International Journal of Neurologic Physical Therapy
2015; 1(1): 1-4
Published online November 12, 2015 (http://www.sciencepublishinggroup.com/j/ijnpt)
doi: 10.11648/j.ijnpt.20150101.11

To Find out the Relationship Between Dizziness and Balance in Benign Paroxysomal Positional Vertigo (BPPV): A Co Relational Study

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To cite this article:
Shahanawaz S. D., Priyanshu V. Rathod. To Find out the Relationship Between Dizziness and Balance in Benign Paroxysomal Positional Vertigo (BPPV): A Co Relational Study. *International Journal of Neurologic Physical Therapy.* Vol. 1, No. 1, 2015, pp. 1-4.
doi: 10.11648/j.ijnpt.20150101.11

Abstract: *Background of the study:* The vestibular system is both a sensory system and a motor system. As a sensory system, the vestibular system provides the central nervous system (CNS) with information about the position and motion of the head and the direction of gravity. The CNS uses this information, together with information from other sensory systems. The otolith organs can signal tilts with respect to gravity and slow, drifting movements, but only when these movements are linear, rather than rotational. *Objective of the study:* The study aimed at investigating the correlation between dizziness and balance in the BPPV subjects by using outcome measure Dizziness Handicap Inventory and Berg Balance Scale *Methodology:* Total 56 subjects were enrolled Age group is 18-65, Both Males and Females. Able to experiencing symptoms for longer period of 3 months, Able to transfer from sitting to standing and move independently. Able to tolerate the exercise ,and we carried out to descriptive analytical ,co relational study .From this study we have taken the data of the subjects who have treated for 9 weeks by using the exercise protocol with outcome measure of dizziness handicap inventory and berg balance scale. *Results:* Validity was tested by assessing the degree to which DHI total score and DHI sub scale components i.e physical, functional, emotional correlated with the Berg balance scale, by Spearman correlation coefficient. *Conclusion:* The study was concluded that the better the improvement in dizziness, the better is the balance of dizziness caused by BPPV, it also observed that there is more strong co relation functional component.

Keywords: Vestibular Exercises, Dizziness, Balance, BPPV, Functional, Physical, Emotional

1. Introduction

One of the most important tasks of the human postural control system is that of balancing the body over the small base of support provided by the feet. As a sensor of gravity, the vestibular system is one of the nervous system's most important tools to control posture. The vestibular system is both a sensory system and a motor system. As a sensory system, the vestibular system provides the central nervous system (CNS) with information about the position and motion of the head and the direction of gravity. The CNS uses this information, together with information from other sensory systems. The otolith organs can signal tilts with respect to gravity and slow, drifting movements, but only when these movements are linear, rather than rotational [16, 17, 23].

If balance is disturbed in a standing human, limb muscles are activated at short latencies to restore equilibrium. Because the latencies of these muscle activations are shorter than a voluntary reaction time, and because they act to restore equilibrium, they are called automatic postural responses. Although the most important sensory trigger for automatic postural responses is somatosensory inputs, vestibular inputs may also play a role. These muscle responses are present with eyes closed, so they can be triggered without visual stimulation. These responses are missing in patients with absence of vestibular function; the responses remain, however, after procedures in animals that eliminate the canals but spare the otoliths. The magnitude of the responses is also proportional to head acceleration, all of which suggests a vestibular and, more specifically, an otolith origin for fast, automatic postural responses when surface

and visual inputs are not available [7, 8, 20]

The use of visual and vestibular information for the control of posture is complicated by the fact that these sense organs are located in the inertially unstable head. Because the center of gravity of the head is located above its axis of rotation, any movement of the body results in head motion. Uncontrolled head motion complicates the use of vestibular information to make estimates of body motion and position. Also, if the range of head motions exceeds what can be compensated for by the VOR, blurred vision could result. For these reasons, investigators have suggested that the nervous system might stabilize the head with respect to gravity during postural control, either to simplify the interpretation of vestibular information or to facilitate gaze stabilization [16]

The otolith organs can signal tilts with respect to gravity and slow, drifting movements.

Proprioceptive feedback reaches the CNS from the receptors located in muscles and joints, vestibular apparatus in the inner ear and eyes, muscles and joint receptor are stimulated by movements of musculoskeletal system. The vestubular apparatus provides information on whole body position and is stimulated when upright posture changes, The eyes help orient the head and body with respect to environment.

2. Objective of the Study

The study aimed at investigating the correlation between dizziness and balance in the BPPV subjects by using outcome measure Dizziness Handicap Inventory and Berg Balance Scale

3. Methodology

The study was approved by the Ethics in Research Committee) of Dr. D. Y. Patil Vidyapeeth, Pune and Study protocol is register with CTRI no: CTRI/2015/10/006308. Dizziness patients caused BPPV who signed the Informed Consent Form were enrolled in the study.

Based on the earlier research among ENT clinics report a higher the prevalence of peripheral dizziness 42% who complained of dizziness.

The study was performed at academic referral department of physiotherapy, our university has a vertigo clinic of patients approx.300 per year and reported the diagnosed BPPV cases was 34 percent so the total sample size estimation was 64 approximately BPPV patients

Total 56 subjects were enrolled Age group is 18-65, Both Males and Females. Able to experiencing symptoms for longer period of 3 months, Able to transfer from sitting to standing and move independently. Able to tolerate the exercise, and we carried out to descriptive analytical ,co relational study .From this study we have taken the data of the subjects who have treated for 9 weeks by using the exercise protocol with outcome measure of dizziness handicap inventory and berg balance scale.

DHI measures self-perceived handicap of dizziness and has been translated into Swedish and the Swedish version has been tested for reliability. The inventory comprises 25 different items, organized in three different dimensions: functional, emotional, and physical. The total maximum score is 100 points; for the functional dimension it is 32 points, the emotional 40 points, and the physical 28 points. The higher the score, the greater the level of self-perceived handicap [13]

Berg Balance Scale (BBS). The scale rates performance from 0 (cannot perform) to 4 (normal performance) on 14 items. The items explore the ability to sit, stand, lean, turn and maintain the upright position on one leg. The psychometric properties of the scale have been assessed on populations of elderly subjects. In those groups of subjects the scale proved to be a valid and reliable instrument. The intrarater and interrater reliability of BBS were very high, the ICC ranged from 0.98–0.99 for intrarater reliability and 0.98 for interrater reliability. Moreover the BBS was found to be a good predictor of falls in a cohort of elderly subjects. A cut-off score of 45 is an established criterion to identify elderly subjects with high risk of fall [2, 11]

It was analysed the data by using the statistical software SPSS 20.0

4. Results

The mean age group of 54.5 years and standard deviation were calculated and the Pearson correlation was performed to calculate correlations between different variables

Validity was tested by assessing the degree to which DHI total score and DHI sub scale components i.e physical, functional, emotional correlated with the Berg balance scale, by Spearman correlation coefficient. Correlation coefficients of DHI total on Berg balance scale was strong considering 0.82 when observed the DHI sub scale components i.e physical ,functional, emotional

The DHI-Functional component when observed on emotional and physical component shows strong co relation

In which functional was strong co relation with berg balance scale 0.86 and in physical component will observe the medium 0.84 and less co orelation with the emotional 0.72.

Table 1. *Co orelation among DHI and Berg Balance Score.*

Sl.No	Items	DHI Total	Functional	Emotional	Physical	Berg Balance Score
1	DHI-Total	1.00				0.82
2	DHI-Functional	0.89	1.00	0.64	0.83	0.86
3	DHI-Emotional	0.88	0.70	1.00	0.72	0.74
4	DHI-Phyiscal	0.81	0.58	0.56	1.00	0.82
5	Berg Balance Score	0.88	0.87	0.52	0.82	1.00

5. Discussion of the Study

With this study, we can see that the physiological decline observed during the aging process, associated to the onset of peripheral vestibular dysfunction, may contribute together to the loss in body balance and functional capacity; however, it is important to stress the need to carry out new studies comparing the relationship of these parameters in the experimental and control groups, in other words, in the elderly with chronic peripheral vestibular dysfunctions and healthy elderly.

Lawrence RH et al. [16, 17], suggested that improvement of DHI subscale physical, and functional in group A decreased in the risk of falling. It has been shown that both the risk of falling and the fear of falling lead to decreased activity decreased functional status, and greater morbidity, addition of visual and proprioceptive exercises resulted in greater reduction of fall risk in dizziness patients caused by BPPV.

The positive correlation between body balance and dizziness can be justified by the fact that the vestibular dysfunction makes it difficult to see and perceive position and movement; it impacts the body's vertical orientation, vision and head stabilization, and it impairs body mass center control, causing unbalance, characterized by an increase in body oscillation, reduction in the stability limit, individual's performance reduction upon gait and increase in the risk of falls. Consequently, this individual with body instability reduces his active mobility; is afraid of falling; loses physical conditioning; is afraid of falling, and reduces social participation and motor skills to perform functional activities independently [12].

The vestibular dysfunction may impair the patients' ability to interpret somatosensory input from feet, so they may perform similarly to normal subjects with acute somatosensory loss due to ankle ischemia, and therefore use hip strategy.

Vestibular, visual, and somatosensory signals influence the organization of normal postural response. The abnormal vestibular information may contribute to abnormal internal representation of stability limits, so patients may behave as if small disturbances in stance push them beyond their stability limits.

In the present study, concerning the without occurrence of dizziness and loss of balance, there was a predominance of elderly have any history of loss of balance or fall, that is, who did not have fall episodes in the past six months. These results may be justified by the fact that these elderly presented a functional interdependence profile adapted to the limitations of the balance disorder stemming from the vestibular dysfunction, in other words, even facing the body instability and the greater risk of falls, triggered by the behaviour of sensorial systems associated with postural control.

6. Conclusion

The study was concluded that the better the improvement in dizziness, the better is the balance caused by BPPV; it also observed that there is stronger co relation functional DHI and Berg balance score.

So the study suggests that improving the dizziness leads to good balance or stability in patients with vertigo.

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