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Validity and Reliability Benton visual-Retention test in brain-injured diagnosis of 8 to 10 years old children in Tehran

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Abstract

The objective of present study is to review the validity and reliability in brain-injured diagnosis of 8 to 10 years old children in Tehran. A group of one hundred elementary school students in second to fourth grade was adopted in a multi stage cluster sampling. The second group was 30 children who referred to neurology centers and was matched according to age, sex and academic grade and intelligence quotient (IQ) with normal children. For the study of test validity "two parallel forms" administration and "one from with two different" administration were applied. Accordingly the test was carried out for one hundred 8 to 10 years old (male and female) children. The validity coefficient for two parallel forms an immediate reconstruction administration was 0/74 and as delayed reconstruction administration was 0/69 while the validity coefficient for C from with two administrations was 0/80 and the validity coefficient for E from with two administrations was 0/83. For the collection of evidence relating to validity of groups differences, two independent means by using T-test and Z- test respectively and the evidence concerning convergent validity by using correlation coefficient with Bender-Gestalt test were applied. The results showed that in Benton Visual –Retention test the brain –injured children have discriminatory power with respect to normal children. Generally, the findings of the present study indicate that Benton Visual – Retention test may be used as a simple and valid test for assessment of brain – injured in 8 to 10 simple and valid test for assessment of brain-injured in 8 to 10 years old children of Tehran.

Keywords: Validity, Reliability, Benton visual-Retention test.

Introduction:

Neuropsychological assessment plays an important role in the diagnosis and treatment of children with developmental and learning disorders. A neuropsychological evaluation can provide critical information regarding the integrity of the central nervous system and give a detailed picture of a child's

neurocognitive functioning across a wide range of abilities. Notably, neuropsychological assessment can contribute to a functional developmental approach by elaborating upon a child's unique profile of strengths and weaknesses and the particular component skills and processing deficiencies that may be contributing to developmental, learning, and social-emotional adaptation or difficulty. Neuropsychological assessment can help distinguish neurogenic (brain-based) from psychogenic (psychological) conditions, sort out how problems in one domain of functioning may impact on another, and guide educational, remedial, and psychotherapeutic interventions (Semrud-Clikeman, 2005;Cortiella & Horowitz, 2014).

Learning Disability as a disability has received significant attention recently in light of the urgent need to ensure timely identification and remediation in order to minimize and prevent its disabling effects on learning in individuals. Often quoted as an 'invisible disability', as not easily identifiable like other 'disabilities', Learning Disability is marked by significant difficulties in learning and academic achievements, with no other obvious disability in individuals. A 'heterogeneous group' of disorders, 'Learning Disability' is manifested by significant difficult ties in the 'acquisition and use of listening, speaking, reading, writing, reasoning or mathematical abilities, and are intrinsic to the individual and presumed to be due to Central Nervous System dysfunction (Pesovaa, Sivevskab & Runcevac, 2014).

The primary identification of students with Learning Disabilities is done usually at the school by the teachers, who through observation assess the need for diagnosis and assessment of these children, who are then referred by them to the special educators (or counselors in absence of special educators in the school) who try to identify the traits of the disorder present in the child (Ahmad, 2015). Child educators and psychologists encounter various learning disabilities, Including those emerging from problems in visual perception, memory and constructional abilities (Huang, Wu, Jing, Wang & Chen, 2007; Mammarella & Pazzaglia, 2010). A number of measures target visual perception and memory impairments, including the Benton Visual Retention Test (BVRT) and the Bender Visual Motor Gestalt Test (Bender, 1938; Koppitz, 1963; Lezak, Howieson & Loring, 2004; Benton, 1992). These tools have been an essential part of the educational and psychological communities' assessment strategies since the early part of the 20th century (Lezak, Howieson & Loring, 2004).

Snow (1998) is examined the factor structure of the BVRT for its value as a measure to diagnose learning disabilities. He sought to determine the "extent to which (the BVRT) assesses visual memory constructs. His study exemplified a developmental pattern with BVRT, although results indicated the assessment's sensitivity is limited to certain ages and seems to plateau at age 9 or 10 (Snow, 1998). The BVRT scoring system has a high inter-rater reliability, with reliability of 0/85 to 0/96 for correct scores and 0/93 to 0/97 for error scores (Lezak, Howieson & Loring, 2004). Lezak (1982) also indicates that the BVRT has high test-retest reliability. Factor analytic results show explained variance values of 0/55 for the visuospatial factor, 0.45 for the memory factor and 0/42 for the concentration factor (Larrabee, Kane, Schuck & Francis, 1985).

Steck (2005) Selected items from various forms of the original Benton Visual Retention Test were used to construct two parallel forms with 20 items in each form. The extension of the test has improved its reliability, often criticized as being too low. By enhancing the reliability, is improved the sensitivity of the test for impairment. Messinis, Lyros, Georgiou and Papathanasopoulos (2009) examined relationships between demographic variables and Benton Visual Retention Test performance in 352 healthy adults, aged 18-84 years. They investigated BVRT performance in 28 acute stroke patients M = 6.14 days after insult. Age, education, and IQ, but not gender, were significantly associated with BVRT performance in healthy participants. The test appears to discriminate adequately between acute stroke patients and matched healthy controls.

Zanini and et al (2014), provided evidence of criterion validity for the Benton Visual Retention Test by making comparisons between older adults with and without a possible diagnosis of Alzheimer's disease. The control group was composed of 50 older adults, and the clinical group was composed by 16 subjects.

The results pointed to evidence of validity for the Benton Visual Retention Test for Administration A (Memory) and Administration C (Copy). The clinical group had significantly poorer performance on most scores. Therefore the BVRT is among the top five tests used by school and clinical psychologists and indicate neurological intactness. The test has been used as a personality test, a test of emotional problems and also as a screening device for brain damage.
Neuropsychological instruments must undergo the same process of validation and adaptation as psychological instruments. Authors consider this important; especially when an instrument is used in another country, because of differences in culture that can generate differences in scores.
It seems this test as much as ever to be an excellent screening test that is also practical and economical. The aims pursued here are to establish a satisfactory reliability and validity.

Research methodology

The population, sample and sampling

The design of this research was cross-sectional with causal-comparative method. A group of one hundred elementary school students in second to fourth grade was adopted in a multi stage cluster sampling. The second group was 30 children who referred to neurology centers and was matched according to age, sex and academic grade and intelligence quotient (IQ) with normal children. For the study of test validity "two parallel forms" administration and "one from with two different" administration were applied.

Research tools

Benton Visual Retention Test

The Benton Visual Retention Test (BVRT) (Benton, 1955; Benton, 1992) is a neuropsychological test of non-verbal memory assessing visual perception, visual memory and visuo-constructive abilities. The test is frequently incorporated in neuropsychological assessment batteries (Thompson, et al., 2006) due to its sensitivity in detecting cerebral disease (Messinis, et al., 2009; Benton, 1992) and its ability to enable assessors to determine the specific acquired cognitive deficit (Thompson, et al., 2007), deciphering whether the deficit is perceptual, motor or memory in nature.
This test comprises a series of geometric shapes, with each design comprising either one major figure or two major figures and one smaller peripheral figure. There are three separate forms, C, D and E that contain 10 designs (simple line drawings). Each of the forms is of approximately equivalent difficulty. Administering the BVRT involves presenting the patient with a drawing of a geometric figure for a variable period of time and then removing the drawing from sight. After a variable delay period, dependent on the administration employed, the patient is then instructed to reproduce the geometric figure previously presented relying solely on their visual spatial memory. Administration A, the standard procedure of the BVRT, involves presenting the drawing for 10 seconds and then requesting immediate recall of the geometric shape. Administration B involves presenting the drawing for 5 seconds and then requesting immediate recall of the geometric shape and administration C involves directly copying the geometric shape. Administration D involves exposure to the drawing for 10 seconds and a delayed response time of 10 seconds. Patient's performances are evaluated based on the number of correct reproductions and the number of errors produced, with an all-or-none score credited (1 for correct or 0 for error). Vakil, et al. (1989) argue for the use of both error and correct scores when evaluating a patient's performance on the BVRT following their research suggesting that error and correct scores are not related in those with right cerebral hemisphere damage. Clinically practical benefits of the BVRT include a short-administration time (the approximate administration time is 5 – 10 minutes) and precise scoring criteria.

Benton and Spreen (1961) found that simulated malingerers produced lower total correct scores and drew more distortions than brain injured patients, but made less perseverations, omission, and size errors.

The Analysis of Data

In this study, four types of information collected in the following way: A type of information related to Benton visual-retention test score that after determining the sample was run individually on each of the subjects. Second information was implementation of the Wechsler Intelligence Scale for matching brain-damaged with normal subjects that was carried out individually on each of the subjects. The third category in visual-motor Bender-Gestalt test that was conducted on 30 subject's brain damaged. The fourth category was view of neurologists and EEG information to recognize brain-damaged subjects.

To verify the validity of Benton test in Iran the following methods were used:

A: Measurement the correlation between subjects' performance in two parallel forms E and C through Pearson correlation coefficient.

B: Measurement of performance's subjects in form C to different administrations testing through the Pearson correlation coefficient.

To evaluate of validity of Benton in Iran the following questions were answered.

A: Is there significant difference between the ratios of brain damaged children with normal children without brain damage that have been diagnosed with Benton test? To answer this question and to evaluate the discriminate validity, t-test for independent groups and Z test was used for two independent ratio and the children are divided into two groups: normal and damaged brain.

B: Is there significant difference between standard error of the mean brain damaged and normal subjects in the Benton test? To answer this question is used from compare two independent means test.

C: Is there significant correlation between Benton visual-Retention test and Bender-Gestalt test scores? To answer this question and estimate the convergent validity was used the Pearson correlation coefficient.

Research Findings

Table 1. Percentage distribution age and sex of the normal students

	Age	**frequency**	**sex**	**frequency**	**grade**	**frequency**
	8	33	girl	50	second	32
	9	34	boy	50	third	35
	10	33			forth	33
total	100	100		100		100

Table 2. Percentage distribution Age and sex of brain damaged students

	Age	**Frequency**	**Sex**	**Frequency**	**Grade**	**Frequency**
	8	10	girl	14	second	10
	9	10	boy	16	third	10
	10	10			forth	10
total	30	30		30	100	30

Table 3. The correlation coefficient of two parallel forms

Form of test	Administration	Count	Correlation coefficient	p
C	A (Immediate reconstruction)	100	0/74	0/01
E				

Table 3 shows that there is a significant correlation between two parallel forms to the immediate reconstruction administration (p<0/01).

Table 4. The correlation coefficient of two parallel forms

Form of test	Administration	Count	Correlation coefficient	p
C	D (Delayed reconstruction)	100	0/69	0/01
E				

Table 4 shows that there is a significant correlation between two parallel forms to the delayed reconstruction administration (p<0/01).

Table 5. The correlation coefficient of two administration in C form

Administration	Form of test	Count	correlation coefficient	p
A (Immediate reconstruction)	C	100	0/80	0/01
D (Delayed reconstruction)				

Table 5 shows that there is a significant correlation between two different administrations implemented in C form (p<0/01).

Table 6. The correlation coefficient of two administrations in E form

Administration	Form of test	Count	Correlation coefficient	p
A Immediate reconstruction	E	100	0/83	0/01
D Delayed reconstruction				

Table 6 shows that there is a significant correlation between two different administrations implemented in E form (p<0/01).

Table 7. Compare two independent ratios in normal and damaged brain children

Group	Count	Average Scores of error	The standard deviation	Degree of freedom	Z	P
Damaged brain children	30	0/73	0/12	58	5	0/01
Normal children	30	0/13				

As Table 7 shows that there is a significant difference between the ratios compare. In deed Benton test has the power to detect brain damages.

Table 8. Compare two mean of independent in normal and brain damaged children

Group	Count	Average Scores of error	The standard deviation	Degree of freedom	t	P
Damaged brain children	30	13/73	3/24	58	7/16	0/01
Normal children	30	7/50	3/49			

According to Table 8, it can be concluded that Benton test has the power diagnostic because there is a significant difference between means (form C in administration of A).

Table 9. Compare two mean of independent in normal and brain damaged children

Group	Count	Average Scores of error	The standard deviation	Degree of freedom	t	P
Damaged brain children	30	16/66	4/18	58	7/16	0/01
Normal children	30	8/73	3/88			

According to Table 8, it can be concluded that Benton test has the power diagnostic because there is a significant difference between means (form C in administration of D).

Table 10. The correlation coefficient between Benton and Bender

Test	Cont of sample	correlation coefficient	P
Benton	30	0/62	0/01
Bender-Gestalt	30		

Table 10 shows there is correlation between Benton and Bender-Gestalt tests.

Conclusion:

The BVRT is a highly validated and reliable form of neuropsychological assessment. It is frequently administered as part of neuropsychological assessment batteries to detect specific neuropsychological dysfunction. This study of the BVRT was initiated in an effort to remedy some of the problems for which the test has received repeated criticism in scientific publications. Specifically, the goals were to improve the BVRT's reliability and sensitivity, to examine whether specificity for disorder could be established. The validity coefficient for two parallel forms in immediate reconstruction administration was 0/74 and in delayed reconstruction administration was 0/69 while the validity coefficient for C from with two administration was 0/80 and the validity coefficient for E from with two administration was 0/83. This represents a clear increase in reliability compared to the values reported in the scientific literature for the original BVRT. Hahlweg and Kuehnlein (1981) reported an internal consistency (Cronbach's alpha) of 0/66 for form C, the form most frequently in use. This difference can be explained by the sample's variance.

The statistical analysis revealed that there is a significant difference between two independent ratios in normal and damaged brain children that emphasize Benton test has the power to detect brain damages. Also Compare two mean of independent in normal and brain damaged children revealed Benton test has the power diagnostic because there is a significant difference between means. Based on of data in table 10, the evidence concerning convergent validity by using correlation coefficient with Bender-Gestalt test were applied and the results showed that in Benton Visual –Retention test the brain –injured children have discriminatory power with respect to normal children so, It was found correlation (0/62) between Benton and Bender tests.

Therefore, the use of the BVRT is suggested to help diagnose brain damage and other neurological diseases in Clinical and neuropsychological evaluations of learning disabilities may be valuable in such cases for the early diagnosis and assessment of the evolution of the disease. An amalgamation of these results suggest that the BVRT is an adequate assessment of current neuropsychological functioning in all administrations.

Benton (1955) suggested that determinants of defective performance on the BVRT, in addition to neurological insult, may include the participant's lack of adequate effort possibly owing to lack of motivation, lack of commitment or lack of interest, depressive mood or anxious state. Whilst it is possible that participant's performance was affected by lack of motivation and commitment to complete the test it is possible that such motivation and commitment may too be lacking in the clinical setting for many reasons.

Future research utilizing the BVRT in clinical samples of brain-damaged patients should address such factors to ensure relevant clinical assumptions and diagnoses are derived from patients' performance. Benton (1992) suggests that extended neuropsychological assessment batteries may invite confounding variables such as "non-neurologic factors of a physical, emotional, and motivational nature (particularly fatigue and sagging motivation but also distrust and hostility) that interact with the condition of the brain". Such factors are most likely to affect acutely brain dysfunctional patients owing to the frequent utility of the BVRT to assess neuropsychological dysfunction in everyday clinical practice (Mooney, Speed, 2001; van Reekum, 1996). The results of this study support prior research purporting that the BVRT is a suitable assessment of neuropsychological dysfunction.

Practical suggestions:

This study sought to validate the BVRT as a useful neuropsychological assessment in brain damage and normal children aged 8-10years. The results demonstrated a significant relationship between performance on the BVRT and performance on the Bender-Gestalt in this age group thus providing valuable new data for this important test. Generally, the findings of the present study indicate that Benton Visual –Retention

test may be used as a simple and valid test for assessment of brain – injured in 8 to 10 simple and valid test for assessment of brain-injured in 8 to 10 years old children of Tehran in Iran.

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