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Diagnostic Validity of Wechsler Intelligence Scale for Children-Fifth Edition (WISC-V) with regard to Neuropsychological Characteristics of Children with Learning Disability

[1]Marzieh Shiri Aminlou, [2]Parviz Sharifi Daramadi, [3]Javad Khalatbari

[1]PhD Student in Psychology and Education of Exceptional Children, Science and Research Branch, Islamic Azad University Tehran, Iran.
[2]full Professor of Psychology and Education of Exceptional Children, Allameh Tabatabai University, Tehran, Iran.
[3]Associate Professor, General Psychology, Tonekabon University, Tonekabon, Iran.

Abstract

The extant study was conducted to examine the diagnostic validity of the Wechsler Intelligence Scale for Children-Fifth Edition (WISC-V) with regard to neuropsychological characteristics of children with specific learning disability in Tehran city, Iran. This research aimed to assess the diagnostic validity, emphasizing the logistic regression analysis. Statistical society of study comprised all elementary school students (first, second, third, and fourth grades) who were studying in Tehran during the academic year 2018-2019. The students with learning disabilities have received educational-therapeutic services from governmental and non-governmental educational and learning-specific problems rehabilitation centers. The sample size included 400 students who were selected among the above-mentioned 20 centers using purposive and convenient sampling methods; besides, it also included 400 students without learning disability who were randomly selected among elementary schools in Tehran city, in line with the objectives of the study. WISC-V(2014) was employed as the measurement tool of the present paper. In case of answering the research questions, analysis of tow-level logistic regression (normal students and students with a learning disability) was used with an emphasis on the diagnostic validity. The research findings indicated that Vocabulary and Information (of verbal comprehension scale), Block Design with time score (of the visual-spatial scale), Arithmetic and Picture Concepts (of fluid reasoning scale), Direct Digit Span, Reverse Digit Span, Sequence Digit Span, Picture Span, and Letter-Number Sequencing (of working memory scale), Coding, Random Cancelation and Structured Cancelation tests (of processing speed index scale) had diagnostic validity. The tests mentioned above could diagnose students with learning disabilities among normal students.

Keywords: Diagnostic Validity, Wechsler Intelligence Scales for Children-Fifth Edition (WISC-V), Neuropsychological Characteristics, Children with Learning Disability.

1. INTRODUCTION

Learning disabilities were introduced as the newest subcategory to exceptional children's realms in the 1960s. Samuel Kirk suggested the term "learning disabilities" for the first time in 1963 to refer to children who have difficulties in school. Such difficulties, however, cannot be considered emotional disorders or mental retardation (Ahadi & Kakavand, 2012).

Specific learning disorder affects the learning of those individuals who have normal intelligence or mental performance. This

disorder is not affected by external factors, such as financial, environmental, and educational poverty, so it is associated with neurological disorders, motor disorders, and sensory injuries. Learning disorders may only affect one educational skill, such as reading vocabulary (Diagnostic and Statistical Manual of Mental Disorders (DSM-5), 2013) .

A most important neurological characteristic of children with a learning disability is poor executive and attention functions (Denckla, 2003). Many studies have indicated that children with learning disabilities have problems in executive functions, cognitive and metacognitive skills (Larry, 2001; Semrud & Clikeman, 2005).

Executive functions regulate behavior outputs, and self-regulative functions include stimuli inhibition and control, the use of working memory, cognitive flexibility, planning and organizing problem-solving, and setting a goal to do tasks. All mentioned cases are essential for learning; however, they are defective in coping with learning disabilities (Denckla, 1991, 1996; Pennington, 2005).

The students with learning disabilities have a poor function in the area of cognitive skills, Diagnostic and Statistical Manual Of Mental Disorders (DSM-5)which is the ability to do various mental activities related to learning, problem-solving and doing homework (Seidman, 2006; McCloskey & Lennon, 2009).

Jager, Jansen, and Reezigt (2005) stated that children with learning disabilities have a poor function in the area of metacognitive skills which accounts for storing information in long-term memory and a set of mechanisms that a person actively uses before, during and after the learning and problem solving process to be able to regulate and guide his cognitive function.

Aarnoutse and Van Leeuwe (2000) and Kleitman and Gibson (2011) stated that learning necessitates the awareness of cognitive systems and also the effective use of them for self-monitoring. The individuals with learning disability poorly function in this area (Ehri, 2005; Aksan & Kisac, 2009).

Many studies have mentioned that educational problems of the children with learning disabilities are related to poor skills in the area of cognitive and metacognitive awareness and defective executive functions (Camahalan, 2006; Temur, Kargm, Bayar, & Bayar, 2010).

Semrud and Clikeman (2005) and Geary (2010) argued that children with a learning disability have lower performance than normal children regarding executive functions, working memory, name memory, face memory, visual-spatial and long-term memory.

Langdon and Warrington (1997),Basso, Burgio, and Caporali (2000), Menon, Mackenzie, Rivera, and Reiss (2002), Hale and Fiorello (2004), and Hale, Naglieri, Kaufman, and Kavale (2004) showed that visual-spatial skills, processing speed, and working memory are weak in children with learning disabilities and predict a lower educational progress for these children in educational settings. In fact, defects in executive functions and attention is regarded as a multiple neuropsychological basis causing learning disabilities.

Studies conducted by Alizadeh (2005), Abedi (2008), and Mirmahdi, Alizadeh, and Seyf Naraghi (2009) indicated that children with a learning disability have a problem in neuropsychological aspects (executive functions, attention, language, visual-spatial processing, memory, and learning) and poor performance in different skills rather than their normal peers.

Sadeghi, Zainali, and Foroughi (2019) stated that since the children with learning disabilities have a poor performance in cognitive abilities, accurate and appropriate assessment of mental and cognitive skills of these children with standard and accurate tools such as Wechsler IQ scales has a significant role in identifying strengths, weaknesses and designing an educational and intervention program to develop performance and psychological abilities of children with learning disabilities.

Johnson, Humphrey, Mellard, and Woods (2010) conducted a meta-analysis on 32 studies about the assessment of cognitive processing. They stated that precision and stability in

decisions on having specific learning disabilities is of great importance. One of the components for defining SLD that is controversial, especially in diagnosis methods, is the assessment of cognitive processes because it plays an effective role in both announcing the SLD diagnosis and being eligible to receive specific educational services. The analysis of assessments in this meta-analysis research indicated a significant difference between the groups of SLD students and their normal peers with regard to the ability of cognitive processing. In fact, assessing and diagnosing differences in cognitive processing criteria is sufficient to justify SLD and eligibility.

IQ scales are instruments which are mostly used by psychologists; at the moment, the fourth and fifth versions of Wechsler IQ scales are highly used by experts (Richerson, Watkins, & Beaujean (2014).

Regarding the importance of using this instrument and increasing the quality of psychological characteristics, ease of use and its clinical application, the theoretical and structural foundations of the scale were reviewed and developed several times. Hence, the underlying structure of Wechsler IQ scale is now based on the Cattell–Horn–Carroll theory (CHC) (Van Aken, Heijden, Veld, Hermans, Kessels, & Egger, 2015).This theory has been used to explain and design the structure of cognitive abilities of Wechsler IQ scale with an emphasis on the neurodevelopmental support of this theory (Reynolds, Vannest, & Fletcher-Janzen, 2013).

In this regard,two knowledge and quantitative naming tests are used to measure processing speed concerning educational contexts and have considerable clinical application for clinical appraisal of students with learning disabilities and attention deficit disorder. Moreover, three tests are used to measure learning ability using storage and retrieval, which can be used in clinical fields related to learning disorders (Canivez, Watkins, McGill, 2019).

Because the working memory scale has various clinical applications in diagnosing learning disability, deficit attention disorder, and other developmental-neurological disorders, and psychological interventions of these students, it therefore exists in the majority of intellectual scales. This factor exists in Stanford–Binet Intelligence Scale-Fifth Edition, The Woodcock-Johnson Tests of Cognitive Abilities–Fourth Edition, and WISC-V (Canivez, Watkins, Dombrowski, McGill, Pritchard, Holingue, et al., 2020).

It can be suggested that the intelligence scales in the fourth edition of the Wechsler intelligence scales for adults are related to neurological and personality fields. Thus, with the increase of test anxiety and cortisol levels, the subject's performance in the working memory scale and then the processing speed decrease. Also, we can pay attention to the negative relationship between the trait of alertness and performance in the processing speed scale. This type of research related to clinical fields is directed to the subject's performance in the four scales of intelligence, to the clinical fields of working memory scale and processing speed, which suggests more applications for Cognitive Proficiency. Combining theoretical foundations related to personality traits and intelligence, cognitive dominance is considered as an effective measure, which can be seen today in the theorizing of attention deficit disorders based on Russell Barkley's (1991) perspective(Chaudhry& Ready).

The visual-Spatial imaging test that has been added to the fifth edition of Wechsler Intelligence Scales measures memory capacity in visual areas (Canivez, Grieder, Buenger, 2021).

Image capacity that measures memory capacity in visual areas assesses the memory capacity using visual working memory, and working memory capacity tests in visual areas and visual immediate memory (Pauls, Daseking, Petermann, 2020).

The fourth edition of WISC (2003) has been replaced with the fifth edition in 2014 that are

calculated through 10 core tests of general intelligence (g), verbal comprehension, fluid reasoning, visual-spatial, working memory, and processing speed. Moreover, six secondary tests provide clinical information, so that a wide range of clinical information can be obtained about intelligence functions by integrating all of them (Watkins, Dombrowskib, Canivez, 2018).

Lace, Merz, Kennedy, Seitz Austin, Ferguson, etc. (2022) state that despite widespread use of WISC-V in recent years, limited research has identified full-scale IQ estimates (FSIQ) in clinical specimens. This study sought to fill the gap in the literature with the study of children with learning disabilities who were under psychological neuropathy. The results indicate that the mean scores of WISC-V tests in the medium to the low range have decreased due to the clinical nature of these samples. The mean differences showed that the FSIQ realistic estimates were accurate, with a standard FSIQ score of approximately 81-92% of participants (fifth) in all five factors and 76-65% (tetrad) or all four factors.

Hence, learning disability diagnosis, which is the accurate learning disability diagnosis based on the psychological assessment principles and methods is not a simple and easy measure but requires advanced tools and professional experts. Even if we have a skilled and professional human force without giving valid tools to these experts, we cannot expect to achieve an optimal and precise learning disability diagnosis process. The full version of Wechsler can be introduced as a valid and authentic tool with high efficiency for learning disability diagnosis. Therefore, standardization of this tool is the most important research priority in the exceptional discipline (Miller & Jones, 2016).

It is worth noting that the diagnostic validity of this tool has not been assessed for Iranian elementary school students with a learning disability. Therefore, the present study explored the diagnostic validity of Wechsler Intelligence Scale for Children-fifth edition (WISC-V) among students with learning disability. If the above instrument is of a desirable validity in diagnosing learning disability, it can be used to diagnose these students in elementary schools, specialized institutions and centers related to education, especially exceptional education, and governmental and non-governmental centers providing counseling and psychological services. Furthermore, educators and specialists will be able to design and implement a timely intervention program for children with learning disabilities based on the results of screening and diagnosis of this version of the Wechsler IQ scale.

2. Method

Population, sample, and sampling method

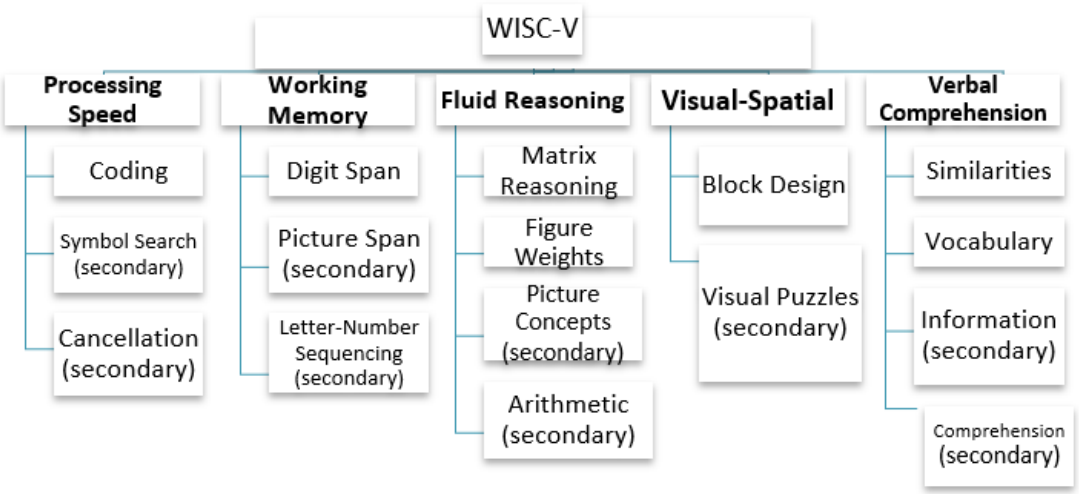
Studies related to validity, especially diagnostic validity consider the target population as the statistical population. Hence, the statistical population of the study comprised all elementary school students (first, second, third, and fourth grades) in Tehran during the academic year 2018-2019; they had diagnostic records as students with learning disabilities in governmental and non-governmental specialized SLD centers in Iran. In line with the research goal, they also included 400 normal students who were randomly selected among the schools in Tehran city. Hence, the present population can be regarded as the target population.

Twenty governmental and non-governmental centers for specific learning problems and 20 elementary schools with almost similar cultural, social, and economic conditions were chosen from 5 municipality districts in Tehran as sampling subjects. Twenty students were evaluated as subjects from each center and school. Therefore, 800 members (400 subjects with a learning disability and 400 normal members) were selected as statistical subjects using a purposive convenient sampling technique. All subjects were evaluated based on the research tool (WISC-V). After the implementation process was ended, all empirical data were inserted into the software and then analyzed. Parents of students who participated in the research signed the consent letter given by the centers.

The measurement tool of the extant study was WISC-V, 2014 and 2015 which has been designed and standardized based on the viewpoints of Wechsler, Edith Kaplan's edition in NCS Pearson incorporation, and the fifth edition of Wechsler Intelligence Scale for Children. This clinical tool approaches cognitive evaluation of 6-16 years and 11 months children and is implemented individually.

The fifth edition includes five primary scales of Verbal Comprehension, Visual-Spatial Processing, Fluid Reasoning, Working Memory, and Processing Speed.The verbal Comprehension Scale includes two primary tests; similarities and vocabulary tests, and two secondary tests; information and comprehension tests. the visual-spatial scale has one primary test; a block design and one secondary test; visual puzzle. The fluid reasoning scale has two primary tests; matrix reasoning and figures weights and two secondary tests of picture concepts and arithmetic. the working memory scale includes one primary test of digit span and two secondary tests of picture span and letter-number sequencing. The processing speed scale includes one primary test of coding and two secondary tests of symbol search and cancellation.

Accordingly, WISC-V includes 16 tests and 21 subtests that its general structure has been shown below:



Statistical analyses have been done within two separate and sequential parts to test research questions about the diagnostic validity of WISC-V with regard to neuropsychological characteristics among students with learning disabilities:

1. Descriptive analyses associated with WISC-V tests among students with a learning disability. To do this, central tendency and dispersion indices were used. The mean index was calculated to show central tendency indices and standard deviation (SD) was measured for dispersion indexes.

Table 1: Number of Normative and Statistical Samples

Condition	Normative Group		SLD Group	
class	Girl	Boy	Girl	Boy
First	*46*	48	42	44
Second	50	51	54	60
Third	54	53	50	56
Fourth	52	46	46	48
	202	198	192	208

Table 2. Descriptive analysis of WISC-V tests among students with a learning disability

Scale	**Test**	**Mean**	**SD**	**Deficiency**
Verbal comprehension	Similarities	9.54	5.20	No
	Vocabulary	4.36	2.70	Yes
	Information	3.66	2.82	Yes
	Comprehension	9.65	4.45	No
Visual-spatial	Block design (with time score)	9.55	4.94	No
	Visual puzzles	9.56	5.11	No
Fluid reasoning	Matrix reasoning	10.11	3.02	No
	Picture concepts	9.61	5.28	No
	Figure weights	9.55	4.95	No
	Arithmetic	3.56	2.46	Yes
Working memory	Digit span (direct)	3.45	2.13	Yes
	Digit span (reverse)	3.90	2.80	Yes
	Picture span	2.64	2.42	Yes
	Letter-number sequencing	2.84	2.96	Yes
Processing speed	Coding	7.04	2.61	Yes
	Symbol search	9.54	5.55	NO
	(Random) Cancelation	7.14	1.63	Yes
	(Structured) cancelation	7.23	2.65	Yes

2. Analyses related to the diagnostic validity of WISC-V's tests among students with a learning disability were done using the analytical-diagnostic method of logistic regression. In this method, data of 400 normal students and 400 students with learning dilatability were used to do diagnostic analysis based on logistic regression. The dependent variable of logistic regression was a two-level variable, which comprised normal students under the "code 1" and students with learning disabilities under the "code 0." Tests' scores are independent variables. The scores greater than one at a significance level of 0.01 and a confidence level of 0.95 indicate diagnostic validity.

3. Findings

- Does WISC-V have diagnostic validity for students with learning disabilities with regard to neuro-psychological characteristics by using logistic regression?

Table 3. Diagnostic validity of verbal comprehension scale based on the logistic regression

Subscale	**B**	**P-value**	**OR**	**CI 95%**	
				Lower	**Upper**
Vocabulary	0.362	<0.01	1.437	1.351	1.529
Similarities	-0.004	0.860	0.996	0.954	1.041
Information	0.345	<0.01	1.412	1.335	1.493
Comprehension	0.017	0.503	1.017	0.968	1.068

According to statistical analyses related to the logistic regression method of WISC-V, vocabulary (OR=1.437, P<0.01) and information (OR=1.412, P<0.01) tests of verbal comprehension scale could significantly predict children's learning disability, while similarities (OR=0.996, P=0.860) and comprehension (OR=1.017, P=0.503) tests could not predict children's learning disability, and did not have an appropriate diagnostic validity.

Table 4. Diagnostic validity of visual-spatial scale based on the logistic regression

Subscale	**B**	**P-value**	**OR**	**CI 95%**	
				Lower	**Upper**
Block design (without time score)	0.027	0.132	1.027	0.992	1.064
Block design (t with time score)	0.812	<0.01	2.252	1.975	2.568
Visual puzzles	0.012	0.490	1.012	0.978	1.047

According to Table 3, block design (with time score) test of visual-spatial scale could significantly predict children's learning disability (OR=2.252, P<0.01), and had a suitable diagnostic validity. On contrary, the results indicated that Block design (without time score) (OR=1.027, P=0.132) and visual puzzles (OR=1.012, P=0.490) tests could not predict children's learning disability, and did not have an appropriate diagnostic validity.

Table 5. Diagnostic validity of fluid reasoning scale based on the logistic regression

Subscale	**B**	**P-value**	**OR**	**CI 95%**	
				Lower	**Upper**
Matrix reasoning	0.049	0.273	1.050	0.962	1.147
Figure weights	-0.002	0.946	0.998	0.943	1.056
Picture concepts	0.475	<0.01	1.609	1.483	1.746
Arithmetic	0.476	<0.01	1.610	1.486	1.745

According to Table 4, picture concepts (OR=1.609, P<0.01) and arithmetic (OR=1.610, P<0.01) tests on a fluid reasoning scale could significantly predict children's learning disability and had a suitable diagnostic validity. On contrary, the results indicated that matrix reasoning (OR=1.050, P=0.273) and figure weights (OR=0.998, P=0.946) tests could not predict children's learning disability, and did not have an appropriate diagnostic validity.

Table 6. Diagnostic validity of working memory scale based on the logistic regression

Subscale	**B**	**P-value**	**OR**	**CI 95%**	
				Lower	**Upper**
Direct digit span	0.351	<0.01	1.421	1.264	1.597
Reverse digit span	0.189	<0.01	1.208	1.080	1.352
Sequential digit span	0.237	<0.01	1.267	1.127	1.424
Picture span	0.339	<0.01	1.404	1.276	1.544
Letter-number sequencing	0.318	<0.01	1.375	1.262	1.497

According to Table 5, direct digit span (OR=1.421, P<0.01), reverse digit span (OR=1.208, P<0.01), sequential digit span (OR=1.267, P<0.01), picture span (OR=1.404, P<0.01), and letter-number sequencing (OR=1.208, P<0.01) tests of working memory scale could significantly predict children's learning disability and had a suitable diagnostic validity.

Table 7. Diagnostic validity of processing speed scale based on the logistic regression

Subscale	**B**	**P-value**	**OR**	**CI 95%**	
				Lower	**Upper**
Coding	.247	**<0.01**	1.281	1.215	1.350
Symbol search	.013	.407	1.013	.983	1.044

Random cancelation	.226	**<0.01**	1.253	1.160	1.355
Structured cancelation	.110	**<0.01**	1.117	1.036	1.204

According to Table 6, coding (OR=1.281, P<0.01), random cancelation (OR=1.253, P<0.01), and structured cancelation (OR=1.117, P<0.01) tests on the processing speed scale could significantly predict children's learning disability and had a suitable diagnostic validity. On contrary, the results indicated that the symbol search (OR=1.013, P=0.273) test could not predict children's learning disability, and did not have an appropriate diagnostic validity.

4. Discussion and Conclusion

The extant study focused on the shortage of empirical information or findings of diagnostic validity of WISC-V. The majority of conducted studies have examined the psychometric features of individual cognitive scales or provided reliability and construct or content validity coefficients of the scales, so their diagnostic validity has been less considered. Hence, those studies that are consistent or are not matched with the findings of the present paper have been proposed relying on the diagnostic validity and testing of the research question in the learning disability group:

- Does WISC-V have diagnostic validity for students with learning disabilities with regard to neuro-psychological characteristics by using logistic regression?

This question was tested using the logistic regression method and it was concluded that "vocabularies" and "information" tests of verbal comprehension scale, "block design with time score" test of visual-spatial scale, "picture concepts" and "arithmetic" tests of fluid reasoning scale, "direct digit span," "reverse digit span," "sequential digit span," "picture span," and "letter-number sequencing" tests of working memory scale, and "coding," "random cancelation," and "structured cancelation" tests of processing speed scale of WISC-V could significantly predict children's learning disability. The tests mentioned above have diagnostic validity in logistic regression and can provide optimal efficiency in the diagnosis of students with a learning disability. Therefore, while recognizing the type of defect, these tests can identify and distinguish students with a learning disability from normal students.

Some studies relevant to the diagnostic validity and reliability of WISC-V in Iran that showed similar results to the present research; for example, Rostami, Sadeghi, Zarei, Haddadi, Torabi, and Salamati (2013) assessed the concurrent validity of the Persian version of Wechsler IQ scale for children-fourth edition (WISC-IV) and Cognitive Assessment System-fourth edition (CAS). The results revealed that there is a concurrent validity between the tests of the two scales. The researchers also mentioned that the tests are able to assess and diagnose the cognitive abilities of children with learning disability And the study of Karami, Karami, and Alipour (2020) that explored the validity of WISC-V by using the fourth edition of WISC. They confirmed the results of high validity of the test in Iran and claimed that their findings are consistent with the results obtained from the construction of test in the USA. Moreover, the results of the present study are in line with those of Changizi, Naderi, and Kamkari (2020) in which they explored the diagnostic validity of learning disability by using the Woodcock-Johnson III Tests of Cognitive Abilities and WISC-V. The results indicated that the working memory and general intelligence scores of children with learning disabilities are lower in the fifth edition of the Wechsler IQ scale than in normal students. There are many differences regarding the scores of factors such as similarities, vocabulary, comprehension, information, word reasoning, picture concepts, figure weights, letter-number sequencing, and symbol search between this group and the normal group; these factors are of diagnostic validity in students with learning disabilities. This study is also in line with foreign studies(outside of Iran) such as the research done by Dumont, Puttaswamy, Barone, Viezel, and Willis (2019) in which the samples were separated into four age groups of

6 to 8 years old, 9 to 11 years old, 12 to 14 years old, and 15 to 16 years old. It was found that in the age range of 6 to 11 years, the internal structure of this tool has 4 scales, but in the age range of 12 years and above, the internal structure increases to 5 factors. Furthermore, the results of the present study are in line with those of Chen, Zhang, Raiford, Zhu, and Weis (2015) in which they explored the lack of factorial change in the WISC-V among samples male and female children. A 5-factor model was tested on a national sample. The results showed that the WISC-V tests indicate the strength of the underlying theoretical and infrastructural structures, the same relationships and validity between each of the factors, the tests and the sum of the factors regardless of gender. Besides, the results of the present study are in line with those of Lace, Merz, Kennedy, Seitz Austin, Ferguson, and Etc.(2022) in which they mentioned that despite the widespread use of the WISC-V in recent years, limited research has identified full-scale IQ estimates (FSIQ) in clinical samples. This study sought to fill the gap in the literature and studied the children with learning disability who were under neuropsychological assessment. The findings indicated that the mean scores for WISC-V tests by regression method and the ratio in the medium to low mean range, according to the clinical nature of these samples has decreased. The mean of differences showed that both regression-based and segmentation/adjustment methods provide realistic estimates of the FSIQ, with the standard FSIQ score being accurate for approximately 81-92% of participants (fifth) in either five factors and 65% -76% (tetrads) or in all four factors. They concluded that it can be said that different results in the validity and reliability of this edition of the scale in different studies can be dependent on the statistical methods and models used in each research, are consistent.

The present study is inconsistent with the study of Watkins, Canivez, Dombrowski, McGill, Pritchard, Holingue, and Jacobson(2021) And (2022); using independent exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) with standardized sample size (N = 2512), they stated that the WISC-V failed to support the five proposed factor groups and no independent reviews have been conducted among the clinical samples. This study examined the latent structure of the 10 initial WISC-V subtests with a large clinical sample whose results did not support the five factors. It was so because Ttre was no prominent pattern coefficient in the sub-factor and in the fifth factor. In fact, it showed a four-factor model similar to WISC-IV with a dominant general factor. It means that a two-factor model with four group factors proposed by CFA and EFA was supported. Moreover, the results of the present study are inconsistent with another study of the aforementioned researchers in 2021 in which they explored the stability and reliability of scores of the WISC-V in an outpatient neuropsychological clinic. They stated that the average WISC-V scores were relatively constant, but the stability scores of the sub-scores were all below 0.80, and the scores only exceeded 0.80 in the Verbal Comprehension Index (VCI), the Visual-Spatial Index (VSI), and the Full Scale Stability Coefficients (FSIQ). It was concluded that VCI, VSI, and FSIQ scores may be stable enough to support normative comparisons, but none of the interpersonal criteria are stable enough to make a reliable clinical decision.

In the present study, in addition to the full-scale intelligence score(FSIQ) that can be cited in diagnosing learning disabilities, the interpretation of indicators and tests confirmed the diagnostic validity of the scale and its tests. However, some factors or indicators more (4 factors of the previous edition) and some less (visual-spatial scale), predicted the learning disability. Despite the existence of diagnostic validity (WISC-5) in neuropsychological characteristics of learning disabilities in this study, it is suggested that further research on cultural, intellectual, and social differences, gender and as well as different statistical methods and models be performed to evaluate the diagnostic validity of the fifth version of the Wechsler IQ scales. Although the creators of the scale claim that we should not see variability in any of these areas, in line with the conducted studies, it is suggested that the

diagnostic validity of the fifth version of children's intelligence scales in addition to clinical samples at the national level,.especially with examples of specific cultural, linguistic, etc. fields should also be examined.

References

[1] Abedi, A. (2008). Cognitive and emotional backgrounds of mathematic learning in children, Yazd, Tenth Conference on Mathematic Teaching.

[2] Ahadi, H., Kakavand, A. (2012). Learning disorders, from theory to practice, Seventh edition, Tehran, Arasbaran.

[3] Aksan, N. & Kisac, B. (2009). A descriptive study: Reading comprehension and cognitive awareness skills journal Of procedia-social-and-behavioral-sciences, Volume 1, Issue 1, 2009, Pages 834-837. https://doi.org/10.1016/j.sbspro.2009.01.149.

[4] Alizadeh, H. (2005). Neurocognitive executive functions and their relationship with developmental disorders, Advances in Cognitive Sciences, 8(4):57-70.

[5] American Psychiatric Association, (2013), Diagnostic and Statistical Manual of Mental Disorder, Fifth Edition (DSM-5).

[6] Aarnoutse, C. A. J. & Van Leeuwe, J. F. J. (2000). Development of poor and better readers during the primary school. Educational Research and Evaluation, 6(3), 251– 278, https://doi.org/10.1076/1380-3611(200009)6:3;1-A;FT251.

[7] Basso, A., Burgio, F., & Caporali, A. (2000). A calculi, aphasia and spatial disorders in left and right brain-damaged patients. Cortex, 36, 265-280.

[8] Camahalan,M. G. (2006). Effects of metacognitive reading program on the reaching achievement and metacognitive strategies of students with cases of dyslexia. Reading Improvement. A Journal Devoted to the Teaching of Reading, 43(2), 77-93.

[9] Canivez, G. L., Grieder, S., & Buenger, A. (2021). Construct validity of the German Wechsler Intelligence Scale for Children–Fifth Edition: Exploratory and confirmatory factor analyses of the 15 primary and secondary subtests. Assessment, 28(2), 327–352. https://doi.org/10.1177/1073191120936330.

[10] Canivez, G. L., Watkins, M. W., & McGill, R. J. (2019). Construct validity of the Wechsler Intelligence Scale for Children—Fifth UK Edition: Exploratory and confirmatory factor analyses of the 16 primary and secondary subtests. British Journal of Educational Psychology, 89(2), 195–224. https://doi.org/10.1111/bjep.12230.

[11] Canivez, G. L., McGill, R. J., Dombrowski, S. C., Watkins, M. W., Pritchard, A. E., & Jacobson, L. A. (2020). Construct validity of the WISC-V in clinical cases: Exploratory and confirmatory factor analyses of the 10 primary subtests. Assessment, 27(2), 274–296. https://doi.org/10.1177/1073191118811609.

[12] - Chaudhry; Maheen, Ready; Rebecca, (2012), Differential Effects of Test Anxiety & Stress on the WAIS-IV, Journal of Young Investigators, Research Article, Vol, 24, Issus 5.

[13] Changizi, T., Naderi, F., Kamkari, K. (2020). Investigate diagnostic validity of the third edition of the new Wadkock-Johnson Cognitive Ability Scale in Learning Disabled Students in Ahvaz city. Psychological Journal of Rooyesh, 8 (3):11-18.

[14] Chen,H. Zhang,O. Raiford, S.E.J, Zhu. Weis,s L. G. 2015 DifferencesFactor invariance between genders on theWechsler Intelligence Scale forChildren–Fifth Edition. Personality and Individual journal.

[15] Denckla, M. B. (1991). Attention deficit hyperactivity disorder, residual type. Journal of Child Neurology, 6, S44-S50.

[16] Denckla, M. B. (1996). A theory and model of executive function: A neuropsychological perspective. In G. R. Lyon & N. A. Krasnegor (Eds.), Attention} memory} and executive (unction (pp. 263-278). Baltimore: Brookes.

[17] Denckla, M. B. (2003). ADHD: Atopic update. Brain and Development, 25, 383 389.

[18] Dumont; Ron, Puttaswamy; Ash, Barone; Anjelica,. Viezel; Kathleen. D, Willis;

John, (2019), Wechsler Intelligence Scale for Children–Fifth Edition Ancillary and Complementary Index Critical Values and Base Rates for the Normative Sample, Journal of Psychoeducational Assessment, Vol 1, 1-12.

[19] Ehri, L. (2005). Learning to Read Words:Theory, Findings, and Issues. CScientific Studies Of Reading, Volume 9, 2005 - Issue 2 9(2), 167–188. https://doi.org/10.1207/s1532799xssr0902_4.

[20] Geary, D. C. (2010). Mathematical disabilities: Reflectionson on cognitive, neuropsychological and components. Learningan dIndividual Differences, 20, 130-133.

[21] Hale, J. B., & Fiorello, C. A. (2004). School neuropsychology: A practitioner's handbook New York: Guilford Press.

[22] Hale, J. B., Naglieri, J., Kaufman, A. S., & Kavale, K. A. (2004). Specific learning disability classification in the New Individuals with Disabilities Education Act: The danger of good ideas. The School Psychologist, 58, 6-14.

[23] Johnson, Evelyn. Humphrey, Michael. Mellard, Daryl. Woods, Kari. L.(2010). Cognitive Processing Deficits and Students with Specific Learning Disabilities: A Selective Meta-Analysis of the Literature.February Learning Disability Quarterly 33(1):3-DOI:10.1177/073194871003300101.

[24] Jager, B., Jansen, M., & Reezigt, G. (2005). The Development of Metacognition in Primary School Learning Environments. School Effectiveness and School Improvement, Volume 16, 2005 Issue 216(2), 179-196. . https://doi.org/10.1080/09243450500114181.

[25] Karami, A., Karami, R., Alipour, A. (2020). The investigation of psychometric properties of the fifth version of Wechsler Children's Intelligence in Iran, Journal of Educational Measurement, 11(41), DOI: 10.22054/jem.2021.51727.2036.

[26] Kleitman, S., & Gibson, J. (2011). Metacognitive beliefs, self-confidence and primary learning environment of sixth grade students. Learning and Individual Differences, Volume 21, Issue 6 21, 728–735. https://doi.org/10.1016/j.lindif.2011.08.003.

[27] Langdon, D. W., & Warrington, E. K. (1997). The abstraction of numerical relations: A role for the right hemisphere in arithmetic? Journal of the International Neuropsychological Society, 3,260-268.

[28] Larry, J. S. (2001). Static balance and developmental coordination disorder. journal of Human Movement Science, 22(4),527-548. doi: 10.1016/j.humov.2003.09.008.

[29] McCloskey, G. & Lennon, L. (2009). Applying an Executive Function Framework in Educational Therapy. In M. Ficksman & J.U. Adelizzi (Eds). Clinical Practice of Educational Therapy: A Teaching Model. New York: Routledge Press.

[30] Menon, V. Mackenzie, K. Rivera, S. & Reiss, A. (2002). Prefrontal cortex involvement inprocessing incorrect arithmetic equations:Evidence from event-related fMRI. Human BrainMapping, 16, 119-130.

[31] Miller; D., & Jones; A. M., (2016), Interpreting the WISC-V from Dan Miller's integrated school neuropsychological/ Cattell-Horn-Carroll model, In A. S. Kaufman, S. E. Raiford, & D. L. Coalson (Eds), Intelligent Testing with the WISC-V, Hoboken, NJ: John Wiley & Sons.

[32] Mirmahdi, S. R., Alizadeh, H., Seyf Naraghi, M. (2009). The impact of training executive functions on mathematics and reading performance in primary students with specific learning disabilities, Journal of Research on Exceptional Children, 1, 1-12.

[33] Pauls, F., Daseking, M., Petermann, F. (2020). Measurement invariance across gender on the second-order five-factor model of the German Wechsler Intelligence Scale for Children–FiftheditionAssessment,27(8),1836-1852. https://doi.org/10.1177/1073191119847762.

[34] Pennington, B. F. (2005). Toward a new neuropsychological model of attention-deficit/hyperactivity disorder: Subtypes and multiple deficits.Biological Psychiatry, 57, 1221- 1223.

[35] Reynolds, C. R. J. Vannest, J.K & Fletcher-Janzen, E. (2013). Encyclopedia

ofspecial education: A reference for the education of children, adolescents,and adults with disabilities and other exceptional individuals (Vol. 3).

[36] Richerson, L. P., Watkins, M. W., & Beaujean, A. A. (2014). Longitudinal Invariance of the Wechsler Intelligence Scale for Children˚ Fourth Editionin a Referral Sample. Journal of Psychoeducational Assessment,0734282914538802.

[37] Rostami,R. Sadeghi,V. Zarei,J. Haddadi, P. Mohazzab-Torabi,S. Salamati,P. (2013).Concurrent Validity of Persian Version of Wechsler Intelligence Scale for Children - Fourth Edition and Cognitive Assessment System in Patients with Learning Disorder. 2013IRANIAN JOURNAL OF PEDIATRICS Apr; 23(2): 183–188.

[38] Sadeghi, A., Zainali, S., Foroughi, Z. (2019). The Effect of Cognitive Skills Training on the Performance and Cognitive Abilities of Children with Learning Disabilities. Journal of Learning Disabilities, 8(2), 38-57. doi: 10.22098/jld.2019.756.

[39] Semrud clikeman,M(2005). Neuropsychological. Aspects for Evaluating Disabilities. Journal of Learning Disabilities, 38,563,568.

[40] Seidman, L.J. (2006). Neuropsychological functioning in people with ADHD across the lifespan. Clinical Psychology Review 26,466 485.

[41] Temur, T., Kargm, T., Bayar, S, A., & Bayar, V. (2010). Metacognitive awareness of grades 6, 7 and 8 students in reading Process. Procedia Social and Behavioral Sciences vol/2/issue/ 2, 4193–4199.https://doi.org/10.1016/j.sbspro.2010.03.663.

[42] Van Aken, L, van der Heijden, T, van der Veld, W .Hermans, L, Kessels, R, and

[43] I. M. Egger, J. (2015). Representation of the Cattell˚Horn˚ Carroll Theoryof Cognitive Abilities in the Factor Structure of the Dutch-LanguageVersion of the WAIS-IV. Assessment 1˚ 9,DOI: 10.1177/1073191115607973 .

[44] Watkins, M.W., Canivez, G.LDombrowski, S.C., McGill, R.J., Alison E. Pritchard, A.E., Holingue, C.B., Jacobson, L.A. (2021,2022). Long-term stability of Wechsler Intelligence Scale for Children–fifth edition scores in a clinical sample, Applied Neuropsychology: Child . Jul-Sep 2022 .10.1080/21622965.2021.1875827, (1-7), (2021).

[45] Watkins; Marley W, Dombrowskib; Stefan C, Canivez; Gary L. (2018), Reliability and factorial validity of the Canadian Wechsler Intelligence Scale for Children–Fifth Edition, Journal of school & educational Psychology, Vol 6, 252-265

[46] Wechsler; David., Kaplan; Edith., (2015), Wechsler Intelligence Scale for Children fifth edition-integrated, Technical and Interpretive Manual, NCS Pearson.

[47] Wechsler; David, (2014), Wechsler Intelligence Scale for Children-Fifth Edition (WISC-V), Administration and Scoring Manual, Pearson Publisher.

[48] W Lace , j. Merz, z. c. Kennedy, E.E. Seitz.D.J. Austin,T.A. Ferguson,B.J. Mohrland,M.D.(2022.)Examination of five- and four-subtest short form IQ estimations for the Wechsler Intelligence Scale for Children-Fifth edition (WISC-V) in a mixed clinical sample. Appl Neuropsychol Child.Jan-Mar 2022;11(1):50-61.doi10.1080/21622965.2020.1747021. Epub 2020 Apr 16