.36
PSI	1388.34	2	694.17	4.37	.01	0.13

To evaluate differences between each two groups in mentioned subscales, post hoc analysis was conducted.

**Table3:** VCI mean different Comparison

Group Comparison	M Dif.	SE	Sig
ADHD. Normal	13.84	4.15	0.009
LD.Normal	13.80	3.91	0.003
ADHD.LD	-.04	3.96	1.00

Post hoc results showed significant differences in VCI mean scores between the ADHD and normal groups ( $P=0.009$ ) and between the LD group and normal group ( $P=0.003$ ), but there were no significant differences in VCI mean scores between the ADHD and LD groups.

**Table4:** PRI mean different Comparison

Group Comparison	M Dif.	SE	Sig
ADHD. Normal	9.80	6.56	0.4
LD.Normal	11.72	4.14	0.02
ADHD.LD	1.91	6.28	0.4

Post hoc results did not show significant differences in PRI mean scores between the ADHD and normal groups and between the ADHD and LD groups. Only significant differences that did occur were between the LD group and normal group ( $P=0.02$ ).

**Table5:** WMI mean different Comparison

Group Comparison	M Dif.	SE	Sig
ADHD. Normal	15.66	3.74	0.001
LD.Normal	17.84	3.47	0.000
ADHD.LD	2.17	3.21	0.8

Post hoc results showed significant differences in mean WMI scores between the ADHD and normal groups ( $P=0.001$ ) and between the LD group and normal group ( $P=0.000$ ). Only there were no significant differences between the LD group and ADHD group.

**Table6:** PSI means different Comparison

Group Comparison	M Dif.	SE	Sig
ADHD. Normal	8.97	3.91	0.8
LD.Normal	10.08	3.14	0.98
ADHD.LD	1.10	3.14	0.98

Post hoc result did not show significant differences in WMI mean scores between the ADHD and normal groups, between the LD group and normal group and between the LD group and ADHD group.

### Conclusion

The results of this study revealed that there were no significant differences between children with ADHD and LD in VCI, PRI and WMI factors, whereas there were significant differences between two clinical groups and control

group in aforementioned factors. A lot of studies have suggested that neuropsychological deficits play a vital role in the appearance of symptoms in ADHD and LD, such as being small right prefrontal cortex, caudate nucleus and Globus Pallidus in children with ADHD (Barkley, 1997; Barkley, DuPaul, & McMurray, 1990; Barkley, Grodzinsky, & DuPaul, 1992; Dophide, 2001; Goodyear & Hynd, 1992) and current neuropsychological hypotheses in LD like Short Attention Span Theory, Minimal Brain Dysfunctions Theory, Hemisphere Dominance and Information Processing Theory declare that some neuropsychological deficits exist in children with LD (Mash, 2008). Also Mash and Wolf (2008), suggested that probably children with learning difficulties face to impairments in one or more of the basic psychological processes. The processes related to cognitive abilities included memory, perception, coordination of the senses, attention, motor skills, and etc. The result of this study was consistent with previous research on verbal comprehension and working memory factors. But the results were a little different on perceptual reasoning and processing speed factors, especially in processing speed that there was no statistically significant difference between three groups. Subscales that measure processing speed are Cancellation, Symbol Search and coding. Normal children had lowest interest to perform coding and Symbol Search subscales despite of researcher's encouragement. While, these children showed great enthusiasm for performance of Cancellation because of attractive pictures that are used in subscale. Children with LD during their special education carried out assignments that were very similar to processing speed subscales, so they were getting ready to do homework faster. Therefore, many children with LD could do those tasks even better than normal children. Also, children with ADHD, predominantly inattentive type showed greater motivation and enthusiasm in doing processing speed subscales, while children with ADHD, predominantly hyperactive-impulsive type was not seen to be motivated. Totally, children with ADHD and LD have neuropsychological deficits, and this issue has been repeated in present research, too. These deficits can affect some children's functions such as cognitive function but in this study we found another factor that can impact neurological frail. Psychological factors such as motivation and interesting in carrying out assignments can decrease neurological affect or improve their function. Accordingly, in the current research attractive and stimulant educational tasks were used and it was tried to increase child's appetite in breeding. There are several limitations that should be considered. Because of lack of literature on this subject, there weren't available enough resources and some resources were out of date. Furthermore, participants couldn't be categorized in subgroups of ADHD and LD groups. So future research should take this issue in to account.

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