A COMPARATIVE STUDY ON THE EFFECTIVENESS OF GANS REPOSITIONING MANEUVER AND BRANDT-DAROFF EXERCISES IN THE MANAGEMENT OF DIZZINESS AND BALANCE AMONG BENIGN PAROXYSMAL POSITIONAL VERTIGO PATIENTS

A dissertation submitted in partial fulfillment of the requirement for the degree of

MASTERS OF PHYSIOTHERAPY

(ELECTIVE- PHYSIOTHERAPY IN NEUROLOGY)

Submitted

To

The Tamil Nadu Dr. M.G.R. Medical University

Chennai-600032

MAY 2018

(Reg.No.271620023)

R.V.S. College of Physiotherapy

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INTERNAL EXAMINER

EXTERNAL EXAMINER

A dissertation submitted in partial fulfilment of the requirement for the degree of **Masters of Physiotherapy – May 2018** to The Tamil Nadu Dr. M.G.R. medical university, Chennai.

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ACKNOWLEDGEMENT

I, thank ***GOD*** for providing me the wisdom and knowledge to complete my study successfully.

With due respect, I Would like to thank ***The Chairman, Managing Trustee and the Secretary of RVS Educational trust,*** for providing me an opportunity to be a part of this esteemed institution.

I would like to express my deep sense of gratitude to my Principal ***Dr. R. Nagarani, M.P.T., M.A., Ph.D.,*** for her support, encouragement and suggestion for the completion of this project.

My special and sincere thanks to ***Mrs. S. Seema , M.P.T.,*** Professor, RVS College of Physiotherapy, for rendering valuable suggestions, constant guidance and support for the progress of my work and fruitful outcome of this study.

I immensely thank all the faculty members of Physiotherapy department for their kind advice and encouragement.

I humbly acknowledge all the love, support and care I received from my beloved husband ***Mr. Jaison Koshy*** , my parents ***Mr. S.John*** and ***Mrs. Lizy John, Mr.K.Kosheymon*** and ***Mrs. Annie Koshy*****,** my sisters ***Mrs. Johnsy Philomon, Miss. Jaslin Koshy*** and brother ***Mr. Philomon Thomas*** throughout my life in making me what I am now.

I would like to express thanks to my friends for their help to complete the study.

Jinsy John

DECLARATION

I hereby declare and present my project work **"A COMPARATIVE STUDY ON THE EFFECTIVENESS OF GANS REPOSITIONING MANEUVER AND BRANDT-DAROFF EXERCISES IN THE MANAGEMENT OF DIZZINESS AND BALANCE AMONG BENIGN PAROXYSMAL POSITIONAL VERTIGO PATIENTS".** The outcome of original research work under taken and carried out by me under the guidance of **Mrs.S.Seema, M.P.T**., Professor, R.V.S. College of Physiotherapy, Sulur, Coimbatore, Tamilnadu.

I also declare that the material of this project has not formed in anyway the basis for the award of any other degree previously from The Tamil Nadu Dr. M.G.R. Medical University, Chennai.

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Introduction

I INTRODUCTION

The vestibular system includes the parts of the inner ear and brain that help control balance and eye movements. If the system is damaged by disease, aging, or injury, vestibular disorders can result, and are often associated with one or more symptoms, among which are vertigo and dizziness. Vertigo is defined as an illusion of movement. Benign paroxysmal positioning vertigo (BPPV) is the most common vestibular disorder. It has a sudden onset that is provoked by a certain position or appears in a determined position. It is widely accepted that individuals exhibit symptoms of benign paroxysmal positioning vertigo when calcium carbonate crystals, known as otoconia, become displaced from the utricle of the inner ear and move into the semicircular canals **(Parnes 1992)**.

The vestibular organ in each ear includes the utricle, saccule, and three semicircular canals which are anterior canal, horizontal canal and posterior canal. The semicircular canals detect rotational movement. They are located at right angles to each other and are filled with a fluid called endolymph. Normally the canals are excited only by head rotation; when particles more dense than endolymph are present in the lumen, however, canals become gravity sensitive, pathologically responding to changes in head position. When the head rotates, endolymphatic fluid lags behind because of inertia and exerts pressure against the cupula, the sensory receptor at the base of the canal. The receptor then sends impulses to the brain about the heads movement. BPPV occurs as a result of otoconia, tiny crystals of calcium carbonate that are a normal part of the inner ears anatomy, detatching from the otolithic membrane in the utricle and collecting in one of the semicircular canals. When the head is still, gravity causes the otoconia to clump and settle. When the head moves, otoconia shift. This stimulates the cupula to send false signals to the brain, producing dizziness, postural sway and

triggering nystagmus. The cause of BPPV is mostly idiopathic. It may develop secondary to various disorders that damage the inner ear, head trauma, infection and aging. The posterior canal is involved in 80 percent of cases and lateral canal in 15 percent whereas the rarest forms of BPPV is anterior canal with 5 percent of cases. The posterior canal BPPV is the most frequent form of BPPV because the most commonly observed nystagmus, upbeat and torsional, would be produced by excitation of posterior canal. The high prevalence of posterior semicircular canal BPPV is likely determined by the ease in which otoconia can enter into this semicircular canal when the patient lies down **(Thimothy 2006).**

2.4% of all people will experience it at some point of their lifetime. BPPV occurs mostly in older people and both the sexes are affected. The most common symptoms are distinct triggered spells of dizziness, disorientation, losing of balance and nausea. Subtypes of BPPV are distinguished by the particular semicircular canal involved and whether detached otoconia are free floating within the affected canal (Canalithiasis) or attached to the cupula (Cupulithiasis). BPPV is typically unilateral, meaning it occurs either in the right or left ear although in some cases it is bilateral **(Sullivian 2007**).

The diagnosis of BPPV can be done by Dix-Hallpike test, Side-Lying test and Roll Test. The Dix-Hallpike test places the posterior canal on the downside ear in the plane of the pull of gravity. Debris adhering to the cupula or free floating in the long arm of the canal will shift down, resulting in vertigo and nystagmus. The assessment tools for benign paroxysmal positioning vertigo are Dizziness Handicap Inventory, Vertigo Symptom Scale, Patient Specific Functional Scale, Berg Balance Scale, Disability Scale **(Herdman 1994).**

The Dizziness Handicap Inventory is a popular tool used to measure a patient's self- perceived handicap as a result of vestibular disorders. The Dizziness Handicap Inventory provides quantification of the patient's perception of disequilibrium and its impact on daily activities. It is useful to establish subjective improvement. The Berg Balance Scale is considered to be the gold standard compared to other functional balance test. The test is usually administered prior to treatment for elderly patients with vestibular dysfunction **(Sullivian 2014).**

Benign paroxysmal positioning vertigo is usually a self-limiting disorder, compensation occurs naturally over time, but for people whose symptoms do not reduce and who continue to have difficulty returning to daily activities, vestibular rehabilitation can help with recovery by promoting compensation. The goal of vestibular rehabilitation is to use a problem-oriented approach to promote compensation. This is achieved by customizing exercises to address each person's specific problems. Therefore before an exercise program can be designed clinical examination is needed to identify problems related to the vestibular disorder. Depending upon the vestibular-related problems identified, three principal methods of exercise can be prescribed; they are habituation, gaze stabilization, balance training. Habituation exercise is indicated for patients who report increased dizziness when they move around, especially when they make quick head movements, or when they change positions. Simple vestibular exercises or maneuvers aimed at dispersing the otolithic debris from the cupula can speed recovery; antivertiginous drugs are not helpful. For more severe symptoms unresponsive to exercises, three surgical options are available for relief. The first is singular neurectomy, the other two options are partitioning of the labyrinth using a laser technique and nonampullary plugging of the posterior semicircular canal **(Herdman 1994)**.

Several different treatment approaches have been developed each based on pathophysiologic theories of this disorder. The techniques include the canalith repositioning maneuver, the Liberatory (Semont) maneuver, Brandt-Daroff exercises and Gans repositioning maneuver (**Sullivian 2014**).

Brandt-Daroff exercises are a series of movement that can help with certain type of vertigo. They were originally designed to habituate the CNS to the provoking position. They may also act to dislodge debris from the cupula or by causing debris to move out of the canal. It is advised for patients with persistent/ residual or mild vertigo **(Brandt 1980)**.

The Gans repositioning maneuver is a new treatment for posterior canal BPPV. It is a hybrid of semont liberatory maneuver and canalith repositioning maneuver. This maneuver is particularly useful for individuals with vestibular insufficiency, back pain, cervical spondylosis and for those that neck hyperextension is contraindicated. The series of movement help the otolith debris to enter the utricle **(Robert 2006)**.

1.1 Statement of the study

A study to find out and compare the effectiveness of Gans repositioning maneuver and Brandt-Daroff exercises on dizziness and balance among benign paroxysmal positional vertigo patients.

1.2 Need of the study

This study was aimed to introduce the new technique Gans repositioning maneuver for the elderly population in the management of dizziness and balance among benign paroxysmal positional vertigo patients. To create awareness about Gans repositioning maneuver for benign paroxysmal positional vertigo among the physiotherapists.

1.3 Objectives of the study

- To find out the effectiveness of Gans repositioning maneuver on dizziness among benign paroxysmal positional vertigo patients.
- To find out the effectiveness of Brandt-Daroff exercises on dizziness among benign paroxysmal positional vertigo patients.
- To compare the effectiveness of Gans repositioning maneuver and Brandt-Daroff exercises on dizziness among benign paroxysmal positional vertigo patients.
- To find out the effectiveness of Gans repositioning maneuver on balance among benign paroxysmal positional vertigo patients.
- To find out the effectiveness of Brandt-Daroff exercises on balance among benign paroxysmal positional vertigo patients.
- To compare the effectiveness of Gans repositioning maneuver and Brandt-Daroff exercises on balance among benign paroxysmal positional vertigo patients.

1.4 Hypothesis

1. It is hypothesized that there is no significant difference in dizziness and balance following Gans repositioning maneuver among benign paroxysmal positional vertigo patients.
2. It is hypothesized that there is no significant difference in dizziness and balance following Brandt-Daroff exercises among benign paroxysmal positional vertigo patients.
3. It is hypothesized that there is significant difference in dizziness and balance following Gans repositioning maneuver and Brandt-Daroff exercises among benign paroxysmal positional vertigo patients.

1.5 Operational definitions

Benign paroxysmal positional vertigo

Benign paroxysmal positional vertigo is a disorder arising from a problem in the inner ear. It is characterized by episodic vertigo provoked by certain changes in head position in relationship to gravity, such as tipping the head up or down and can experience dizziness, spinning sensation, lightheadedness, unsteadiness, loss of balance and nausea **(Bhattacharyya 2006).**

Gans repositioning maneuver

The Gans repositioning maneuver is a hybrid approach that is used for benign paroxysmal positional vertigo patients with comorbid factors. It incorporates side lying maneuver as its first position. The series of movement in this maneuver helps the otolith debris to enter the utricle **(Omara 2017).**

Brandt-Daroff exercises

The Brandt-Daroff exercises are a series of movements that can help with certain type of vertigo. These exercises are often used for benign paroxysmal positional vertigo which can dislodge and break up the crystals thus relieving symptoms of dizziness and light-headedness **(Gotter 2017).**

Dizziness Handicap Inventory

The Dizziness Handicap Inventory is a popular tool used to measure a patients self perceived handicap as a result of vestibular disorders. It is a 25 item self report questionnaire that quantifies the impact of dizziness on daily life **(Michael 2007).**

Berg Balance Scale

Berg Balance Scale provides a quantitative assessment of balance in older adults. It was intended for use in monitoring the clinical status of patients or effectiveness of treatment interventions over time **(Berg 1989).**

II REVIEW OF LITERATURE

Section A: Studies on general aspects of benign paroxysmal positional vertigo

Section B: Studies on the effect of Gans repositioning maneuver

Section C: Studies on the effect of Brandt-Daroff exercises

Section D: Studies on the reliability and validity of Dizziness Handicap Inventory

Section E: Studies on the reliability and validity of Berg Balance Scale

Section A: Studies on general aspects of benign paroxysmal positional vertigo

Jeremy *et al.,* (2015) conducted a study on benign paroxysmal positional vertigo: history, pathophysiology, office treatment and future directions. benign paroxysmal positional vertigo occurs spontaneously in the year 50-70 year age group. In younger individuals it is the most commonest cause of vertigo following head injury. There is a wide spectrum of severity from inconsistent positional vertigo provoked by any head movement. The cardinal features and a diagnostic test were done by Dix and Hallpike. It was concluded that benign paroxysmal positional vertigo symptoms can resolve spontaneously but can last for days, weeks, months, and years.

Raymond (2008) conducted a study which consists a general review of benign paroxysmal positional vertigo and nystagmus. The main etiopathogenesis, diagnosis and treatments are evoked. This disease occurs frequently and constitutes 50 percent of acute vertigo complaints.190 cases were examined in the study and liberatory maneuvers were given. It was concluded that liberatory maneuvers allowed a very

quick disposition of all the symptoms of benign paroxysmal positional vertigo in the majority of cases.

Stavros *et al.,* (2004) examined the diagnostic, pathophysiologic and therapeutic aspects of benign paroxysmal positional vertigo. It is the most common peripheral vestibular disorder. Ninety cases were examined in this study. The study concluded that canalithiasis of the posterior semicircular canal is considered the most convincing theory of its pathogenesis and development of appropriate therapeutic maneuvers resulted in its effective treatment. Involvement of the horizontal or the anterior canal has been found in a significant rate and the recognition and treatment of these variants completed the clinical picture of the disease.

Section B: Studies on the effect of Gans repositioning maneuver

Omara *et al.,* (2016) conducted this study was to compare between the effectiveness of Gans repositioning maneuver and Epley's repositioning maneuver in improving postural stability in elderly patients with posterior canal benign paroxysmal positional vertigo. A convenient sample of thirty patients was assigned in two groups. Patients in both the groups showed improvement. Therefore it was concluded that Gans repositioning maneuver is as effective as Epley's maneuver in improving postural stability in elderly patients with posterior canal benign paroxysmal positional vertigo.

Saberi *et al.,* (2016) examined this study to compare the efficacy of Gans repositioning maneuver versus Epley's maneuver for safe repositioning for the management of benign paroxysmal posterior canal vertigo. A pilot study was done on twenty patients with benign paroxysmal positional vertigo who were assigned in each groups the higher subjective and objective success rate of Epley's repositioning maneuver has been achieved compared with Gans maneuver in one day but after one

week the results were equal which indicated that the irreversibility of Gans maneuver was more than Epley's maneuver.

Bardaroy *et al.,* (2015) conducted this study was to determine the effect of a hybrid treatment the Gans repositioning maneuver with or without post maneuver restrictions, compared with canalith repositioning maneuver on treatment of posterior canal benign paroxysmal positional vertigo. A total of forty five subjects were selected. All the patients showed improvement within the groups. Therefore it was demonstrated that the Gans repositioning maneuver as a new treatment is effective in treating posterior canal benign paroxysmal positional vertigo with no benefits to post maneuver restrictions.

Gans *et al.,* (2006) conducted this study was to find out the efficacy of a new treatment maneuver for benign paroxysmal positional vertigo. Independent investigations reveal that semont liberatory maneuver and canalith repositioning maneuver provide an excellent outcome for most patients. In certain aspects of these maneuvers such as hyperextension of neck for canalith repositiong maneuver and brisk lateral motion for semont liberatory maneuver are contraindicated for patients with vertebrobasilar insufficiency, cervical spondylosis and back problems. A hybrid approach, the Gans repositioning maneuver was developed for these patients. Two hundred seven participants were enrolled in this prospective study. All were treated with Gans repositioning maneuver. Participants returned for follow up at one week interval until it was determined that the posterior canal benign paroxysmal positional vertigo was clear. It was concluded that Gans repositioning maneuver is efficacious treatment for dizziness with less rate of recurrence for posterior canal benign paroxysmal positional vertigo.

Section C: Studies on the effect of Brandt-Daroff exercises

Dashti (2015) examined the effectiveness of Brandt –Daroff exercises in treating patients with acute and chronic benign paroxysmal positional vertigo. One hundred benign paroxysmal positional vertigo patients were referred by neurology consultants to physiotherapy departments. Subjects were distributed to either acute or chronic groups based on the duration of the benign paroxysmal positional vertigo. Patients with neck problems or neurological problems were excluded. All the patients received Brandt-Daroff exercises daily until full recovery was noted. It was concluded that Brandt-Daroff exercises is very effective technique in treating both acute and chronic benign paroxysmal positional vertigo.

Devangi *et al.,* (2015) conducted the study to compare the role of modified Epley's maneuver and Brandt-Daroff in treatment of posterior canal benign paroxysmal positional vertigo. In this study patients were divided in two groups. One group was given modified Epley's maneuver and the other group was given a combination of modified Epley's and Brandt-Daroff exercises. When intergroup comparison was made there was better improvement in group two after 1 week and in group one after one month of treatment. It was concluded that both the treatment approaches were effective in reducing vertigo symptoms and improving independence level but combined approaches can give better results.

Dongwook *et al.,* (2012) examined the effectiveness of Brandt-Daroff exercises on the vestibular organ of women with vertigo. The purpose of this study is to find out the effects of Brandt-Daroff exercises on balance, perception of subjective visual vertical and nystagmus. Seventeen women of age 19-21 were selected who had more than one symptom. Vestibular functions were assessed through the use of a balance

pad, subjective visual vertical and videonystagmography. Each subject performed the Brandt-Daroff exercise five times a day for two weeks. The study revealed that two weeks performance of the Brandt-Daroff exercises improved some vestibular functions of women with vertigo.

Section D: Studies on the reliability and validity of Dizziness Handicap Inventory

Joo *et al.,* (2012) examined the disabilities in daily life, depressiveness and physical restrictiveness due to dizziness of patients with peripheral vestibular dizziness such as benign paroxysmal positional vertigo, vestibular neuritis were quantified by the evaluation with Dizziness Handicap Inventory questionnaires before and after the treatment. The questionnaires were administered to 150 patients diagnosed as benign paroxysmal position vertigo patients and vestibular neuritis. Comparative analyses have been carried out on each disease in terms of pre and post treatment and subcategories. The degree of handicap due to dizziness was more severe in terms of functional, emotional and physical limitations in benign paroxysmal positional vertigo patients. The high intra and inter reliability of the Dizziness Handicap Inventory was confirmed.

Nola *et al.,* (2010) examined the validity of Dizziness Handicap Inventory in a population of subjects with vertigo. The Dizziness Handicap Inventory was culturally and linguistically adapted for its use in Italian population. A cross sectional design was used to examine the internal consistency and concurrent validity. The study population consisted of 50 patients. To confirm the external validity of Dizziness Handicap Inventory, the correlation test between the total scores and single subscales and 8 scales of the Short Form Health Survey was performed. The single subscale of Dizziness Handicap Inventory scale (functional, emotional, physical) were respectively -0.599,-

0.563,-0.398. The Dizziness Handicap Inventory demonstrated good reliability and is recommended in the evaluation of disability in patients with dizziness.

Sussane (2009) evaluated the study to describe the reliability and validity of Dizziness Handicap Inventory. The questionnaire was to evaluate well being and level of function in patients with dizziness. Fifteen patients with vestibular dysfunction completed and commented on the Dizziness Handicap Inventory. The subjects included were of 30-87 years of age. The test-retest reliability for the scale was good to fair (k =0.63). The study concluded that the test-retest reliability was good. The content validity was also good since all the patients were content with the questionnaires.

Whitney *et al.,* (2005) verified the usefulness of Dizziness Handicap Inventory in screening for benign paroxysmal positional vertigo. A retrospective case review was done. Charts of 383 patients with a variety of vestibular diagnosis were reviewed. Validity was assessed by patients before the onset of physical therapy intervention. Individuals with benign paroxysmal positional vertigo had significantly higher mean scores on the newly developed subscale of Dizziness Handicap Inventory. The five item predictor of the likelihood of having benign paroxysmal positional vertigo (chi2 = 8.35; p <0.01). On the two item benign paroxysmal positional vertigo scale, individuals who had a score of 8 of 8 were 4.3 times more likely to have benign paroxysmal positional vertigo compared with individuals who had a score of zero. It was concluded that the items on the Dizziness Handicap Inventory appear to be helpful in determining the likelihood of an individual having the diagnosis of benign paroxysmal positional vertigo.

Jacobson (1990) examined that conventional vestibulometric techniques are inadequate for quantifying the impact of dizziness on everyday life. The twenty five

item Dizziness Handicap Inventory was developed to evaluate the self perceived handicapping effects imposed by vestibular system disease. The items were subgrouped into three content domains representing functional, emotional, and physical aspects of dizziness and unsteadiness. Cronbach's alpha coefficient was employed to measure reliability based on the consistency of the preliminary version. The final version of Dizziness Handicap Inventory was administered to one hundred and six patients and demonstrated good internal consistency reliability. With the exception of the physical subscale, the mean values for Dizziness Handicap Inventory scores increased significantly with increases in the frequency of dizziness episodes. Test-retest reliability was high.

Section E: Studies on the reliability and validity of Berg Balance Scale

Alghwiri *et al.,* (2016) evaluated that people with vestibular disorders are susceptible to imbalance hence this study was done to verify the reliability and validity of Berg Balance Scale for vestibular disorder patients. A convenient sample of eighty two persons with vestibular disorders of age group 43±14 was included and 56% among them were females. Significant scores was found on Berg Balance Scale ($r = 0.54$, $p<0.05$). The test-retest reliability of Berg Balance Scale as well as the inter-rater and intra-rater reliability reflected high agreement. The Berg Balance Scale demonstrated good reliability and validity and can be utilized for persons with vestibular disorders.

Shahanawaz *et al.,* (2015) conducted a study to find out the relationship between dizziness and balance in benign paroxysmal positional vertigo. The study aimed at investigating the correlation between dizziness and balance in benign paroxysmal positional vertigo patients by using outcome measure Dizziness Handicap

Inventory and Berg Balance Scale. Total 56 subjects were enrolled. Age group is 18-65, both males and females. The data was taken from subjects who were treated for 9 weeks by using exercise protocol. Validity was tested by assessing the degree to which Dizziness Handicap Inventory total score and Dizziness Handicap Inventory sub scale components i.e. physical, functional, emotional (r=0.82) correlated with the Berg Balance Scale (r=0.86), by spearman correlation coefficient. The study was concluded that the better the improvement in dizziness, the better is the balance of dizziness caused by benign paroxysmal positional vertigo; it is also observed that there is more strong correlation functional component.

Susan *et al.,* (2003) examined the purpose of the study was to determine the concurrent validity of Berg Balance Scale in people with vestibular disorders. A retrospective review of the charts of people who met the criteria of having completed the Berg Balance Scale was noted. Seventy patients were selected, 19 male and 51 female. The age range was 14 to 88 years. The scores on the Berg Balance Scale was moderate but significant by means of spearman order correlation ($r= 0.71$; $p<01$). A significant difference was identified on the Berg Balance Scale between older and younger individual with vestibular disorder. It was concluded that the Berg Balance Scale established concurrent validity for people with vestibular dysfunction.

III METHODOLOGY

3.1 Study setting

The study was conducted in Physiotherapy outpatient department, RVS college of Physiotherapy, Sulur, Coimbatore.

3.2 Selection of subjects

20 subjects were randomly selected who fulfilled the inclusion and exclusion criteria and were divided into two groups.

Group 1-Gans repositioning maneuver

Group 2-Brandt-Daroff exercises

3.3 Variables

3.3.1 Dependent variable

Dizziness

Balance

3.3.2 Independent variables

Gans repositioning maneuver

Brandt-Daroff exercises

3.4 Measurement tool

Variable	**Tool**
Dizziness	Dizziness Handicap Inventory
Balance	Berg Balance Scale

3.5 Study design

The study design adopted was pre test and post test, experimental design.

3.6 Inclusion criteria

- Age: 50-60 years
- Clinically diagnosed with posterior semicircular canal benign paroxysmal positional vertigo with unilateral involvement.
- Patients who are co-operative.
- Both the gender.

3.7 Exclusion criteria

- Previous or current diagnosis of labyrinthine diseases such as menieres disease, labyrinthitis or vestibular neuritis.
- Disorders of central nervous system.
- Patients who are on medications for vertigo control.
- Anterior or horizontal semicircular canal involvement.
- Neurological problems that induce vertigo.
- Visual and auditory impairment.
- Cognitive and perceptual deficits.

3.8 Orientation to the subjects

Before the collection of data, all the subjects were explained about the purpose of the study the investigator about the various test procedure. The consent and full cooperation of each participant was sort after complete explanation of the condition and demonstration of the procedure involved in the study.

3.9 Materials used

- Couch
- Patient consent form
- Dizziness Handicap Inventory questionnaire form
- Berg Balance Scale form

3.10 Test administration

Dizziness Handicap Inventory

The Dizziness Handicap Inventory is a 25 item self report questionnaire that quantifies the impact of dizziness on daily life by measuring self perceived handicap.

There are three domains:

1. Functional (9 questions, 36 points)
2. Emotional (9 questions, 36 points)
3. Physical (7 questions, 28 points)

Item scores are summed. There is a maximum score of 100 and minimum score of 0. The higher the score, the greater the perceived handicap due to dizziness.

Answers are graded:

- 0 - no
- 2- sometimes
- 4 – yes

Berg Balance Scale

Balance among older adults with vestibular disorders was assessed by Berg Balance Scale. This scale consists of 14 functional tasks which require the subjects to perform

after the investigations. The achieved level was recorded and used for evaluation for the effectiveness of interventions and for quantitative descriptions of function in clinical practice.

3.11 Procedure

20 subjects were selected randomly between the age group of 50-60 years. All the subjects underwent a pre-test assessment of dizziness by using Dizziness Handicap Inventory scale and balance by using Berg Balance Scale. The pre-test assessment was taken following procedure and providing Gans repositioning maneuver and Brandt-Daroff exercises for 2 weeks of intervention.

Group A- Gans repositioning maneuver

The Gans repositioning maneuver incorporated the side lying maneuver as its first position. At first the patient was in primary position, seated and facing forward. The head of the patient is turned 45˚ away from the affected ear and the patient moved into a side lying position on the involved side. The second position was a roll from the involved side to the position 45˚ of uninvolved side. After provocation of symptoms elicited by second position, the patient is instructed to shake head side-to-side three or four times. Finally the patient is returned to an upright seated position with head turned forward to central position. The maneuver was given one session/week for two weeks.

Figure 1: Shows the patient is seated and facing forward

Figure 2: Shows the head of the patient is turned to 45˚.

Figure 3: Shows the patient is side lying on the involved side with head turned 45˚.

Figure 4: Shows the patient is rolled on to the uninvolved side.

Figure 5: Shows the head of the patient is shaken side to side.

Group B – Brandt-Daroff exercise.

The patient is first seated on the couch. The head of the patient is tilted 45˚ to the unaffected side and is instructed to lie down on the affected side. The patient has to remain in this position for 30 seconds and then return to the sitting position and head back to centre. Again the head is tilted 45˚ to affected side and the patient is instructed to lie down on the unaffected side for 30 seconds and then back to sitting position. The treatment duration was three sessions/day for two weeks.

Figure 6: Shows the patient is seated and facing forward.

Figure 7: Shows the patient is side lying on the affected side and head turned to 45^0.

Figure 8: Shows the patient returned to sitting position from side lying position.

Figure 9: Shows the patient side lying on the unaffected side with head turned 45˚.

3.12 Collection of data

20 benign paroxysmal positional vertigo subjects were selected and divided into 2 groups for the study. The group A received Gans repositioning maneuver and group B received Brandt-Daroff exercises. Both the experimental groups were given treatment for 2 weeks. Before and after 2 weeks of treatment intervention the dizziness and balance was evaluated by Dizziness Handicap Inventory and Berg Balance Scale respectively and recorded.

3.13 Statistical technique

Collection of data were analyzed by paired 't' test to find out significance difference between pre and post test value for experimental groups and further unpaired 't' test was applied to find out difference between group.

IV DATA ANALYSIS AND RESULTS

4.1 Data analysis

This chapter deals with the systematic presentation of the analyzed data followed by the interpretation of the data.

a) Paired 't' test

$$\bar{d} = \frac{\sum d}{n}$$

$$s = \sqrt{\frac{\sum d^2 - \frac{(\sum d)^2}{n}}{n-1}}$$

$$t = \frac{\overline{d\sqrt{n}}}{s}$$

Where,

d – Difference between pre test and post test values

$\bar{d} = \frac{\sum d}{n}$ – Mean of difference between pre test and post test values

n – Total number of subjects

s – Standard deviation

b) Un paired t' test

$$s = \sqrt{\frac{\sum(x_{1-}\ \bar{x}_1)^2+\sum(x_{2-}\ \bar{x}_2)^2}{n_1+n_2-2}}$$

$$t = \frac{\bar{x}_{1-}\ \bar{x}_2}{S}\sqrt{\frac{n_1 n_2}{n_1+n_2}}$$

Where,

S = Standard deviation

n_1 = Number of subjects in Group A

n_2= Number of subjects in Group B

$\bar{x}_1$ = Mean of the difference in values between pre-test and post-test in Group-A

$\bar{x}_2$= Mean of the difference in values between pre-test and post-test in Group-B

TABLE 1

Shows the comparative mean value, mean difference, standard deviation and paired 't' value between pre and post-test values of dizziness among Group A.

Measurement	Mean	Mean Difference	Standard Deviation	Paired 't' value
Pre-test	87.2	71	10.91	20.57*
Post-test	16.2			

*0.005 level of significance.

In group A for dizziness the calculated paired 't' value is 20.57 and 't' table value is 3.250 at 0.005 level. Since the calculated 't' value is more than 't' table value, it shows that there is significant difference in dizziness following Gans repositioning maneuver among benign paroxysmal positional vertigo patients.

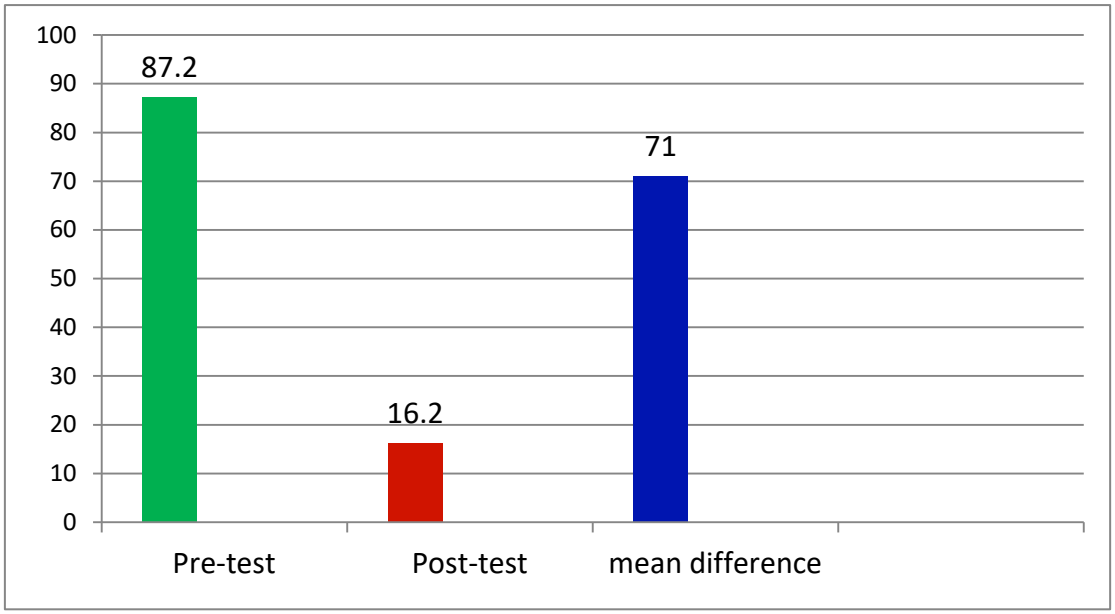

Figure 10: Shows the graphical representation of pre and post-test values of dizziness in Group A.

TABLE 2

Shows the comparative mean value, mean difference, standard deviation and paired 't' value between pre and post-test values of dizziness among Group B.

Measurement	Mean	Mean Difference	Standard Deviation	Paired 't' value
Pre-test	80.5	56.3	11.7	15.21*
Post-test	24.2			

*0.005 level of significance.

In group B for dizziness the calculated paired 't' value is 15.21 and 't' table value is 3.250 at 0.005 level. Since the calculated 't' value is more than 't' table value, it shows that there is significant difference in dizziness following Brandt-Daroff exercises among benign paroxysmal positional vertigo patients.

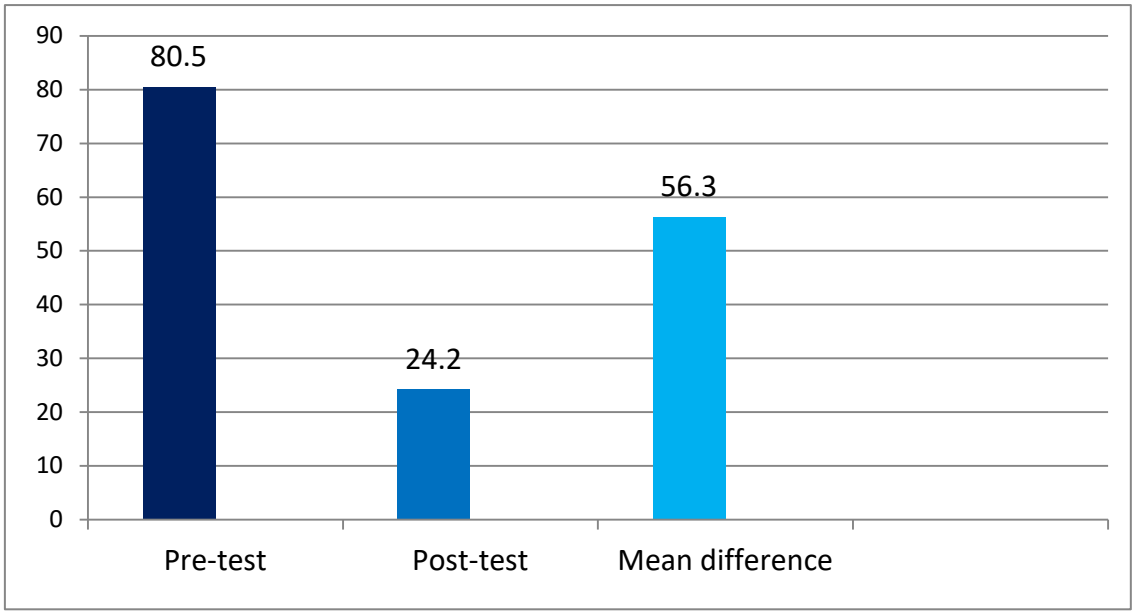

Figure 11: Shows the graphical representation of pre and post-test values of dizziness in Group B.

TABLE 3

Shows the comparative mean value, mean difference, standard deviation and unpaired 't' values of dizziness between Group A and Group B.

S. no	Groups	Improvement		Standard deviation	Unpaired 't' value
		Mean	Mean difference		
1	Group-A	71	14.7	11.31	2.90*
2	Group-B	56.3			

*0.005 level of significance

In group A and B for dizziness the calculated unpaired 't' value is 2.90 and 't' table value is 2.87 at 0.005 level. Since the calculated 't' value is more than 't' table value, it shows that there is significant difference between Gans repositioning maneuver and Brandt-Daroff exercises in the management of dizziness among benign paroxysmal positional vertigo patients.

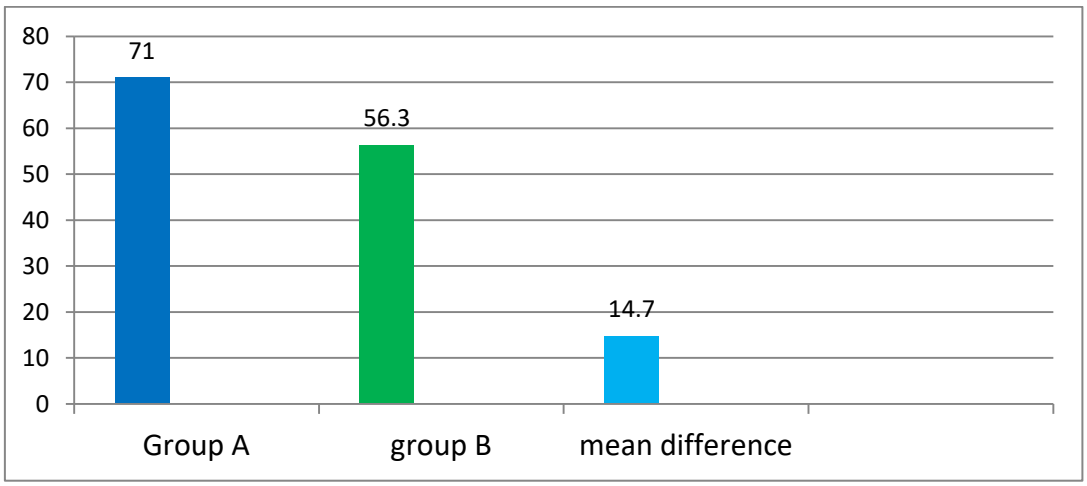

Figure 12: Shows the graphical representation of mean values of dizziness in Group A and Group B.

TABLE 4

The table Shows the comparative mean value, mean difference, standard deviation and paired 't' value between pre and post-test values of balance among Group A.

Measurement	Mean	Mean Difference	Standard Deviation	Paired 't' value
Pre-test	23.6	16.7	4.21	12.52*
Post-test	40.3			

*0.005 level of significance.

In group A for balance the calculated paired 't' value is 12.52 and 't' table value is 3.250 at 0.005 level. Since the calculated 't' value is more than 't' table value, it shows that there is significant difference in balance following Gans repositioning maneuver among benign paroxysmal positional vertigo patients.

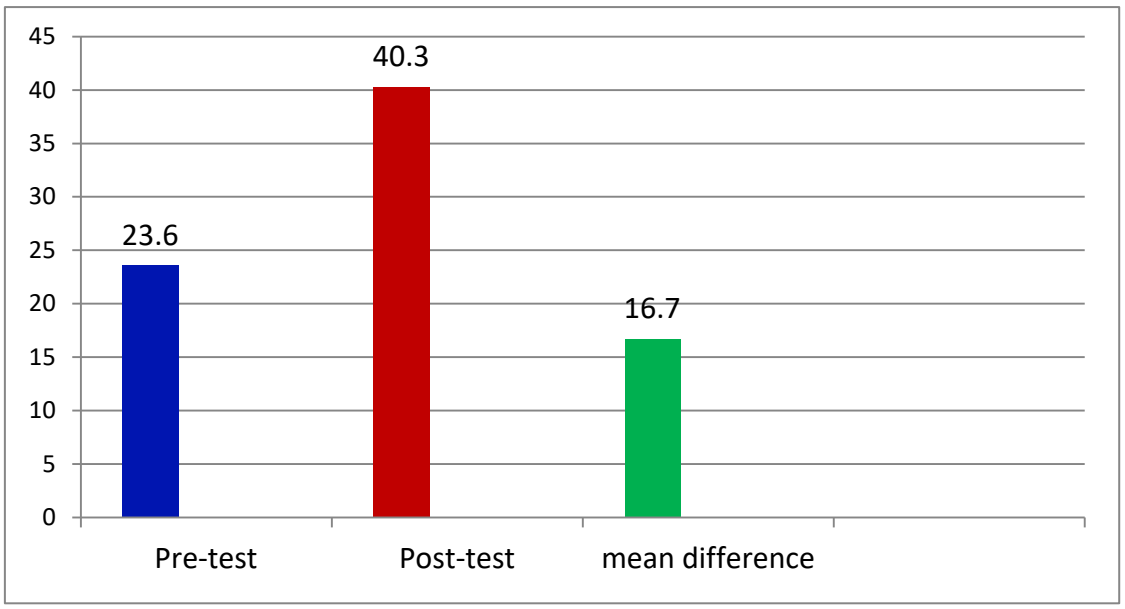

Figure 13: Shows the graphical representation of pre and post-test values of balance in Group A.

TABLE 5

Shows the comparative mean value, mean difference, standard deviation and paired 't' value between pre and post-test values of balance among Group B.

Measurement	Mean	Mean Difference	Standard Deviation	Paired 't' value
Pre-test	21.6	11.1	4.12	8.51*
Post-test	32.7			

*0.005 level of significance.

In group B for balance the calculated paired 't' value is 8.51 and 't' table value is 3.250 at 0.005 level. Since the calculated 't' value is more than 't' table value, it shows that there is significant difference in balance following Brandt-Daroff exercises among benign paroxysmal positional vertigo patients.

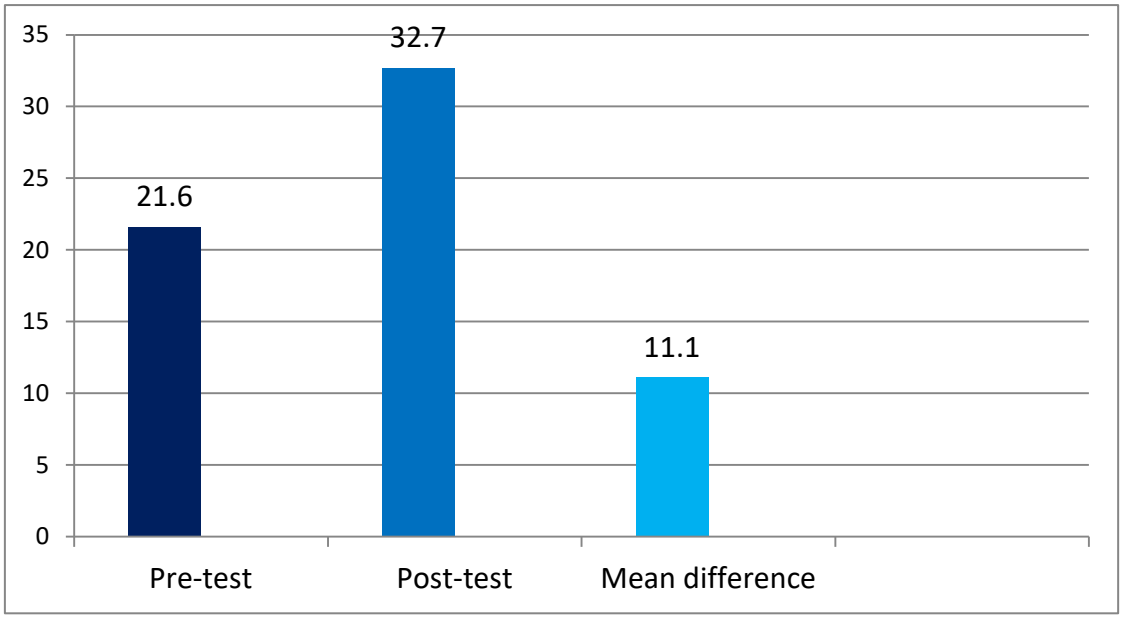

Figure 14: Shows the graphical representation of pre and post-test values of balance in Group B.

TABLE 6

Shows the comparative mean value, mean difference, standard deviation and unpaired 't' values of balance between Group A and Group B.

S. no	Groups	Improvement		Standard deviation	Unpaired 't' value
		Mean	Mean difference		
1	Group-A	16.7	5.6	4.16	3.00*
2	Group-B	11.1			

*0.005 level of significance

In group A and B for balance the calculated unpaired 't' value is 3.00 and 't' table value is 2.87 at 0.005 level. Since the calculated 't' value is more than 't' table value, it shows that there is significant difference between Gans repositioning maneuver and Brandt-Daroff exercises in the management of balance among benign paroxysmal positional vertigo patients.

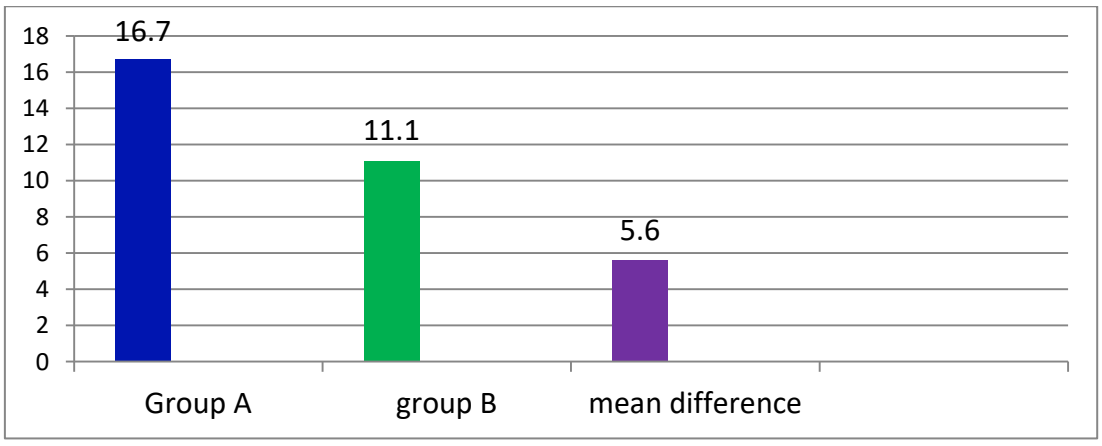

Figure 15: Shows the graphical representation of mean values of balance in Group A and Group B.

4.2 Results

20 benign paroxysmal positional vertigo subjects were selected for the study. The subjects were randomly divided into two groups.

Group A was treated with Gans repositioning maneuver.

Group B was treated with Brandt-Daroff exercises.

Before starting the treatment, dizziness was graded by Dizziness Handicap Inventory and balance was graded by Berg Balance Scale. The measurement was repeated at the end of the study duration.

Analysis of dependent variable dizziness in Group A: The calculated paired 't' value is 20.57 and the table 't' value is 3.250 at 0.005 level of significance. Hence, the calculated 't' value is greater than the table 't' value there is significant difference in dizziness with Gans repositioning maneuver among benign paroxysmal positional vertigo patients .

Analysis of dependent variable dizziness in Group B: The calculated paired 't' value is 15.21 and the table 't' value is 3.250 at 0.005 level of significance. Hence, the calculated 't' value is greater than the table 't' value there is significant difference in dizziness with Brandt-Daroff exercises among benign paroxysmal positional vertigo patients .

Analysis of dependent variable dizziness between Group A and Group B: The calculated unpaired 't' value is 2.90 and the table 't' value is 2.878 at 0.005 level of significance. Hence, the calculated 't' value is greater than table 't' value there is significant difference statistically between Gans repositioning maneuver and Brandt-Daroff exercises in improving dizziness among benign paroxysmal positional vertigo patients .

When comparing the mean values of Group A and B, Group A subjects treated with Gans repositioning maneuver showed more difference than Group B. Hence it is

concluded that Gans repositioning maneuver is more effective than Brandt-Daroff exercises in reducing dizziness among patients with benign paroxysmal positional vertigo patients.

Analysis of dependent variable balance in Group A: The calculated paired 't' value is 12.52 and the table 't' value is 3.250 at 0.005 level of significance. Hence, the calculated 't' value is greater than the table 't' value there is significant difference in balance with Gans repositioning maneuver among benign paroxysmal positional vertigo patients .

Analysis of dependent variable balance in Group B: The calculated paired 't' value is 8.51 and the table 't' value is 3.250 at 0.005 level of significance. Hence, the calculated 't' value is greater than the table 't' value there is significant difference in balance with Brandt-Daroff exercises among benign paroxysmal positional vertigo patients .

Analysis of dependent variable balance between Group A and Group B: The calculated unpaired 't' value is 3.00 and the table 't' value is 2.878 at 0.005 level of significance. Hence, the calculated 't' value is greater than table 't' value there is significant difference statistically between Gans repositioning maneuver and Brandt-Daroff exercises in improving balance among benign paroxysmal positional vertigo patients .

When comparing the mean values of Group A and B, Group A subjects treated with Gans repositioning maneuver showed more difference than Group B. Hence it is concluded that Gans repositioning maneuver is more effective than Brandt-Daroff exercises in improving balance among patients with benign paroxysmal positional vertigo patients.

V DISCUSSION

The benign paroxysmal positional vertigo is the most common disorder causing dizziness and imbalance. The aim of the study was to compare the effectiveness Gans repositioning maneuver and Brandt-Daroff exercises among benign paroxysmal positional vertigo patients. The 20 benign paroxysmal positional vertigo subjects divided into two groups, group A and B, each group consist of 10 subjects. Group A was treated with Gans repositioning maneuver and group B was treated with Brandt-Daroff exercises.

Results of the present study shows that there is significant difference in dizziness and balance following Gans repositioning maneuver. It is supported by Omara *et al.,* (2016) the objective of his study was to compare between the effectiveness of Gans repositioning maneuver and Epley's repositioning maneuver in improving postural stability in elderly patients with posterior canal benign paroxysmal positional vertigo. A convenient sample of thirty patients were assigned in two groups. Patients in both the groups showed improvement. Therefore it was concluded that Gans repositioning maneuver is as effective as Epley's maneuver in improving postural stability in elderly patients with posterior canal benign paroxysmal positional vertigo. Gans *et al.,* (2006) the purpose of this study was to find out the efficacy of a new treatment maneuver for benign paroxysmal positional vertigo. Independent investigations reveal that semont liberatory maneuver and canalith repositioning maneuver provide an excellent outcome for most patients. In certain aspects of these maneuvers such as hyperextension of neck for canalith repositiong maneuver and brisk lateral motion for semont liberatory maneuver are contraindicated for patients with vertebrobasilar insufficiency, cervical spondylosis, back problems. A hybrid approach , the Gans repositioning maneuver was developed for these patients. Two hundred seven

participants were enrolled in this prospective study. All were treated with Gans repositioning maneuver. Participants returned for follow up at one week interval until it was determined that the posterior canal benign paroxysmal positional vertigo was clear. It was concluded that Gans repositioning maneuver is efficacious treatment for dizziness with less rate of recurrence for posterior canal benign paroxysmal positional vertigo.

Results of the present study shows that there is significant difference in dizziness and balance following Brandt-Daroff exercises. Dashti (2015) examined the effectiveness of Brandt –Daroff exercises in treating patients with acute and chronic benign paroxysmal positional vertigo . One hundred benign paroxysmal positional vertigo patients were referred by neurology consultants to physiotherapy departments. Subjects were distributed to either acute or chronic groups based on the duration of the benign paroxysmal positional vertigo. Patients with neck problems or neurological problems were excluded. All the patients received Brandt-Daroff exercises daily until full recovery was noted. It was concluded that Brandt-Daroff exercises is very effective technique in treating both acute and chronic benign paroxysmal positional vertigo. Devangi *et al.,* (2015) compared the role of modified Epley's maneuver and Brandt-Daroff in treatment of posterior canal benign paroxysmal positional vertigo. In this study patients were divided in two groups. One group was given modified Epley's maneuver and the other group was given a combination of modified Epley's and Brandt-Daroff exercises. When intergroup comparision was made there was better improvement in group two after 1 week and in group one after one month of treatment. It was concluded that both the treatment approaches were effective in reducing vertigo symptoms and improving independence level but combined approaches can give better results.

Both the techniques, Gans repositioning maneuver and Brandt-Daroff exercises clinically shows improvement in dizziness and balance but statistically there is significant improvement following Gans repositioning maneuver in reducing dizziness and improving balance among benign paroxysmal positional vertigo patients.

In Gans repositioning maneuver, when the patient is rolled from the affected side to the unaffected side the otolith debris moves to the common crus and after the head of the patient is shaken side to side and returned to the upright seated position the otolith debris enters the utricle. The Gans repositioning maneuver avoids hyperextension of the neck hence there is less recurrence.

Hence the hypothesis 1, 2 rejected and 3 accepted.

VI CONCLUSION

20 benign paroxysmal positional vertigo patients were included in this study and randomly divided into two groups and each group consisted of 10 subjects. Group A was treated with Gans repositioning maneuver. Group B was treated with Brandt-Daroff exercises. After two weeks of intervention dizziness and balance improved significantly.

The statistical result shows that there is improvement in both the groups. When comparing both, Gans repositioning maneuver showed more significant improvement in dizziness and balance among benign paroxysmal positional vertigo patients than Brandt-Daroff exercises.

6.1 Limitations

- Limited sample size.
- Social factor.
- Short duration study.
- Limited age group.
- Posterior semicircular canal benign paroxysmal positional vertigo patients were only considered.

6.2 Suggestions

- Large study group can be done for better results.
- Study duration can be increased.
- Compared with other exercises.

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ANNEXURES

ANNEXURE I

ASSESSMENT CHART

I. Subjective Examination

Name :

Age :

Sex :

Dominance :

Occupation :

Address :

Chief complaints :

History of present illness :

Past medical history :

Previous treatment history :

Drug history :

Family history :

Social history :

Personal history :

Occupational history :

General examination :

Vital sign :

II Objective examination

A) On observation

Built of patient :

Musculature :

Trophical changes :

External appliances :

Deformities :

B) On palpation

Tenderness :

Warmth :

Tone :

Oedema :

Spasm :

C) On examination

I Higher Functions

a) Level of consciousness

Glasgow coma scale

II Sensory assessment scale

Superficial senses :

Deep senses :

Combined cortical :

IV Motor examination

a) Muscle power : Upper extremity

b) Tone

Assess hyper tonicity and hypo tonicity

c) Girth measurement

d) Deep tendon reflexes

e) Superficial reflexes

f) Primitive reflexes

g) Range of motion

V Co-ordination

Equilibrium test

Non – equilibrium test

VI Functional assessment

Activities of daily living

To assess balance: Berg Balance Scale

To assess dizziness: Dizziness Handicap Inventory

ANNEXURE II

DIZZINESS HANDICAP INVENTORY

P1. Does looking up increase your problem?	Yes	No	Sometimes
E2. Because of your problem, do you feel frustrated?	Yes	No	Sometimes
F3. Because of your problem, do you restrict your travel for business or recreation?	Yes	No	Sometimes
P4. Does walking down the aisle of a supermarket increase your problem?	Yes	No	Sometimes
F5. Because of your problem, do you have difficulty getting into or out of bed?	Yes	No	Sometimes
F6. Does your problem significantly restrict your participation in social activities such As going out to dinner, going to the movies, dancing, or to parties?	Yes	No	Sometimes
F7. Because of your problem, do you have difficulty reading?	Yes	No	Sometimes
P8. Does performing more ambitious activities like sports, dancing, household chores Such as sweeping or putting away dishes increase your problem?	Yes	No	Sometimes

E9. Because of your problem, are you afraid to leave your home without having someone accompany you?	Yes	No	Sometimes
E10. Because of your problem, have you been embarrassed in front of others?	Yes	No	Sometimes
P11. Do quick movements of your head increase your problem?	Yes	No	Sometimes
F12. Because of your problem, do you avoid heights?	Yes	No	Sometimes
P13. Does turning over in bed increase your problem?	Yes	No	Sometimes
F14. Because of your problem, is it difficult for you to do strenuous housework or yard work?	Yes	No	Sometimes
E15. Because of your problem, are you afraid people might think you are intoxicated?	Yes	No	Sometimes
F16. Because of your problem, is it difficult for you to go for a walk by yourself?	Yes	No	Sometimes
P17. Does walking down a sidewalk increase your problem?	Yes	No	Sometimes
E18. Because of your problem, is it difficult for you to concentrate?	Yes	No	Sometimes
F19. Because of your problem, is it difficult for you walk around the house in the dark?	Yes	No	Sometimes

E20. Because of your problem, are you afraid to stay home alone?	Yes	No	Sometimes
E21. Because of your problem, do you feel handicapped?	Yes	No	Sometimes
E22. Has your problem placed stress on your relationships with members of your family or friends?	Yes	No	Sometimes
E23. Because of your problem, are you depressed?	Yes	No	Sometimes
F24. Does your problem interfere with your job or household responsibilities?	Yes	No	Sometimes
P25. Does bending over increase your problem?	Yes	No	Sometimes

ANNEXURE III

BERG BALANCE SCALE

SITTING TO STANDING INSTRUCTIONS: Please stand up. Try not to use your hand for support.

( ) 4 able to stand without using hands and stabilize independently

( ) 3 able to stand independently using hands

( ) 2 able to stand using hands after several tries

( ) 1 needs minimal aid to stand or stabilize

( ) 0 needs moderate or maximal assist to stand

STANDING UNSUPPORTED INSTRUCTIONS: Please stand for two minutes without holding on.

( ) 4 able to stand safely for 2 minutes

( ) 3 able to stand 2 minutes with supervision

( ) 2 able to stand 30 seconds unsupported

( ) 1 needs several tries to stand 30 seconds unsupported

( ) 0 unable to stand 30 seconds unsupported

If a subject is able to stand 2 minutes unsupported, score full points for sitting unsupported. Proceed to item #4.

SITTING WITH BACK UNSUPPORTED BUT FEET SUPPORTED ON FLOOR OR ON A STOOL INSTRUCTIONS: Please sit with arms folded for 2 minutes.

( ) 4 able to sit safely and securely for 2 minutes

( ) 3 able to sit 2 minutes under supervision

( ) 2 able to able to sit 30 seconds

( ) 1 able to sit 10 seconds

( ) 0 unable to sit without support 10 seconds

STANDING TO SITTING INSTRUCTIONS: Please sit down.

( ) 4 sits safely with minimal use of hands

( ) 3 controls descent by using hands

( ) 2 uses back of legs against chair to control descent

( ) 1 sits independently but has uncontrolled descent

( ) 0 needs assist to sit

TRANSFERS INSTRUCTIONS: Arrange chair(s) for pivot transfer. Ask subject to transfer one way toward a seat with armrests and one way toward a seat without armrests. You may use two chairs (one with and one without armrests) or a bed and a chair.

( ) 4 able to transfer safely with minor use of hands

( ) 3 able to transfer safely definite need of hands

( ) 2 able to transfer with verbal cuing and/or supervision

( ) 1 needs one person to assist

( ) 0 needs two people to assist or supervise to be safe

STANDING UNSUPPORTED WITH EYES CLOSED INSTRUCTIONS: Please close your eyes and stand still for 10 seconds.

( ) 4 able to stand 10 seconds safely

( ) 3 able to stand 10 seconds with supervision

( ) 2 able to stand 3 seconds

( ) 1 unable to keep eyes closed 3 seconds but stays safely

( ) 0 needs help to keep from falling

STANDING UNSUPPORTED WITH FEET TOGETHER INSTRUCTIONS: Place your feet together and stand without holding on.

( ) 4 able to place feet together independently and stand 1 minute safely

( ) 3 able to place feet together independently and stand 1 minute with supervision

( ) 2 able to place feet together independently but unable to hold for 30 seconds

( ) 1 needs help to attain position but able to stand 15 seconds feet together

( ) 0 needs help to attain position and unable to hold for 15 seconds

REACHING FORWARD WITH OUTSTRETCHED ARM WHILE STANDING INSTRUCTIONS: Lift arm to 90 degrees. Stretch out your fingers and reach forward as far as you can. (Examiner places a ruler at the end of fingertips when arm is at 90 degrees. Fingers should not touch the ruler while reaching forward. The recorded measure is the distance forward that the fingers reach while the subject is in the most forward lean position. When possible, ask subject to use both arms when reaching to avoid rotation of the trunk.

( ) 4 can reach forward confidently 25 cm (10 inches)

( ) 3 can reach forward 12 cm (5 inches)

( ) 2 can reach forward 5 cm (2 inches)

( ) 1 reaches forward but needs supervision

( ) 0 loses balance while trying/requires external support

PICK UP OBJECT FROM THE FLOOR FROM A STANDING POSITION INSTRUCTIONS: Pick up the shoe/slipper, which is in front of your feet.

( ) 4 able to pick up slipper safely and easily

( ) 3 able to pick up slipper but needs supervision

( ) 2 unable to pick up but reaches 2-5 cm(1-2 inches) from slipper and keeps balance independently

( ) 1 unable to pick up and needs supervision while trying

( ) 0 unable to try/needs assist to keep from losing balance or falling

TURNING TO LOOK BEHIND OVER LEFT AND RIGHT SHOULDERS WHILE STANDING INSTRUCTIONS: Turn to look directly behind you over toward the left shoulder. Repeat to the right. (Examiner may pick an object to look at directly behind the subject to encourage a better twist turn.)

( ) 4 looks behind from both sides and weight shifts well

( ) 3 looks behind one side only other side shows less weight shift

( ) 2 turns sideways only but maintains balance

( ) 1 needs supervision when turning

( ) 0 needs assist to keep from losing balance or falling

TURN 360 DEGREES INSTRUCTIONS: Turn completely around in a full circle. Pause. Then turn a full circle in the other direction.

( ) 4 able to turn 360 degrees safely in 4 seconds or less

( ) 3 able to turn 360 degrees safely one side only 4 seconds or less

( ) 2 able to turn 360 degrees safely but slowly

( ) 1 needs close supervision or verbal cuing

( ) 0 needs assistance while turning

PLACE ALTERNATE FOOT ON STEP OR STOOL WHILE STANDING UNSUPPORTED INSTRUCTIONS: Place each foot alternately on the step/stool. Continue until each foot has touched the step/stool four times.

( ) 4 able to stand independently and safely and complete 8 steps in 20 seconds

( ) 3 able to stand independently and complete 8 steps in > 20 seconds

( ) 2 able to complete 4 steps without aid with supervision

( ) 1 able to complete > 2 steps needs minimal assist

( ) 0 needs assistance to keep from falling/unable to try

STANDING UNSUPPORTED ONE FOOT IN FRONT INSTRUCTIONS: (DEMONSTRATE TO SUBJECT) Place one foot directly in front of the other. If you feel that you cannot place your foot directly in front, try to step far enough ahead that

the heel of your forward foot is ahead of the toes of the other foot. (To score 3 points, the length of the step should exceed the length of the other foot and the width of the stance should approximate the subject's normal stride width.)

( ) 4 able to place foot tandem independently and hold 30 seconds

( ) 3 able to place foot ahead independently and hold 30 seconds

( ) 2 able to take small step independently and hold 30 seconds

( ) 1 needs help to step but can hold 15 seconds

( ) 0 loses balance while stepping or standing

STANDING ON ONE LEG INSTRUCTIONS: Stand on one leg as long as you can without holding on.

( ) 4 able to lift leg independently and hold > 10 seconds

( ) 3 able to lift leg independently and hold 5-10 seconds

( ) 2 able to lift leg independently and hold ≥ 3 seconds

( ) 1 tries to lift leg unable to hold 3 seconds but remains standing independently.

( ) 0 unable to try of needs assist to prevent fall

TOTAL SCORE (Maximum = 56)

ITEM DESCRIPTION	SCORE (0-4)
Sitting to standing	_____
Standing unsupported	_____
Sitting unsupported	_____
Standing to sitting	_____
Transfers	_____
Standing with eyes closed	_____
Standing with feet together	_____
Reaching forward with outstretched arm	_____
Retrieving object from floor	_____
Turning to look behind	_____
Turning 360 degrees	_____
Placing alternate foot on stool	_____
Standing with one foot in front	_____
Standing on one foot	_____
Total	_____

ANNEXURE IV

RAW SCORES OF DIZZINESS

Table 7: Pre and post test values of dizziness of group A.

Sr. No.	Pre test	Post test
1.	89	12
2.	88	8
3.	91	9
4.	92	12
5.	85	27
6.	75	21
7.	80	20
8.	91	27
9.	89	16
10.	92	10

Table 8: Pre and post test values of dizziness of group B.

Sr. No.	Pre test	Post test
1.	91	33
2.	90	31
3.	81	22
4.	75	18
5.	88	30
6.	70	23
7.	89	10
8.	82	22
9.	74	20
10.	65	33

ANNEXURE V

RAW SCORES OF BALANCE

Table 9: Pre and post test values of balance of group A.

Sr. No.	Pre test	Post test
1.	17	38
2.	21	40
3.	24	40
4.	29	45
5.	30	41
6.	29	38
7.	20	35
8.	22	40
9.	24	46
10.	20	40

Table 10: Pre and post test values of balance of group B.

Sr. No.	Pre test	Post test
1.	16	24
2.	22	31
3.	16	35
4.	25	32
5.	17	25
6.	22	36
7.	23	39
8.	21	30
9.	28	41
10.	26	34

ANNEXURE VI

PATIENT CONSENT FORM

I . . . . . Voluntarily consent to participate in the research named on **"A COMPARATIVE STUDY ON THE EFFECTIVENESS OF GANS REPOSITIONING MANEUVER AND BRANDT-DAROFF EXERCISES AMONG THE MANAGEMENT OF DIZZINESS AND BALANCE IN BENIGN PAROXYSMAL POSITIONAL VERTIGO PATIENTS "**

The researcher has explained me the treatment approach in brief, risk of participation and has answered the questions related to the study to my satisfaction.

Signature of patient **Signature of researcher**

Signature of witnessR

Date :

Place: