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Original Article

Determination of Anxiety, Health Anxiety and Somatosensory Amplification Levels in Individuals with Benign Paroxysmal Positional Vertigo

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OBJECTIVES: Psychiatric comorbidities may intensify peripheral vertigo and increase the number of repositioning maneuvers required. This study was designed to examine the relationship between benign paroxysmal positional vertigo (BPPV) and anxiety and assess its association with somatic amplification and health anxiety.

MATERIALS and METHODS: Sixty patients with BPPV (43 women, 17 men; age range: 24-81 years, mean age 40.4±13.3), and 60 healthy participants (29 women, 31 men; age range: 18-71, mean age 38.2±11.43) were prospectively enrolled. The participants completed the Beck Anxiety Inventory (BAI), Short Health Anxiety Inventory (SHAI), and Somatosensory Amplification Scale (SSAS) questionnaires.

RESULTS: The BAI scores of the patients with BPPV were higher than those of the control group participants and were as follows: (16.4 vs. 12.7; p=0.01). The SHAI (p=0.44) and SSAS (p=0.60) scores were not significantly different between the two groups. The BAI scores were positively correlated with the SHAI (rho: 0.273, p=0.035) and SSAS (rho: 0.357, p=0.005) scores. Neither the number of BPPV attacks nor the number of Epley maneuvers required showed any correlation with the BAI [(rho: 0.208, p=0.11); (rho: −0.007, p=0.96)], SHAI [(rho: 0.068, p=0.06); (rho: 0.021, p=0.87)], and SSAS [(rho: −0.081, p=0.53); (rho: −0.012, p=0.92)] scores.

CONCLUSION: Our findings indicate that patients with BPPV had higher anxiety scores than healthy participants. Although our findings indicated normal health anxiety and somatic amplification levels in patients with BPPV, regular evaluation of psychological status would be a good strategy to prevent chronic dizziness.

KEYWORDS: Benign paroxysmal positional vertigo, vertigo, anxiety

INTRODUCTION

Benign paroxysmal positional vertigo (BPPV) is the most common vestibular disorder. It is defined as abrupt, unexpected attacks of vertigo that causes fear or anxiety and is triggered by movements and changing of head position. Vertigo is usually a stressful experience and may simply trigger fear or phobic behavior and anxiety and decrease quality of life. Indeed, high rates of comorbidity between vestibular and psychiatric (30%-50%) syndromes have been reported [1, 2]. Bigelow et al. [3] reported that patients with peripheral vertigo had a higher risk of depression (OR, 3.4; 95% CI, 2.9-3.9), anxiety (OR, 3.2; 95% CI, 2.8-3.6), and panic disorder (OR, 3.4; 95% CI, 2.9–4.0). Dizziness is a frequent complaint of individuals with anxiety, and in 30%-50% of patients complaining of dizziness, no noticeable medical condition can be identified; the prevalence of anxiety and other somatoform diseases is increased in these patients [4]. Furthermore, Chen et al. [5] reported that patients with anxiety disorder may have a higher risk of developing BPPV in a nationwide population-based cohort study. Furman et al. [6] hypothesized a neuro-anatomical model to study the connection between emotion processing pathways and the vestibular system. However, this connectivity is presently under dispute.

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Health anxiety involves concerns about having a severe disorder and fear of the consequences of having a disease [7]. Excessive health anxiety—and its older synonym, hypochondriasis—is widely prevalent; in fact, 81% of undergraduate students experience a certain degree of health anxiety and 6% of people claim to experience a substantial level of health anxiety in their lives [7, 8]. Additionally, patients with medical diseases report increased rates of elevated health anxiety [9]. Elevated health anxiety results in greater use of health care services, many unnecessary investigations or tests, and a huge burden on the economy [10].

The notion of somatosensory amplification was introduced by Barsky et al [11]. Somatosensory amplification refers to the predisposition to perceive a somatic sensation as being dense, noxious, and distressing. Increased levels of somatosensory amplification are supposed to turn body sensations into symptoms and elevate existing symptoms [12]. The somatosensory amplification score showed a positive correlation with the symptoms of various conditions, including myofascial pain, migraine, fibromyalgia, and asthma [12].

Freyler et al. reported that modern health concerns were linked to somatosensory amplification and health anxiety [13]. Many studies also indicated the comorbidities of psychiatric diseases and BPPV; however, this study is the first to investigate the association of anxiety, health anxiety, and somatic amplification with BPPV [12, 13]. We hypothesize that anxiety, health anxiety, and somatic amplification may intensify peripheral vertigo and may increase the number of repositioning maneuvers required. This study aimed to reveal the association between BPPV and anxiety and evaluate its relationship with health anxiety and somatic amplification.

MATERIALS AND METHODS

Participants and Study Design

A total of 60 consecutive patients with BPPV [mean (SD) age: 40.4 (13.3) years; 43 women and 17 men; age range: 24-81 years] were included in this single-center prospective case-control study conducted in the Ear Nose Throat (ENT) and Neurology Outpatient Clinics between February and September 2017. To be eligible for enrollment, participants were assessed using videonystagmography (VNG) (VisualEyes VNG, Micromedical Technologies, USA) by two experienced audiologists, and the BPPV diagnosis of positional nystagmus was performed using the Dix–Hallpike test and/or Roll test. The patients were examined by both ENT and neurology specialists. Migraine was diagnosed by the neurologist according to the International Classification of Headache Disorders criteria, 3rd edition [14].

The participants filled the sociodemographic form, Beck anxiety inventory (BAI), Short Health Anxiety Inventory (SHAI), and the Somatosensory Amplification Scale (SSAS) forms at the initial visit. Patients diagnosed with BPPV who were aged ≥18 years were included in the study. Patients diagnosed with other peripheral or central vertigo diseases, those with vestibular migraine or any severe medical condition that was unstable, those who were pregnant or breastfeeding, and those who were incapable of filling the form because of dementia or cognitive impairment were excluded.

The control group comprised the relatives of consecutive patients who were referred to the neurology clinic for entrapment neuropathy or radiculopathy. The relatives of patients were evaluated by neurologists and were requested to be participants in the research. Patients who had previous vertigo attacks or unstable medical and psychiatric diseases were not included. The same exclusion criteria were used for both patients with BPPV and healthy participants.

The clinical research ethics committee of our institution approved the study. The study was conducted according to the ethical principles of the Helsinki Declaration. Informed consents were obtained from all participants.

Main Outcome Measures

Sociodemographic Form and Clinical Characteristics

The sociodemographic form comprised a questionnaire regarding the participants' sociodemographic status (i.e., age and gender), history of previous history of BPPV and psychiatric disease, recent upper tract infection or head trauma, migraine, or motion sickness and was completed by both the patients and healthy participants.

Clinical features of BPPV

The localization, side, affected semicircular canal/s (horizontal, lateral, or anterior), and the number of Epley maneuvers for reposition/treatment were recorded. Only one maneuver was performed per clinic visit. Canalith repositioning maneuvers were performed until nystagmus disappeared or the patient became comfortable.

Beck Anxiety Inventory (BAI)

This is a self-reported measure of anxiety. Twenty-one items can be scored from 0 to 3 in terms of the severity of the symptom over the past month. The total score is calculated by calculating the sum of the twenty-one items. An elevated total score indicates severe levels of anxiety [15, 16]. BAI scores between 0 and 21 are considered to indicate low anxiety; 22-35, moderate anxiety; and ≥36, potentially concerning levels of anxiety.

Short Health Anxiety Inventory (SHAI)

The SHAI evaluates health anxiety independently of physical health status anxiety [17]. For the present study, we used the 18-item version of the SHAI, which comprised two divisions: a main division composed of 14 items evaluating cognitive, affective, and behavioral aspects of health anxiety and a 4-item "negative consequences" division assessing the participant's perspective on the unpleasantness of being ill.

Each item is composed of four statements (do not, 0 point; occasionally, 1 point; frequently, 2 point; and constantly, 3 point) that can be scored from 0 to 54 point, and individuals provide answers that best reflects their feelings. Karapicak et al. [18] established the reliability and validity of the Turkish form. The cutoff score of the SHAI has not been clearly established thus far; however; some authors have used 15, 18, or 20 as the cutoff score. The cutoff score was set at 18 in the present study [18].

Somatosensory Amplification Scale (SSAS)

The SSAS assesses the sensitivity of mild bodily sensations. The SSAS comprises 10 items with a Likert scale ranging from 1 (not at all) to 5 (extremely) [11]. The total amplification score is determined by sum-

ming the scores. Gulec et al.[19] established the reliability and validity of the Turkish form.

Statistical Analysis

Data are expressed as mean ± standard deviation (SD). The normality of the data was tested using the Kolmogorov–Smirnov test. The chi-square was used to compare parametric variables. The Mann–Whitney U test was used to compare nonparametric variables. Spearman rank correlation was used to evaluate the correlation between the variables. All statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS), version 24.0 (IBM Corp.; Armonk, NY, USA). The level of significance was set at $p<0.05$.

RESULTS

Sociodemographic and Clinical Variables

Table 1 shows the sociodemographic and clinical characteristics of the groups. The mean ages of the patients with BPPV and the healthy participants were 40.5 (±13.3) and 38.2 (±11.4) years, respectively (p=0.505). Women comprised a large part of the BPPV group [43 women (percentage) vs. 27 men (percentage)]; gender distribution was not equal (p=0.009). Motion sickness was significantly higher in patients with BPPV than in healthy participants (p<0.001). Among the 60 patients with BPPV, 18 (30%) were diagnosed with migraine. Eleven healthy participants (18.3 %) were diagnosed with migraine. There was a significant difference (p=0.136) in the incidence of migraine between the BPPV and control groups. There was no significant difference in the history of previous psychiatric disorder (p=0.114), recent infectious diseases (p=0.171), or head trauma (p=0.496) between the groups.

Clinical features of BPPV

The posterior canal was the most commonly affected (n=34; 56.7%), whereas the remaining patients had their horizontal canal affected (n=25; 41.7%). One patient (1.7%) had multiple canal involvement. Among the 60 patients, 22 (36.7%) had bilateral, 20 (33.3%) right-side, and 18 (30%) left-side BPPV. Eleven (18.3%) had a first episode of BPPV, whereas 81.7% suffered from recurrent attacks. The mean number of BPPV episodes among the patients was 1.4 (1.3) (range: 1-6). The number of previously reported BPPV episodes was as follows: 30 patients (50%), 1 episode; 8 patients (13.3%), 2 episodes; 3 patients (10%), 3 episodes; 5 patients (8.3%), ≥4 episodes. Gender did not have a significant effect on the number of BPPV episodes (p=0.888).

The mean number of Epley maneuvers was 1.9 (1.4) (range: 1-8). Most patients (n=48; 80%) were sufficiently treated with one (n=30; 50%) or two (n=18; 30%) Epley maneuvers. The remaining 20% (n=12) of

Table 1. Demographic and clinical findings of all participants

Variable	BPPV group (n=60)	Control group (n=60)	p
Age			
Mean (SD)	40.5 (13.3)	38.2 (11.4)	0.505
Range	24-81	18-71	
Gender			
Female	43 (71.6%)	29 (48.3%)	0.009
Male	17 (28.3%)	31 (51.7%)	
Psychiatric disorder history			
Positive	8 (13.3%)	3 (5%)	0.114
Negative	52 (86.7%)	57 (95%)	
Recent infection history			
Positive	4 (6.6%)	0	0.171
Negative	56 (93.3%)	60 (100%)	
Recent head trauma			
Positive	2 (3.3%)	0	0.496
Negative	58 (96.6%)	60 (100%)	
Migraine			
Positive	18 (41.7%)	11 (79.4%)	0.136
Negative	42 (58.3%)	49 (20.6%)	
Motion sickness			
Positive	20 (33.3%)	0	0.001
Negative	40 (66.6%)	60 (100%)	

N: Number of participants; BPPV: Benign positional paroxysmal vertigo; SD: Standard deviation; p<0.05, bold indicates statistical significance.

Table 2. Psychological tests of patients with BPPV and healthy participants

Measures		Patients with BPPV (n=60)	Healthy participants (n=60)	p
BAI	Mean (SD)	16.4 (9.7)	12.7 (9.6)	0.01
	Range	(0-44)	(1-49)	
SHAI	Mean (SD)	15.5 (7.0)	14.9 (7.2)	0.443
	Range	(3-41)	(2-40)	
SSAS	Mean (SD)	25.1 (6.6)	25.8 (7.5)	0.602
	Range	(12-40)	(12-44)	

N: Number of participants; SD: Standard deviation; BPPV: Benign paroxysmal positional vertigo; BAI: Beck Anxiety Inventory; SHAI: Short Health Anxiety Inventory; SSAS: Somatosensory amplification scale; p<0.05. bold indicates statistical significance.

patients required three or more maneuvers as follows: three maneuvers for 4 (6.7%) patients, four maneuvers for 4 (6.7%) patients, and five or more maneuvers for 4 (6.7 %) patients. Gender did not have a significant effect on the number of Epley maneuvers (p=0.587).

BAI, SHAI, and SSAS Scores in Patients with BPPV and Healthy Participants

Table 2 demonstrates the SSAS, BAI, and SHAI scores of both groups. The BAI scores of the patients and healthy participants were 16.4 (9.7) and 12.7 (9.6) (p=0.01), respectively. The SHAI scores did not show a significant difference between the two groups (15.53 for the BPPV group vs. 14.9 for the healthy participants) (p=0.443). The mean SSAS scores of the patients and the healthy participants were 25.1 (6.6) and 25.8 (7.5), respectively (p=0.602).

Depending on having a single (n=11) or recurrent attack in patients with BPPV (n=49), three psychometric symptoms did not show any significant difference. These are BAI (p=0.760), SHAI (p=0.521), and SSAS (p=0.461).

Correlation among the BAI, SHAI, and SSAS Scores in Patients with BPPV

The BAI scores were positively correlated with SHAI (rho: 0.273, p=0.035) and SSAS (rho: 0.357, p=0.005) scores.

The SHAI scores did not show any correlation with SSAS scores (rho: 0.237, p=0.068).

Correlation between the BAI, SHAI, and SSAS Scores and the Number of Previous BPPV Attacks and Total Number of Epley Maneuvers Required for Treatment in Patients with BPPV

Neither the number of BPPV attacks nor the required number of Epley maneuvers showed any correlation with the BAI [(rho: 0.208, p=0.11); (rho: –0.007, p=0.96)], SHAI [(rho: 0.068, p=0.06); (rho: 0.021, p=0.87)], and SSAS [(rho: –0.081, p=0.53); (rho: –0.012, p=0.92)] scores, respectively.

We did not find any relationship between the number of previous BPPV attacks and the total number of Epley maneuvers required for treatment [(rho: 0.37, p=0.78)] in the patients with BPPV.

DISCUSSION

It is essential for clinicians to recognize psychiatric comorbidities to avoid unnecessary tests and treatments. Our research aimed to assess the relationship of BPPV with anxiety, health anxiety, and somatic amplification. Our findings revealed higher anxiety scores in patients with BPPV than in healthy participants. Moreover, the anxiety scores of the patients with BPPV correlated with their health anxiety and somatic amplification scales. However, none of these scales showed any correlation with the number of previous BPPV attacks or the total number of Epley maneuvers required for treatment.

The number of women in the BPPV group were significantly higher than those in the control group (p=0.009). This finding is in agreement with those of previous studies, suggesting that women are more affected than men, with a ratio of approximately 2:1 [20, 21]. The present study revealed that motion sickness was significantly higher in patients with BPPV than in the healthy participants (p=0.001).

Various recurrence rates of BPPV have been previously reported. Kansu et al.[22] found a recurrence rate of 53.8% within the first 2 years in their patients. Nunez et al. [23] reported that the annual percentage recurrence was approximately 15%, with roughly 50% having a recurrence within 40 months. In their statements, 81.7% of the patients claimed to have had a history of BPPV. The posterior canal (56.7%) and horizontal canal (41.7%) were the most common type of BPPV in our study. We did not observe right- or left-sided dominancy for BPPV. The mean number of Epley maneuvers was 1.9; indeed, 80% of the patients with BPPV needed only one or two repositioning maneuvers.

The patients with BPPV exhibited higher BAI scores than the healthy participants (p=0.001). Kahraman et al. [24] evaluated their patients with BPPV using the BAI and a panic agoraphobia scale questionnaire both before canalith repositioning treatment and 7 and 14 days after the treatment. The panic agoraphobia scores were significantly higher in patients with BPPV than in control group participants during each period (p<0.001); the BAI scores were also found to be notably elevated in the BPPV group compare with the control group at the first and second visit (p<0.001). Ferrari et al. [25] reported that affective symptomatology, such as depression, anxiety, demoralization, phobia, and somatization, were significantly prevalent in patients with BPPV. However, our study did not reveal any significant difference in the SHAI and SSAS scores between the patients with BPPV and healthy participants.

The BAI scores exhibited a positive correlation with both the SHAI and SSAS scores in the patients with BPPV. To date, a limited number of studies have assessed comorbid anxiety disorders and health anxiety disorders. Overlapping symptoms of hypochondriasis and obsessive–compulsive disorder were pointed out by Abramowitz et al. [26]. Sunderland et al. [8] reported a notable relationship between generalized anxiety disorder and health anxiety. Previous studies also indicated that health anxiety disorders and depression are highly and positively associated with increased age [27]. Korkmaz et al. [28] also reported a positive correlation between health anxiety and somatosensory amplification levels in individuals with normal coronary angiography findings. Finally, research suggests that health anxiety disorders may be particularly associated with several mental disorders and have overlapping symptomology.

There are several hypotheses attempting to explain the link between psychiatric and vestibular disorders. According to the otogenic hy-

pothesis, secondary anxiety arises from primary neurotologic problems, whereas the interactive hypothesis states that preexisting anxiety is magnified by neurotologic conditions [29]. The link between the vestibular and emotional processing system can be explained as follows: (1) the level of anxiety is mediated by the monoaminergic inputs to the vestibular system, (2) the emotional responses related with vestibular dysfunctions are controlled by the parabrachial nucleus network, and (3) the noradrenergic outflow from the locus coeruleus is the main mediator on how these symptoms respond to novel stimuli [6, 30, 31].

Our study has some limitations. First, the only tool used to evaluate psychological distress was a self-reported questionnaire; we did not use structured interviews.

Self-reporting questionnaires fail to measure clinical interviews and are thus weaker in matching anxiety levels to clinical diagnosis.

Second, most of the patients with BPPV had previous episodes; indeed, only 18.3% of the patients with BPPV had only a single episode. The results of our selective small sample cannot be generalized. Future prospective research using larger sample sizes is needed to further investigate the influence of anxiety, health anxiety, and somatic amplification in vertigo. Nevertheless, the strength of the present study is that the patients with migraine and healthy participants were evaluated by neurologists for migraine diagnosis. The diagnosis of BPPV was made using electronystagmography, and repositioning maneuvers were conducted by two experienced audiologists.

CONCLUSION

This is the first study to investigate the association of anxiety, health anxiety, and somatic amplification with BPPV. Our findings indicated that patients with BPPV had higher levels of anxiety scores than healthy participants. Furthermore, their anxiety scores showed a positive correlation with both their health anxiety and somatic amplification scores. The anticipatory fear of acute episodes of vertigo may negatively affect patients with BPPV and increase their anxiety levels regardless of whether they previously suffered from this condition. Anxiety exaggerates physical symptoms, inhibits medical care. Although our findings revealed normal health anxiety and somatic amplification levels in the patients, timely assessment of psychological status would be a good strategy to prevent chronic dizziness.

Ethics Committee Approval: Ethics committee approval was received for this study from the Ethics Committee of Acibadem Mehmet Ali Aydinlar University (2019-07/28).

Informed Consent: Written informed consent was obtained from the patients who participated in this study.

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Author Contributions: Concept – A.Ö.; Design – P.Y.D.; Supervision – A.Ö., P.Y.D.; Resource – E.A.A.; Materials – E.A., A.Ö.; Data Collection and/or Processing – N.K., P.Y.D.; Analysis and/or Interpretation – A.Ö., E.A.; Literature Search – E.A.A.; Writing – P.Y.D., A.Ö.; Critical Reviews - N.K.

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