

**Assessing and Documenting/Quantifying the Balance Status and QOL issues by different parameters in Balance Disorder Patients evidence basing Vestibular physiotherapy**

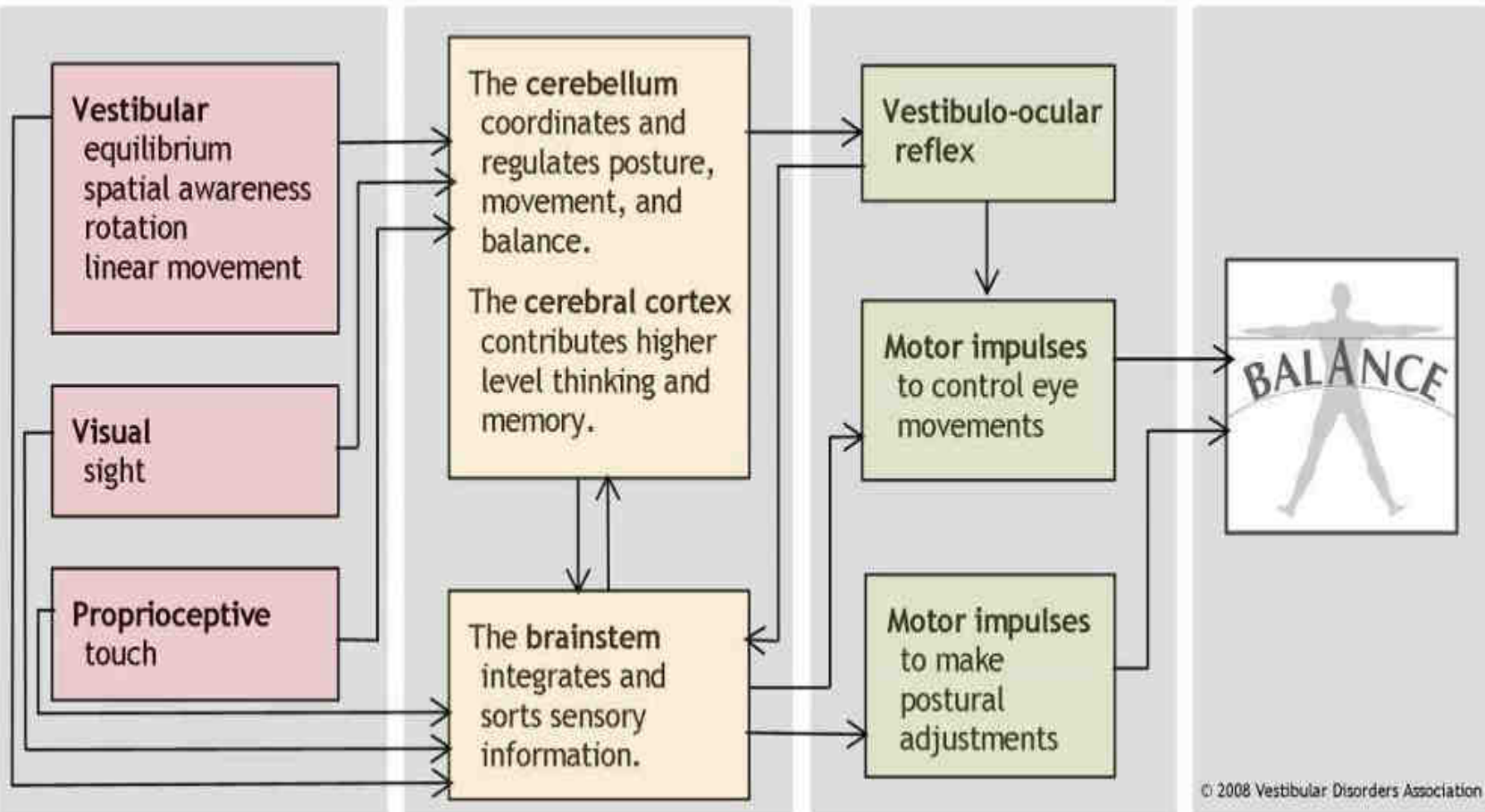


*Presented by*  
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**Vertigo And Deafness Clinic, Kolkata**



**Vestibular Rehabilitation** can improve static and dynamic balance and gait, reduce symptoms of dizziness of comorbid depression and anxiety, and ultimately result in an increase of self confidence and quality of life of sufferers (Ricci N A et al 2010)

SENSORY INPUT → INTEGRATION OF INPUT → MOTOR OUTPUT → BALANCE



# Current approach

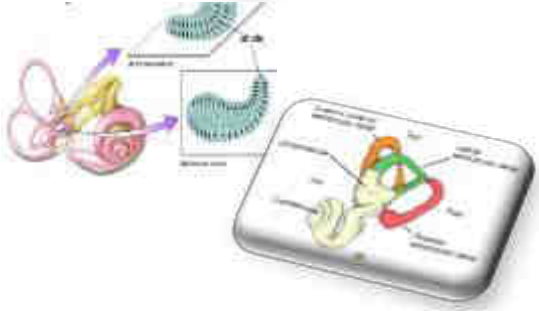
Diagnosis of disease



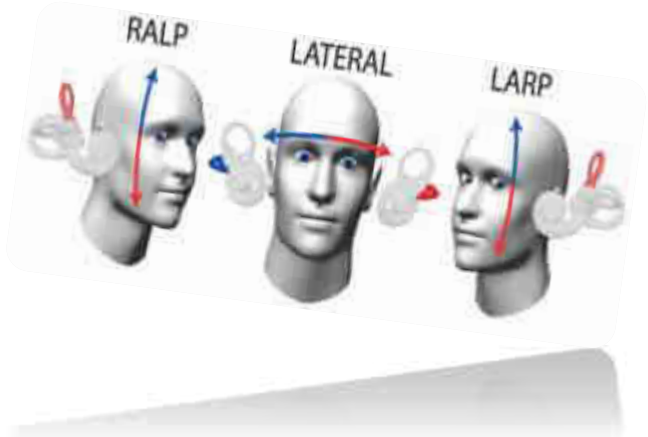
Localize the exact site of lesion



Identify specific organ



Modern vestibulometry



# Therapeutic approach of Vestibular disorders



## Medical therapy

- Steroids for vestibular neuritis
- diuretics for Meniere's disease
- psychotropic drugs SSRIs
- benzodiazepines for psychogenic vertigo
- migraine prophylactic drugs for Vertiginous migraine



## Physical therapy

- ❖ To improve the general balance function and sharpen the balancing skills of the subject,
- ❖ To enhance the vestibular compensatory mechanism
- ❖ To enhance the functionality of a damaged part of the vestibular labyrinth or that of a deranged mechanism in the vestibular system



## Questions To Ask A Patient With A Vestibular Disorder

- ✓ Do you experience spells of vertigo (a sense of spinning)? If yes, how long do these spells last?
- ✓ When was the last time the vertigo occurred? Is the vertigo spontaneous, induced by motion, induced by position changes?
- ✓ Do you experience a sense of being off-balance(disequilibrium)? If yes, is the feeling of being off-balance constant, spontaneous, induced by motion, induced by position changes, worse with fatigue, worse in the dark, worse outside, worse on uneven surfaces?
- ✓ Does the feeling of being off-balance occur when you are lying down, sitting, standing, or walking?

- At what time of day do you feel best? \_\_\_\_\_ worst?
- How many times per day do you experience symptoms?
- Do you have hearing problems?
- Do you have visual problems?
- Have you been in an accident (e.g., motor vehicle)?
- What medications do you take?
- Do you live alone?
- Do you have stairs in your home?
- Do you smoke? If yes, please indicate how much per day.
- Do you drink alcohol? If yes, please indicate how much

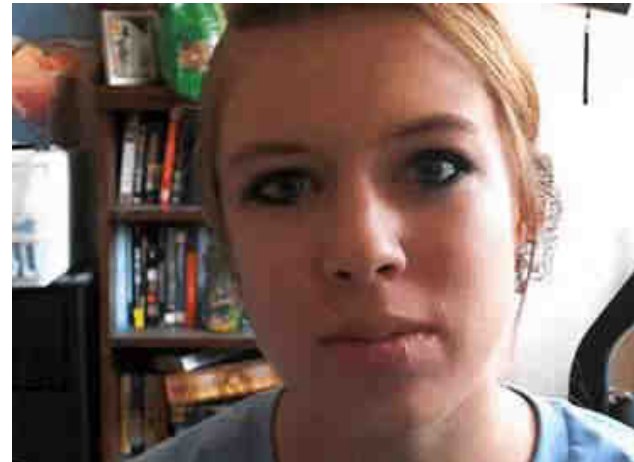
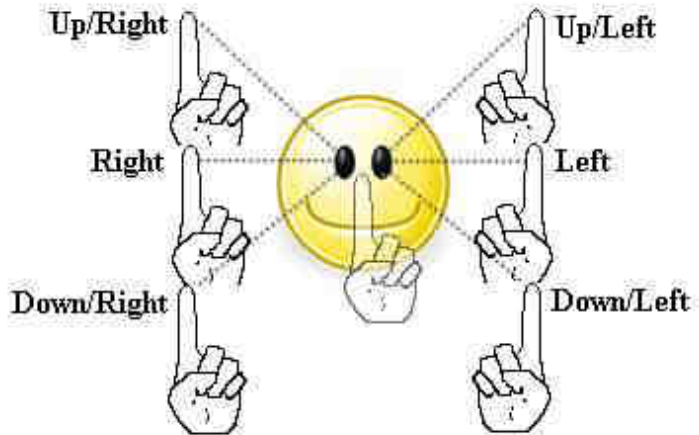


# Clinical Examination

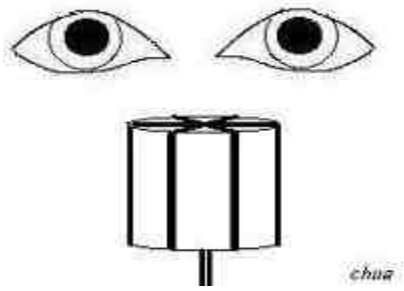
**Oculomotor** : Extraocular movements, pursuit, saccades, VOR

**Somatosensation**—Proprioception, light touch, vibration; quantified tests: vibration threshold, tuning fork test.

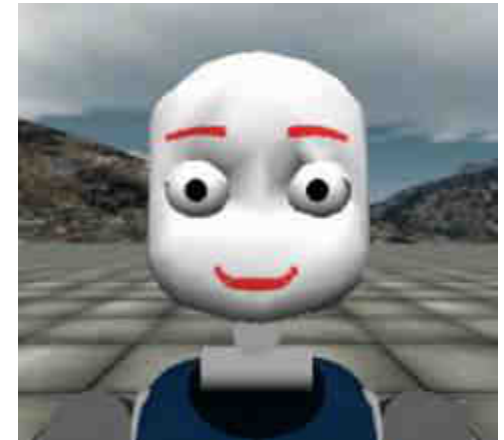
**Vision**—Visual acuity and field.







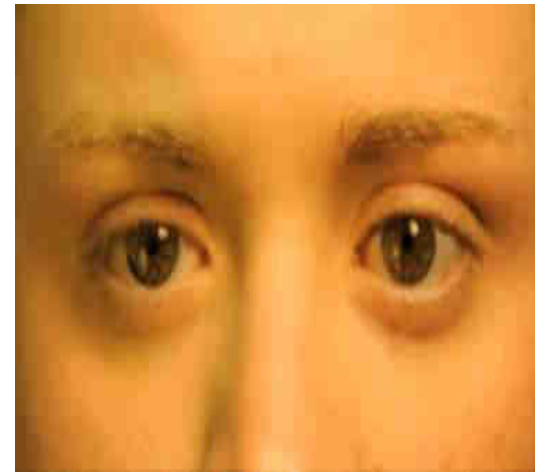
**Optokinetic nystagmus**



**Saccade Movement**



**Vestibuloocular Reflex**



**Nystagmus**

## Coordination

- Optic ataxia/past pointing, rebound, diadochokinesia, heel to shin, and postural fixation.

## Range of motion (active and passive)

- Upper and lower extremity, neck (rotation, extension, flexion, lateral flexion).

## Strength (gross)

- Grip, upper extremity, lower extremity, trunk.

## Postural Deviations

- Scoliosis, kyphosis, lordosis



## □ Positional Testing

Hallpike-Dix test, Supine Roll test

## □ Motion Sensitivity

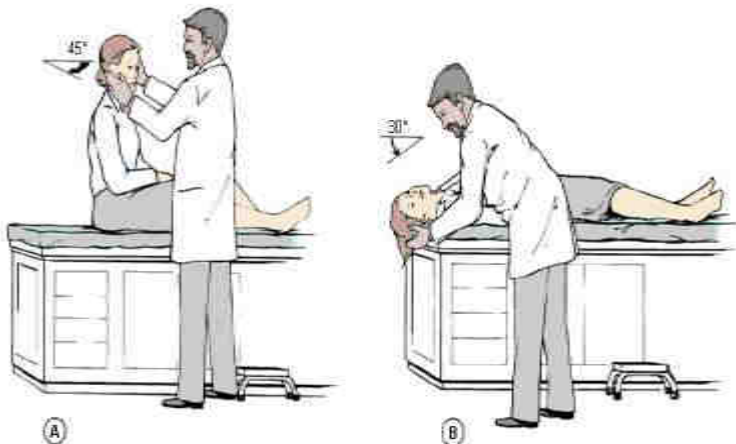
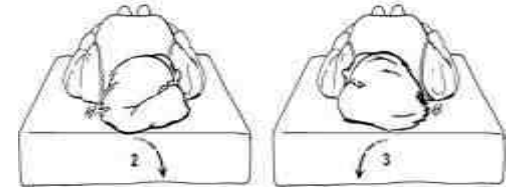
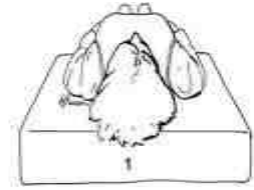
Motion- and position-induced dizziness

## □ Sitting Balance (active or passive, anterior - posterior, and lateral)

Weight shift, equilibrium reactions

## □ Static Balance (performed with eyes open and closed)

Romberg test, Sharpened Romberg test, single leg stance



### Methods - Static Balance



Romberg (ROM)



Sharpened Romberg (SRM)



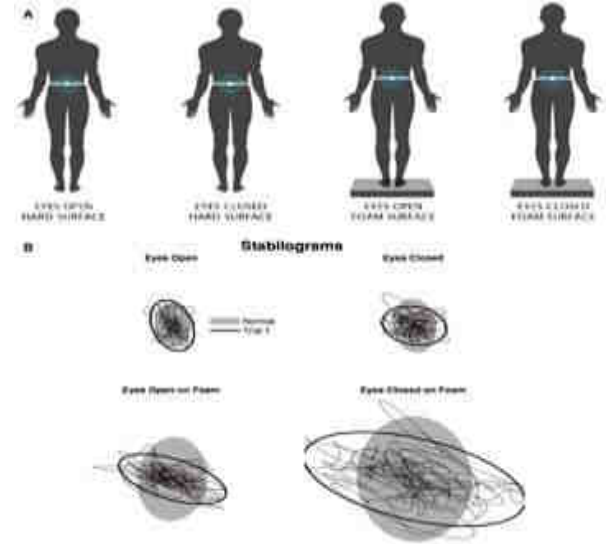
Single Leg Standing (SLS)

➤ **Balance with Altered Sensory Cues**

Eyes open and closed, foam.

➤ **Dynamic Balance (self-initiated movements)**

Standing reach ,Fukuda's stepping test

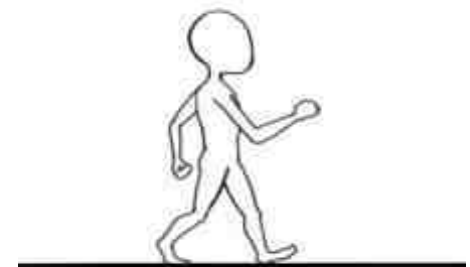


## Ambulation

Normal gait, tandem walk, walk while turning head, Dynamic Gait Index, Timed "Up & Go" test

## Functional Gait Assessment

Obstacle course, double-task activities, stars, ramps, grass, sand



## BURG BALANCE SCALE

- BBS has **14** items which assess balance during functional activities in daily life;
- These activities are classified from 0 to 4, with 0 being the worst mark and 4 the best performance from the realization of independence tasks.
- The sum of these points can reach a maximum of 56 points - the less points the larger danger to the individual's stability.
- This scale has a cut mark for the risk of falls, in which individuals with values equal to or **above 45** present **less risk of falling** in the activities assessed.

**Miyamoto ST, Lombardi Junior I, Berg KO, Ramos LR, Natour J. Brazilian version of the Berg balance scale. Braz J Med Biol Res 2004;37:1411-1421.**

**Bogle Thorbahn LD, Newton RA. Use of the Berg Balance Test to predict falls in elderly persons. Phys Ther 1996;76:576**

## BURG BALANCE SCALE

Category	Component	Score
Sitting balance	Sitting unsupported	0-4
Standing balance	Standing unsupported	0-4
	Standing with eyes closed	0-4
	Standing with feet together	0-4
	Standing on one foot	0-4
	Turning to look behind	0-4
	Retrieving object from floor	0-4
	Tandem standing	0-4
	Reaching forward with an outstretched arm	0-4
Dynamic balance	Sitting to standing	0-4
	Standing to sitting	0-4
	Transfer	0-4
	Turning 360 degrees	0-4
	Stool stepping	0-4
<b>Total</b>		<b>0-56</b>



## ACTIVITIES –SPECIFIC BALANCE CONFIDENCE SCALE

- Self-administered or administered via personal or telephone interview.
- Percentage points on the scale form 0% to 100%.
- ABC scale has good face validity, high internal consistency, and high test-retest reliability.
- Useful for evaluating functional limitation and perceived handicap or disability before and after intervention and for helping patients

Helen S. Cohen et al. Development of the Vestibular Disorders Activities of Daily Living Scale: Arch Otolaryngol Head Neck Surg. 2000;126(7):881-887. doi:10.1001/archotol.126.7.881

Powell, LE & Myers AM. The Activities-specific Balance Confidence (ABC) Scale. J Gerontol Med Sci 1995; 50(1): M28-34

# ACTIVITIES –SPECIFIC BALANCE CONFIDENCE SCALE

Patient Name: \_\_\_\_\_ Date: \_\_\_\_\_

## The Activities-specific Balance Confidence (ABC) Scale\*

**Instructions to Participants:** For each of the following activities, please indicate your level of confidence in doing the activity without losing your balance or becoming unsteady from choosing one of the percentage points on the scale from 0% to 100% If you do not currently do the activity in question, try and imagine how confident you would be if you had to do the activity. If you normally use a walking aid to do the activity or hold onto someone, rate your confidence as if you were using these supports.

0%    10    20    30    40    50    60    70    80    90    100%  
 No Confidence Completely Confident

How confident are you that you will not lose your balance or become unsteady when you...

1. ...walk around the house? \_\_\_\_\_%
2. ...walk up or down stairs? \_\_\_\_\_%
3. ...bend over and pick up a slipper from the front of a closet floor? \_\_\_\_\_%
4. ...reach for a small can off a shelf at eye level? \_\_\_\_\_%
5. ...stand on your tip toes and reach for something above your head? \_\_\_\_\_%
6. ...stand on a chair and reach for something? \_\_\_\_\_%
7. ...sweep the floor? \_\_\_\_\_%
8. ...walk outside the house to a car parked in the driveway? \_\_\_\_\_%
9. ...get into or out of a car? \_\_\_\_\_%
10. ...walk across a parking lot to the mall? \_\_\_\_\_%
11. ...walk up or down a ramp? \_\_\_\_\_%
12. ...walk in a crowded mall where people rapidly walk past you? \_\_\_\_\_%
13. ...are bumped into by people as you walk through the mall? \_\_\_\_\_%
14. ...step onto or off of an escalator while you are holding onto a railing? \_\_\_\_\_%
15. ...step onto or off an escalator while holding onto parcels such that you cannot hold onto the railing? \_\_\_\_\_%
16. ...walk outside on icy sidewalks? \_\_\_\_\_%

\*Powell LE & Myers AM. The Activities-specific Balance Confidence (ABC) Scale. Journal of Gerontology Med Sci 1995; 50(1):M28-34.

**Total ABC Score:** \_\_\_\_\_

Scoring: \_\_\_\_\_ / 16 = \_\_\_\_\_ % of self confidence  
Total ABC Score

**MEDICARE PATIENTS ONLY**  
 100% - \_\_\_\_\_ % Function = \_\_\_\_\_ % Impairment

Patient Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Therapist Signature: \_\_\_\_\_ Date: \_\_\_\_\_

## DIZZINESS HANDICAP INVENTORY

- 25-item self-report questionnaire that quantifies the impact of dizziness on daily life by measuring self-perceived handicap.
- Three domains:
  - 1) Functional (9 questions, 36 points)
  - 2) Emotional (9 questions, 36 points)
  - 3) Physical (7 questions, 28 points)
- The higher the score, the greater the perceived handicap due to dizziness.  
Answers are graded:
  - 0 (no)
  - 2 (sometimes)
  - 4 (yes)
- Maximum score of 100 and a minimum score of 0

Jacobson GP, Newman CW: The development of the Dizziness Handicap Inventory. Arch Otolaryngol Head Neck Surg 1990, 116:424-427

# DIZZINESS HANDICAP INVENTORY

**Instructions:** The purpose of this scale is to identify difficulties that you may be experiencing because of your dizziness. Please check "always", or "no" or "sometimes" to each question. Answer each question only as it pertains to your dizziness problem.

	Questions	Always	Sometimes	No
P1	Does looking up increase your problem?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
E2	Because of your problem, do you feel frustrated?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F3	Because of your problem, do you restrict your travel for business or pleasure?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
P4	Does walking down the aisle of a supermarket increase your problem?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F5	Because of your problem, do you have difficulty getting into or out of bed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F6	Does your problem significantly restrict your participation in social activities, such as going out to dinner, going to movies, dancing or to parties?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F7	Because of your problem, do you have difficulty reading?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F8	Does performing more ambitious activities like sports, dancing, and household chores, such as sweeping or putting dishes away; increase your problem?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
E9	Because of your problem, are you afraid to leave your home without having someone accompany you?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
E10	Because of your problem, have you been embarrassed in front of others?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
P11	Do quick movements of your head increase your problem?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F12	Because of your problem, do you avoid heights?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
P13	Does turning over in bed increase your problem?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F14	Because of your problem, is it difficult for you to do strenuous housework or yard work?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
E15	Because of your problem, are you afraid people may think that you are intoxicated?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F16	Because of your problem, is it difficult for you to go for a walk by yourself?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
P17	Does walking down a sidewalk increase your problem?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
E18	Because of your problem, is it difficult for you to concentrate?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F19	Because of your problem, is it difficult for you to walk around your house in the dark?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
E20	Because of your problem, are you afraid to stay home alone?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
E21	Because of your problem, do you feel handicapped?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
E22	Has your problem placed stress on your relationship with members of your family or friends?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
E23	Because of your problem, are you depressed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F24	Does your problem interfere with your job or household responsibilities?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
P25	Does bending over increase your problem?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



# Dynamic Gait Index

## 1. Gait Level Surface

Instructions: Walk at your normal pace from here to the next mark (20 feet).

Grading: Mark the lowest category that applies.

- (3) Normal: Walks 20', no assistive devices, good speed, no evidence of imbalance, normal gait pattern.
- (2) Mild Impairment: Walks 20', uses assistive devices, slower speed, mild gait deviations.
- (1) Moderate Impairment: Walks 20', slow speed, abnormal gait pattern, evidence of imbalance.
- (0) Severe Impairment: Walks 20' without assistance, severe gait deviations or imbalance.

## 2. Change in Gait Speed

Instructions: Begin walking at your normal pace (for 5 feet), when I tell you 'go', walk as fast as you can (for 5 feet). When I tell you 'slow', walk as slowly as you can (for 5 feet).

Grading: Mark the lowest category that applies.

- (3) Normal: Changes walking speed smoothly without loss of balance or gait deviation. Shows a significant difference in walking speeds between normal, fast, and slow.
- (2) Mild Impairment: Changes speed but demonstrates mild gait deviations, or no gait deviations but unable to achieve a significant change in velocity, or uses an assistive device.
- (1) Moderate Impairment: Makes only minor adjustments to walking speed, or accomplishes a change in speed with significant gait deviations, or changes speed but loses balance but is able to recover and continue walking.
- (0) Severe Impairment: Unable to change speeds, or loses balance and has to reach for wall or be caught.

## 3. Gait with Horizontal Head Turns

Instructions: Begin walking at your normal pace. When I tell you 'look right', keep walking straight and head to the right. Keep looking to the right until I tell you 'look left', then keep walking straight and turn head to the left. Keep your head to the left until I tell you 'look straight', then keep walking straight but your head to the center.

Grading: Mark the lowest category that applies.

- (3) Normal: Turns head smoothly with no change in gait.
- (2) Mild Impairment: Turns head smoothly with slight change in gait, i.e. minor disruption to smooth gait path, or uses walking aid.
- (1) Moderate Impairment: Turns head smoothly with moderate change in gait, i.e. slows down, staggers but recovers, can continue to walk.
- (0) Severe Impairment: Turns head smoothly with severe disruption of gait, i.e. staggers outside 15" path, loses balance, stops, reaches for wall.

## Dynamic Gait Index(Cont..)

### 4. Gait with Vertical Head Turns

Instructions: Begin walking at your normal pace. When I tell you 'look up', keep walking straight and tilt your head up. Keep looking up until I tell you 'look down', then keep walking straight and tilt your head down. Keep looking down until I tell you 'look straight', then keep walking straight and return your head to the center.

Grading: Mark the lowest category that applies.

- \_\_\_ (3) Normal: Performs head turns with no change in gait.
- \_\_\_ (2) Mild Impairment: Performs head turns with slight change in gait, i.e. minor disruption to smooth gait path or uses walking aid.
- \_\_\_ (1) Moderate Impairment: Performs head turns with moderate change in gait, i.e. slows down, staggers but recovers, can continue to walk.
- \_\_\_ (0) Severe Impairment: Performs head turns with severe disruption of gait, i.e. staggers outside a 15" path, loses balance, reaches for wall.

### 5. Gait and Pivot Turn

Instructions: Begin walking at your normal pace. When I tell you 'turn and stop', turn as quickly as you can to face the opposite direction and stop.

Grading: Mark the lowest category that applies.

- \_\_\_ (3) Normal: Pivot turns safely within 3 seconds and stops quickly with no loss of balance.
- \_\_\_ (2) Mild Impairment: Pivot turns safely in over 3 seconds and stops with no loss in balance.
- \_\_\_ (1) Moderate Impairment: Pivot turns slowly, requires verbal cueing, requires several small steps to catch balance following turn and stop.
- \_\_\_ (0) Severe Impairment: Cannot pivot turn safely, requires assistance to turn and stop.

### 6. Step Over Obstacle

Instructions: Begin walking at your normal pace. When you come to the obstacle, step over it, not around it, and continue walking.

Grading: Mark the lowest category that applies.

- \_\_\_ (3) Normal: Steps over box without changing gait, no evidence of imbalance.
- \_\_\_ (2) Mild Impairment: Steps over box, but must slow down and adjust steps to clear box safely.
- \_\_\_ (1) Moderate Impairment: Steps over box, but must stop before stepping over. May require verbal cueing.
- \_\_\_ (0) Severe Impairment: Cannot step over box without assistance.

## Dynamic Gait Index(Cont..)

### 7. Step Around Obstacles

Instructions: Begin walking at a normal speed. When you come to the first cone (about 6 feet away), walk around it on the right side. When you come to the second cone (6 feet past first one), walk around it on the left.

Grading: Mark the lowest category that applies.

- \_\_\_ (3) Normal: Walks around cones safely without changing gait, no evidence of imbalance.
- \_\_\_ (2) Mild Impairment: Walks around both cones, but must slow down and adjust gait to clear cones.
- \_\_\_ (1) Moderate Impairment: Walks around both cones, but must significantly slow gait or requires verbal cueing.
- \_\_\_ (0) Severe Impairment: Unable to clear cones, walks into one or both, or requires physical assistance.

### 8. Steps

Instructions: Walk up these stairs as you would at home (i.e. using the rail if necessary). At the top, turn around and come down.

Grading: Mark the lowest category that applies:

- \_\_\_ (3) Normal: Alternates feet, no rail.
- \_\_\_ (2) Mild Impairment: Alternates feet, must use rail.
- \_\_\_ (1) Moderate Impairment: Two feet to a stair, must use rail.
- \_\_\_ (0) Severe Impairment: Cannot do safely.

- To assess the likelihood of falling in older adults.
- Designed to test eight facets of gait.
- **Time:** 15 minutes
- **Scoring:** A four-point ordinal scale, ranging from 0-3. “0” indicates the lowest level of function and “3” the highest level of function.
- **Total Score = 24**
- **Interpretation:** < 19/24 = predictive of falls in the elderly  
> 22/24 = safe ambulatory

Whitney s et al(2000):The Dynamic Gait Index relates to self reported fall history in individuals with vestibular function :Journal of Vestibular Research



## The Timed Up and Go (TUG) Test

- **Purpose:** To assess mobility
- **Equipment:** A stopwatch
- **Directions:** Patients wear their regular footwear and can use a walking aid if needed. Begin by having the patient sit back in a standard arm chair and identify a line 3 meters or 10 feet away on the floor.
- **Instructions to the patient:** When I say “Go,” I want you to:
  - Stand up from the chair
  - Walk to the line on the floor at your normal pace
  - Turn
  - Walk back to the chair at your normal pace
  - Sit down again
- On the word “Go” begin timing. Stop timing after patient has sat back down and record.
  - Time: \_\_\_\_\_ seconds**
- ***An older adult who takes  $\geq 12$  seconds to complete the TUG is at high risk for falling.***
- TUG AND DGI are helpful for identifying fall risk in the persons with vestibular dysfunction

Whitney S L et al.(2004)The sensitivity and specificity od TUG and DHI for self reported falls in persons with vestibular disorders:Jn of Vestibular Research

# Fall Efficacy Scale

Name: \_\_\_\_\_

Date: \_\_\_\_\_

On a scale from 1 to 10, with 1 being very confident and 10 being not confident at all, how confident are you that you do the following activities without falling?

<b>Activity:</b>	<b>Score:</b> 1 = very confident 10 = not confident at all
Take a bath or shower	
Reach into cabinets or closets	
Walk around the house	
Prepare meals not requiring carrying heavy or hot objects	
Get in and out of bed	
Answer the door or telephone	
Get in and out of a chair	
Getting dressed and undressed	
Personal grooming (i.e. washing your face)	
Getting on and off of the toilet	
<b>Total Score</b>	

A total score of greater than 70 indicates that the person has a fear of falling

## **Usefulness of Some Current Balance Tests for Identifying Individuals with Disequilibrium Due to Vestibular Impairments**

**Helen S. Cohen, EdD, OTR<sup>a</sup> and Kay T. Kimball, PhD<sup>b</sup>**

<sup>a</sup>Bobby R. Alford Department of Otolaryngology – Head and Neck Surgery, Baylor College of Medicine, Houston, TX

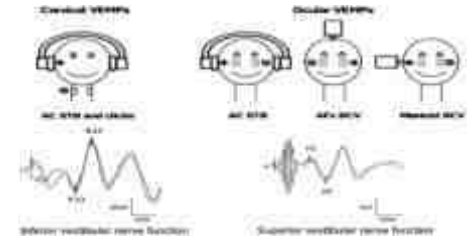
<sup>b</sup>Statistical Design and Analysis, Austin, TX

### **Abstract**

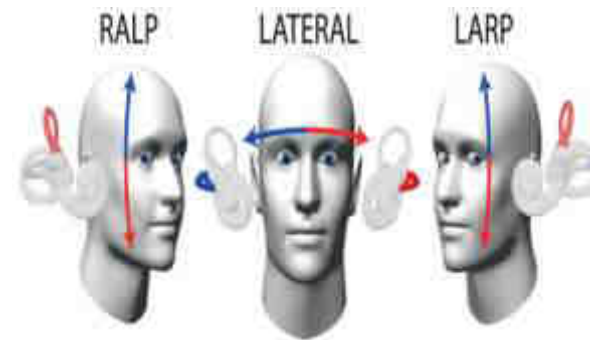
The goal of this study was to determine which of several clinical balance tests best identifies patients with vestibular disorders. We compared the scores of normals and patients on the Berg Balance Scale (Berg), Dynamic Gait Index (DGI), Timed Up and Go (TUG), Computerized Dynamic Posturography Sensory Organization Test (SOT), and a new obstacle avoidance test: the Functional Mobility Test (FMT). The study was performed in an out-patient balance laboratory at a tertiary care center. Subjects were 40 normal adults, and 40 adults with vestibular impairments. The main outcome measures were the sensitivity of tests to patients and specificity to normals. When adjusted for age the Berg, TUG, DGI and FMT had moderate sensitivity and specificity. SOT had moderately high sensitivity and specificity. SOT and FMT, combined, had high sensitivity and moderate specificity. Therefore, the kinds of tests of standing and walking balance that clinicians may use to screen patients for falling are not as good for screening for vestibular disorders as SOT. SOT combined with FMT is better. When screening patients for vestibular disorders, when objective diagnostic tests of the vestibular system, itself, are unavailable, tests of both standing and walking balance, together, give the most information about community-dwelling patients. These tests may also indicate the presence of sub-clinical balance problems in community-dwelling, asymptomatic adults.



## Vestibular Function Tests



Videonystagmography (VNG), cervical and ocular VEMP subjective visual vertical tests (SVV) , video head impulse test (VHIT) the dynamic visual acuity test (DVA) . ,etc. **can accurately and very precisely identify the exact part or function of the balance system** That specific part of the balance organ can then be very precisely stimulated by physical therapy.



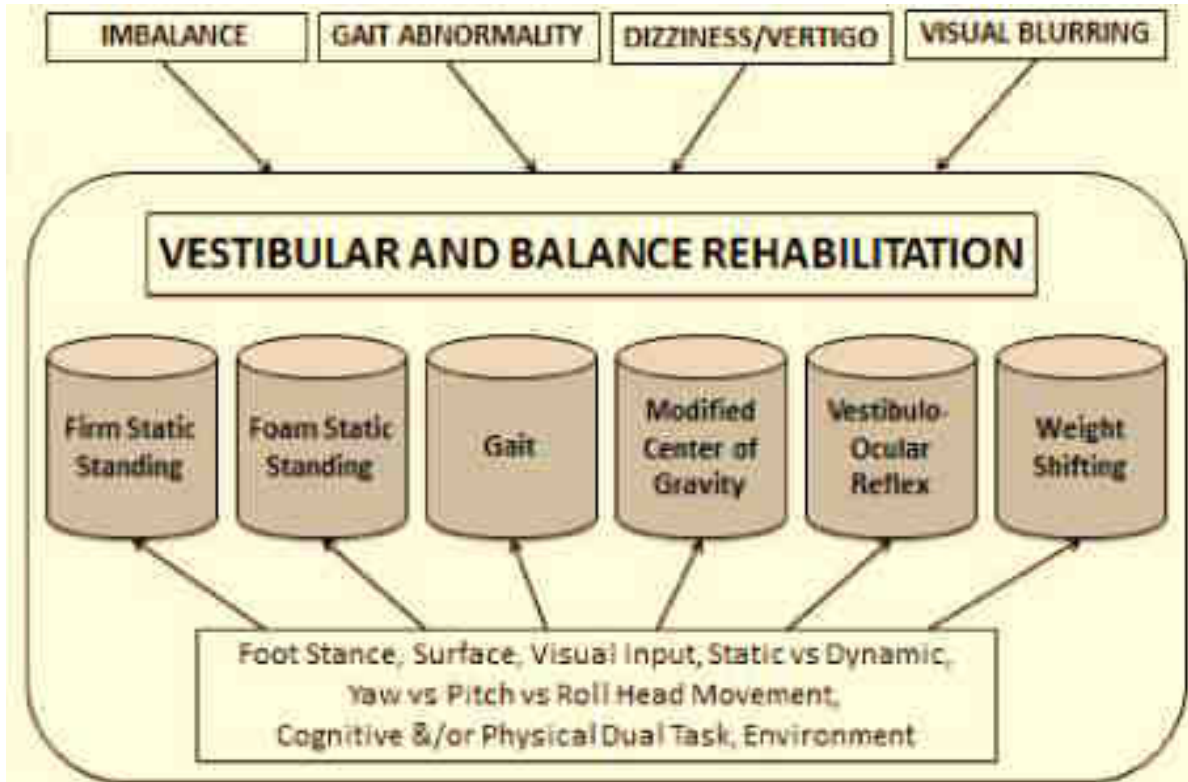
Wuyts FL, Furman J, Vanspauwen R, Van de Heyning P. Vestibular function testing. *Curr Opin Neurol.* 2007 Feb; 20(1): 19-24.



## Vestibular and Balance Rehabilitation

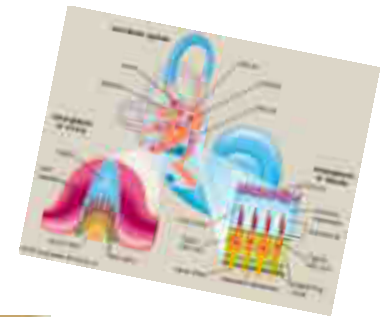
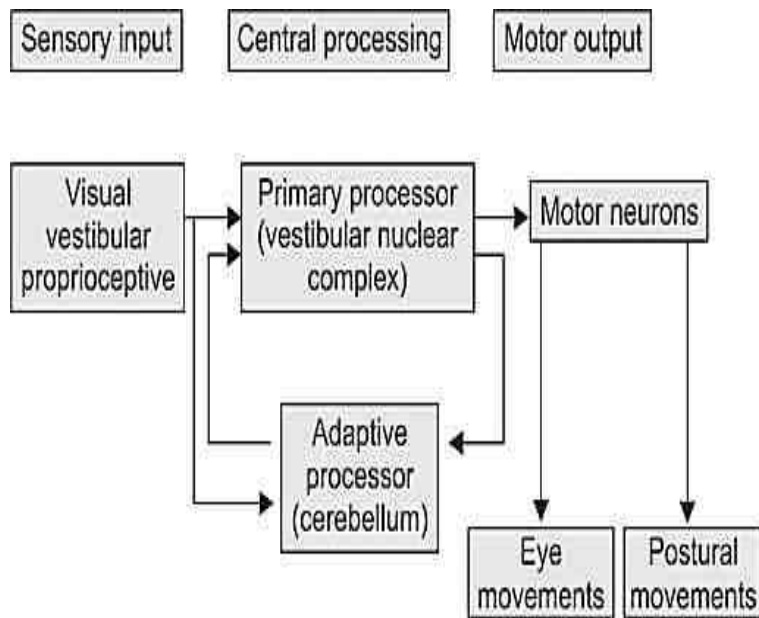


- Each balance disorder patient has different needs which require to be addressed by the team of **Neurotologist, Vestibular Physiotherapist and Neuro-rehabilitation specialist**.





Vestibular Rehabilitation use central mechanism of neuroplasticity(adaptation, habituation and substitution)to increase static and dynamic postural stability and to improve visuovestibular interaction in situations that conflicting sensory information. (Crane BT et al 2010,Bamiou D E at al 2008)



Michel Lacour et al. Interaction between Vestibular Compensation Mechanisms and Vestibular Rehabilitation Therapy: 10 Recommendations for Optimal Functional Recovery. Front Neurol. 2014; 5: 285.

## Adaptation Exercise:

- The goal is long term changes to neural responses with reduction of symptoms (Hall, 2009).
- Induce Vestibular Ocular Reflex (VOR) function (Alghadir, 2013).
- VOR x1 - stationary object with head movements (Hall, 2009)
- VOR x2 - moving object with head movements (Hall, 2009)
- Exercises are progressed from sitting to standing, and finally to ambulation (Alghadir, 2013).





## Substitution Exercise:

- To substitute alternative strategies for missing vestibular function (Hall, 2009)
- Combine the use of **visual and somatosensory cues with vestibular cues** to improve gaze and postural stability in patients with vestibular deficits
- Imaginary Target Exercise
- Active Eye –Head Movements
- Progression can be made from sitting to standing, and finally to ambulation (Alghadir, 2013).
- Substitution is used most commonly with **bilateral vestibular involvement** (Alghadir, 2013).



# Habituation Exercise

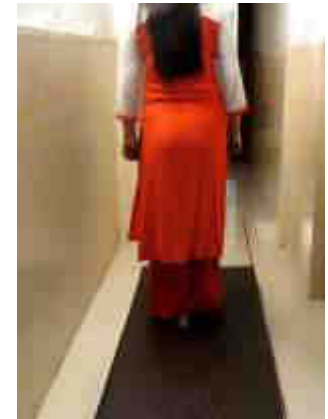
- Used for treatment of **unilateral Vestibular loss**
- Type of mechanism of compensation (Hall, 2009).
- **Repeated exposure to a provocative stimulus** results in the reduction of the pathological response to that stimulus.
- It is more effective for peripheral causes of vertigo compared to central causes (Hall, 2009).



Brandt-Daroff Habituation Exercise

# Balance Exercises:

- **Static balance:** trained under conditions of altered vision and somatosensation (Hall, 2009)
- **Dynamic balance:** Walking with head turns, quick turns to the right and left while walking, performing secondary tasks while walking such as tossing a ball, and performing cognitive tasks while walking (Hall, 2009)
- Progressions are made by narrowing the BOS and increasing the compliance of the surface (Hall, 2009).
- Trying to sit and balance on a gym ball



# Non-specific physical therapy

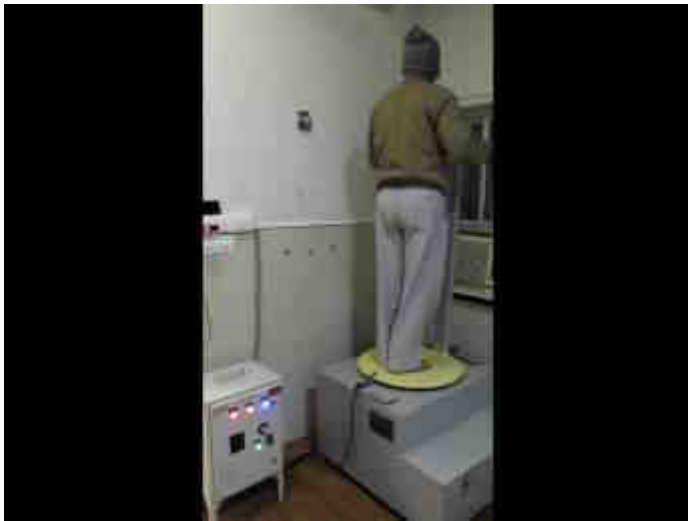
- To improve the general balance function and also expedite the process of vestibular compensation.
  - Generalized, non-specific exercises, they are
  - Not targeted to improve the function of any particular balance
- a) Cawthorne-Cooksey Exercises
  - b) Yogic asanas
  - c) Tai Chi exercises



## Specific organ-targeted physical therapy :

Specifically and individually stimulating the defective sensors in the vestibular labyrinth in the ears (like the utricle / saccule/ semi-circular canals) to sharpen and augment their sensitivity after the defect has been identified by the modern vestibular function tests e.g., moving the head in the plane of the semi-circular canal that has been identified to have been damaged.

(Byung In Han et al. Vestibular Rehabilitation Therapy: Review of Indications, Mechanisms, and Key Exercises J Clin Neurol. 2011 Dec; 7(4): 184–196)



Horizontal Canal Specific Training

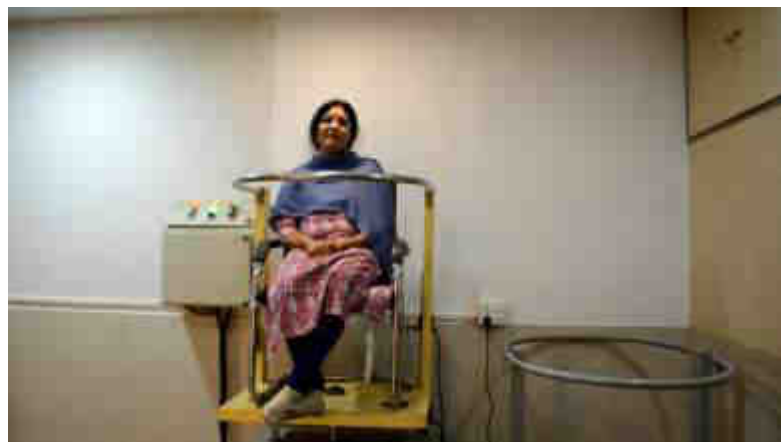


Anterior Posterior Canals Specific Training

## Specific organ-targeted physical therapy :



**Utricle Specific Training**



**Saccule Specific Training**



## ***Virtual reality systems***

- Overcome the fear of fall by adapting them to different types of challenging situations
- VR training is usually a variant of habituation
- **Pavlou et al(2012)**suggested that it was very helpful.
- **Suarez et al(2016)** reported that a virtual reality system that changes sensory information( visual,vestibular,somatosensory) and improvement of balance



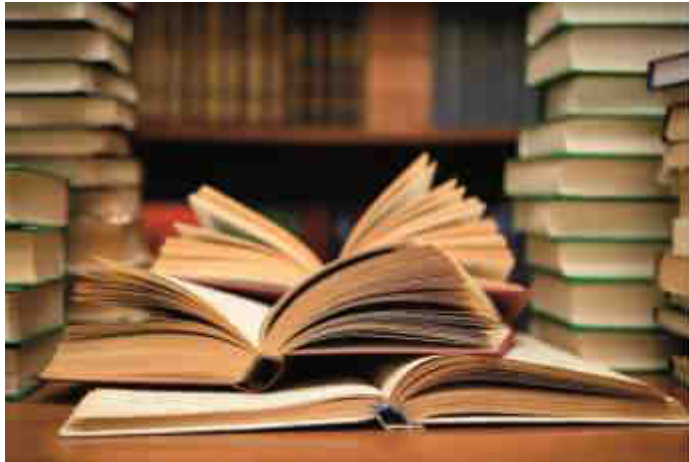


# DOCUMENTATION



SUBJECTS	VESTIBULOMETRY	PHYSICAL THERAPY INTERVENTION	ABC (%) PRE TREAT	ABC (%) POST TREAT	BBS(_/56)PRE TREAT	BBS(_/56)POST TREAT	DHI PRE TREAT	DHI POST TREAT
SUB 1	ab lateral canal	Specific organ therapy,Balance training	40	86	28	50	30	8
SUB 2	bilateral vestibulopathy	Specific organ therapy,Balance training,gait training	20	80	12	48	40	12
SUB 3	normal	Vertual Reality	60	90	38	52	18	8
SUB 4	ab utricular	Specific organ therapy,Balance training	50	86	38	46	22	10
SUB 5	ab lateral canal	Specific organ therapy,Balance training	20	30	32	36	56	48
SUB 6	normal	Vertual Reality	54	88	38	48	22	10
SUB 7	normal	Vertual Reality	58	90	40	50	20	8
SUB 8	ab lateral canal	Specific organ therapy,Balance training	60	96	40	52	18	8
SUB 9	ab utricular	Specific organ therapy,Balance training	62	92	38	50	24	10
SUB 10	ab utricular	Specific organ therapy,Balance training	30	90	38	56	30	12
SUB 11	normal	Vertual Reality	58	94	40	52	24	10
SUB 12	normal	Vertual Reality	54	92	39	50	22	8
SUB 13	ab lateral canal	Specific organ therapy,Balance training	40	90	28	54	28	8
SUB 14	ab utricular	Specific organ therapy,Balance training	50	90	36	52	20	10
SUB 15	Normal	Vertual Reality	70	94	48	54	22	8
SUB 16	normal	Vertual Reality	36	86	36	50	18	10
SUB 17	ab Lateral canal	Specific organ therapy,Balance training	50	96	40	54	24	12
SUB 21	ab lateral and posterior canal	Specific organ therapy,Balance training	48	84	34	48	28	14
SUB 22	Ab Lat ,ant And post, saccule	Ab Lat ,ant And post, saccule	40	60	32	46	34	16
SUB 23	Normal	Vertual Reality	60	88	38	56	18	10
SUB 24	Normal	Vertual Reality	64	90	40	56	16	8
SUB 25	ab Lateral canal	Specific organ therapy,Balance training	50	84	34	48	28	12
SUB 26	ab lateral and posterior canal	Specific organ therapy,Balance training	46	82	32	48	36	12
SUB 27	ab utricular	Specific organ therapy,Balance training	52	90	34	50	24	8

# Research Paper



## INVITED ARTICLE

### Specific Organ Targeted Vestibular Physiotherapy: The Pivot in the Contemporary Management of Vertigo and Imbalance

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#### Abstract

**Introduction** Advancements in our understanding of vestibular physiology and how it changes in different diseases have established that of the three therapeutic approaches to treat disorders of the vestibular system viz. pharmacotherapy, surgery and physical therapy, it is the later i.e., physical therapy which is the most efficacious modality in the management of balance disorders. The futility of vestibular sedatives in the correction of vestibular disorders and in the restoration of balance and the very limited role of surgery has now been recognised.

Advancements in vestibulometry now enable us to localise any lesion in the vestibular system with utmost precision and also determine the exact cause of the balance disorder. The site of lesion and the specific organ that is defective can now be very precisely identified. Treatment modalities especially that for physical therapy hence have to be organ specific, and if possible, also disease specific.

**Aims and Objectives** The study aims at evaluating the efficacy of physiotherapy in the management of balance disorders and also assesses the efficacy of organ targeted physical therapy, a new concept in restoring balance after vestibulometry has identified the offending organ.

**Materials and Methods** The study was conducted in the specialised physical therapy unit for balance and gait disorder patients which is a part of Vertigo and Deafness Clinic in Kolkata, India. Special instruments for physical therapy devised by the first author were used for stimulation of specific sense organs in the vestibular labyrinth that

were found to be defective in vestibulometry. Specially made Virtual reality programs were used in patients suffering from psychogenic balance disorders. The pre and post therapy status was evaluated by different standard scales to assess balance and dizziness.

**Results** Very promising results were obtained. Organ targeted physiotherapy where defective sense organs were specifically stimulated showed remarkable improvement in different measures. Virtual reality exercises too showed very promising results in patients of psychogenic vertigo.

**Keywords** Vestibular physiotherapy · Management of balance disorders · Physical therapy for vertigo

#### Introduction

Physiotherapy or physical therapy is defined as the treatment of disease, deformity and/or disability by physical methods such as massage, heat treatment, and exercise or physical workouts rather than by medicines or by surgery. The essence of physiotherapy is to improve and enhance the functionality of a dysfunctional or malfunctioned body part and to stimulate and boost the residual function of a damaged organ and thereby provide a better quality of life. Physical therapy adapts the body to overcome challenges that are limiting daily physical activities necessary for sustenance of normal life. Vestibular physiotherapy is physical therapy that helps in the correction of vestibular disorders (that present as vertigo/imbalance/unsteadiness) and in the improvement of body's balance mechanism. Some ailments respond to medical treatment, some to surgery and some to physical therapy. Vestibular disorders respond best to a two pronged therapeutic approach viz.

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Thank You

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