

# A Study to Assess Effectiveness of Cawthorn Cooksey Exercises on Balance and Dizziness in Benign Paroxysmal Positional Vertigo

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## Abstract

### Background and Objectives:

Benign paroxysmal Positional Vertigo (BPPV) is a disorder arising in the inner ear. Its symptoms are repeated episodes of positional vertigo, that is, dizziness on changing the positions of the head. The symptoms of Benign paroxysmal Positional Vertigo (BPPV) are dizziness, loss of balance, light-headedness, blurred vision and nystagmus associated with vertigo, nausea, vomiting. Cawthorne Cooksey exercises in the form of habituation exercises are simple, inexpensive treatment that may be suitable for home based exercise program. Hence the objective of this study is to assess the effectiveness of Cawthorne Cooksey exercises on balance and dizziness in Benign Paroxysmal Positional Vertigo.

### Methods:

All the subjects with symptoms of dizziness and disequilibrium are clinically diagnosed having Benign Paroxysmal Positional Vertigo (BPPV). These subjects were recruited after being evaluated according to the criteria. A written informed consent signed by the subject was taken after they were explained about the study. Subjects were rehabilitated for 1 month that is 15 alternate days to improve balance and eliminate dizziness. The interventions of Cawthorne Cooksey exercises were performed. The outcome of the intervention were measured using Timed Up and Go test (TUG), Dizziness Handicap Inventory (DHI), and Functional Disability Scale (FDS) pre intervention and post intervention

### Outcome Measures:

The patients were evaluated in the beginning and at the end of 1 month using Timed Up and Go (TUG), Dizziness handicap inventory (DHI) and Functional Disability Scale

### Result:

Following 1 month of training with Cawthorne Cooksey exercises on balance and dizziness the results showed that the mean value and standard deviation of TUG post intervention is 8.7 and 1.78, mean value and standard deviation of DHI post intervention is 26.03 and 8.51 and the mean value and standard deviation of FDS post intervention is 1.3 and 0.75.

### Conclusion:

Cawthorne Cooksey exercises are effective in improving Balance and dizziness in BPPV

### Keywords:

Benign Paroxysmal Positional Vertigo (BPPV), Cawthorne Cooksey Exercises, Balance, Dizziness.

### Introduction:

Benign paroxysmal Positional Vertigo (BPPV) is a disorder arising in the inner ear. Its symptoms are repeated episodes of positional vertigo, that is, of a spinning sensation caused by changes in the position of the head.<sup>1</sup> It is a peripheral vestibular disorder characterized by short episodes of mild to intense dizziness. Episodes are brief (<1 min and typically 15–20 s) and are always provoked by changes in head position relative to gravity, such as lying down, rolling over in bed, rising from a supine position, and extending the head to look upward.<sup>2</sup> Benign Paroxysmal Positional Vertigo is an idiopathic condition with approximately 50-70% of cases occurring without any known cause. It is most prevalent in people between the ages of 50 and 70 years old, though it can occur at any time.<sup>3</sup> The prevalence of Benign Paroxysmal Positional Vertigo has been reported to range from 10.7 to 64 per 100,000.<sup>4</sup>

The one-year prevalence of BPPV increased with age and was seven times higher in those older than 60 years, compared with those aged 18 to 39 years. BPPV was more common in women than men in all age groups, with a reported ratio of 2:1 to 3:1.<sup>5</sup>

Benign Paroxysmal Positional Vertigo affects three canals:<sup>3</sup>

- Superior (anterior)
- Lateral (horizontal)
- Posterior

Benign Paroxysmal Positional Vertigo occurs when the otoconia of the macula are dislodged and transferred into the lumen of one of the semicircular canals. This unintentional movement interferes with the endolymphatic system and stimulates the motion receptor (ampulla) of the affected canal, resulting in vertigo. The exact reason for the calcium crystals separating from the macula is not well understood. The condition is believed to arise following viral infection or trauma, but in the majority of cases it occurs in the absence of any identifiable illness or upset. It is also believed to be linked to age-related changes in the protein and gelatinous matrix of the otolithic membrane.<sup>6</sup> • Moving the head to one side. Example: when turning in bed. • Tilting the head backwards to look up. Example: hanging up washing or taking something from the top shelf. • Bending over. Example: to tie shoe laces.<sup>7</sup>

The signs and symptoms of Benign Paroxysmal Positional Vertigo are often transient, with symptoms commonly lasting less than one minute (paroxysmal). Signs and symptoms may include: Dizziness, Vertigo (a sense that your surroundings are spinning or moving), Loss of balance, Light-headedness, Blurred vision and nystagmus associated with vertigo, Nausea, Vomiting. Activities that bring about the signs and symptoms of Benign Paroxysmal Positional Vertigo may include:

The Dix–Hallpike maneuver is used to diagnose posterior canal Benign Paroxysmal positional vertigo. The patient is seated and positioned so that the patient's head will extend over the top edge of the table when supine. The head is turned 45° toward the ear being tested. The patient is quickly lowered into the supine position with the head extending about 30° below the horizontal. The patient's head is held in this position and the examiner observes the patient's eyes for nystagmus. After the head is lowered, the typical nystagmus onset has a brief latency (1–5 seconds) and limited duration (typically <30 seconds). With the eyes in the mid (neutral) position, the nystagmus has a slight vertical component, the fast phase of which is up beating. There is a stronger tensional component, the fast phase of which has the superior pole of the eye beating toward the affected (dependent) ear. The direction of the nystagmus reverses when the patient is

brought into the upright position and the nystagmus will fatigue with repeat testing. Along with the nystagmus, the patient will describe feeling vertiginous, the intensity of which parallels the nystagmus response. It should be emphasized that the 2 posterior canals are tested independently, the right with the head turned right and the left with the head turned left. Testing for lateral canal Benign Paroxysmal Positional Vertigo is done by laying the patient supine and then quickly turning the patient's head (and body) laterally toward the side being tested. A purely horizontal nystagmus occurs that is geotropic (fast component toward the lowermost ear) in the majority of cases.<sup>3</sup> Previous study have shown the effect of Cawthorne and Cooksey Exercises in Patients, affecting Balance Following Vestibular Problem in Elderly concluded that Cawthorne and Cooksey exercises are form of habituation exercises that are simple, inexpensive treatment and which may be suitable for home based exercise program<sup>8</sup>

So the aim of this study was to assess the effectiveness of Cawthorne Cooksey Exercises on balance and dizziness in Benign Paroxysmal Positional Vertigo.

### Subjects and Methods:

The subjects of this study were 30 BPPV patients who were hospitalized at or visited *Kempegowda Institute of Medical Science Hospital and Research Center, Bangalore, Karnataka, India*. All subjects consented to participate in this study. All the 30 participants included in the study were briefly explained about the nature of the study and were treated using Cawthorne Cooksey exercises.

The inclusion criteria were as follows: 1. Subjects of both genders. 2. Subjects who were diagnosed with unilateral posterior and lateral canal Benign Paroxysmal Positional Vertigo. 3. Subjects who demonstrated a positive Dix-Hallpike test. 4. Subjects who complained of bouts of positional vertigo lasting for upto 1 minute. 5. Subjects with normal functional range of motion of the neck and the back. 6. Subjects who gives consent for the intervention. The Ethics Committee of Kempegowda Institute of Medical Science Hospital and Research Center. The characteristics of the subjects are shown in Table 1 and 2.

**Table 1: Age distribution of patients studied**

Age in years	No. of patients	%
31-40	9	30.0
41-50	11	36.7
51-60	4	13.3
61-70	6	20.0
Total	30	100.0

Mean  $\pm$  SD: 47.93 $\pm$ 11.20

**Table 2: Gender distribution of patients studied**

Gender	No. of patients	%
Female	18	60.0
Male	12	40.0
Total	30	100.0

All the 30 patients underwent tests such as, DHI test, FDS test and, TUG test and their training comprised of Cawthorne Cooksey exercises for one hour three times a week every alternate day for a period of one month. The Cawthorne Cooksey exercises consisted of exercises in lying, sitting, standing and moving. The whole process was observed and guided by a therapist.

The exercises are as follows:

#### 1. In bed (5times $\times$ 2 repetitions)

- Eye movements -- at first slow, then quick
- Up and down.
- From side to side.
- Focusing on finger moving from 3 feet to 1 foot away from face
- Head movements at first slow, then quick, later with eyes closed
- Bending forward and backward.
- Turning from side to side.

#### 2. Sitting (5times $\times$ 2 repetitions)

- Eye movements and head movements as above.
- Shoulder shrugging and circling.
- Bending forward and picking up objects from the ground.

#### 3. Standing (5times $\times$ 2 repetitions)

- Eye, head and shoulder movements as before.
- Changing from sitting to standing position with eyes open and shut.
- Throwing a small ball from hand to hand (above eye level).
- Throwing a ball from hand to hand under knee.
- Changing from sitting to standing and turning around in between.

#### 4. Moving About (5times $\times$ 2 repetition)

- Walk across room with eyes open and then closed.
- Walk up and down slope with eyes open and then closed.
- Walk up and down steps with eyes open and then closed.
- A game like bowling where the patient has to roll a ball on floor.
- Circling a person who will throw a large ball forward and back.

The data collected in the present study were done using SPSS 18.0, and R environment ver.3.2.2 were used for the analysis of the data. Descriptive and inferential statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean  $\pm$  SD (Min-Max) and results on categorical measurements are presented in Number (%). Significance is assessed at 5 % level of significance.

### Assumptions

The following assumptions on data are made,

1. Dependent variables should be normally distributed.
2. Samples drawn from the population should be random; Cases of the samples should be independent. Student t test (two tailed, dependent) has been used to find the significance of study parameters on continuous scale with in each group.

### Results:

Table 3, 4 and 5 shows values of pre-test and post-test of the outcome measures. Changes in DHI, FDS and TUG between pre-test and post-test were statistically significant. Table 6 shows the pre and post mean  $\pm$  standard deviation and mean difference of outcome variables.

Dizziness Handicap Inventory	Pre	Post	% Change
<40	2(6.7%)	27(90%)	83.3%
40-80	24(80%)	3(10%)	-70.0%
>80	4(13.3%)	0(0%)	-13.3%
Total	30(100%)	30(100%)	-

**Table 3: Dizziness Handicap Inventory**

Functional Disability Scale	Pre	Post	% Change
0	0(0%)	4(13.3%)	13.3%
1	2(6.7%)	14(46.7%)	40.0
2	5(16.7%)	11(36.7%)	20.0%
3	10(33.3%)	1(3.3%)	-30.0%
4	11(36.7%)	0(0%)	-36.7%
5	2(6.7%)	0(0%)	-6.7%
Total	30(100%)	30(100%)	-

**Table 4: Functional Disability Scale**

Timed Up and Go Test (in sec)	Pre	Post	% Change
1-5	0(0%)	0(0%)	0.0%
6-10	0(0%)	26(86.7%)	86.7%
11-15	16(53.3%)	4(13.3%)	-40.0%
16-20	13(43.3%)	0(0%)	-43.3%
21-25	1(3.3%)	0(0%)	-3.3%
Total	30(100%)	30(100%)	-

**Table 5: Timed Up and Go Test (in sec)**

Variables	Pre	Post	Difference	t value	P value
Dizziness Handicap Inventory	64.57 $\pm$ 15.37	26.03 $\pm$ 8.51	38.533	17.501	<0.001**
Functional Disability Scale	3.20 $\pm$ 1.03	1.30 $\pm$ 0.75	1.900	14.617	<0.001**
Timed Up and Go Test (in sec)	15.57 $\pm$ 3.15	8.70 $\pm$ 1.76	6.867	15.745	<0.001**

**Table 6: Comparison of outcome variables between pre and post assessment**

### Discussion:

The aim of this study was to find the effectiveness of Cawthorne Cooksey exercises on balance and dizziness in Benign Paroxysmal Positional Vertigo. Cawthorne Cooksey exercises have proved to be effective on balance and dizziness in patients with Benign Paroxysmal Positional Vertigo. Cawthorne Cooksey exercises was introduced to rehabilitate the patients with symptoms of vestibular disorder, chiefly to correct balance and dizziness. The rehabilitation includes Vestibulo-Ocular Reflex adaptation exercises to assist the central nervous system to adapt to a change or loss in inputs to the vestibular system, habituation exercises to reduce pathologic responses to a provoking stimulus, and substitution exercises to promote the use of the remaining sensory system. Several randomized control studies have provided evidence that Cawthorne Cooksey exercises are effective in improving postural control and reports of dizziness symptoms.

In this study, the mean difference for DHI was 38.53 points with p-value 0.001, the mean difference in score of TUG in the group pre and post intervention was 6.87 points with p-value 0.001. and the mean difference for FDS was 1.90 points with p-value 0.001. The results obtained showed that there was significant improvement post intervention in all the three outcomes.

Dizziness Handicap Inventory (DHI) questionnaire is used to evaluate the self-perception of the disabling effects imposed by dizziness on Quality Of Life. The scale is administered before and after rehabilitation. The minimal score is 0 and the maximum possible is 100 points. The greater the score, the worse the vestibular patient's perception of Quality Of Life. Classification of the dysfunction was established by Yorke et al in the following way: slight dysfunction (16 to 34 points), moderate dysfunction (36 to 52 points), and severe dysfunction (over 54 points). In this study, the mean difference for DHI was 38.53 points with p-value being 0.000. Aquaroni Ricci et al reported that reduction in the total score of 18 or more points is considered a significant improvement in the Quality Of Life.

Functional Disability Scale (FDS) was developed to determine a patient's response to physical therapy. The scale is administered before and after rehabilitation. In this study, the mean difference for FDS was 1.90 points with p-value being 0.000. Studies have reported that using Functional Disability Scale patients who believed their vestibular disorders were more

disabling did not improve as much as those patients who perceived themselves to be less disabled.

Timed Up and Go Test (TUG) is a quick measure of dynamic balance, the risk of falling and mobility which has been used in several studies to assess functional performance in balance and mobility in BPPV patients. It is quick and easy to administer with high inter- and intra-reliability, demonstrating consistent and reliable results. In this study, the mean difference in score of TUG in the group pre and post intervention was 6.87 points with p-value being 0.000. Mimi Jacobs, Tom Fox have reported in Assessment of fall risk may which include a review of fall history, medications, underlying conditions, functional status, neurologic status, psychological factors, and environmental factors that the “Timed Up and Go” (TUG) Test is an objective, valid, and reliable test.

From the study it has been concluded that Cawthorne Cooksey exercises can be used effectively to treat symptoms of balance and dizziness in BPPV as there is statistical significance seen in the post intervention in patients with BPPV. Patients showed significant improvement after intervention with reduction in the score of TUG, DHI and FDS.

#### **Limitation of the Study:**

This study was carried out on small sample size, Uncooperative patients, Only unilateral cases were included. Therefore, more research on large groups and follow up about the improvement should be conducted.

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#### **References:**

1. Bhattacharyya N, Baugh RF, Orvidas L, Barrs D, Bronston LJ, Cass S, et al. Clinical practice guideline: benign paroxysmal positional vertigo. *Otolaryngology-Head and Neck Surgery* 2008; 139(5):S47-S81.
2. Nicki R. Colledge, Brian R Walker, Stuart H Ralston. *Neurological disease. Davidson's Principle and Practise of medicine*; 21: 1171.
3. Parnes L, Agrawal S, Atlas J. *Diagnosis and Management of Benign Paroxysmal Positional Vertigo (BPPV)* 2003; 169(7): 681-693.
4. Hilton M, Pinder D. The Epley (canalith repositioning) maneuver for benign paroxysmal positional vertigo. *Cochrane Database Systematic Review* 2004: CD003162.
5. Von Brevern M, Radtke A, et al. Epidemiology of benign paroxysmal positional vertigo: A population based study. *J Neurol Neurosurg Psychiatry*. 2007;78(7):710-715.
6. Fife TD. Benign paroxysmal positional vertigo. *Seminars in neurology*. 2009; 29(5):500-508.
7. Musat J. The Clinical Characteristics and Treatment of Benign Paroxysmal Positional Vertigo in the Elderly. *Romanian Journal of Neurology* 2010;9(4):189-192.
8. Neeraj Ruhela, Pankaj Gupta, The effect of Cawthorne and Cooksey Exercises in Patients, affecting Balance Following Vestibular Problem in Elderly, *Indian Journal of Physiotherapy and Occupational Therapy* 7.4 (Oct-Dec 2013): 147-152.