

A Comparison of Vestibular Activities and Participation Questionnaire Scores by Vestibular Diagnoses

Vestibüler Tanılara Göre Vestibüler Aktiviteler ve Katılım Anketi Puanlarının Karşılaştırılması

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ABSTRACT Objective: The purpose of this study was to show how vestibular disorders restrict activities and the extent to which they impose limitations on participation by comparing the Vestibular Activities and Participation (VAP) scores and vestibular diagnoses in patients presenting with balance disturbances, and to investigate whether the VAP questionnaire can be used as an auxiliary tool for treatment planning and outcome assessment. **Material and Methods:** Patients who presented to the Kastamonu Training and Research Hospital Ear, Nose, and Throat Outpatient Clinic with complaints of dizziness and vertigo between October 2021 and October 2023 and who were diagnosed with vestibular migraine, vestibular neuritis, Meniere's disease, persistent postural-perceptual dizziness, bilateral vestibulopathy, unilateral vestibulopathy, or benign paroxysmal positional vertigo (BPPV) following tests and examinations were retrospectively evaluated. Scores for the VAP questionnaire and vestibular diagnoses were compared. **Results:** No significant difference was observed between genders and the VAP score ($p=0.355$). No correlation was determined between age and VAP score ($r=-0.069$; $p=0.364$). VAP scores were significantly higher among individuals with vestibular neuritis diagnoses than those without ($p<0.001$) and were significantly lower among individuals with diagnoses of BPPV than those without ($p<0.001$). **Conclusion:** This study supports the routine application of the VAP questionnaire, together with physical examination and laboratory tests, for the assessment of activity and participation in patients with vestibular disorders. VAP scores registered in different vestibular diagnoses may be useful in the planning of vestibular rehabilitation programs aimed at improving limitations in activities of daily living and participation and in post-treatment evaluations.

ÖZET Amaç: Bu çalışmanın amacı, denge bozukluğu nedeniyle başvuran hastalarda vestibüler tanılar ile Vestibüler Aktiviteler ve Katılım [the Vestibular Activities and Participation (VAP)] skorlarını karşılaştırarak, vestibüler bozuklukların aktiviteleri nasıl sınırlandırdığını ve katılımı ne ölçüde kısıtladığını göstermek ve VAP anketinin tedavi planlaması ve sonuç değerlendirmesi için kullanılabilecek yardımcı bir araç olup olmadığını araştırmaktır. **Gereç ve Yöntemler:** Çalışmamızda, Ekim 2021-Ekim 2023 tarihleri arasında Kastamonu Eğitim Araştırma Hastanesi Kulak Burun Boğaz Polikliniği'ne baş dönmesi şikayetiyle başvuran, yapılan muayene ve tetkikler sonucu vestibüler migren, vestibüler nörit, Meniere hastalığı, kalıcı postural-algisal baş dönmesi, bilateral vestibülopati, unilateral vestibülopati ve benign paroksizmal pozisyonel vertigo (BPPV) tanıları alan hastalar retrospektif olarak incelendi. VAP anketi skorları ile vestibüler tanılar karşılaştırıldı. **Bulgular:** Cinsiyetler ve VAP skoru arasında anlamlı bir fark gözlenmedi ($p=0,355$). Yaş ile VAP skoru arasında bir korelasyon saptanmadı ($r=-0,069$; $p=0,364$). VAP skorları, vestibüler nörit tanısı olan bireylerde olmayanlara göre anlamlı derecede daha yüksekti ($p<0,001$) ve BPPV tanısı olan bireylerde olmayanlara göre anlamlı derecede daha düşüktü ($p<0,001$). **Sonuç:** Çalışmamız vestibüler bozukluğu olan hastalarda aktivite ve katılımı değerlendirmek için VAP anketinin fizik muayene ve laboratuvar testleriyle beraber rutin kullanımını desteklemektedir. Vestibüler tanılara göre elde edilen VAP skorları günlük yaşam aktivitelerindeki limitasyonları ve katılımdaki kısıtlılıkları iyileştirmeye yönelik vestibüler rehabilitasyon programlarının planlanmasında ve tedavi sonrası değerlendirmelerin yapılmasında yararlı olabilir.

Keywords: Benign paroxysmal positional vertigo; vertigo; dizziness

Anahtar Kelimeler: Benign paroksizmal pozisyonel vertigo; vertigo; baş dönmesi

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Vestibular disorders, including vertigo and dizziness affect approximately 20-30% of the general population and are frequent causes of presentations to the emergency department, neurology and ear, nose, and throat clinics. Numerous factors, such as peripheral causes associated with the vestibular system, central nervous system diseases, and cardiologic, psychiatric, and hematological diseases are involved in the etiology.¹ Medical history and vestibular tests are the most important components of the diagnostic evaluation. Because of the complex etiology of vestibular disorders, multidisciplinary approaches may be required. In addition, laboratory tests and imaging methods are also employed for central/peripheral vertigo differentiation and to determine the site of the lesion when evaluating patients with vestibular disorders.²

Vestibular disorders have a significant impact on individuals' physical and psychological conditions and quality of life.³ Patients with a vestibular disorder may tend to avoid various activities and restrict their movements due to fear of falling or triggering symptoms.⁴ The performance of numerous activities of daily living, such as climbing stairs, shopping, and driving, may be made difficult due to fear and avoidance. These avoidance behaviors result in vestibular disorder leading to greater disability by affecting the individual's ability to adapt. Individuals with a vestibular disorder may thus become socially isolated by gradually abandoning essential daily activities.⁵ Anxiety accompanying vertigo has a more adverse impact on social life.⁶

The Vestibular Activities and Participation (VAP) questionnaire was developed in 2012 by Alghwiri et al. for the purpose of examining the inhibitory effect of vestibular disorders on individuals' activities and participation.⁷ It consists of 34 questions, with patients being asked to rate the degree of difficulty experienced due to vestibular disorders. Patients rated the questions by evaluating the difficulty experienced in performing activities without assistance as "none (0)," "mild difficulty (1)," "moderate difficulty (2)," "severe difficulty (3)," "unable to perform the activity (4)," and "non-applicable (NA)." The total VAP questionnaire score was obtained by calculating the mean scores for the questions follow-

ing the removal of those marked "NA." Higher scores indicate greater difficulty in activity and participation.⁸ The VAP questionnaire is a valid and reliable tool for evaluating functionality in daily life and restrictions on participation in individuals with a vestibular disorder.⁷

The purpose of this study was to show how vestibular disorders restrict activities and the extent to which they impose limitations on participation by comparing VAP scores and vestibular diagnoses in patients presenting with balance disturbances and to investigate whether the VAP questionnaire can be used as an auxiliary tool for treatment planning and outcome assessment.

MATERIAL AND METHODS

Approval was received from the Kastamonu University Clinical Research Ethical Committee, before commencement (date: November 09, 2023, no: 2023-KAEK-128). All procedures involving human participants were compatible with the institution's (Kastamonu University Ethical Committee) ethical principles and the 2008 Declaration of Helsinki. Written consent forms were obtained from the patients.

Patients who presented to the Kastamonu Training and Research Hospital Ear, Nose, And Throat Outpatient Clinic with complaints of dizziness and vertigo between October 2021 and October 2023 and who were diagnosed with vestibular migraine, vestibular neuritis, Meniere's disease, persistent postural-perceptual dizziness (PPPD), bilateral vestibulopathy (BVP), unilateral vestibulopathy (UVP), or benign paroxysmal positional vertigo (BPPV) following tests and examinations were retrospectively evaluated. The scores for the VAP questionnaire, applied to all patients during examinations, and vestibular diagnoses were compared. Patients under 18 years and those who could not be definitely diagnosed because the tests were not completed were excluded.

Analyses were performed using the SPSS version 22 software (SPSS Inc., Chicago, IL, USA). Categorical data were expressed as number and percentage values, and continuous data as mean±standard deviation. The normality of the dis-

tribution of the continuous variables was assessed using the Kolmogorov-Smirnov test. The Student's t-test was applied in two-way group comparisons and one-way analysis of variance in the comparison of more than two variables. The relationships between continuous variables were examined using Pearson's correlation test. Receiver operating characteristic (ROC) curves were drawn to measure the diagnostic value of the VAP score in determining the presence of vestibular neuritis and BPPV. A significance level of $p < 0.05$ was set for the analyses.

RESULTS

A total of 176 patients, 124 women (70.5%) and 52 men (29.5%) were included in the study. The patients' mean age was 53.5 ± 14.6 years, and their mean VAP score was 1.6 ± 0.8 . Vestibular neuritis was diagnosed in 15.9% of patients, vestibular migraine in 10.2%, PPPD in 17.6%, Meniere's disease in 1.7%, UVP in 23.3%, BVP in 6.3%, and BPPV in 25% (Table 1).

A significant difference was observed among the patients' VAP scores, which was derived from the difference between vestibular neuritis and PPPD, UVP, BVP, and BPPV. The vestibular neuritis group registered a higher VAP score ($p < 0.001$). No significant difference was observed between genders and VAP score ($p = 0.355$). No correlation was also determined between age and VAP score ($r = -0.069$; $p = 0.364$) (Table 2).

TABLE 1: Patients' demographic characteristics, vestibular diagnoses, and VAP scores.

		n	%
Sex	Female	124	70.5
	Male	52	29.5
Age, $\bar{X} \pm SD$		53.5 ± 14.6	
VAP score, $\bar{X} \pm SD$		1.6 ± 0.8	
Vestibular diagnoses	Vestibular neuritis	28	15.9
	Vestibular migraine	18	10.2
	PPPD	31	17.6
	Meniere's disease	3	1.7
	UVP	41	23.3
	BVP	11	6.3
	BPPV	44	25.0

SD: Standard deviation; VAP: Vestibular activities and participation; PPPD: persistent postural-perceptual dizziness; UVP: unilateral vestibulopathy; BVP: bilateral vestibulopathy; BPPV: benign paroxysmal positional vertigo.

TABLE 2: Relationships between VAP scores and other parameters.

		VAP score	
		$\bar{X} \pm SD$	p value
Sex	Female	1.6 ± 0.7	0.355*
	Male	1.7 ± 0.9	
Vestibular diagnoses	Vestibular neuritis	2.2 ± 0.9	<0.001**
	Vestibular migraine	1.7 ± 0.7	
	PPPD	1.6 ± 0.6	
	Meniere's disease	2.1 ± 1.0	
	UVP	1.5 ± 0.8	
	BVP	1.4 ± 0.8	
	BPPV	1.3 ± 0.5	
		r value	p value
Age		-0.069	0.364***

*Student's t-test; **One-way analysis of variance; ***Pearson correlation analysis.

SD: Standard deviation; VAP: Vestibular activities and participation; PPPD: persistent postural-perceptual dizziness; UVP: unilateral vestibulopathy; BVP: bilateral vestibulopathy; BPPV: benign paroxysmal positional vertigo.

VAP scores were significantly higher among individuals with vestibular neuritis diagnoses than those without ($p < 0.001$) and were significantly lower among individuals with diagnoses of BPPV than those without ($p < 0.001$) (Table 3).

The ability of the VAP score to predict vestibular neuritis was investigated using Receiver operat-

TABLE 3: A comparison of VAP scores in terms of presence of diseases

		VAP score	
		$\bar{X} \pm SD$	p value*
Vestibular neuritis	Yes	2.2 ± 0.9	<0.001
	No	1.5 ± 0.7	
Vestibular migraine	Yes	1.7 ± 0.7	0.369
	No	1.6 ± 0.8	
PPPD	Yes	1.6 ± 0.6	0.966
	No	1.6 ± 0.8	
Meniere's disease	Yes	2.1 ± 1.0	0.253
	No	1.6 ± 0.7	
UVP	Yes	1.5 ± 0.8	0.324
	No	1.6 ± 0.7	
BVP	Yes	1.4 ± 0.8	0.389
	No	1.6 ± 0.8	
BPPV	Yes	1.3 ± 0.5	<0.001
	No	1.7 ± 0.8	

*Student's t-test applied. SD: Standard deviation; VAP: Vestibular activities and participation; PPPD: persistent postural-perceptual dizziness; UVP: unilateral vestibulopathy; BVP: bilateral vestibulopathy; BPPV: benign paroxysmal positional vertigo.

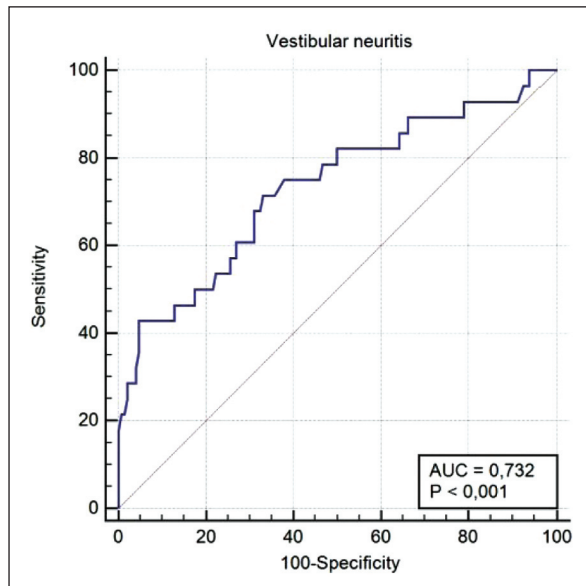


FIGURE 1: ROC curve of the VAP score for vestibular neuritis.

ROC: Receiver operating characteristic; VAP: Vestibular activities and participation; AUC: Appropriate use criteria.

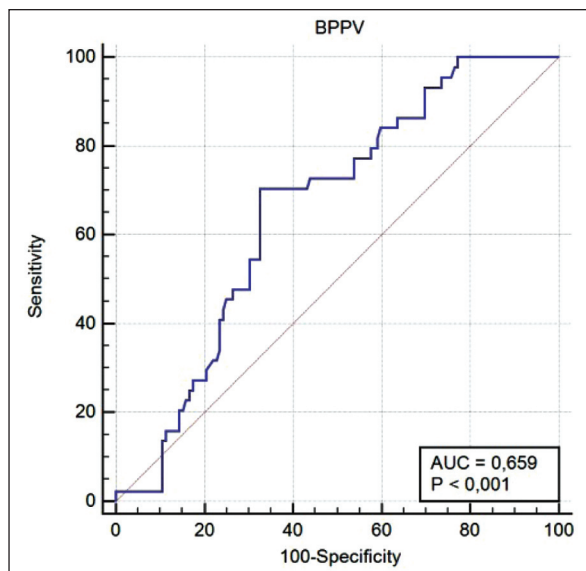


FIGURE 2: ROC curve of the VAP score for BPPV.

ROC: Receiver operating characteristic; VAP: Vestibular activities and participation; BPPV: benign paroxysmal positional vertigo; AUC: Appropriate use criteria.

ing characteristic (ROC) analysis, and a cut-off value was determined. A VAP score cut-off value of 1.742 exhibited 71.4% sensitivity and 66.9% specificity and appeared to represent a good determinant of vestibular neuritis (Figure 1).

The ability of the VAP score to predict BPPV was also investigated using ROC analysis, and a cut-off value was determined. Accordingly, a cut-off value of 1.462 exhibited 70.5% sensitivity and 67.4% specificity and also emerged as a good indicator of BPPV (Figure 2) (Table 4).

DISCUSSION

Vestibular disorders cause a diminution in the individual's quality of life and restriction in daily activities of living. Workforce losses and decreased productivity at work, a weakening of the individual's participation in social life, and rising health costs all impose a heavy social and economic burden. Epidemiological studies have reported a higher incidence of vestibular dysfunction in women. This sexual dimorphism in vestibular function may derive from hormonal differences between men and women.⁹ Similarly in the present study, and consistent with the previous literature, vestibular disorders were more common in women, who constituted 70.5% of the patient group. However, no significant gender difference was observed in terms of VAP scores ($p=0.355$). As with many systems in the body, aging also produces a degenerative effect on the vestibular system. A measurable decrease in peripheral vestibular functions has been demonstrated with age. The incidence of BPPV, one of the most common causes of vertigo, increases with age, peaking at an approximate average age of 60.¹⁰ BPPV was also the most common vestibular disorder in the present study, and the mean age of the patients with vestibular disorder was

TABLE 4: The specificity and sensitivity of the VAP score in determining the presence of vestibular neuritis and BPPV.

	p value	AUC	95% confidence interval		Sensitivity	Specificity	Cut-off
			Lower threshold	Upper threshold			
Vestibular neuritis	<0.001	0.732	0.660	0.796	71.4	66.9	>1.742
BPPV	<0.001	0.659	0.584	0.729	70.5	67.4	≤1.462

AUC: Appropriate use criteria; BPPV: benign paroxysmal positional vertigo.

53.5±14.6 years. However, no correlation as determined between age and VAP scores ($r=-0.069$; $p=0.364$).

Vestibular rehabilitation is a special exercise-based therapy developed for supporting medical treatment and intended to symptomatically treat vertigo when vestibular compensation is insufficient.¹¹ Diagnostic tests alone are not always sufficient to determine the treatment. The patient's general health status, individual characteristics, and functional status are also important in determining the treatment methods. A situation that triggers attacks can be regarded as challenging by the individual and can result in social isolation.¹² Monzani et al. reported that patients, especially women, suffering from vertigo exhibit significant phobic anxiety and depressive mental states, and that this fear of vertigo is closely associated with the perception of disability.¹³ Therefore, the evaluation of patients' own perspectives toward their disability and restrictions plays an important role in treatment planning. This can be done using scales that evaluate body functions and participation in activities together in the field of vestibular rehabilitation.¹²

Patients with BPPV in this study registered significantly low VAP scores. BPPV is the most common cause of peripheral vertigo and results in short-term, transient vertigo triggered by head movements, which is typically associated with otolith displacement in the semicircular canals. It generally resolves with appropriate repositioning maneuvers in a single clinical visit, although some risk factors cause recurrent or persistent BPPV.^{14,15} In agreement with the previous literature, the most common vestibular disorder in this study was also BPPV, representing 25% of all cases. Hypertension and diabetes have been reported to be associated with recurrent BPPV, and the presence of both diseases represents a risk in terms of residual disease. Obesity has also been reported to exhibit an adverse effect on residual disease improvement.¹⁵ Lower VAP scores being determined in patients diagnosed with BPPV in the present study supports the idea that the disease can be treated effectively, sufficiently, and rapidly in patients without comorbidities with the repositioning maneuvers applied and that these patients experience less restriction in activity and participation.

VAP scores were significantly higher in this study in patients diagnosed with vestibular neuritis, a widespread cause of peripheral vertigo. Vestibular neuritis generally emerges following viral upper respiratory tract infection and is thought to result from the inflammation of the vestibular component of the eighth cranial nerve. It can persist for a few days or for weeks.¹⁶ The symptoms worsen during activity and affect the course of daily life.¹⁷ Permanent, long-term disability can develop in patients' daily activities.¹⁸ In addition to symptomatic treatment, patients with vascular neuritis may require vestibular rehabilitation to increase their tolerance of vertigo and body stability.¹⁷ The higher VAP scores in patients with vestibular neuritis in this study confirm the need for vestibular rehabilitation in these patients due to the condition restricting their activities and participation.

The VAP questionnaire can be applied as a valid and reliable scale for evaluations performed before and after vestibular rehabilitation aimed at improving limitations in the daily activities of living and participation among patients with vestibular disorder and in monitoring responses to treatment. To the best of our knowledge, this is the first study to evaluate the VAP scores in terms of vestibular diagnoses. Important limitations of this study include its retrospective nature and the lack of sufficient patient numbers in the diagnostic subgroups. We recommend that similar studies be conducted with larger patient groups.

CONCLUSION

This study supports the routine application of the VAP questionnaire, together with physical examination and laboratory tests, for the assessment of activity and participation in patients with vestibular disorders. VAP scores registered in different vestibular diagnoses may be useful in the planning of vestibular rehabilitation programs aimed at improving limitations in activities of daily living and participation and in post-treatment evaluations.

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Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise,

working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: Fatma Atalay, Sezai Sacid Anbar; **Design:** Fatma Atalay, Murat Yaşar; **Control/Supervision:** Fatma Atalay, Murat Yaşar; **Data Collection and/or Processing:** Fatma Atalay, Sezai Sacid Anbar, Tuğçe Toplu; **Analysis and/or Interpretation:** Fatma Atalay, Murat Yaşar; **Literature Review:** Tuğçe Toplu, Sezai Sacid Anbar; **Writing the Article:** Fatma Atalay; **Critical Review:** Murat Yaşar; **References and Fundings:** Fatma Atalay, Tuğçe Toplu; **Materials:** Fatma Atalay, Murat Yaşar, Sezai Sacid Anbar, Tuğçe Toplu.

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