UNIVERSITY STUDENTS IN TWO DISCTINCT BRANCHES SHOW PERFORMANCE DIFFERENCES ON THE MANGINA-TEST SCORES

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ÖZET

İki Farklı Daldan Üniversite Öğrencilerinin Mangina Testi Skorlarında Gösterdikleri Performans Farkları

Amaç: Mangina testi öğrenme güçlüğü, dikkat eksikliği hiperaktivite bozukluğu (DEHB) ve öğrenme güçlüğü ile birlikte görülen DEHB vak'alarının tanısında kullanılan bir nöropsikometrik araçtır. Bu test "analitik olarak özel görsel algısal yetenekleri" ölçer ve uyarıcının yön, uzaysal yönlenim, büyüklük ve boyutu doğrudan muhakeme etme kapasitesi konusunda ayrıntılı bilgi verir. Çalışmanın amacı mimarlık bölümüne devam eden üniversite öğrencilerinin Mangina test performanslarını, sosyal bilimlerin farklı bölümlerine devam eden öğrencilerinkilerle karşılaştırmaktır.

Yöntem: Örneklem 19-30 yaş aralığında (21.65±1.65), Mimarlık veya Sosyal Bilimlerin çeşitli bölümlerinde okuyan 80 öğrenciden oluşmuştur. Dışlama ölçütleri düzeltilmemiş görme veya işitme bozukluğu; depresyon, kafa travması öyküsü, geçirilmiş nörolojik ve/veya psikiyatrik rahatsızlık, antidepresan, psikostimülan veya başkaca psikotrop ilâçları almakta veya bunları kısa süre önce bırakmış olma. Mangina-Testi ile analitik görsel algılama; üniversite eğitim-öğretimine ilişkin performans genel başarı puanı, lise dersleri bilgisi ve muhakeme yeteneği Öğrenci Seçme ve Yerleştirme Sınavı (ÖSYM) puanı ile ölçülmüştür.

Bulgular: Temel Bileşenler Analizinde, Mangina test puanları ile Üniversiteye Giriş Sınavı toplam puanı aynı faktöre yüklenmiştir. Bağımsız gruplar için t testi sonuçları, öğrenci grupları arasında birikimli ortalama puan açısından anlamlı fark gösterdiğinden, bu değişken Varyans analizinde ortak değişken olarak kullanılmıştır. 2x2 MANCOVA analizi (eğitim görülen bölüm: mimarlık, sosyal bilimler, cinsiyet) öğrenci grupları arasında Mangina-Testi puanları açısından anlamlı fark olduğunu (Wilk's lambda: F(9.67)=2.463, p=.017), Mimarlık öğrencilerinin puanlarının daha yüksek olduğunu ortaya koymuştur.

Tartışma: Çalışma, üniversiteye giriş puanı ile ölçülen özellikler kontrol edildikten sonra dahi mimarlık öğrencilerinin analitik görsel algılama performansının daha yüksek olduğunu bulmuştur. Mevcut çalışma Mangina-Testinin analitik görsel algılama yeteneğinin derecelerini sâdece klinik örneklemlerde değil sağlıklı örneklemlerde de ortaya koyabildiğini göstermiştir. Söz konusu iki öğrenim alanının özelikleriyle uyumlu olan bu sonuç, Mangina-Testi'nin Türk toplumu için kurultu geçerliği yönünde ek kanıt oluşturmuştur.

Anahtar Kelimeler: Mangina-Testi, analitik–spesifik görsel algılamanın analizi, üniversite öğrencileri

ABSTRACT

Objective: The Mangina-Test is a very useful neuropsychometric tool for the diagnosis of varying degrees of Learning Abilities and Disabilities (LD), Attention Deficit Hyperactivity Disorder (ADHD) and comorbid ADHD with LD. This test measures "Analytical-Specific Visual Perceptual Skills" and renders detailed information on the capacity for judging the exact direction, spatial orientation, size and dimension of stimuli pertaining to specific perceptual analysis. The aim of the present study was to compare the Mangina-Test performance of university students who attend Architecture (20 females, 19 males) to those attending the various departments of Social Sciences (20 females, 20 males).

Method: The sample consisted of 80 students who were 19-30 years of age (X=21.65± 1.65) and were attending Architecture or Social Sciences (Departments of Psychology, Sociology, Business Administration, Economics, International Relations, Philosophy). Exclusion criteria were: uncorrected visual deficits, symptoms of depression, head injury, history of neurological and/or psychiatric disorders, taking or having recently stopped antidepressant medications, psychostimulants or other psychotropic drugs. Besides the Mangina-Test scores, Cumulative Grade Point Averages (CGPA) and State-Wide University Entrance Examination (SUEA) scores were also obtained. The latter score represents level of knowledge with regards to the high school curriculum and the capacity to reason.

Findings: Principal component analysis was performed to study the factor structure of these scores. The scores of the Mangina-Test and SUEA loaded on the same factor. Since t-test for independent groups also revealed a significant difference (p=.0001) between the student groups, the effect of the "composite" capacity (information on curricular content and the ability to reason) that SUEA scores represent was statistically controlled by using it as a covariate in multivariate analysis of variance (MANOVA). A 2x2 MANOVA (student group: Architecture/ Social Sciences; sex: male/female) revealed a significant effect of student group (Wilk's lambda: F(9,67)=2.463, p=.017). There was a non significant difference between the student groups on CGPA. In contrast, Architecture students scored significantly higher than Social Sciences students on the Mangina-Test scores that pertain to size and dimension judgments and on mixed judgments where combined size, dimension, direction and spatial orientation analysis of stimuli is critical.

Discussion: Even after controlling for the SUEA score, the Mangina-Test stimuli show selective sensitivity to the "Analytical-Specific Visual Perception" of Architecture and Social Sciences students.

These findings demonstrate that the usefulness of the Mangina-Test is not only for the diagnosis of varying degrees of abilities in normal and disabilities in certain pathological conditions, but also, in the description of the specific perceptual characteristics of normal adult populations enrolled in two different university branches. This result, which is in consistency with these two fields of education, provides additional proof of the Mangina Test in terms of construct validity for Turkish society.

Keywords: Mangina-Test, analysis of analytical-specific visual perception, university students

OBJECTIVE

The Mangina Diagnostic Tool of Visual Perception (Mangina-Test: MT) measures "analytical-specific visual perception" and denotes the ability to identify simple stimuli that are inserted in increasingly more complex stimuli within a limited span of time according to their exact direction, spatial orientation, size, dimension and shape (Mangina, 1994a, 1998). The test has been extensively studied in children with learning disability and also in children with attention deficit hyperactivity disorder (Chiarenza and Benvenuti 2002, Mangina 1994a, b, Mangina and Beuzeron-Mangina 1992a, b, 1994, 1996, 2000a, b, 2004, Mangina et al. 2000, Mangina and Sokolov 2006). The findings of these studies showed that the analytical-visual perceptual skills that the Mangina-Test measures is a fundamental representation of visual perception and also the degree of learning ability and/or disability. Accordingly, the Mangina-Test renders detailed information on the capacity for judging the spatial orientation, exact direction, size and dimension of stimuli pertaining to analytical-specific perceptual analysis.

The Mangina test has been studied on samples from also Turkey (Karakaş et al. 2006a, b, c). In the Karakaş et al (2006a) study, the Mangina-Test and other tests of visuospatial cognition was found to measure similar processes. However, the strongest representative of visuospatial cognition appeared to be the Mangina-Test. The test measures the ability or disability to learn (Mangina and Beuzoron-Mangina, 1988, 1992a). Accordingly, the scores of the Mangina-Test loaded in the Turkish children to a second factor where the Seri-

al Digit Learning Test (SDLT) score, a measure of learning ability, also took place (Karakaş et al. 2006a).

The scores of the Mangina-Test predicted the scores that ADHD patients obtained on Conner's Teacher Rating Scale and Conner's Parent Rating Scale (explained variances 20% and 19%, respectively). The total score of the Mangina-Test also predicted membership to ADHD and control groups (estimation correctness: 75.97%). Other tests of visuospatial cognition only slightly increased the correctness of the classification. These findings showed that it may be unnecessary to include other tests of visuospatial cognition in the assessment protocol in case there is time pressure. Overall, findings on Turkish samples (Karakaş et al. 2006b, c) provided evidence for the clinical usefulness of the Mangina-Test in cultures other than those that the test was originally designed for.

The primary objective was to study the effectiveness of the Mangina-Test in differentiating healthy adult groups. The specific objective was to study the differential ''analytical perceptual abilities'' between branch of university training where education largely relies on visuo-spatial skills (Architecture) and another where those skills are not paramount (Social Sciences). The study is thus a validation study that uses the technique of "extreme groups".

METHOD

Participants

The sample consisted of 80 students who were 19-30 years of age (X=21.65±1.65) and were attending Architecture or Social Sciences (Departments of Psychology, Sociology, Business Administration, Economics, International Relations, Philosophy). The distribution of the participants to the two branches (Architecture and Social Sciences), to grades and to gender are shown at Table 1.

Exclusion criteria were uncorrected visual deficits, symptoms of depression, head injury, history of neurological and/or psychiatric disorders, taking or having recently stopped taking antidepressant medications, psychostimulants or other psychotropic drugs.

The nature of the study was fully explained to volunteers and those whose characteristics matched the exclusion criteria were included in the sample after they signed a standard Informed Consent Form.

Assessment Devices

Mangina-Test

The Mangina-Test (Mangina, 1994a, 1998) measures the exact discrimination of size, dimension, direction, and spatial orientation and provides information on the analytical-specific visual skills (Beuzeron-Mangina 1996, Mangina 1981b, 1983a, 1994a, Mangina and Beuzeron-Mangina 1988, 1992a, 1992b, 1996, 2000a, b, 2004). The test had also been used on various Turkish samples including healthy children, children with attention deficit hyperactivity disorder and specific learning disability (Karakaş et al. 2006a, b, c, Karakaş et al. 2008).

The Mangina-Test includes 44 items that gradually increase in difficulty. In each item, there is a simple figure which is embedded in a complex one. Task is to identify and to mark to simple figure in the complex one. Sixteen items are scored for perception of size and dimension (S/D); these items are related to mathematical ability (Mangina 1981b). Sixteen items are scored for perception of direction and spatial orientation (D/S); these are related to reading and reading comprehension (Mangina 1981b). Six items include all four dimensions (S/D and D/S); these items render a score for stimuli with mixed dimensions (M). The sum of the scores provides a total score (T). Response time for each item was recorded. However, in accordance with administration rules of the Mangina-Test, a time limit of 20 sec was used for each item.

State-Wide University Entrance Examination (SUEA)

According to the "Law on University Training", students who wish to be trained in any branch of any university in Turkey has to be successful at SUEA. This examination consists of a battery of tests designed to measure knowledge pertaining to the courses in the high school curriculum and to reasoning ability. The acade-

Table 1. Demographic Characteristics of the Participants

BRANCH	GRADE			SAMPLE SIZE	AGE (yrs)	GENDER	
	2.	3.	4.			Female	Male
Architecture	10	11	19	41	21.56±1.53	21	19
Social Sciences	11	15	14	39	21.74±1.79	20	20
TOTAL	21	26	33	80	21.65±1.65	41	39

Table 2. Principal Component Analysis (PCA) On Scores of the Mangina-Test, State-Wide University Entrance Examination and Cumulative Grade Point Average

Variables	Factor 1	Factor 2	Factor 3	Factor 4
MT-Direction/Spatial Orientation/TC	**0.87**	0.00	0.00	
MT- Size/Dimension / TC	**0.70**	0.52	0.00	
MT- Mixed / TC	**0.64**	0.00	0.54	
MT- Size/Dimension	0.00	**0.84**	0.00	
SUEA total score	0.00	**0.70**	0.00	
MT- Mixed	0.00	0.00	**0.86**	
MT- Direction/Spatial Orientation	0.00	0.49	**0.61**	
GPA	0.00	0.00	0.00	**.79**
Eigenvalue	*2.53*	*2.38*	*1.12*	*1.05*
Experienced variance (%)	*23.16*	*18.58*	*17.24*	*11.82*
Cumulative variance (%)	*23.16*	*41.74*	*58.97*	*70.79*

mic success in the university training was evaluated via the Cumulative Grade Point Average (CGPA).

Procedures

A standard Information Sheet was used for collecting information on demographic characteristics, on the status of the participant with regards to the inclusion and exclusion criteria, issues on academic training, SUEA and CGPA scores.

The Mangina-Test was individually administered by a single tester who had been trained in administering and scoring the Mangina-test. All testing procedures followed the guidelines that are stated in the Manual of the Mangina-Test (Mangina 1994a 1998).

FINDINGS

The factor structure of the Mangina-Test was analyzed using Principal Component Analysis (PCA). The effect of branch of training was studied using Multivariate Analysis of Co-Variance (MANOVA).

As indicated in Table 2, the model obtained using principal component analysis with varimax rotation had an explained variance of 70.79%. Factor 1 included all scores that pertained to response duration. The factor was labeled "psychomotor speed". Factor 2 included the MT score on perception of size and dimension (S/D) and the SUEA score. The S/D score is related to mathematical ability. SUEA also has a high weighting on knowledge of mathematics and mathematical reasoning. The factor was labeled "mathematical ability". Factor 3 included MT scores on mixed stimuli and on perception of direction and spatial orientation (D/S). The factor was labeled "reading and reading comprehension''. Factor 4 included the CGPA score; the factor was labeled "academic achievement".

Table 3 shows that t-test for independent groups revealed a significant difference (p=.0001) between the student groups on SUEA score (Table 3). The effect on CGPA was nonsignificant.

The abilities that SUEA score represents (curricular knowledge and reasoning ability) was used as a covariate in a 2x2 MANOVA (branch: Architecture and Social Sciences; sex: male/female). (Wilks' Lambda: F (9.67) = 2.463).

Analysis revealed a significant effect of branch of training on the Mangina-Test scores (Wilks' Lambda: F (9.67) = 2.463, p<.05). Gender did not have a significant effect.

According to post hoc analyses, the students of Architecture scored significantly higher than Social Sciences

Table 3. Summary Table for Independent t-Tests between the SUEA Scores and CGPA of Participants in Architecture and In Social Sciences

	BRANCH	N	χ	t-value	p
SUEA	Architecture	41	328.28 ± 16.78	310.41	<.001
	Social sciences	39	310.41 ± 11.24		
CGPA	Architecture	41	2.50 ± 0.49	-1.43	>0.05
	Social sciences	39	2.67 ± 0.57		

Table 3: Comparison of HAD subscale scores considering several variables (n=298)

Type of hospital unit in which patient was housed	n	%	HAD-A Mean (SD)	Significance	HAD-D Mean (SD)	Significance
Surgical	137	54	9.48 (4.11)	t=2.945	10.06 (3.44)	t=5.890
Internal medicine	161	46	8.11 (3.95)	p<0.01	7.90 (2.88)	p<0.001
Previous hospitalization						
Yes	220	73.8	8.93 (4.10)	t=1.380	9.18 (3.31)	t=2.544
No	78	26.2	8.19 (3.96)	p>0.05	8.08 (3.27)	p<0.05
Duration of hospitalization						
2-5 days	170	57.0	9.05 (4.05)	KW=2.286	9.26 (3.41)	KW=2.286
6-10 days	106	35.6	8.24 (4.14)	p>0.05	8.38 (3.10)	p>0.05
11 days and over	22	7.4	8.73 (3.83)		8.55 (3.51)	

students on the three scores of the Mangina-Test (perception of size and dimension, direction and spatial orientation, perceptual analysis of mixed stimuli).

DISCUSSION

The present study showed that the Mangina-Test is useful not only for evaluating analytical-specific perceptual ability in normal children or for the assessment of children with ADHD or LD, but also in describing the analytical-specific perceptual characteristics of normal adult populations.

As in the previous studies on Turkish samples (Karakaş et al. 2006a, b, c), the factor structure of the Mangina-Test was found to be in line with the basic concepts upon which this neuropsychometric test was originally developed. Accordingly, the Mangina-Test scores were grouped under a factor labeled as ''mathematical abilities'' and ''reading and reading comprehension''. None of the scores loaded to the ''academic achievement'' factor where the CGPA score took place. The present study had also recorded the response durations for the three types of stimuli. These duration scores separately loaded to a ''psychomotor speed'' factor. In future studies, response speed may be included in the scoring protocol of the Mangina–Test to investigate whether the score would further contribute to the evaluation of the analytical-specific perceptual ability.

Analytical-specific visual perception is critical for training and success in Architecture. However, these abilities are not directly included in the training that is offered in different branches of Social Sciences. Indeed, Mangina-Test performance of Architecture students was significantly higher than that of the Social Sciences students, demonstrating a higher analytical-specific visual perception in the former group. The significant difference between the Architecture and Social Sciences students is not due to differences in academic success since the student groups were not found to be significantly different with respect to their CGPA. The difference is also not a product of general curricular knowledge or reasoning ability since the contaminating effect of these variables had been statistically controlled in the present study by using the SU-EA scores as the co-variate.

CONCLUSION

The limitation of this study basically derives from its cross-sectional design. The present study cannot provide information on the possible causes of the difference between the two groups. The difference may be a result of the training student groups are receiving. The difference may also be due to proactive history; the constellation of abilities and personality characteristics that may also have led the students to choose their branches. The difference between Architecture and Social Sciences on analytical-specific visual perception should be investigated in future studies, preferably using a longitudinal design with one control group.

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