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Validity and Reliability of the "Visual Object and Space Perception Test" in Turkish

Visual Object and Space Perception" Testinin Türkçe Versiyon Geçerlik ve Güvenirliği

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ABSTRACT

Aim: Although many tests evaluating visual perceptual impairment have been developed in the clinic, it is seen that the tests within Turkish validity and reliability are insufficient. Visual Object and Space Perception (VOSP) Test, which evaluates visual and spatial perception separately, is distinguished from other visual perceptual tests as a sensitive battery. In our study, it is aimed to analyze Turkish cultural adaptation, validity, and reliability of VOSP Test, which evaluates visual-spatial functions in stroke survivors and healthy individuals.

Methods: Twenty-seven stroke patients with right hemisphere lesions and 54 healthy individuals were included in our study. Criterion validity method has been used to examine the validity. Internal consistency, Cronbach alpha and test-retest methods have been used for the reliability of the test.

Results: Eighty-one participants [45 (55.6%) female] have been included in our study. The mean age was 46.04±14.74 years. Turkish version of the VOSP test has been found to be sufficient and reliable according to the Cronbach Alpha Coefficient (0.923).

Conclusion: In the light of the findings of our study, it has been concluded that the Turkish version of the VOSP Test is a valid and reliable measurement tool and that this test can be benefited by scientific and clinical studies.

Key Words: Visual Perception, Space Perception, Stroke, Reliability, Validity

ÖZET

Amaç: Klinikte görsel algısal bozukluğu değerlendiren birçok test geliştirilmiş olmasına rağmen Türkçe geçerlilik ve güvenilirliği bulunan testlerin yetersiz kaldığı görülmektedir. Görsel ve uzaysal algıyı ayrı ayrı değerlendiren "Görsel Nesne ve Uzaysal Algı (Visual Object and Space Perception, VOSP)" hassas bir batarya olarak diğer görsel algısal testlerden ayrılmaktadır. Çalışmamızda inme geçiren bireyler ve sağlıklı bireylerde görsel-uzaysal işlevleri değerlendiren VOSP Testinin Türkçe kültürel adaptasyon, geçerlik ve güvenirlik analizinin yapılması amaçlanmıştır.

Yöntem: Çalışmamıza sağ hemisfer lezyonuna bağlı inme tanısı almış 27 hasta birey ve 54 sağlıklı birey dahil edildi. Geçerliliğin incelenmesinde kriter geçerliği yönteminden yararlanıldı. Testin güvenilirliği için; iç tutarlılık, Cronbach Alpha ve test-tekrar test yöntemlerine başvuruldu.

Bulgular: 81 katılımcı [45 (%55,6) kadın] dahil edildi. Yaş ortalaması 46,04±14,74 idi. VOSP testinin Türkçe versiyonu Cronbach Alfa katsayısına göre yeterli ve güvenilir bulundu (ICC=0,923).

Sonuç: Çalışmamızın bulguları ışığında, VOSP Testinin Türkçe versiyonunun geçerli ve güvenilir bir ölçme aracı olduğu, bilimsel ve klinik çalışmalarda bu ölçekten yarar sağlanabileceği sonucuna ulaşıldı.

Anahtar Kelimeler: Görme Algısı, Uzaysal Algı, İnme, Geçerlik, Güvenirlik

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Introduction

Visual spatial perception is a complex process involving the stimulus and the identification of its localization [1]. Two different components of this process can be mentioned as visual and spatial perception. Visual perception component is defined as the ability to recognize and distinguish visual stimuli and interpret these stimuli by combining them with previous experiences. As for the spatial perception component, it is defined as the ability to provide information about the object's position in space, their relationships among themselves, their relationships between their parts of the body, and their body's relationships with objects including the mental rotation of objects, the ability to imagery and, above all, the ability to visualize [2].

Visuospatial abilities are mandatory for functional tasks in everyday life and deficits of them frequently occur following a stroke [3]. It is stated that incidence of visuoperceptual deficits varies between 20-54% after stroke and it prevents their independence in daily life activities by effecting the motor recovery of patients [4,5]. In addition, it is among the cases that are reported for it to put the person's safety at risk in daily life by increasing the risk of falling [6]. In this context, it is very important to evaluate visuospatial perception with valid and reliable tests. Also, National Clinical Guidelines recommend that every patient with stroke who appears to have perceptual difficulties should assess with a standardized measurement [7].

It is seen in the literature that many different scales are used to assess visual perceptual disorders [8]. However, most of these scales do not evaluate visuospatial perception as a whole. They either assess only spatial perception, as in the Judgment of Line Orientation Test or only assess object detection, as in the *Benton Face Recognition Test*. In addition, most visual tests are intensively influenced by other cognitive skills such as the Clock test [9-12]. In this sense, Visual Object and Space Perception Battery (VOSP), which is different from many evaluations used in the literature, was developed by Warrington and James in 1991 to evaluate both visual and spatial perception separately. Schintu et al. was revealed that subtest of VOSP related to parietal, temporal and frontal areas in their study designed with voxel-based lesion symptom mapping approaches [13]. Furthermore, it was distinguished from other tests with its specific evaluation of visual and spatial skills by minimizing the need for motor, attention, recall and executive functions. One of the advantages of this test is that the object decision test included in the VOSP battery allows the evaluation of aphasic patients [14].

It has been stated that VOSP, developed specifically to reveal certain problems in individuals with right hemisphere damage, detects the presence of disorders in visuospatial skills, or is sensitive to changes in these skills, seen in various neurologic diseases such as Dementia with Lewy Bodies, and atypical Parkinsonian syndrome [15,16]. Although there are studies showing that this test is used in many populations, including the healthy elderly population, there is no information that it is reliable for use in the stroke patient population [17,18].

In our study, we aim to analyze the Turkish cultural adaptation, validity, and reliability of the VOSP Test, which evaluates visuospatial functions, and to introduce it into clinical use.

Methods

Design

This study has been conducted with the approval of İstanbul Medipol University Non-Interventional Clinical Research Ethics Committee on 6 August 2020 (no. E-10840098-772.02-34222/approval number 606). All individuals who agreed to participate in the study have been informed about the study and written consent has been obtained from all of them.

Participants

Patients who applied to İstanbul Medipol University, Faculty of Medicine, Department of Neurology and Necmettin Erbakan and Selçuk University Faculty of Medicine Department of Neurology were conducted. Patients who diagnosed with stroke due to right hemisphere lesion because of clinical and radiographic examinations by neurologist were included. Also, healthy individuals have been placed in our study.

The inclusion criterias for patient participation were (1) between the ages of 18-80, (2) able to communicate in Turkish, (3) diagnosed with stroke with a right hemisphere lesion, (4) a score above 24 on the Standardized Mini Mental State Examination (SMMSE), (5) at least primary school graduate, (6) individuals who signed the informed consent form.

The exclusion criterias of patients' participation were; (1) those with visual problems due to peripheral causes, (2) having a neurological disease other than stroke, (3) individuals with severe hearing impairment, (4) not being able to understand or speak the Turkish language.

The inclusion criterias of healthy controls were; (1) between the ages of 18-80, (2) able to communicate in Turkish, (3) at least primary school graduate, (3) a score above 24 on the SMMSE, (4) individuals without any neurological disease.

Measurements

Demographic Form

The demographic information form has been filled in verbally by the researcher. Information about the individuals' age, gender, education level, anamnesis, diagnosis have been included.

Visual Object and Space Perception Battery (VOSP)

Before the VOSP test is analyzed, a preliminary test of visual sensory efficiency (shape detection screening test) is performed to determine whether the patient has adequate visual and sensorial capacity to finish the VOSP subtests [14].

Shape Detection Screening Test*

Visual object and spatial perception can only be evaluated meaningfully in patients with sufficient visual sensory capacity. Normal acuity is necessary for the cognitive tasks of visual perception. But in addition to this, it is also necessary to distinguish between shapes. The VOSP Test is not suitable for patients with significant impairment in the shape detection screening test. Individuals who score 15 or less are considered to fail this test. There are two different cards. One of them is a practice card to explain the task at the beginning. Other one is stimulus cards (20 cards) to calculate the score. On the cards, there is the letter X, partially erased, on the irregular background patterns. The individual is asked to report whether the letter X is exists on the pattern. Some cards do not include X letter [14].

VOSP and Subtests

The VOSP Test was developed by Warrington and James in 1991 to assess visuospatial perception. It consists of 8 subtests, four of which are visual object perception (incomplete letters, silhouettes, object decision, progressive silhouettes) and four space perception (dot counting, position discrimination, number location, cube analysis). There is no order in the tests. The total number of correct points is recorded as the score. The test has no set administration time and is administered at an appropriate rate for the patient [14].

Test 1: Incomplete Letters

The test consists of 20 (70% deleted) stimulus cards and 2 (30% deleted) practice cards used to explain the test. The letters F and B are shown on the practical cards and the individuals are asked to name them. Patients with speech disorders are asked to identify the letters by drawing or signs. If the individual cannot name or identify the practice cards, the test is canceled. The total number of correct answers is recorded as a score (maximum score =20) [14].

Test 2: Silhouettes

The test consists of two sequences as 15 animal silhouettes and 15 object silhouettes. The individual is first shown the silhouette of an animal and is asked to name it by being explained that it is an animal drawing. For individuals with speech disorders, this task may involve identifying the animal through any means available. Then the individual is asked to name the objects or to describe each silhouette by using signs or by describing how the object is used. If 5 errors are made in both series, the test should be ended. The total number of silhouettes named or described is recorded as a score (maximum score=30) [14].

Test 3: Object Decision

The test consists of 20 cards. Each card contains three distractions and a real two-dimensional object. Distractions consist of object-like shapes, but they are purely imaginary. Individuals are asked to choose the real object. The total number of correct answers is recorded as a score (maximum score =20) [14].

Test 4: Progressive Silhouettes

The test consists of two series, a silhouette of a gun and a silhouette of a trumpet. In each series, there are 10 silhouettes created by rotationally changing the angle of view of the lateral axis from 90 degrees to 0 degrees. If the individual is unable to name the silhouette, they are encouraged to define it indirectly or by means of signs. The number of attempts now that each object can be identified is collected and recorded as a score. However, in this test, it means that the sooner individuals identify the object, the better the level is. The number of attempts required to identify each object is summed and recorded as the score (number of attempts =10+10) [14].

Test 5: Dot Counting

Test stimuli consist of black dot sequences on a white card. There are 10 stimulus cards in total in the test. The individual is asked how many dots there are on the card. If the first card is answered incorrectly, the individual is asked to point to each dot. If the individual has pointed incorrectly,

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(but not because of omissions), the dot counting test is ended. The total number of correct answers is recorded as a score (maximum score =10) [14].

Test 6: Position Discrimination

An identical or different matching task comparing the position of a point in a square with the position of a point in a second square provides information about the right hemisphere lesion. 20 stimulus cards are shown in this test. Each card consists of 2 squares placed horizontally. One of the squares has a black dot imprinted exactly in the center, and the other a black dot imprinted just off-center. Individuals are asked to show the dot in the center of the square. The reminder "Look at both squares before deciding." is made for individuals who constantly choose the right or left square. The total number of correct answers is recorded as a score (maximum score =20) [14].

Test 7: Number Location

Ten stimulus cards are shown in the test. In the upper square there are randomly placed numbers (from 1 to 9), and in the lower square there is a black dot corresponding to one of the numbers above. The task in this test is to find the number corresponding to the position of the dot. There are two practice cards used to explain the task. If a mistake is made on the first card, the individual is informed about the correct number before moving on to the second practice card. If the individual answers both practice cards incorrectly, the test is ended. The total number of correct answers is recorded as a score (maximum score =10) [14].

Test 8: Cube Analysis

There are two practice cards and 10 stimulus cards to explain the task in the test. The difficulty level of the test is increased by adding hidden cubes. The individual is asked to say how many cubes are on the cards. If they fail to calculate both practice cards, the test is ended. The total number of correct answers is recorded as a score (maximum score =10) [14].

Translation and Cultural Adaptation Steps

Permission to administer the VOSP Test has been obtained from its author, Elizabeth Warrington. The VOSP Test was translated from its original language English to Turkish by 1 expert physiotherapist and 2 experts' psychologists who are with sufficient knowledge in the field of cognitive rehabilitation. The translations were combined into a single form. Later, the scale was translated back into English by a linguist who is not a healthcare Professional with a good level of English. The new English scale was sent to the original author of the test for approval. To evaluate the scale for cultural adaptations, a pre-test study was conducted with 20 people and necessary corrections were made (Figure).

Sample Size

We have used univariable and multivariable linear regression models to estimate the association between the VOSP score and severity of illness, mean values of right hemisphere lesion with age, gender, and education levels as co-variables, to avoid over-adjustment due to the relatively small sample size. Coefficients with 95% confidence intervals (CIs) have been reported.

Data Analysis

IBM SPSS software (Version 22.0, IBM Corp., Armonk, NY) statistical package program has been used to analyze the data. Number-percentage ratios, mean, standard deviation, median, and minimum-maximum values have been used in the descriptive statistics of the data. Kolmogorov-Smirnov test was used to evalute the normal distrubiton of the variables. For the analysis of the obtained scores, Kruskal Wallis test has been used for more than two independent groups and Mann Whitney U test has been used for two independent groups. The criterion validity method was used to examine the validity. For the reliability and internal consistency of the test Cronbach Alpha and Test-Retest reliability methods have been used. The Cronbach-*a* coefficient is interpreted as highly reliable if it is $a > 0.80$. For test-retest reliability, Intraclass Correlation Coefficient (ICC) has been calculated by choosing a one-way random effects model.

Results

107 volunteers participated in our study, including 42 patients and 65 healthy individuals. 5 patients have been excluded due to the Covid-19 pandemic, 10 patients have been excluded for scoring less than 24 in SMMT, and 11 healthy individuals have been excluded due to transportation. 81 participants [45 (55.6%) female] have been joined. Mean age was 46.04±14.74 (min-max=21-78) years. There were statistically significant differences between the under 50 years old and over in the incomplete letters (p=0.018), silhouettes (p=0.001), progressive silhouettes (p=0.000), cube analysis (p=0.004), and VOSP total (p=0.000) tests. The results of the VOSP tests according to the age of par-

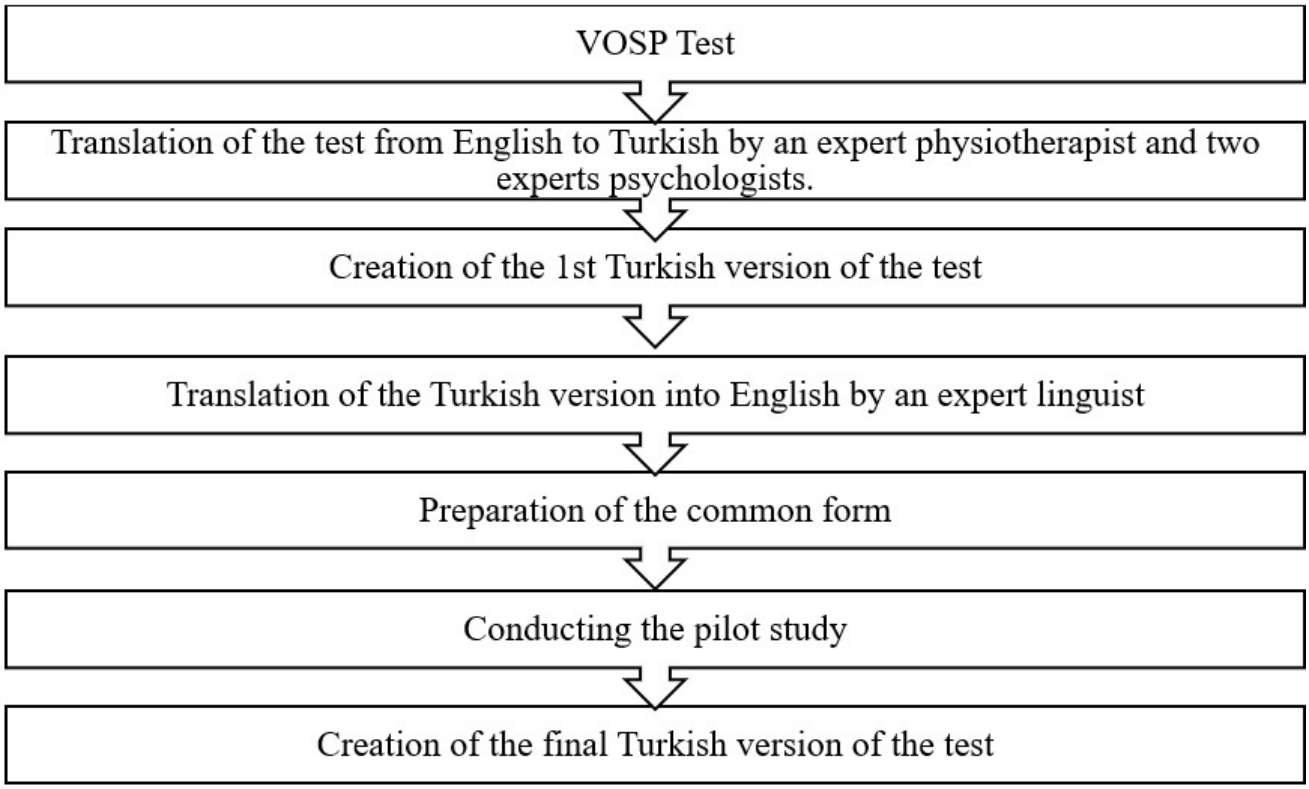

Figure 1. Translation Stages

VOSP Visual Object and Space Perception Test

ticipants were shown in Table 1. There was no statistically significant difference between the education levels of participants in dot counting (p=0.773), position discrimination (p=0.463), and cube analysis (p=0.179) tests. In accordance with the education level of participants the VOSP tests results were given in the Table 2.

Translation and Cultural Adaptation

Due to the feedback and suggestions of the committee and invited patients, changes have been made to the Turkish version of the questionnaire to better align the translated version with the original, to adapt the questionnaire to Turkish culture, and to ensure all items were easily understandable. The corkscrew card has been removed from the silhouettes test. For individuals who did not understand the letter X in the shape detection screening test, the word "cross" has been used instead of X. The word "cube" has been used instead of "solid brick" in the cube analysis test. After these changes, all participants in the pre-test said that the questionnaire was easy to answer, items were clear, they had no doubt and knew all the objects in the questionnaire. The consensus version of the questionnaire was not further modified during the study.

Reliability

Cronbach-*a* has been used to evaluate the homogeneity of the questions regarding the internal consistency within the test. The internal consistency of VOSP was excellent (Cronbach-*a*=0.923). The ICC value for the test-retest reliability was found between 0.881-0.951 at the confidence interval of 95%, which suggests a high level of test-retest reliability (Table 3).

Discussion

This study showed that the VOSP Test has been found a valid and reliable test in which we planned to investigate the Turkish validity and reliability of the VOSP test, which is used to evaluate visual and spatial perception disorders, in patients with stroke due to right hemisphere lesion and healthy individuals in our study.

The VOSP test, is a comprehensive assessment scale and used in various neurological diseases-to evaluate visual and spatial perception separately with different subtests [1,14,16,19]. Although VOSP is mostly studied in healthy individuals, also with Alzheimer's and mild cognitive impairment, there is no reliability study conducted on individuals with stroke [1,13,14].

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Table 1. The VOSP Results of Participants According to The Age

VOSP	<50 years (N=45)				>50 years (N=36)				p
	Mean	SD	Min	Max	Mean	SD	Min	Max	
Incomplete letters	18.955	0.320	7.0	20.0	18.305	0.325	12.0	20.0	0.018*
Silhouettes	19.155	0.575	8.0	27.0	15.777	0.671	9.0	23.0	0.001**
Object decision	17.333	0.419	4.0	20.0	15.944	0.608	9.0	20.0	0.124
Progressive silhouettes	13.911	0.585	5.0	19.0	10.694	0.628	3.0	18.0	0.000**
Dot counting	9.911	0.042	9.0	10.0	10.000	0.000	10.0	10.0	0.068
Position discrimination	19.377	0.273	10.0	20.0	19.305	0.254	13.0	20.0	0.629
Number location	8.577	0.443	1.0	20.0	8.027	0.426	2.0	10.0	0.531
Cube analysis	9.488	0.163	4.0	10.0	8.833	0.259	3.0	10.0	0.004**
VOSP Total	116.755	1.804	82.0	133.0	107.583	2.070	77.0	127.0	0.000**

SD *Standard Deviation*, Min *Minimum*, Max *Maximum*, VOSP *Visual Object and Space Perception*, *p<0.05, **p<0.01

Table 2. The VOSP Results of Participants According to The Education Level

		N	Mean	SD	Min	Max	p
Incomplete letters	Primary	34	18.294	0.366	12.0	20.0	0.006**
	Secondary	14	17.714	0.879	7.0	20.0	
	College and more	33	19.454	0.123	18.0	20.0	
Silhouettes	Primary	34	16.676	0.732	8.0	26.0	0.000**
	Secondary	14	15.000	0.907	9.0	21.0	
	College and more	33	19.787	0.630	9.0	27.0	
Object decision	Primary	34	15.617	0.652	4.0	20.0	0.009**
	Secondary	14	16.500	0.635	13.0	20.0	
	College and more	33	17.939	0.445	9.0	20.0	
Progressive silhouettes	Primary	34	10.882	0.724	3.0	18.0	0.000**
	Secondary	14	10.571	0.953	6.0	18.0	
	College and more	33	14.939	0.523	8.0	19.0	
Dot counting	Primary	34	9.970	0.029	9.0	10.0	0.773
	Secondary	14	9.928	0.071	9.0	10.0	
	College and more	33	9.939	0.042	9.0	10.0	
Position discrimination	Primary	34	19.205	0.272	13.0	20.0	0.463
	Secondary	14	19.285	0.507	13.0	20.0	
	College and more	33	19.515	0.305	10.0	20.0	
Number location	Primary	34	7.382	0.511	1.0	10.0	0.050*
	Secondary	14	8.214	0.672	3.0	10.0	
	College and more	33	9.363	0.414	5.0	20.0	
Cube analysis	Primary	34	8.823	0.317	3.0	10.0	0.179
	Secondary	14	9.285	0.194	8.0	10.0	
	College and more	33	9.545	0.131	8.0	10.0	
VOSP Total	Primary	34	107.325	2.446	77.0	126.0	0.000**
	Secondary	14	107.243	2.529	92.0	121.0	
	College and more	33	120.152	1.453	96.0	133.0	

SD *Standard Deviation*, Min *Minimum*, Max *Maximum*, VOSP *Visual Object and Space Perception*, *p<0.05, **p<0.01

Table 3. The Test-retest Reliability of Turkish Version of VOSP

VOSP	Test scores	Re-test scores	ICC	%95 CI
	X±SD	X±SD		
Incomplete letters	18.46±2.61	18.67±2.08	0.751	0.612-0.840
Silhouettes	16.54±4.27	17.65±4.26	0.931	0.892-0.955
Object decision	15.95±3.47	16.71±3.26	0.917	0.871-0.947
Progressive silhouettes	6.84±3.13	12.48±4.17	0.655	0.463-0.778
Dot counting	9.84±0.49	9.95±0.22	0.733	0.460-0.816
Position discrimination	19.18±1.82	19.34±1.70	0.756	0.620-0.843
Number location	8.00±2.69	8.33±2.79	0.763	0.632-0.848
Cube analysis	8.99±1.87	9.19±1.35	0.752	0.614-0.840
VOSP total	104.18±14.79	112.68±13.01	0.923	0.881-0.951

X *Mean*, SD *Standard Deviation*, VOSP *Visual Object and Space Perception*, ICC *Intraclass Correlation Coefficient*

In the recent studies, it is stated that each hemisphere has complementary role in object recognizing but space perception mainly depends on integrity of the right hemisphere. The right hemisphere is dominant in object and space perception [13, 20]. However, the VOSP test was especially designed for the right hemisphere damage [14]. In the light of this information, stroke patients with right hemisphere damage were selected for our study.

The VOSP test is a good neuropsychometric test for detecting visual perceptual problems and even revealing the deterioration of existing problems [18,21]. Consistent with the literature, we found that VOSP total and subtest scores were lower in individuals with right hemisphere stroke, where visual perceptual problems are common, than individuals without any cognitive impairment [22].

The VOSP test has been reported to be a sensitive battery in measuring visuospatial functions [1,15,23]. When we scan the literature, in addition to internal consistency being seen in the different subtests of the test, it has been reported in various studies that the internal consistency of the silhouettes test is high in general [17,23,24]. It has been reported that the silhouettes test is more than 90% sensitive in detecting progress in individuals with mild cognitive impairment and Alzheimer's disease [23]. In our study, we have also found that there is high internal consistency in silhouettes (ICC: 0.931) and object decision (ICC: 0.917) tests and test total score (ICC: 0.923), which is in line with the literature.

In addition to the perception of depth and object size, there are age-related changes in visual acuity, accommodation, adaptation to darkness, color and peripheral vision, and visual processing speed decreases with age [25,26]. The decrease in performance with age in the visual perception part of the VOSP test is associated with this situation, and it is not clear whether normal aging affects space perception disproportionately compared to visual perception [27]. In our study, in which we examined our cases based on the age of 50, we found that individuals without any cognitive impairment over the age of 50 had lower scores than the total of cube analysis and the VOSP test in all visual tests, except for object decision, while those who had a stroke due to right hemisphere lesion had a lower score than only the silhouettes test. These results support the literature [14,17,18].

Studies on the effect of gender on VOSP have generally concluded that this factor has no effect on the test [16,18,21]. It is also seen that there is no significant consistency in studies indicating gender differences [24]. In our study, when the effect of the gender factor on the VOSP test was examined, it was seen that among all participants, women had higher scores in visual perceptual tests, and there was no gender difference in spatial perceptual tests, except for the position discrimination test. When the group who had a stroke due to right hemisphere damage was examined, it was found that there was no difference between the genders. When the effect of education on the scale was examined, individuals with high education level had better results in the total score of the test and visual perceptual tests, and in the patient group only in the progressive silhouettes test, individuals with higher education level had better results. As a matter of fact, it has been stated in other studies in the literature that education level is an important determining factor [18,24].

During cultural adaptation of the test, some modifications were made for better understanding and scoring. In studies on the analyzes of VOSP in the literature, it was reported that there were problems in both the object and animal naming parts of the silhouettes test, and that people could not name some cards in this section accurately. In this case, it is advised that the naming can be accepted

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as correct if it has almost the same meaning or synonyms with the objects on the cards (hare for rabbit card), or if the names of young animals or the diminutive suffix/adjective/noun expressions are used (lamb for sheep card etc.) and the subcategories of correct answers are given (winter shoes for shoe card etc.) [19]. Similar problems have been encountered in our study (such as calf or ox for the cow, battery car for the tractor, lizard for the crocodile, folding chair or coffee table for deckchair, hand broom for dustpan, adjustable wrench for spanner etc.), and it has been decided to score each option as correct after developers' approval. However, since the corkscrew card in the objects section of this test was named by only two people and many of the participants were religious and non-alcoholic individuals, it has been thought that sociocultural factors might be a factor, and this card has been removed from the test, and with developers' approval, this section has been evaluated out of 29 points instead of 30 points. A similar issue occurred with the trumpet card in the progressive silhouettes test. Out of the individuals who could not name the trumpet, the answers of the ones who correctly described the object on this card and called it clarinet or flute, which is one of the more familiar instruments in Turkish culture, or called it saxophone, has been accepted as correct with developers' approval.

The "Incomplete Letters" test, which consists of the English alphabet, makes the application of the test difficult in some countries. Due to the letter difference in the alphabet, the incomplete letters subtest was not used in the validity study on Chinese individuals, and the VOSP was adapted to consist of 7 subtests [24]. In the adaptation phase of the scale to Turkish in our study, no changes have been made in the test, due to the fact that there is no difference from the English alphabet except for the letters "W" and "X" and, since the answers given to these letters by individuals who do not speak English, "double V" or "Inverted M" instead of W, and "cross" instead of X have been approved by developers. For a similar reason, before moving on to the subtests of the VOSP Test, instead of the "X" used in the shape detection screening test, the word "cross" has been used for individuals who did not know this letter. In the cube analysis test, the "Solid Brick" question asked to the individuals has not been understood, so the word "Cube" has been used instead of this description.

Limitations

There are several limitations in this study that could be addressed in future research. First, individuals who had a stroke after the right hemisphere lesion without cognitive impairment were heterogeneous in terms of gender and education level. Secondly, it was mainly based on urban residents, lacking data from rural areas. The different sociocultural areas. Finally, wide age range in our population was another limitation of our study.

Conclusion

When visual perceptual problems are not apparent, they can be easily overlooked and remain undetected. It is important to test visual and perceptual skills separately to identify affected areas, determine rehabilitation protocols, and organize daily activities. In this context, the VOSP test, which assesses both visual and spatial skills, presents advantages over many other tests as it is easy to score and has established cut-off values. In our study, it was determined that the VOSP test is a valid and reliable assessment tool for evaluating visual-spatial impairments and can be used in the Turkish population.

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