

A Comparative Study on the Effectiveness of Incremental Vestibulo-Ocular Reflex Adaptation Training and Conventional Physiotherapy on Dizziness and Balance in Patients with Benign Paroxysmal Positional Vertigo

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Abstract:

➤ Objective:

To evaluate the efficacy of traditional vestibular rehabilitation and incremental vestibulo-ocular reflex adaption training in treating dizziness and balance in patients with benign paroxysmal positional vertigo (BPPV).

➤ Methodology:

The research was conducted at RVS College of Physiotherapy. The study was authorized by the RVS College of Physiotherapy review board, and the subjects gave their informed consent before the study began.

➤ Results:

Patients in group A who received incremental vestibulo-ocular reflex adaptation training have a greater difference in mean values than those in group B.

➤ Conclusion:

According to the study's findings, patients with benign paroxysmal positional vertigo benefit more from incremental vestibulo-ocular reflex adaption training than from traditional vestibular rehabilitation in terms of balance and dizziness.

Keywords: Benign Paroxysmal Positional Vertigo, Balance, Dizziness Handicap Inventory, Gradual Vestibulo-Ocular Reflex Adaption Training, Traditional Vestibular Rehabilitation, and Berg Balance Scale.

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I. INTRODUCTION

Vertigo is defined as an illusion of movement, either because the person is rotating in space or because the outside world is circling around them. Dizziness is a subjective and nebulous symptom that refers to a sense of spatial disorientation, motion of the environment, or

lightheadedness. Diseases ranging from benign and self-limiting (like neuritis vestibularis) to severe and possibly fatal (like cardiac arrhythmias or acute cerebral vascular events) can produce the symptoms. Patients who experience dizziness do have significant functional impairments, including a higher risk of falls, disabilities, and handicaps, as well as a higher frequency of symptom-related anxiety, despair, or

dread. Dizziness can be treated by the pharmacological medication such as anti-anxiety medication, anti-cholinergic drugs or antihistamine, non-pharmacological treatment includes life style changes, balance therapy, psychotherapy. Surgical interventions for dizziness is constructive surgery it includes decompression of the endolymphatic sac, destructive procedure is labyrinthectomy and neurectomy this is the approach to the internal auditory canal through the middle fossa. It was described for decompression of the internal auditory canal and for the removal of small acoustic neuromas.

The capacity to remain upright when moving or remaining stationary is known as balance. Balance is essential for general mobility and stability as well as for confidently performing daily tasks. Common balance problems are decreased muscle strength, vertigo, disequilibrium, presyncope. Various factors influencing the balance include age, muscle strength, and mental health conditions.

The most prevalent peripheral vestibular end-organ illness, benign paroxysmal positional vertigo (BPPV), is characterized by a sudden, fleeting gyratory feeling along with nystagmus. Changes in the head's position with regard to gravity cause symptoms, which can vary in intensity from moderate dizziness to crippling episodes that can cause nausea or vomiting and seriously impair day-to-day functioning.

By rotating the eyes in the opposite direction of the head, the vestibulo ocular reflex (VOR) keeps images on the retina steady during head movement. The gain (eye/head velocity) equals unity when gazing at a distance since the eye and head velocities are equal in magnitude.

The VOR gain demand is first set 0.1 higher than the subject's real far viewing pertaining gain in incremental vestibulo ocular training. A 0.1 difference between gain demand and actual gain results in a retinal image slip error of 15°/s for a head impulse with peak velocity of 150°/s. Based on previous research demonstrating a trending gain increase during at 0.1 difference, we hypothesize that this velocity is near, but above, the threshold for the perception of visual instability. The gain demand is set 1.0 above the subject's pretraining gain at the conclusion of the training session by gradually increasing the 0.1 difference. After 15 minutes, this training method boosts VOR gain by about 10%.

II. METHODOLOGY

➤ Study Setting

The study was carried out at the RVS College of Physiotherapy's outpatient division in Suler, Coimbatore.

➤ Selection of Subjects

Twenty participants who met the inclusion and exclusion criteria were chosen at random and split into two groups. Group A and Group B.

- Group A: Training group for incremental vestibulo ocular reflex adaptation

- Group B: Traditional vestibular rehabilitation group

➤ Variables

- *Dependent Variables*

- ✓ Dizziness
- ✓ Balance

- *Independent Variables*

- ✓ Incremental vestibulo ocular reflex adaptation training
- ✓ Conventional vestibular rehabilitation

- *Measurement Tool*

- ✓ Dizziness- Dizziness handicap inventory
- ✓ Balance- Berg balance scale

- *Study Design*

Pre and post experimental study.

- *Inclusion Criteria*

- ✓ Clinically diagnosed posterior semicircular canal BPPV - upbeat and torsional nystagmus in Dix Hallpike test
- ✓ Age between 30 to 40 years
- ✓ Both genders were included

- *Exclusion Criteria*

Vertigo in the center

- ✓ Additional peripheral vestibular conditions
- ✓ Back and neck musculoskeletal issues
- ✓ Neurological disorders that cause demyelinating, degenerative, and impairment
- ✓ Psychological issues
- ✓ Peripheral neuropathy
- ✓ Loss of eyesight and hearing

➤ Orientation to the Patient

The goal of the study was stated to each participant prior to data collection. The investigator provided a thorough explanation of the berg balance scale for measuring balance and the dizziness handicap inventory for measuring dizziness. Following a thorough explanation of the condition and a demonstration of the study's procedures, each participant's agreement and full cooperation were requested.

➤ Test Administration

- *Dizziness Handicap Inventory*

A patient's self-perceived handicap due to vestibular problems can be measured with the Dizziness Handicap Inventory. Functional, emotional, and physical disabilities are its three constituents. There are twenty-five questions on the patient's experience of dizziness in this three-point questionnaire. Based on their own experiences, patients were asked to respond to the questions as-always, sometimes, or no. The patient's degree of vertigo is assessed using those

responses. The patient's sense of disequilibrium and how it affects day-to-day activities are quantified by the DHI.

- *Berg Balance Scale*

One test for evaluating functional balance is the Berg Balance Scale. It uses 14 exercises to assess both dynamic and static balance. The measure has been helpful in forecasting fall risk, results, and even the duration of inpatient rehabilitation stays. Based on their individual experiences, patients were asked to respond to the questions as always, sometimes, or no.

- *Treatment Procedure*

- *Incremental Vestibulo Ocular Reflex Adaptation Training*

Training include shaking head fixation, alternate fixation, separation fixation and reverse fixation.

- *Patient and Therapist Position*

All the exercises done in sitting position and therapist stands behind the patient.

- *Shaking Head Fixation*

- *Procedure*

The patient was kept seated. Request that the patient swivel their head from left to right and up and down while keeping their eyes fixed on the target in front of them. For three weeks, have the patient repeat this thirty times a day.

- *Alternate Fixation*

- *Procedure*

The patient was kept seated. Request that the patient close their eyes and look up, down, left, and right at the target object while simultaneously moving their head and eyes. For three weeks, have the patient repeat this thirty times a day.

- *Separate Fixation*

- *Procedure*

The patient was kept seated. Ask the patient to gaze up, down, left, and right at the object; their eyes will move first, followed by their head. For three weeks, have the patient repeat this thirty times a day.

- *Reverse Fixation*

- *Procedure*

The patient was kept seated. Ask the patient to move their head in the opposite direction as their eyes while they look up, down, left, and right at the objects. For three weeks, have the patient repeat this thirty times a day.

- *Conventional Vestibular Rehabilitation*

- *Procedure*

The patient was kept seated. Request that the patient move their eyes in both horizontal and vertical directions, first gently and then rapidly. For three weeks, have the patient

repeat this thirty times a day. The patient was kept in a sitting position for gaze stability. For one minute, ask the patient to move their head in both horizontal and vertical directions while concentrating on stationary and moving objects. For three weeks, have the patient repeat this thirty times a day.

- *Collection of Data*

Twenty participants with benign paroxysmal positional vertigo were chosen, and they were split into two groups.

- ✓ Group A: Incremental vestibulo ocular reflex adaptation training group

- ✓ Group B: Traditional vestibular rehabilitation group

Balance is assessed using the Berg Balance Scale and documented both before and after the therapy intervention is finished. Dizziness is assessed using the Dizziness Handicap Inventory.

- *Statistical Technique*

The paired "t" test was used to evaluate the data in order to determine whether there was a significant difference between the groups' pre- and post-test values. The unpaired "t" test was then used to determine whether there was a difference between the groups.

III. DATA ANALYSIS

The calculated paired "t" value for dizziness in group A is 22.558, while the "t" table value is 3.250 at the 0.005 level. The study indicates that there is a significant difference in dizziness among patients with benign paroxysmal positional vertigo after incremental vestibulo ocular reflex adaptation training since the calculated "t" value is greater than the "t" table value above.

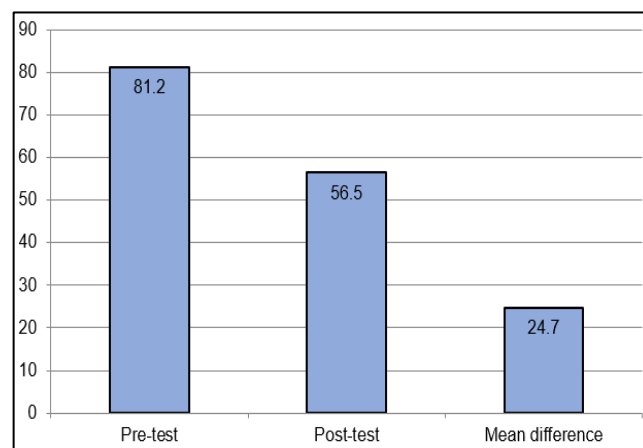


Fig 1 Displays a Graphic Depiction of Group A's dizzy Mean and Mean Difference Values Before and After the Test.

The calculated paired "t" value for dizziness in group B is 14.028, while the "t" table value is 3.250 at the 0.005 level. The calculated "t" value is greater than the "t" table value above, indicating a substantial difference in dizziness among patients with benign paroxysmal positional vertigo after traditional vestibular rehabilitation.

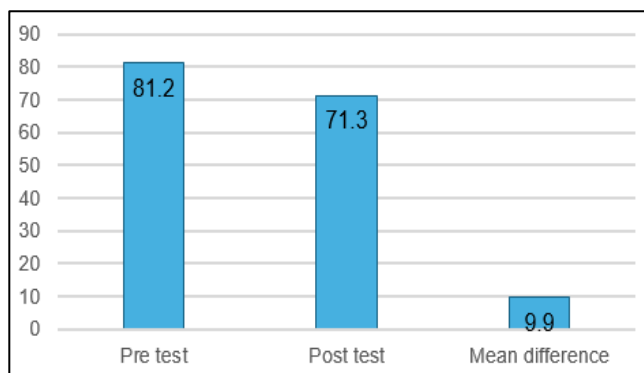


Fig 2 Displays the Group B Mean Difference Values for Dizziness as Well as the Pre- and Post-Test Means Graphically.

The calculated unpaired "t" value for dizziness in groups A and B is 12.185, while the "t" table value is 2.878 at the 0.005 level. The calculated "t" value is greater than the "t" table value above, indicating that incremental vestibulo ocular reflex adaptation training significantly reduces dizziness in patients with benign paroxysmal positional vertigo.

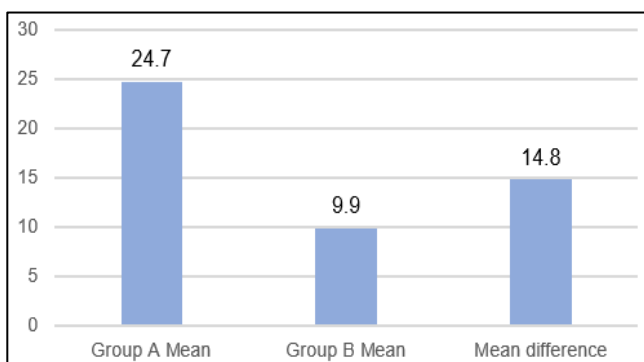


Fig 3 Displays the Dizzy Handicap Inventory's Graphical Depiction for Groups A and B.

Group A's determined paired "t" value for balance is 15.384, and the "t" table value is 3.250 at the 0.005 level. The calculated "t" value is greater than the "t" table value above, indicating that patients with benign paroxysmal positional vertigo differ significantly in how they respond to incremental vestibulo ocular reflex adaptation training.

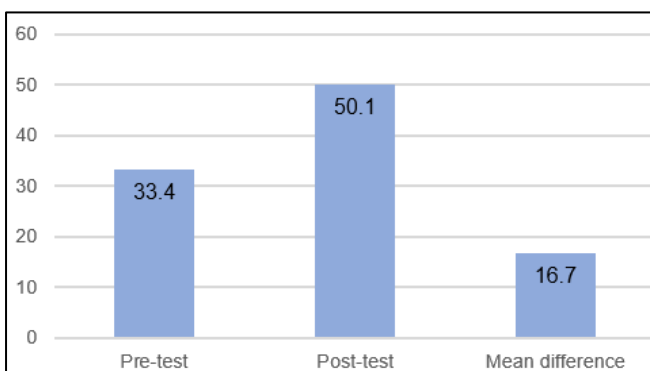


Fig 4 Displays the Pre-Test and Post-Test Means as Well as the Mean Difference Values of Group A's Balance Graphically.

Group B's determined paired "t" value for balance is 12.727, and the "t" table value is 3.250 at the 0.005 level. The study indicates that there is a substantial difference in balance among patients with benign paroxysmal positional vertigo after traditional vestibular rehabilitation since the computed "t" value is greater than the "t" table value above.

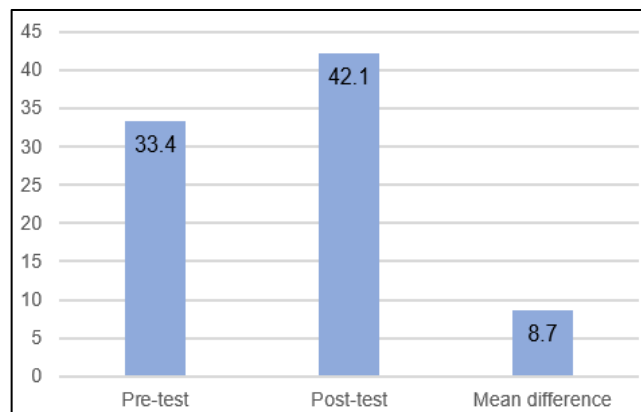


Fig 5 Displays the Pre-Test and Post-Test Means as Well as the Mean Difference Values of Group B's Balance Graphically.

The unpaired "t" value for balance in groups A and B is 6.249, while the "t" table value is 2.878 at the 0.005 level. The study indicates that there is a substantial difference between incremental vestibulo ocular reflex adaptation training in lowering balance among patients with benign paroxysmal positional vertigo because the calculated "t" value is greater than the "t" table value above.

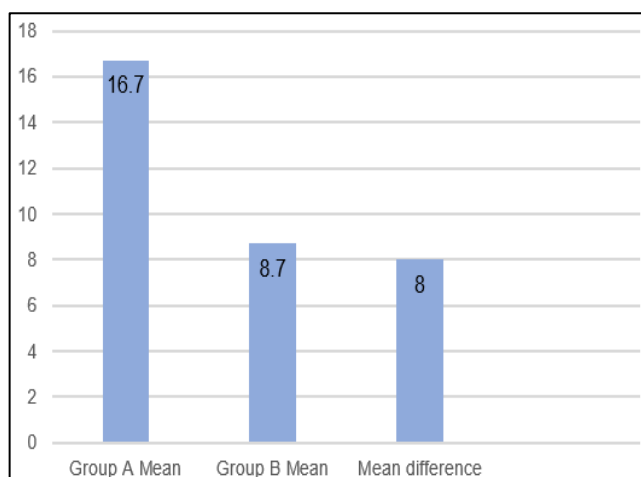


Fig 6 Shows Graphical Representation of Berg Balance Scale in Group A and Group B.

IV. RESULTS

Patients in group A who received incremental vestibulo ocular reflex adaptation training differed more from those in group B when comparing their mean values. Therefore, it is determined that in individuals with benign paroxysmal positional vertigo, incremental vestibulo ocular reflex adaptation training reduces dizziness more effectively than traditional vestibular rehabilitation.

V. DISCUSSIONS

The most frequent form of vertigo, benign paroxysmal positional vertigo (BPPV), is characterized by spinning feelings brought on by a shift in head position relative to gravity. When the patient is lying on one side during the Dix-Halpike maneuver, nystagmus beating in an upward and torsional orientation with the top poles of the eyes beating toward the lower ear is used to diagnose BPPV affecting the posterior canal. The most popular term for a condition with a distinctive clinical appearance brought on by free floating particles inside the posterior semicircular canal is benign paroxysmal positional vertigo. The several kinds of vertigo brought on by peripheral vestibular disorders are referred to as "benign".

The word "paroxysmal" refers to a crucial feature of the condition: the vertigo is intermittent rather than chronic. The term "positional" suggests a specific correlation between the patient's head position in relation to gravity and their symptoms.

The study's objective was to determine and contrast the effects of traditional vestibular rehabilitation and incremental vestibulo ocular reflex adaption training on balance and dizziness in patients with benign paroxysmal positional vertigo. Twenty patients with benign paroxysmal positional vertigo were split into two groups, Group A and Group B, each with ten participants. Group B received traditional vestibular rehabilitation, while Group A received incremental vestibulo ocular reflex adaption training

The current study's findings demonstrate that gradual vestibulo ocular reflex adaptation training significantly improves balance and dizziness. According to Rinaudo (2021), progressive vestibulo ocular reflex adaption training helps individuals with benign paroxysmal positional vertigo feel less lightheaded and unsteady.

As a result, the third hypothesis is accepted whereas the first and second are rejected.

VI. CONCLUSION

In patients with benign paroxysmal positional vertigo, incremental vestibulo ocular reflex adaptation training is more effective than traditional vestibular rehabilitation, according to the statistical results, which also showed a significant improvement in balance performance and a reduction in group dizziness.

➤ Restrictions

- This is restricted to the size of the sample.
- The study was completed in a little amount of time.
- The small number of patients receiving therapy at the RVS outpatient department

RECOMMENDATIONS

- A similar study with a bigger sample size could be conducted.
- This study can be conducted for a long time.
- This research can be conducted in a variety of contexts.

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