Original Article

Effectiveness Of Gaze Stability Exercises And Brandt Daroff Exercises On Dizziness And Quality Of Life In Benign Paroxysmal Positional Vertigo (BPPV)

Nida Khan,[1] Aymen Farooq,[2] Aqsa Anwar,[3] Maryam Adeel[4]

Abstract

Objective: To compare the effectiveness of gaze stability exercises with Brandt Daroff exercises on dizziness in patients having Benign Paroxysmal Positional Vertigo (BPPV).

Study design: It was a Randomized Control Trial Study.

Place and duration of study: The study was conducted in Shifa Clinic Jauharabad for 5 months from 1st September 2024 to 31st January 2025.

Material and Methods: 30 patients were selected on the basis of inclusion criteria which comprised of patients of both genders, age group comprising of 20-70 years old who were diagnosed with BPPV. Data was collected using Dizziness Handicap Inventory (DHI) at baseline before implementation of intervention and after one week of intervention. The patients were selected by using non probability convenient sampling initially. There was random allocation of participants into two groups, group A and group B. Group A received Brandt Daroff exercises along with balance training exercises while group B received Gaze stability exercises along with balance training exercises. Both groups were received intervention for one week.

Results: The data was statistically analyzed with the help of SPSS version 24. Both groups were shown to have significant improvements in DHI scores. However, the improvement in Group A was comparatively greater than in Group B (p value < 0.05).

Conclusion: It was concluded from the study that Brandt Daroff exercises are more effective than gaze stability exercises in improving dizziness and quality of life in patients having BPPV.

Keywords: Benign Paroxysmal Positional Vertigo, Brandt Daroff exercises, Balance exercises Dizziness, Gaze stability exercises.

1. Introduction

Benign Paroxysmal Positional Vertigo (BPPV) is among the most common vestibular disease. The vestibular system is the sensory system of inner ear that maintains the equilibrium of the body.[1] There are many balance disorders including labyrinthitis and Meniere's disease. BPPV is also a type of balance disorder.[2] It is the most common vestibular disease.[3] A tiny, calcified otolith that is constantly floating around loose in the inner ear is the fundamental mechanism of BPPV.[4]

Every year, there are 64 cases of BPPV for every 100,000 persons. According to reports, the lifetime prevalence of BPPV is 1.6 percent in males and 3.2 percent in females. The majority of BPPV cases happen in the fifth to seventh decades of life.[5] According to reports, dizziness and vertigo were the most common reasons for patients over 65 to see a general practitioner or an ENT specialist.[6] The BPPV symptoms include nausea, vomiting, nystagmus, impairment in balance, dizziness and vertigo. Risk factors include female gender, hypertension, headache, pulmonary infection, elevated lipid fat level, migraine, cerebrovascular disease, menopause, allergies, COPD and infection.[7]

The etiology of BPPV is either primary or idiopathic (50 to 70%) and secondary (30 to 50%). The causes of BPPV which are of secondary in nature include closed head trauma (7%–17%), Meniere disease's (5%), vestibular neuritis, migraine (<5%) and inner ear surgery (<1%).[8]

Posterior canal BPPV is reported to be more common than lateral canal as well as anterior canal BPPV.

Physiotherapist, DHQ Jhelum,[1] Riphah International University, Islamabad,[2] Lecturer, Center of Advanced Studies in Health and technology (CASHT),[3] Student, Center of Advanced Studies in Health and technology (CASHT)[4]

Correspondence: Nida Khan, Physiotherapist, DHQ Jhelum **Email:** knida816@gmail.com

The Posterior canal comprises 90% BPPV, Horizontal canal affect 15% BPPV diagnosis and anterior canal affect 1-2%BPPV diagnosis.[9]

Diagnostic tests for BPPV include Dix-Hall pike maneuver, torsional nystagmus, reversal of nystagmus upon sitting, fatigability of the response, lateral head turns (horizontal canal BPPV) and classic vertigo during positioning. The Dix-Hall pike maneuver is proved to be the definitive diagnostic test for posterior canal BPPV. If the Dix-Hall pike maneuver provokes the appropriate nystagmus then the diagnosis of BPPV is confirmed.[10]

BPPV treatment include both the vestibular rehabilitation and vestibulosuppressant medications. Physical Therapy management of BPPV include various maneuvers techniques, balance exercises, gaze stability exercises, habituation exercises and vestibular exercises. Epley's maneuver as well as the semont-liberatory maneuver are used to treat canalith repositioning. A type of physical treatment called vestibular rehabilitation involves motions of the head and trunk to enhance balance. Exercises for balance and gaze stability are useful in the treatment of BPPV.[11]

The efficacy of vestibular exercises in decreasing the duration of symptoms in the acute phase of peripheral vestibular disorders is evident.[12] The vestibular rehabilitation therapy is very effective for balance coordination in patients with BPPV. One of the most popular and practical exercises used to help BPPV patients with their symptoms is gaze stabilization. In individuals with unilateral vestibular hypofunction, gaze stability exercises are used to decrease sensitivity to head movements and dizziness, and improve gaze stability.[13]

Gaze stability exercise are of two types, adaptation and substitution exercise. Adaptation exercises are concerned with maintaining postural stability while the substitution exercises maintain the central pre-organized eye motion. Repeated head and eye motions are a part of adaptation exercises. By adjusting to changes or losses in vestibular system input, these support the central nervous system. The eyes are kept focused on a stationary target as the head is moved to the right and left. Using the remaining sensory inputs, substitution exercises help with postural control.[14]

Particle repositioning activities are grouped together as the Brandt-Daroff exercises. These can be carried out without a licensed health professional's supervision. These aim to promote the loosening of Canalith and decreases the chance of reoccurrence of BPPV. The Brandt-Daroff exercises have been proved to be very effective treatment in the symptomatic relief of BPPV.[15]

Several studies about the effects of Brandt Daroff exercises and gaze stability exercises have been conducted. Evidence for comparing the two approaches is sparse in literature, based on varied clinical experiences and a smaller number of research with limited methodological design. There has been no work regarding effectiveness of these two techniques in improving dizziness in patients having BPPV. This study will contribute in comparing the effects of these techniques on treating dizziness and enhancing quality of life in patients after diagnosis of BPPV and to compare the effectiveness of both techniques.

2. Materials & Methods

A 5 months- Randomized Control Trial was conducted in Shifa clinic Jauharabad from 1st September 2024 to 31st January 2025. The sample size was calculated using Open Epi calculator.[16] 30 patients were selected who provided consent and met inclusion criteria. The patients were selected by using non probability convenient sampling initially and then randomly allocated into two groups (Group A and Group B) by using sealed envelope method. Ethical concerns were taken into consideration. The Inclusion Criteria comprised of patients diagnosed with BPPV who were having symptoms for atleast 3 days. Both genders were represented, and their ages ranged from 20 to 70. Patients having a history of vertibrobasilar insufficiency, cerebrovascular illness, or other neurological disorders that impair balance were

excluded. The patients who were on treatment for vestibular disorder were excluded from the study. Those with hearing loss or having history of recent trauma or past eye infection or surgery were also excluded. Group A received Brandt Daroff exercises along with balance training exercises. In order to perform the Brandt-Daroff exercises, the patients were told to sit up straight and then lie sideways with their heads angled about halfway upward. The patients were instructed to shift into a sitting posture after remaining in the side-lying position for 30 seconds or until the lightheadedness had passed. After being told to remain

seated for 30 seconds, the participants were told to repeat the process on the other side. Group B received Gaze stability exercises along with balance training exercises. The gaze stability exercise was carried out as follows: the subject moved his or her head to the left and right while maintaining eye focus on a stationary target. The exercise was repeated three times throughout the day and was recorded using the Dizziness Handicap Inventory (DHI) at baseline and one week after the intervention. SPSS version 24 was used to analyze the data. A paired t-test was used for within-group analysis, and an independent sample t-test was used to compare the means of the two study groups because the data was normally distributed and outcome variable was continuous.

3. Results

There were 30 patients in all, 14 of whom were men and 16 of them were women. Patients in Group A were 47.80±13.529 years old on average, whereas those in Group B were 44.40+_13.490 years old on average. An independent sample t-test showed a statistically significant difference ($p < 0.0001$) in DHI scores between the two groups, favoring the Group A. The study results are tabulated with 95% confidence intervals. The null hypothesis, which assumed similar differences in outcome values among groups, was tested statistically and rejected, indicating significant differences in treatment outcomes between the two groups.

Total Mean score of DHI in group A was 70.93±23.7 that was improved to 29.2±14.57 after 1 weeks of intervention with significant difference i-e; p value < 0.001. The total mean score of DHI in Group B was 60.0 ±17.1 pre intervention that was improved to 50.53±14.21 after 1 weeks of intervention. Significant improvements were noted in group A when mean scores of both groups were compared having a p-value below 0.001.

Table 1: Between Group Differences of Primary Outcome Variables

Variable	Pre intervention		P value	Post intervention		P value
	Group A Mean ± SD	Group B Mean ± SD		Group A Mean ± SD	Group B Mean ±SD	
Total functional	28.67±9.371	26.00±8.452	0.420	11.73±7.667	22.6±7.037	<0.001
Total emotional	22.0 ±11.8	15.7 ±6.84	0.87	8.13 ±4.98	12.5 ±5.42	<0.001
Total Physical	20.27 ±5.84	18.27 ±3.53	0.67	8.67 ±4.186	15.73 ±3.99	<0.001
Total DHI[1] score	70.93 ±23.7	60.0 ±17.1	0.160	29.2 ±14.57	50.53 ±14.21	<0.001

The current study showed significant improvement in both groups receiving Brandt Daroff exercise as well as gaze stability exercise combined with balance exercises. Paired t test was applied for the analysis within group. Table 2 displays the mean, standard deviation, and p-values. The DHI scores showed a statistically significant difference ($p < 0.001$) in favor of Group A, according to the Paid t-test. 95% confidence intervals are included with the study outcomes.

Total Mean score of DHI in group A was 70.93±23.7 that was improved to 29.2±14.57 after 1 weeks of intervention (P- Value < 0.001). The total mean score of DHI in Group B was 60.0 ±17.1 pre intervention that was improved to 50.53±14.21 after 1 weeks of intervention.

Table 2: Within Group Comparison of Means Pre and Post Intervention

Variables		Pre Intervention (Mean ± SD)	Post Intervention (Mean ± SD)	P Value
Total functional	Group A	28.67±9.371	11.73±7.667	<0.001
	Group B	26.00±8.452	22.6±7.037	<0.001
Total emotional	Group A	22.0 ±11.8	8.13 ±4.98	<0.001
	Group B	15.7 ±6.84	12.5 ±5.42	<0.001
Total physical	Group A	20.27 ±5.84	8.67 ±4.186	<0.001
	Group B	18.27 ±3.53	15.73 ±3.99	<0.001
Total DHI score	Group A	70.93 ±23.7	29.2 ±14.57	<0.001
	Group B	60.0 ±17.1	50.53 ±14.21	<0.001

4. Discussion

According to the current study's findings, both groups that received Brandt Daroff exercises and gaze stabilization exercises in addition to balance exercises had a noticeable improvement. However; mean scores of the groups showed more improvement in the group receiving Brandt Daroff exercises combined with balance exercise. The study aligned with the study conducted by Andika Herlina and his colleagues. They came to the conclusion that vertigo symptoms significantly decreased following five weeks of Brandt Daroff exercises. This study is different from our study with respect to the time duration of implementation of intervention and the sample size.[17]

The findings of the study carried out by Heloísa Freiria Tsukamoto and his associates were in agreement with the current investigation. They examined how the vestibular rehabilitation therapy regimen affected the patients' quality of life and postural balance when they had vestibular system complaints. They used the visual analog scale of dizziness, DHI, and force platform stabilometry to measure quality of life. They performed the exercises for 12 weeks and noted significant improvement in postural balance.[18]

The effectiveness of Gaze Stability Exercise in older persons with dizziness was investigated by Lisa et al. They came to the conclusion that older persons who exhibit symptoms of dizziness but do not have any known vestibular abnormalities have a higher fall risk reduction when vestibular specific gaze stabilization exercises are added. This study and ours are connected in that we have demonstrated the impact of gaze stabilization exercises on dizziness and the quality of life of BPPV patients. Nonetheless, our research is comparative in nature, comparing the results of gaze stabilization exercises and Brandt Daroff activities.[19]

Shiji Gopinath and his colleagues compared the effects of Brandt-Daroff Maneuver with the Epleys Maneuver which were followed by gaze stability exercise on dizziness and vertigo in patients with BPPV. They concluded that both the treatment regimens produced a marked decline in vertigo and dizziness in BPPV patients. That study however lacked in showing much great difference between the treatment groups. It was suggested that both the techniques are effective in their own way.[20]

The results of the current study also aligns with the study conducted by Dongwook Han and his colleague's in some aspects. Both studies have shown subsequent improvement in the performance of patient and improvement in the daily activities of life and quality of health status. In their study, the subjects were women in their 20s who suffered dizziness but had not been diagnosed with vertigo. Our study included diagnosed patients of BPPV, both genders having age between 20 and 60.[21]

Conclusion:

The study's findings indicate that Brandt Daroff exercises are superior to gaze stability and balance exercises in terms of reducing vertigo and enhancing quality of life in individuals with BPPV.

Limitations of the study:

The present study is limited by small sample size and short intervention period. Furthermore, no long term follow up of patients was done after the intervention stopped to determine the maintenance effects.

Recommendations:

Further studies with larger sample size and long term follow-up are needed to evaluate the long-term impact of both treatments.

Disclosure /Conflict of interest:

Authors declare no conflict of interest.

References:

1. Kim J-S, Zee DS. Benign paroxysmal positional vertigo. New England Journal of Medicine. 2014;370(12):1138-47.
2. Kang CMC, Tusa RJ, editors. Vestibular rehabilitation: rationale and indications. Seminars in Neurology; 2013: Thieme Medical Publishers.
3. Hughes CA, Proctor L. Benign paroxysmal positional vertigo. The Laryngoscope. 1997;107(5):607-13.
4. You P, Instrum R, Parnes L. Benign paroxysmal positional vertigo. Laryngoscope investigative otolaryngology. 2019;4(1):116-23.
5. Parnes LS, Agrawal SK, Atlas J. Diagnosis and management of benign paroxysmal positional vertigo (BPPV). Cmaj. 2003;169(7):681-93.
6. Zaidi SH SA. Benign Paroxysmal Positional Vertigo (BPPV). InVertigo. 2013;(pp. 81-90).
7. Branch W, Barton J. Approach to the patient with dizziness. UpToDate Retrieved January. 2014;30:2019.
8. Bhattacharyya N, Gubbels SP, Schwartz SR, Edlow JA, El-Kashlan H, Fife T, et al. Clinical practice guideline: benign paroxysmal positional vertigo (update). Otolaryngology–Head and Neck Surgery. 2017;156(3_suppl):S1-S47.
9. Furman JM, Cass SP. Benign paroxysmal positional vertigo. New England Journal of Medicine. 1999;341(21):1590-6.
10. Katsarkas A. Benign paroxysmal positional vertigo (BPPV): idiopathic versus post-traumatic. Acta oto-laryngologica. 1999;119(7):745-9.
11. Simhadri S, Panda N, Raghunathan M. Efficacy of particle repositioning maneuver in BPPV: a prospective study. American journal of otolaryngology. 2003;24(6):355-60.
12. Ribeiro KMOBdF, Freitas RVdM, Ferreira LMdBM, Deshpande N, Guerra RO. Effects of balance vestibular rehabilitation therapy in elderly with benign paroxysmal positional vertigo: a randomized controlled trial. Disability and rehabilitation. 2017;39(12):1198-206.
13. Chauhan A, Desai D. Treatment for Posterior Canal Benign Paroxysmal Positional Vertigo–A Critical Review. Website: www ijpot com. 2016;10(1):5.
14. Kundakci B, Sultana A, Taylor AJ, Alshehri MA. The effectiveness of exercise-based vestibular rehabilitation in adult patients with chronic dizziness: A systematic review. F1000Research. 2018;7.
15. Mandalà M, Salerni L, Nuti D. Benign positional paroxysmal vertigo treatment: a practical update. Current treatment options in neurology. 2019;21:1-18.
16. Saxena A, Prabhakar MC. Performance of DHI score as a predictor of benign paroxysmal positional vertigo in geriatric patients with dizziness/vertigo: a cross-sectional study. PloS one. 2013;8(3):e58106.
17. Herlina A, Nofia VR, editors. THE EFFECTIVENESS OF BRANDT DAROFF EXERCISES ON VERTIGO EVENTS IN SUBJECTS OF VERTIGO PATIENTS. Proceeding International Conference Syedza Saintika; 2020.
18. Tsukamoto HF, Costa VdSP, Silva Junior RAd, Pelosi GG, Marchiori LLdM, Vaz CRS, et al. Effectiveness of a vestibular rehabilitation protocol to improve the health-related quality of life and postural balance in patients with vertigo. International archives of otorhinolaryngology. 2015;19:238-47.
19. Hall CD, Heusel-Gillig L, Tusa RJ, Herdman SJ. Efficacy of gaze stability exercises in older adults with dizziness. Journal of Neurologic Physical Therapy. 2010;34(2):64-9.
20. Gopinath S, TU VKKJ. Effect of Epleys Maneuver versus Brandt-daroff Maneuver followed by gaze stability exercise on dizziness and vertigo in subjects with benign paroxysmal positional vertigo (BPPV). 2020.
21. Kollén L, Frändin K, Möller M, Olsén MF, Möller C. Benign paroxysmal positional vertigo is a common cause of dizziness and unsteadiness in a large population of 75-year-olds. Aging clinical and experimental research. 2012;24:317-23.