Vestibular Examination Tools (and handouts) – MU PT 8390, Fall 2012

-- a subset of Instruments and Questionnaires available online: http://web.missouri.edu/~proste/tool/vest/

Performance based instruments:

1. CTSIB - Clinical Test of Sensory Integration on Balance "Foam & Dome"
2. Fukuda Step Test
3. Motion Sensitivity Score (also known as the Motion Sensitivity Quotient, MSQ)
4. *Dynamic Gait Index (DGI)* … *see Geriatric Exam Tool Kit*
5. *Functional Gait Assessment (FGA)* … *see Geriatric Exam Tool Kit*

Questionnaires:

6. *Activities specific Balance Confidence scale – ABC* … *see Geriatric Exam Tool Kit*
7. Dizziness Handicap Inventory (DHI)
8. Geriatric Depression Scale
9. Modified Falls Efficacy Scale (MFES)

Handouts: *(more to come during the vestibular unit)*

10. Dizziness symptomology
11. BPPV Treatment Algorighm - Herdman
12. Intertpreting Nystagmus
13. Algorithm for differential diagnosis - Dunphy
14. Epidemiology & duration of Vertigo
15. Central vs. Peripheral Lesion
16. Vestibular Tests & Measures Study Guide: ***how to perform them***

Clinical Test of Sensory Organization and Balance (CTSIB)

test is the therapist's version of the Computerized Dynamic Posturography which attempts to measure the way that vision, vestibular and somatosensory interaction allows us to maintain our balance against the forces of gravity. The test was developed by Shumway-Cook and Horak in 1986 *(Phys Ther)* and further discussed as a clinical tool in 1987 *(Phys Ther).* Patients with uncompensated unilateral vestibular deficits have been shown to have difficulty when visual and support surface information are manipulated (Nashner, 1982).

General Instructions:
Have the subject remove their shoes. Have the subject stand erect without moving, looking straight ahead as long as possible or until the trial is over.

Instructions:

Condition 1:
Stand on the floor with arms across your chest and your hands touching your shoulders, feet together with ankle bones touching, and hold for 30 sec (Horak, 87)

Condition 2:
Stand on the floor with arms across your chest and your hands touching your shoulders, feet together with ankle bones touching with your eyes closed, and hold for 30 sec (Horak, 87)

Condition 3:
Stand on the floor with arms across your chest with your hands touching your shoulders, feet together with ankle bones touching the **visual conflict dome** on your head with your eyes open, and hold for 30 sec (Horak, 87)

ndition 4:
Stand on a 3 inch high density foam cushion with your arms crossed and touching your shoulders, feet together with the ankle bones touching, and your eyes open, holding for 30 sec (Horak, 87)

Condition 5:
Stand on a 3 inch high density foam cushion with your arms crossed and touching your shoulders, feet together with ankle bones touching, and your eyes closed, holding for 30 sec (Horak, 87)

Condition 6:
Stand on a 3 inch high density foam cushion with your arms crossed and touching your shoulders, feet together with ankle bones touching, and your eyes open looking into the dome, holding for 30 sec (Horak, 87)

In Horak's article (1987) she suggests that each test be performed 3 times. She also suggested that a sway grid could be used to quantify motion in addition to documenting the time that the subject could maintain the position. Shumway-Cook and Horak (1986) also suggest that sway may be quantified in the following manner:

1= minimal sway
2= mild sway
3= moderate sway
4=fall

Criteria to stop timing the task:
The subject's arms moved from the original position, the subject's foot moved, or they opened their eyes during an eyes closed trial.

In Condition 5 and 6, we believe that the only system that you can use to maintain your balance is your vestibular system. Weber and Cass (1993) determined that falls on Condition Five correlated with the results of the CDP **90%** of the time.

Fukuda Step Test (Fukuda, 1959)

1. Two concentric circles (.5 and 1 meter radii) with 15 degree angle divisions
2. Subjects were blindfolded with their arms flexed at 90 wearing no shoes
3. Subjects stepped in place 100 times in a quiet room with low light (the examiner can not speak during the testing)
4. Most subjects tested (n = 500) stayed in the original position
5. Forward progression of up to 3 meters was seen
6. Up to 30 degrees to the right or left was considered to be normal with 50 steps
7. Backward movement was rarely seen in people without disease
8. Patients with peripheral lesions tend to deviate to one side: with a central disorder the patient has large side to side excursions

Ask the subject to raise their arms to 90 degrees, close their eyes and march in place for 50 steps. Try to stay in one place. Note if the patient moves and in what direction. This test assists in the clinical picture but is not always reliable.

Positive Fukuda: distance traveled is > 50 cm. (19.7 in.).
Herdman, S.J. (2007). Vestibular Rehabilitation. Philadelphia: FA Davis, 3rd ed.

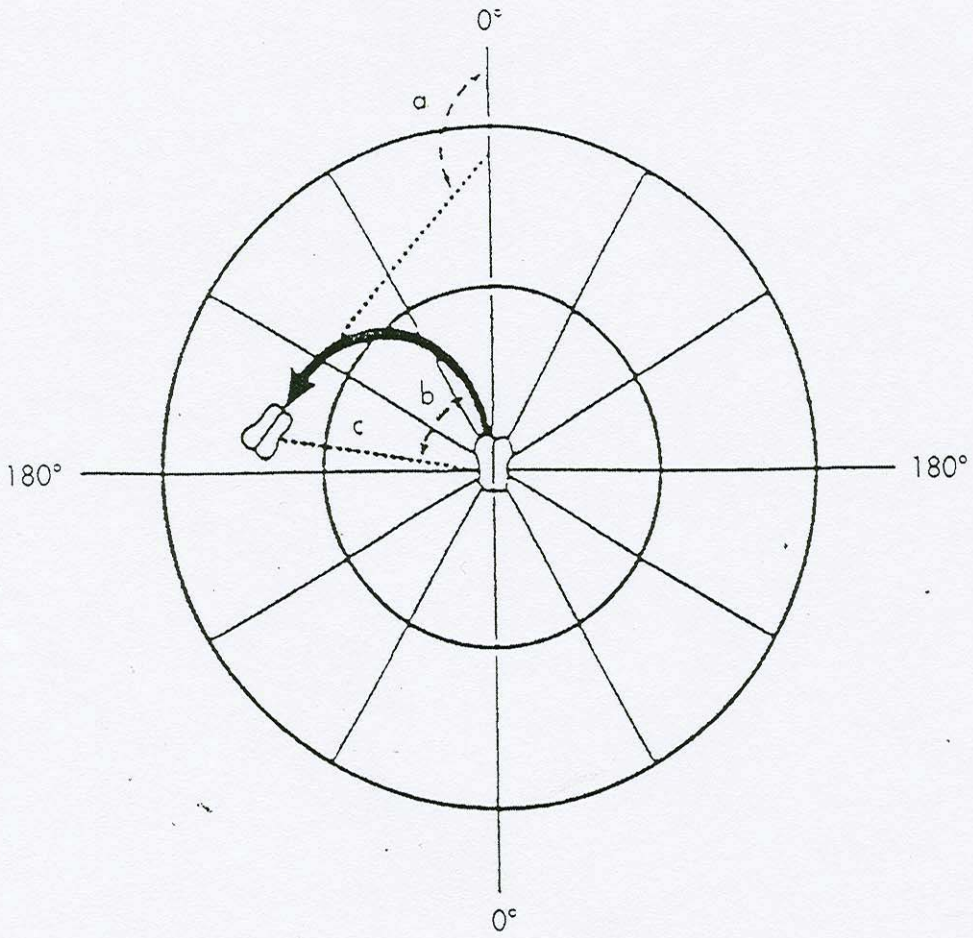


Fig. 28-15. The Fukuda stepping test for peripheral vestibular clients uses a floor grid to detect the extent of drift that occurs during an eyes-closed stepping task. (Reprinted from Newton R: *Brain Injury* 3:335. 1989.)

Adapted from: Umphred DA. *Neurological Rehabilitation*. 3rd ed. St. Louis, MO: Mosby, Inc.1995.

MOTION SENSITIVITY SCORE

Positional Testing

Position Change	Symptoms Intensity	Symptom Duration	Score (I+D)	Nystagmus
Baseline Symptoms		_____	_____	
1. Sitting⇒Supine				
2. Supine⇒Left side				
3. ⇒⇒Right side				
4. Supine⇒sitting				
5. Left Dix-Hallpike				
6. ⇒⇒Sitting				
7. Right Dix-Hallpike				
8. ⇒⇒Sitting				
9. Sitting⇒Nose to left knee				
10. ⇒⇒Sitting erect				
11. Sitting⇒Nose to right knee				
12. ⇒⇒Sitting erect				
13. Sitting⇒Neck rotation				
14. Sitting⇒ Nectkflexion & extension				
15. 180 degree turn to the right				
16. 180 degree turn to left				
		Total		
		MSQ		

a. symptom intensity: subjective (patient report) scale from 0 to 5
(0 = no symptoms, 5 = severe symptoms)
b. symptom duration: scale from 0-3
(5-10 sec = 1 point; 11-30 sec = 2 points; >30 sec = 3 points)
c. total score = intensity + duration for each position change
d. MSQ (motion sensitivity quotient) = **(#Positons × Total Score) / 20.48**

ADAPTED FROM RICHARD A. CLENDANIEL LECTURE'98

Abbott: 0-10% = mild; 11-30% = moderate; 31-100% = severe
Improvement indicated by:

- Decreased number of provoking positions
- Increased number of reps before symptom occurrence
- Decreased intensity of symptoms
- Shorter duration of symptoms

Dizziness Handicap Inventory

Population: Adult population, vestibular system disease

Description: The Dizziness Handicap Inventory was designed to assess the disability that patients perceive they have due to dizziness. The test contains three subscales which cover the areas of function, emotion, and the physical aspects.

Mode of Administration: The Dizziness Handicap Inventory is a paper and pencil self administered test.

Completion:

Time to Complete: 5 minutes

Time to Score: 5 minutes

Scoring: A yes response on the inventory receives 4 points.
A sometimes response on the inventory receives 2 points.
A no response on the inventory receives 0 points.
The points may then be combined totally to assign a total score or they may be combined by subscale.

Interpretation: The higher the points, either total or for a particular subscale, a patient scores the greater their perceived disability due to dizziness.

Reliability: Tests for internally consistency reliability were performed on 106 patients. Chronbach's alpha coefficient was computed for the total test and the three subscales. The total test had an alpha value of 0.89, demonstrating a good level of internal consistency. The subscales had an alpha value in the range of .72 to .85 demonstrating moderate internal consistency when they are independently examined.

Test-retest reliability was tested on a group of 14 patients who took the test two times. Pearson correlations were calculated resulting in a coefficient of 0.97 for the total score and a range of 0.92 to 0.97 for the subscales. All of these scores reflect excellent test-retest reliability.

Validity:

Content validity of the Dizziness Handicap Inventory was established through which the 25 questions were selected. The test began as a series of 61 questions and then went through a battery of sessions in which the less statistically reliable measures were eliminated. This process resulted in the 25 questions which appear on the final form.

Reference:

Jacobson GP, Newman CW. The Development of the Dizziness Handicap Inventory. *Arch Otolaryngol Head 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 or unsteadiness. Please answer "yes," "no," or "sometimes" to each question. *Answer each question as it pertains to your dizziness or unsteadiness problem only.*

	ITEM	RESPONSE
P1.	Does looking up increase your problem?	
E2.	Because of your problem, do you feel frustrated?	
F3.	Because of your problem, do you restrict your travel for business or recreation?	
P4.	Does walking down the aisle of a supermarket increase your problem?	
F5.	Because of your problem, do you have difficulty getting into or out of bed?	
F6.	Does your problem significantly restrict your participation in social activities such as going out to dinner, going to movies, dancing, or to parties?	
F7.	Because of your problem, do you have difficulty reading?	
P8.	Does performing more ambitious activities like sports, dancing, household chores such as sweeping or putting dishes away increase your problem?	
E9.	Because of your problem, are you afraid to leave your home without having someone accompany you?	
E10.	Because of your problem, have you been embarrassed in front of others?	
P11.	Do quick movements of your head increase your problem?	
F12.	Because of your problem, is it difficult for you to do strenuous housework or yardwork?	
P13.	Does turning over in bed increase your problem?	
F14.	Because of your problem, is it difficult for you to do strenuous housework or yardwork?	
E15.	Because of your problem, are you afraid people may think you are intoxicated?	
F16.	Because of your problem, is it difficult for you to go for a walk by yourself?	
P17.	Does walking down a sidewalk increase your problem?	
E18.	Because of your problem, is it difficult for you to concentrate?	
F19.	Because of your problem, is it difficult for you to walk around your house in the dark?	
E20.	Because of your problem, are you afraid to stay home alone?	
E21.	Because of your problem, do you feel handicapped?	
E22.	Has your problem placed stress on your relationships with members of your family or friends?	
E23.	Because of your problem, are you depressed?	
F24.	Does your problem interfere with your job or household responsibilities?	
P25.	Does bending over increase your problem?	

Reprinted with permission. Jacobson GP, Newman CW. The Development of the Dizziness Handicap Inventory. *Arch Otolaryngol Head Neck Surg* 1990; 116:424-427.

Geriatric Depression Scale

Population: Elderly patients

Description: A 30 question survey designed to rate depression in elderly patients. The survey is easy to administer and is used primarily as a screening instrument in evaluating an elderly patient.

Mode of Administration: The survey may be administered in two formats, either self-administered or administered by a physician to a patient.

Completion:

Time to Complete: Approximately 5 minutes

Time to Score: Approximately 5 minutes

Scoring: Of the 30 survey questions included on the GDS, 10 indicate depression when answered with a negative response and the other 20 indicate depression with a positive response. Questions 1, 5, 7, 9, 15, 19, 21, 27, 29 and 30 indicate depression with a negative answer. Questions that indicate depression, either with a positive or negative response, are allocated one point. The points are then added together to form a total score for the GDS.

Interpretation: The cutoff for the scale is as follows:

normal:	0 to 9 points
mild depressive:	10 to 19 points
severe depressive:	20-30 points

Reliability: 100 patients were divided into two groups in order to test the GDS in relation to the Zung Self-Rating Depression Scale and the Hamilton Rating Scale for Depression. In terms of the correlation with the total score it was found that all three measures represent internally consistent tools (GDS correlation: 0.56 range 0.32-0.83).

(Lewis CB, McNerney T. Clinical Measure of Functional Outcomes "The Functional Outcomes Tool Box)

A calculation of Chronbach's alpha confirms the internal consistency of the GDS. The calculated alpha value was 0.94 indicating a high level of internal consistency.

Internal consistency was also tested for using the split half technique. Here the results again indicated internal consistency for the GDS. A reliability coefficient of 0.94 was calculated for the GDS.

Test retest reliability was computed by having 20 patients retake the survey one week later, resulting in a correlation of 0.85.

Validity:

The GDS has a strong level of content validity. Content validity is established by the manner in which the individual survey questions were selected. The final questions for the GDS were selected out of 100 questions and they represented the ones with the highest correlation between the total score and depression.

The primary test for validity was done by comparing the patients scores on the GDS with the classification of the patients on the basis of Research Diagnostic Criteria for affective disorders. The GDS proved to be a valid indicator of depression for the elderly on this measure.

Reference:

Yesavage JA, Brink TL, Rose TL, Lum O, Huang V, Adey M, Leirer VO. Development and Validation of a Geriatric Depression Screening Scale: A Preliminary Report. *Journal of Psychiatric Research* 1983; 17(1):37-49.

GERIATRIC DEPRESSION SCALE

Instructions: Choose the best answer for how you felt over the past week.

1. Are you basically satisfied with your life?.....yes\no
2. Have you dropped many of your activities and interests? yes\no
3. Do you feel that your life is empty? yes\no
4. Do you often get bored? yes\no
5. Are you hopeful about the future?.....yes\no
6. Are you bothered by thoughts you can't get out of your head? yes\no
7. Are you in good spirits most of the time? yes\no
8. Are you afraid that something bad is going to happen to you? yes\no
9. Do you feel happy most of the time? yes\no
10. Do you often feel helpless?.....yes\no
11. Do you often get restless and fidgety? yes\no
12. Do you prefer to stay at home, rather than going out and doing new things? yes\no
13. Do you frequently worry about the future? yes\no
14. Do you feel you have more problems with memory than most? yes\no
15. Do you think it is wonderful to be alive now?.....yes\no
16. Do you often feel downhearted and blue? yes\no
17. Do you feel pretty worthless the way you are now? yes\no
18. Do you worry a lot about the past? yes\no
19. Do you find life very exciting? yes\no
20. Is it hard for you to get started on new projects?.....yes\no
21. Do you feel full of energy? yes\no
22. Do you feel that your situation is hopeless? yes\no
23. Do you think that most people are better off than you are? yes\no
24. Do you frequently get upset over little things? yes\no
25. Do you frequently feel like crying?.....yes\no
26. Do you have trouble concentrating? yes\no
27. Do you enjoy getting up in the morning? yes\no
28. Do you prefer to avoid social gatherings? yes\no
29. Is it easy for you to make decisions? yes\no
30. Is your mind as clear as it used to be? yes\no

Modified Falls Efficacy Scale (MFES)

Population: Elderly with balance or mobility dysfunction

Description: The Modified Falls Efficacy Scale (MFES) is a 14 activity questionnaire that is an expanded version of the original 10 activity Falls Efficacy Scale (FES). The MFES includes outdoor activities, which the FES does not cover. (closer to ABC now)

Mode of Administration: Either the patient or the clinician can complete the test.

Scoring:

Time to Complete: Less than 5 minutes.

Time to Score: Less than 5 minutes.

Scoring: Each item is scored on a 10 point visual analogue scale. 0=not confident/not sure at all, 5=fairly confident/fairly sure, and 10=completely confident/ completely sure. Scores can fall in between 0, 5, and 10.

Interpretation: Higher scores reflect more confidence, less fear of falling. Lower scores reflect less confidence and more fear of falling.

Reliability: Cronbach's alpha was used to demonstrate internal consistency of the items on the questionnaire and the result was 0.95. Test-retest reliability was measured for every question as well as the overall test by testing two groups twice, one week apart. Intraclass correlation coefficients were calculated. The lowest ICC was .54 for the individual items. The overall ICC for the MFES was .93.

Validity: In order to evaluate the discriminative validity of the MFES, subjects from two separate samples were scored. The one sample consisted of healthy elderly and the other sample included patients from a Falls and Balance Clinic (FBC). Significant differences were found between the two groups using multivariate analysis of variance (MANOVA) with post hoc univariate ANOVA.

Reference: Hill, K.D., Schwarz, J.A., Kalogeropolous, A.J., & Gibson, S.J. (1996). Fear of Falling Revisited. Arch Phys Med Rehabil, 77, 1025-1029.

The Modified Falls Efficacy Scale

	Not Confident At All (0)	(1)	(2)	(3)	(4)	Fairly Confident (5)	(6)	(7)	(8)	(9)	Completely Confident (10)
Items from Tinetti et al[1]											
1. Get dressed and undressed											
2. Prepare a simple meal											
3. Take a bath or shower											
4. Get in/out of a chair											
5. Get in/out of bed											
6. Answer the door or telephone											
7. Walk around the inside of your house											
8. Reach into cabinets or closets											
9. Light house keeping											
10. Simple shopping											
Additional items											
11. Using public transportation											
12. Crossing roads											
13. Light gardening or hanging out the wash*											
14. Using front or rear steps at home											

The items on the scale are scored from 0 to 10, with 0 meaning "not confident/not sure at all," 5 being "fairly confident/fairly sure," and 10 being "completely confident/completely sure." Subjects are asked, "How confident/sure are you that you do each of the activities without falling?"

* Rate most commonly performed of these activities

[1] Tinetti M, Richman D, Powell l. Falls efficacy as a measure of fear of falling. J Gerontol 1990; 45:P239-43.

Dizziness Symptomology

Subjective complaint	Mechanism	Etiology
"room spinning" (compensates by squinting or closing eyes)	**Vertigo** Vestibular Definition: Illusory sensation of motion of self or environment	• **BPPV** (canalithiasis or cupulolithiasis) • **Unilateral Peripheral Hypofunction**, ie asymmetry of tonic firing (could be secondary to chronic Meniere's) • **UVL**: Unilateral Peripheral lesion: viral (labyrinthitis), trauma, vascular, perilymph fistula • Unilateral central lesion (to vestibular nuclei in Pons): CVA, MS, CHI • Very loud noise – Tullios • Migraine headache • Drugs
"going to faint … light headed" "I woke up on the floor."	**Syncope** Vascular Metabolic	• **Othrostatic hypotension** e.g. drug SE • Hypoglycemia • Vertebrobasilar Insufficiency • Anemia (internal bleeding or B-12 deficiency) • Cardiac Pump Failure, drop in cardiac output, valve stenosis • **Arrhythmias**: A-Fib (may be benign); PVC (too frequent or bigeminy, trigeminy, couplets, V-tach …) • Anxiety attack, hyperventilation • Hypothroid condition • Severe HTN – brain attack • Carotid sinus hypersensitivity (palpation triggers Valsalva with hypotensive episode)
"lost my balance … no reason"	**Dysequilibrium**	• **BVL** (ototoxicity, bilateral infections, age-related degeneration, meningitis) • **Chronic UVL** • **Ototoxicity** (gentamicin, an antibiotic destroys hair cells) • Central lesion to vestibular cortex (parietal lobe) • Surgery for acoustic neuroma that damages vestib n., or a Vestibular neurectomy as treatment for severe Meniere's • **Peripheral Neuropathy** (diabetic, alcoholic, pernicious anemia) with insensate feet (also impaired skin, joint, and muscle propioceptors) • Impaired neuromuscular control / reflexes, righting reactions, reaction time, nerve conduction velocity (aging) • LE weakness, (esp with decr DF ROM – loss of ankle strategy) • Cerebellar lesion, ataxia

Oscilopsia: blurring with head movement

Adapted from: O'Sullivan, S.B. and Schmitz T.J. (Eds.). (2007). Physical rehabilitation: assessment and treatment (5th ed.). Philadelphia: F. A. Davis Company. p.1004.

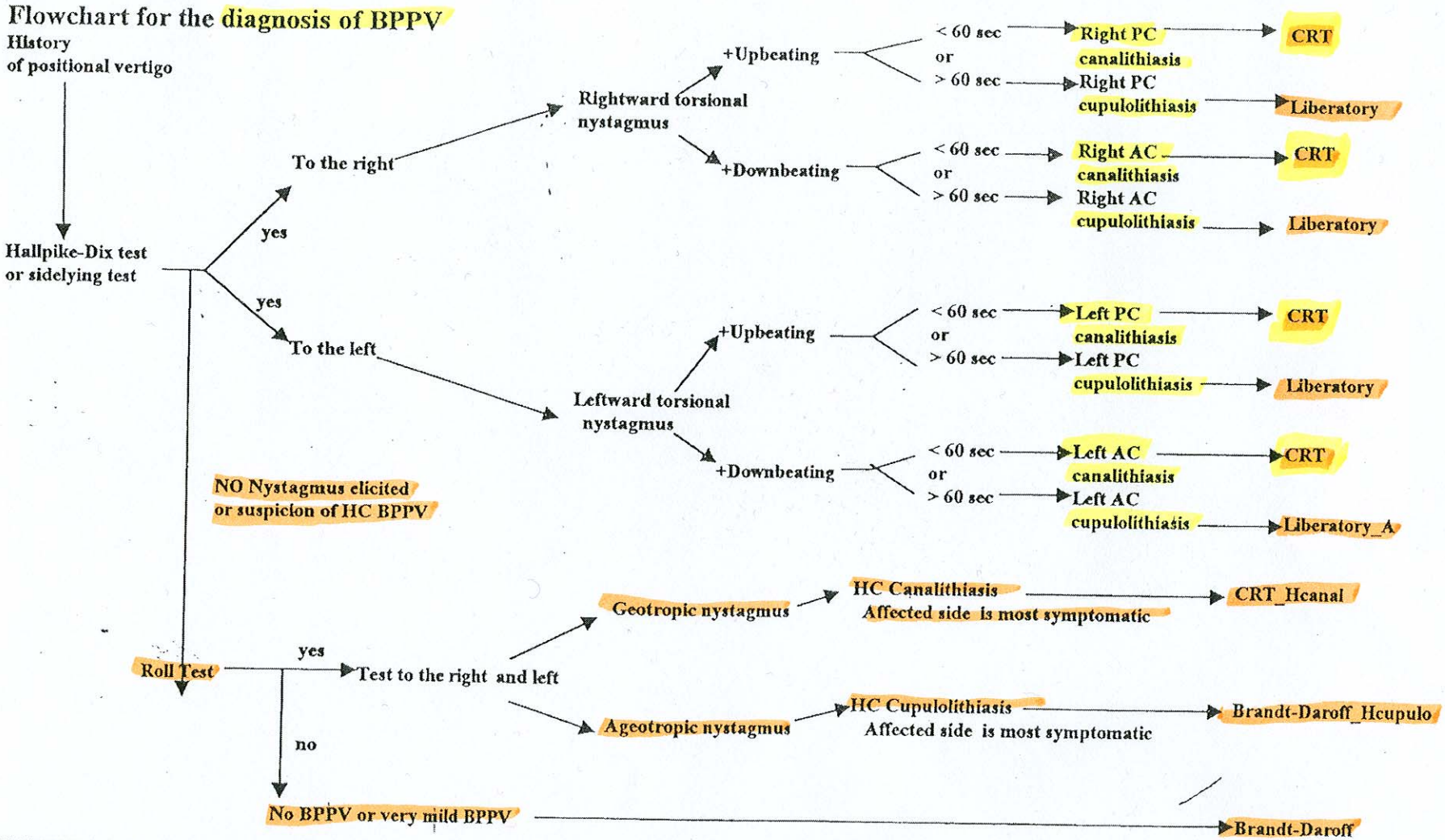


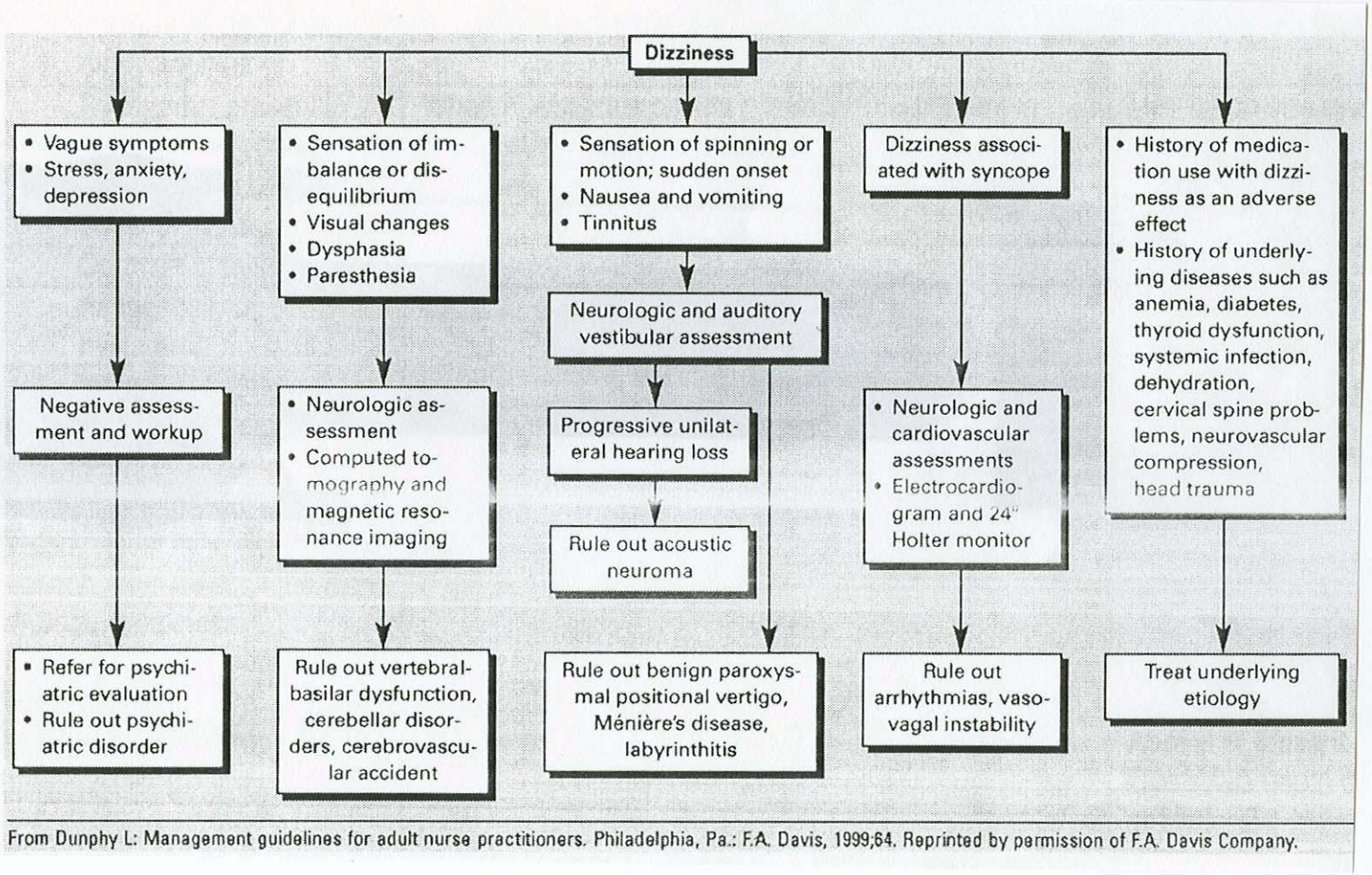
FIGURE 19–10. Schematic for assessment leading to treatment. Identification of the direction and duration of the nystagmus leads to the identification of which canal is involved and whether the BPPV is from canalithiasis or cupulolithiasis. This information directs the appropriate choice of treatment.

Herdman SJ. *Vestibular Rehabilitation.* 2nd ed. Philadelphia, PA: F A Davis Co; 2000.

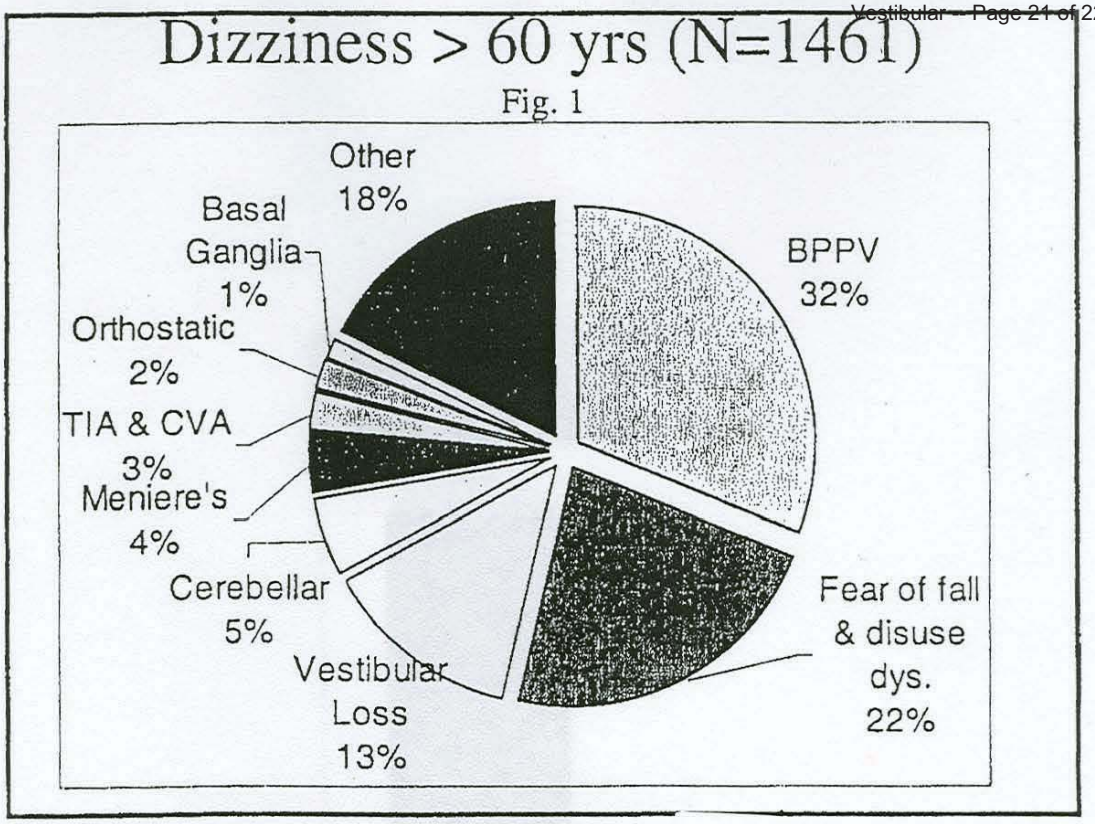
c/m II
c m III

Motion:	Pendular	Smooth, sinusoidal motion
	Jerk	Slow drift, rapid recovery
Beat Direction	Horizontal	Side to side
	Vertical	Up and down
	Rotatory	Rotation of Iris
Gaze Direction	Horizontal	Gaze left or right
	Vertical	Gaze Up or down
	Unidirectional	Nystagmus only in one direction of gaze
	BiDirectional	Nystagmus on both directions of gaze
Severity	First Degree	On one side only
	Second Degree	In primary position also
	Third Degree	On opposite side also, same beat
Conjugacy	Disconjugate	Jerk nystagmus in one eye, slow drift in the other.

http://www.eolas.ca/oculomtr/Nystagms/Nyst_3.htm



From Dunphy L: Management guidelines for adult nurse practitioners. Philadelphia, Pa.: F.A. Davis, 1999;64. Reprinted by permission of F.A. Davis Company.



Tusa RJ. Pathophysiology, 2004.

Table 7. Duration of spells of dizziness

Duration	Etiology
Seconds	Benign Paroxysmal Positional Vertigo (BPPV)
	Perilymphatic fistula
	Orthostatic hypotension
Minutes	Transient Ischemic Attacks (TIA)
	Migraine lasts up to 48 hours, but dizziness generally for minutes.
	Panic Attacks
Hours-days	Ménière's disease and hydrops

Tusa RJ. Pathophysiology, 2004.

Table 2. Features that Distinguish Peripheral from Central Causes of Vertigo

Findings	Peripheral Cause	Central Cause
Direction of Nystagmus	Usually mixed plane (horizontal and torsional)	Usually single plane (horizontal, torsional or vertical)
Effect of Gaze	Nystagmus increases with gaze toward direction of quick phase	Nystagmus either does not change or it reverses direction
Effect of Fixation	Nystagmus decreases	Nystagmus either does not change or it increases
Ice-water caloric test	Spontaneous nystagmus does not change when affected ear is irrigated; nystagmus decreases or reverses direction when non-affected side is irrigated.	Spontaneous nystagmus increases when affected ear is irrigated; nystagmus reverses direction when non-affected side is irrigated
Balance	If the patient is younger than age 50 years, balance is usually normal except for a positive sharpened Romberg's test. If older than age 50 years, the patient may have positive Romberg's test.	May have severe defect regardless of age (positive Romberg, patient veers when walking with eyes open)

Tusa RJ. Pathophysiology, 2004.

Vestibular Tests & Measures: Study Guide

Nystagmus is described by the direction of the quick phase. Rotary / Torsional N. is described by the direction that the superior pole of the iris moves, L or R.		**Directions to perform TEST**	**Positive sign demonstrated by**	**Central vs. Peripheral**
Eye Movement Range		Take your finger out past 18-24" to examine if the patient has full ocular range of motion. Ask the patient to follow a moving object (your finger) that is held several feet in front of the patient's face (to avoid convergence of eyes.)		
Smooth pursuit	Maintains gaze stabilization when rate of eye movement is < 60d/sec	Hold the patient's head stationary. Have the patient follow your slowly moving finger horizontally (from center to 30 degrees right and then to 30 degrees left), and then vertically (center to 30 degrees up to 30 degrees down). The test can be repeated; you may have to hold the eyelids up in order to see the downward eye movement clearly.	> 3 saccades per eye movement. Nystagmus: quick phase AWAY from lesion side	Central
End point Nystagmus (normal response)		During maintenance of an extreme eye position. Head fixed. Eyes follow my finger and then held at the end point. (all 4 directions).	1-2 beats is normal.	
Gaze evoked Nystagmus (abnormal response)		Hold the patient's head stationary. Have the patient follow your finger so she/he is looking 30 degrees to the right, left, up, down. Pause for 20 seconds in each of those positions to observe for nystagmus. Note the direction of the nystagmus in each position. Be sure to keep your finger 18-24 inches away from the patient's face throughout the entire test.	Nystagmus not normal if lasts > 5 sec.	Central or Cranial III, IV, VI
Saccades: jerky, involuntary eye movements during tracking		Continue to hold the patient's head stationary. Hold your finger about 15 degrees to one side of your nose. Ask the patient to look at your nose, then at your finger, repeating several times. Do this from the right, left, up, and down. You are looking for the number of eye movements it takes for the patient's eyes to reach the target. Normal is <2.	Saccades can be normal when smooth pursuit motion is very fast	Central
Diplopia		Patient report. Lasting > 2 weeks		Central: rule out MS, TBI
Oscillopsia: visual blurring with head movement	Decreased VOR gaze stability with head motion	Patient report (see also Dynamic Visual Acuity Test) May also be reported as "seaweed" movement without head mvmt.		Peripheral or Central
Skew deviation Cross Cover Test		Therapist alternately covers and uncovers each eye, while patient keeps their eyes open. Look for misalignment and dropping of the eye after cover is removed. A vertical misalignment (skew deviation) can be indicative of otolith imbalance on the side where the eye was too low or indicative of a central brainstem lesion.	Vertical misalignment	Brainstem, also utricle dysfunction.

Ocular Tilt Reaction OTR (can accompany Wallenberg syndrome)		Observation: Triad = head tilt + skew deviation + torsion See illustration on: O'Sullivan 4th ed. p.832 O'Sullivan 5th ed. p.1013		Unilateral brainstem Medullary infarct
Subjective Visual Vertical (SVV)		Equipment: 5 gallon bucket with a straight line drawn across the bottom of the bucket (inside and outside). Task: with their head "inside" the bucket, the patient turns the bucket so that they perceive the line to be vertical.	Abnormal if > 2 degrees off	Utricle function
Spontaneous nystagmus (not movement or position related)		Holding the patient's head with one hand. Have the patient look straight ahead and observe for nystagmus (slow phase/fast phase). **Horizontal Nystagmus that stops w gaze fixation = Peripheral** **Nystagmus that does NOT stop with gaze fixation = Central**		
Optokinetic nystagmus (normal physiological occurrence of nystagmus under these conditions)		If you have access to an optokinetic drum, have the patient follow the striped lines with their eyes while you slowly move the drum in one direction. Repeat this procedure rotating the drum in the opposite direction. You should observe for optokinetic nystagmus (slow phase eye movements in the direction of drum rotation). Be careful to not rotate the drum too quickly. You should note if the patient does not produce slow phase eye movements or if the slow phase eye movements are saccadic in nature. Additionally, you should note the direction of drum movement in which this occurs.		
VOR Gain 1. Maintained Fixation	Maintains fixed gaze with head movement (eyes move opposite to head).	"Keep your eyes on my finger." "Move your head to the left … right … up … down" (at rate > 60d / sec)		
VOR 2. Head **Thrust** Test. (eyes open: **EO**) Tilt head 30d down.	Faster and harder to perform than the test of VOR Maintained Fixation	The patient will need to understand what will be done so their neck is relaxed during the test. If you noted that the patient had pain or significant restriction in cervical spine mobility, this test should be performed with extreme caution or should be deferred. Grasp the patient's head firmly with both hands on the side of their head. Tilt their head forward 30° so that horizontal semi-circular canals are level in the horizontal plane. Instruct the patient to look at your nose. Move the patient's head slowly back and forth being sure the patient is relaxed. Then, suddenly move the patient's head in one direction and stop. The head movement should be moved through a small amplitude with the position held at the end. Observe for the patient's ability to maintain visual fixation. You should note if the patient makes corrective saccades to re-fixate on your nose and the direction of head movement that caused the re-	Saccade (to catch up) L sided thrust yields saccade? = L lesion Helpful to differentiate L / R	Peripheral: UVL, BVL

		fixation saccades, *e.g. if a **thrust to the L** yields a saccade to re-fixate on your nose a **Left UVL** is indicated.* Note: If you are uncomfortable moving the person's head from center to an eccentric position, try moving the person's head from an eccentric position to center		
VOR 3. Head **Shaking** Induced Nystagmus. (eyes closed – **EC**) Tilt head 30d down.		Eyes are closed and with 30° neck flexion (horizontal SCC position). I shake their head vigorously (2 Hz) L&R for 20 cycles. Stop and then they open their eyes (best viewed with frenzels).	Horiz. Nystagmus = Peripheral UVL *Vertical Nystagmus = Central*	
VOR 4. VOR Cancellation Tilt head 30d down. Cerebellum has to inhibit the VOR Gain during VOR Cancellation		Tilt their head forward 30° Sitting with their arms extended in front of them, thumbs up (in "shooters position"). They maintain gaze on thumbs while twisting / rotating their trunk and arms as a unit to the left and right. Their head moves with target (thumbs), canceling VOR Gain Alternate: Grasp the patient's head firmly with both hands on the side of their head. Tilt their head forward 30° while you move in the same direction that you move the patient's head with your face remaining directly in front of the patient's face.	Saccades, Nystagmus	Central: Cerebellar
VOR 5. Dynamic Visual Acuity Test – **DVA** Tilt head 30d down.	Passive Test	Have the patient wear their glasses if they need distance correction. Depending on the type of acuity chart being utilized, have the patient sit the appropriate distance from the chart. (The ETDRS charts are designed to be viewed from a distance of 4 meters to provide Snellen equivalent acuity ratios or LogMAR values as noted on the chart). Have the patient read to the lowest line that they can until they cannot correctly identify all the letters on a given line. Note the line where this occurs and/or the number of optotypes the patient incorrectly identifies. Now, standing behind the patient, grasp the patient's head firmly with both hands on the side of their head, tilt their head forward 30° so that horizontal semi-circular canals are level in the horizontal plane. While moving their head side to side at a frequency of 2 Hz (2 complete side to side cycles per second – use metronome if available) have the patient read to the lowest line that they can until they can not correctly identify all the letters on a given line. Note the line where this occurs and/or the number of optotypes the patient incorrectly identifies. Keep the range of motion of the head movements small so as to not restrict the visual field, which may occur with patients who wear glasses. ***If "lose" >2 lines compared to static = oscillopsia.*** ***If lose >3 lines = Vestibular hypofunction.***		Horiz. SCC

Positional Maneuvers				
1. Hallpike-Dix Test (test unaffected side first, if obvious from history)	Test of **Posterior** and **Anterior** SCC + Post. SCC sign will be Upbeating (cranial) nystagmus (63%) + Ant. SCC sign will be Downbeating (caudal) nystagmus (12%)	Criteria for positive HPD sign: (example below is for **R** side lesion) 1. torsional/linear-rotary nystagmus; reproduced by provocative positioning with <u>affected **R** ear down</u> 2. brief **latency** of 5-15 seconds before the start of nystagmus. 3. nystagmus of **brief** duration, (***toward the lesion*** i.e. **R** torsion) 4. **reversal** of nystagmus direction on return to upright position (***away from lesion*** i.e. **L** torsion) 5. response diminishes with repetition of maneuver (fatigability)	Vertigo, **Nystagmus:** • < 60s Canalithiasis • > 60s: Cupulolithiasis (fatigues) • Persistent: possibly Central	Peripheral: misplaced or adhered otoconia
2. Roll Test (See O'Sullivan 5th ed. p.1010)	Test of **Horizontal** SCC (1%)	Will be positive to both sides, with one side being worse. • Geotropic Nystagmus = Canalithiasis → Horizontal CRT • Ageotropic Nystamus = Cupulolithiasis → Brandt Daroff		Peripheral: misplaced or adhered otoconia
3. Vertebral Art. Test		• Maneuver: Sit with knees on elbows and chin in hand. Look up to the (right) for 30 seconds. • Maneuver: Sitting with (passive) cervical extension and rotation, holding 30 sec. (Magee p.154)	Vertigo, nystagmus, headache, visual disturbance central signs.	
Functional Tests				
Motion Sensitivity		**Instruments:** *Motion Sensitivity Score* (Vestibular System Evaluation & Training): *rolling, sit to stand, etc. (16 items), with vertigo rated for duration and intensity.*		
Balance & Mobility		**Instruments:** • *Functional Reach, Multidimensional Reach* • *Berg Balance* • *Tinetti Balance & Gait* • *TUG, and the Five-Times Sit to Stand* • *Preferred Gait Speed* • *Dynamic Gait Index: 4-item & Functional Gait Assessment* • *Fukuda* • *Perturbation Tests (hips, sternum)* • *Clinical Test of Sensory Integration and Balance (CTSIB)*	**Questionnaires:** • *Dizziness Handicap Inventory* • *Modified Falls Efficacy Scale* • *Activities-specific Balance Confidence (ABC) Scale* • *Physical Activity Scale for the Elderly (PASE)* • *Cognition:* o *Mini MentalState Exam* o *The Blessed Orientation-Memory-Concentration (BOMC) Test* o *Geriatric Depression Scale*	

Portions adapted from Herdman SJ. Vestibular Testing & Rehabilitation Competency Course, Notes, Emory University & APTA. March, 2004.
Abbott C., Prost E., Aug. 2010.