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Diagnosis of Learning Disability in Children

Marzieh Gholamitooranposhti, Ph.D.
Department of Psychology, Roudehen Branch, Islamic Azad University, Roudehen, Irant
Ali Delavar*, Ph.D.
Department of Assessment and Measurement, Faculty of Psychology and Educational Sciences, Allameh Tabataba'i University, Tehran, Iran.
Hassan Pasha Sharifi, Ph.D.
Department of psychology, Roudehen Branch, Islamic Azad University, Roudehen, Iran.
Nastaran Sharifi, Ph.D.
Department of psychology, Roudehen Branch, Islamic Azad University, Roudehen, Iran.

Abstract

Children with cognitive disability have a poor performance in all of the visual –motor tests. Therefore, diagnosis and rehabilitation of these learning disabilities seem necessary. The purpose of the present study was to construct and normalize a learning disability test for pre-school students. A researcher-made visual-spatial test was devised consisting of seven sections (symbolization, space status, visual distinction, visual argumentation, visual memory sequence, maze, and rotational form) whose content validity was confirmed by psychology professors and then was performed on a sample of 206 preschool students. The questions were analyzed, and their validity, reliability and cut point were determined. This test showed an acceptable reliability. Then, to determine the construct validity and components of the tests, Varimax normalized method was used. Conformity factor analysis was also used to determine the validity of the factors which confirmed that the structure of questionnaire had an acceptable fitness to the data. Independent t-test demonstrated that there is a significant difference between the average scores of the normal students and those with learning disability. To investigate convergent validity, we used learning disability checklist that was simultaneously completed by the mothers. The results of Chi-Squared test demonstrated that there is a significant relationship between these two variables: the completed checklist by mothers and completed learning disability test by children. Considering the acceptable reliability and validity of the tests, it can be a tool to be used by learning disorders and counseling centers.

Key words: learning disability, construct, children, normalization, preschool.

Introduction

Visual perception involves complex and active processes. Visual perception depends on visuospatial working memory, especially the spatiotemporal integration of the perceived elements through the ocular exploration of visual scenes (Pisella, 2017). Mohammad, Rashed and Shirmohammadi (2017) believed when performing tasks such as remembering letters, numbers, objects, or shapes, a person's Visual Sequential Memory (VSM) plays a crucial role, especially when the order of the tasks is important. Lack of VSM makes the person's life more challenging, possibly leading to dyslexia and dyscalculia. Visual perception is a process in which visual information gets analyzed. In this process, vision gets integrated with other senses' information and past memories.

Weakness in visual perceptual skills is one the most important reasons of learning disorders in a way that the federal government of America considered resolving visual perception disability as a remedy for learning disorders (Association, 2013). Also, it was found that small kids that have problems in visual perception, are faced with more reading problems at school age (Ortiz, Estévez, Muñetón, & Domínguez, 2014). Meanwhile, direct training of visual perception abilities is proposed as a reassuring method for

* **Correspond Author**
Email: delavarali@yahoo.com

recovery and improvement of dyslexic students' reading performance (Nandakumar & Leat, 2008). Processing information in the visual perception field is defined to be one of the most important predicting factors for class readiness. Kids suffering from cognitive disabilities show poor results in every visual-motor test, especially the performance of kids suffering from learning disabilities in the Bender-Gestalt test in multiple studies is lower than their peer (Silver & Hagin, 2002).

Bugden and Ansari (2016) found out those who are suffering from advanced math disorder (Dyscalculia) have a weaker visual perception and weaker active visual - spatial memory and that these factors play an important part in divulging math disorders. Sometimes, math and reading disorders happen at the same time and as the results of some studies showed, disorders in reading and math have a relationship with weakness in active memory, processing speed and verbal understanding (Willcutt et al., 2013). To achieve diagnoses before entering school, it is necessary to identify these students at the age of 5 to perform therapeutic and educational proceedings as fast as possible.

Method

Participants

The method of this research was survey - descriptive. The statistical society of this research consisted of 350 preschool kids that, by choosing 206 people about 60% of students were chosen as the samples of the study ($\frac{206}{350} = 60\%$ is enough). The sample group included kids that were between the ages of 5 years and 6 months to 5 years and 12 months.

For checking the reliability, three methods were used: A-Retesting Method B-Parallel, Peer or Equivalent Tabs method and C-Internal Consistency Method (Delavar & Zahrakar, 2010).

Instruments

For creating the study tools, some actions were made as listed below:

1- First, all of the preschool books were studied carefully and a list of their content was developed and then some preschool teachers were invited to some meetings to offer their points of view on this subject;

2- Then, the available theories about preschool children learning disabilities were studied and the test components with a number of subscales related to available components in the children learning disability theories were determined;

3- Next, the experimental form was prepared and adjusted. For example, Frostyge's theory believes that spatial perception is to some extent dependent on the ability to distinguish between the same letters as "d and b". There are several questions raised in this regard.

4- A sample of preschool children was randomly selected.

5- The test was performed on the people of the sample group;

The researcher-made visual-spatial test consisted of seven sections (symbolization, space status, visual distinction, visual argumentation, visual memory sequence, maze, and rotational form);

6- Finally, the test psychometric specifications were analyzed and studies.

To verify the reliability of the questionnaire, three methods were used: a) the method of open examination, b) the method of parallel and c) peer or equivalent method.

Goodenough IQ Test:

This test is one the simple tests to evaluate children general intelligence devised by Florence Goodenough. This test has 51 parts and is used to measure the intelligence of 3 to 13 old children. Kid's total score determines their Mental age. The reliability of this test using Classification Method was 0.80 and retesting coefficient after 12 weeks was 0.75. Validity of this and Stanford - Binet test using the correlation coefficient was reported between 0.36 and 0.74 (Behpajoh & Salehi, 2001).

Learning disability checklist:

This checklist had 69 questions based on some theories about Bio-neural structure of people suffering from learning disorder. This form is specific to preschool children and is filled by their mothers and its content validity was confirmed by some experts and the reliability was estimated to be 0.92 (Gholami, Delavar & Sharifi, 2017).

Procedure

The perception visual- spatial learning disability test was conducted in 3 stages. The first test consisted of 30 questions conducted on 60 students. After analyzing them, a lot of these questions were removed and the test was piloted again. The secondary pilot test consisted of 74 questions whose reliability was checked through the Cronbach's alpha estimated to be 0.71. Then by using the loop method, the eighth question of the spatial perception factor was removed and the spatial rotation factor was fully removed, in

the end 51 projective questions were remained for the final performance.

Findings

The purpose of this study was to construct and validate a learning disability diagnosis test and to discuss its psychometric properties.

Internal Consistency (Cronbach's Alpha)

The results of the final estimation of learning disability test subscales in the study showed that Alpha's coefficient for the subscales of symbolization, space situation, clear sight, visual reasoning, visual sequential memory, maze and shape rotation are 0.88, 0.83, 0.78, 0.61, 0.65, 0.42, 0.50 respectively and the total scale of learning disability is 0.82.

As it can be seen, the internal consistency coefficient of the components and the full set of 51 projective questions (Alpha's coefficient) are at an acceptable level which shows the high precision of the test in evaluating the intended attributes by the tests makers.

Retesting

Twenty of the students after a time gap of 25 days answered all of the questions again and then, consistency coefficient of the subscales as well as the full scale were calculated. The domain of correlation coefficient was 0.86. This result implies that the questions of the learning disability test have high consistency.

Duplicating

In this research, the statistical calculations showed that the Pearson correlation coefficient between the two halves of the questionnaire is r= 0.76. This coefficient of credit shows that the two halves of the questionnaire were highly correlated and had a high internal consistency.

Validity of Learning Disability Test

To check the validity of this questionnaire, face validity, discriminant validity, concurrent validity and construct validity (factor analysis) were checked.

Face Validity

The appearance of the test was reviewed by four psychology professors and ten experienced preschool teachers who were asked to clarify obscure questions and give comments about the face validity of each question.

Discriminant Validity

Can the perception visual - spatial learning disability test separate normal kids from kids with learning disability?

Table 1.
Independent T Test for comparing normal kids and kids with learning disability

	Leven's test for equality of variance		T-test for equality of means				
	F.	**Sig.**	**T**	**D.F.**	**Sig.**	**Mean Def.**	**Std. error .d**
Equal variance assumed	1.16	2.82	-16.59	204	0.001	-24.97	1.50
Equal variance not assumed			-14.54	22.05	0.001	-24.97	1.71

The result of independent T-Test showed that the learning disability test differentiates between the normal kids and kids with learning disability.

Convergent Validity

Is there a relationship between perception visual - spatial learning disability test and the checklist filled by the mothers?

In this test, for checking the concurrent validity, the learning disability checklist which was filled by the mothers was analyzed.

Table 2.
Chi-squared test used for checking the relation between the two variables of the filled checklist by mothers and the learning disability test

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1237.131[a]	888	0.001
Likelihood Ratio	342.821	888	1.000
Linear-by-Linear Association	11.702	1	0.001
N of Valid Cases	130		

The above Table shows the results of the Chi-square test with its value as 1237.13 which is significant. Therefore, we conclude that there is a significant relationship between the two variables of the mother-filled checklist and the learning disability test.

To find the relationship intensity between the two variables (learning disability test and the checklist), the Cramer's V test was used.

Table 3.
Cramer's V test

		Value	Approx. Sig.
Nominal by Nominal	**Phi**	3.085	0.001
	Cramer's V	0.630	0.001
N of Valid Cases		130	

The last Table shows the results of the Cramer's V test. The numerical value of this statistic is 0.63 which is significant at the 0.001 level. It can be concluded that the intensity of the relationship is relatively high.

Construct Validity

Which factors saturated the content of the perception visual - spatial learning disability test?

To determine if the set of materials of the questionnaire consists of important and significant factors, an exploratory factor analysis was performed through analyzing the main components and Varimax rotation.

Table 4.
The results of related sizes to KMO and Bartlett's test in learning disability test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		**0.731**
Bartlett's Test of Sphericity	**Approx. Chi-Square**	3225.004
	df	861
	Sig.	0.000

As seen in the table, the amount of KMO is 0.73 and meaningful level of the Bartlett's test is lower than 0.005. So based on both criteria, it can be concluded that the implementation of factor analysis based on the correlation matrix is the result of the sample group.

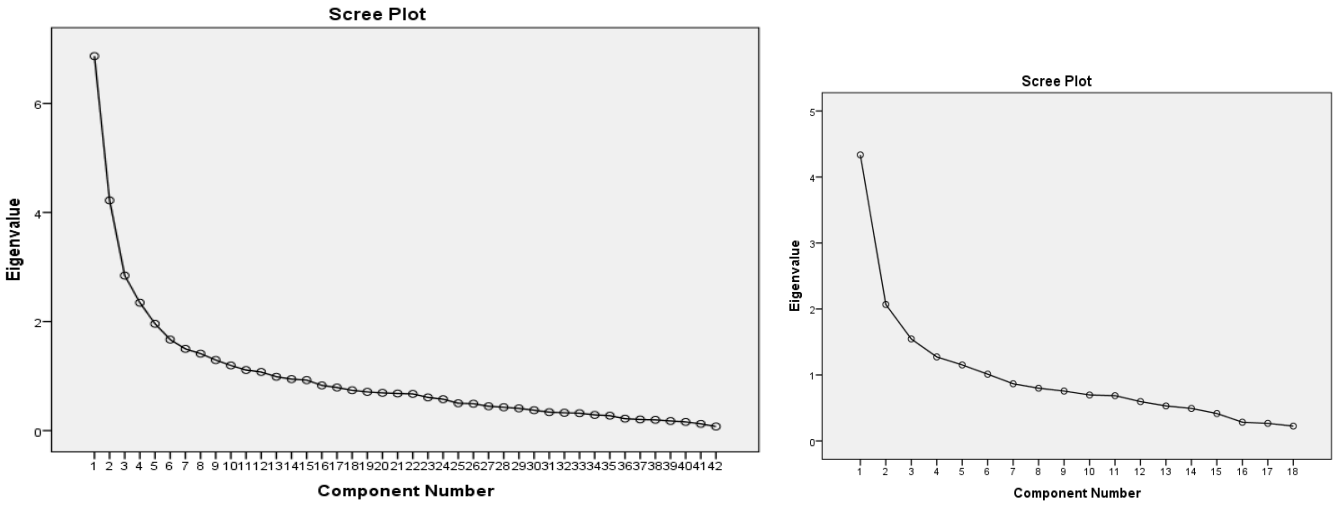

Figure 1.
SCREE

Also, SCREE chart structure was used to continue the analysis and to adopt the right solution.It can be concluded from SCREE chart that the first factor in the not rotated solution always expresses the most variance which in this test is about 16 percent and the total amount of the expressed variance by the twelve main factors is 65 percent. The most important factor is symbolization, situation in space, visual distinction and the least important factor is maze and rotate shapes. The selection criterion for identifying each factor was a factor of 0.3 up. In the analysis of factors, 7 factors were named.

Table 5.
The factors and number of questions related to each factor are their importance, respectively

Factor	Question Number associate to any question	Title factor
Factor 1	1-2-3-4-5-6-7-8-9-10	symbolization
Factor 2	1-2-3-4-5-6-7	situation in space
Factor 3	1-2-3-4-5	visual distinction
Factor 4	1-2-3-4	visual reasoning
Factor 5	1-2-3-4	sequence of visual memory
Factor 6	1-2-4	maze
Factor 7	2-4-5	rotate shapes

The above table shows that the most important factor in learning disability is the symbolization and situation in space.

Moreover, LISREL software was used to verify the confirmatory factor analysis and the fit model was examined.

Table 6.
Model Fit Summary

scale	IFI	RMSEA	CFI	AGFI	GFI	$\frac{x^2}{df}$
state in space and visual distinction	0.97	0.07	0.97	0.89	0.93	$\frac{114.17}{53}$
visual reasoning, sequence of visual memory, maze and rotate shapes	0.68	0.04	0.67	0.84	0.90	$\frac{105.67}{71}$

The comparative fit index (CFI) and the root mean squared error of approximate was (RMSEA) 0.08 or lower (Kline, 2015), goodness of fit index (GFI) and the adjusted goodness of fit index (AGFI) were bigger or equally to 0.09 which would be indicative of very good fit between the hypothesized model and the data (Browne & Cudeck, 1993; Hu & Bentler, 1999).

Discussion and Conclusion

Weakness in perceptual visual - spatial skills is considered as one of the most important reasons of learning disability.Moreover, many neuroscience experts believe that synaptic bonds in the field of brain development in the early years of life are a lot higher than the next periods. Also, it is believed that in the age range of 5, they slightly get reduced; therefore, the researchers of this study decided to devise a test that could identify learning disability in the age of 5. For this purpose, the perception visual - spatial learning disability test was created in three stages. At first, the primarily pilot test was executed with 60 people: in this stage the level of perception and understanding of preschool students was clarified. The questions were analyzed, some were deleted, and the new test was repiloted with a sample of 68 people whose results were analyzed and the final form was prepared. The final test was executed on a group of 206 preschool students of Shahr Babak city. For the final review of the test, three methods were used: A- Internal consistency method; B- Retesting method C- Parallel, and Peer or Equivalent forms method.

For checking the internal consistency of the questions, the Cronbach's alpha method was used and the amount of the Alpha on the whole scale of learning disability was 0.82.

For calculating the retesting method, the number of 20 people participated in the test - retest process, correlation coefficient was calculated between both sets of the subscale scores and whole scales. The domain of the correlation coefficient was calculated to be 0.86 which shows a meaningful relationship in the error rate of 0.01. Also, the Pearson correlation coefficient between the two halves of the questionnaire was found to be r= 0.76. This credit coefficient showed that there is a high correlation between the two halves of the questionnaire. The collection of the factors showed that the final test has high reliability.

For checking the discriminate validity and that the test differentiated between normal and disability people, the independent T test was used whose results showed that the test differentiates between the normal and disable kids. For checking convergent validity, the learning disability checklist was used which was filled by the participants' mothers. Then, the answers of 130 people were analyzed with the Chi- Squared test showing that this relationship was meaningful at the 0.00 level. Therefore, we concluded that there is a meaningful relationship between the two variables of the checklist completed by the mothers and the learning disability test completed by the children. For analyzing construct validity, the exploratory factor analysis method in Varimax method was used. It can be deduced from analyzing the spatial perception subtest and question factors that there are 7 significant factors: the most important factors in order are perceptual symbol finding, shape status in space, clear sight, visual reasoning, visual sequential memory, maze and object rotation and 65 percent of the whole variance is explained in this regard.

1-It is suggested that another test be constructed for children with dyslexia who are mostly suffering in areas such as morphology, phonology, semantic and pragmatic like rapid automatized naming test (Ghaem, Soleymani, & Dadar, 2011; Soleymani, Barkhordar, 2011).

2-Regarding the importance of early identification of students with learning disabilities, it is suggested to do the same research in other areas and compare the results with those of this study.

3- It is advisable to set up a program for the treatment of learning disabilities from a preschool age because when students go to school, they have to follow the curriculum along with their classmates and do not have the opportunity to take medical treatment.

4- It is suggested that some longitudinal studies be conducted on this test. For example, finding the students with learning disabilities in preschool and follow up to see if they have the same problem in third grade.

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