What is Vestibular Rehabilitation?
AND
Who would benefit from treatment?

Vestibular rehabilitation is an exercise-based program, designed by a specialized physical therapist, to improve balance and reduce dizziness-related problems. The inner ear, the brain's 'balance center.' At your appointment, a physical therapist will evaluate your symptoms and review your medical history. (Source: Cleveland Clinic website)

Vestibular rehabilitation is symptom driven.

Who would benefit from Vestibular Rehabilitation?

- In the Chronic dizzy patient and imbalanced patient why are symptoms continuing?

- Why has the natural compensation process not worked in some people?

- Have you ever wondered how to help these people without surgery or use of medication? Or perhaps the patient needs surgery and medications... How do you know which group of patients need what?

Let's first identify 2 groups of people

Group 1
- The patient has an UNSTABLE lesion, i.e., the locus of the lesion is changing over time.
- The historical hallmark is spontaneous events
- More likely to be assisted with medicine or surgery

Group 2
- The patient has a STABLE lesion yet uncompensated by the central process
- The historical hallmark is symptoms provoked by something
- More likely to be served with Vestibular Rehab Therapy (VBRT)

Subjective History:

- Onset
- Description of symptoms
- Hearing
- Loss/Tinnitus/Pressure
- Visual Changes
- Difficulty reading: Do words jump? Are lines wavy? Do you need to use your finger to keep track of which line you are on when reading a newspaper?
- Fatigue level
- Confusion/orientation status
- Memory loss?
- Stairs into home or inside home?
- Do you live alone?
- Do you drive a car?
- Can you grocery shop?

Differential Diagnoses that can cause Dizziness

- Neuritis
- Labyrinthitis
- Migraines and in particular Vestibular Migraines. -Must be medically managed first.
- Meniere's Disease / Endolymphatic Hydrops
- Perilymphatic fistulas
- Superior Canal dehiscence
- Concussions
- Labyrinthine Concussions
- bppv
- Cervicogenic Dizziness

Differential Diagnoses that can cause Dizziness

- Unilateral vestibular loss (UVL)
- Bilateral vestibular loss (BVL)
- Drug ototoxicity
- Highly unlikely to get true vertigo from lesion above the level of the pons. More likely to get imbalance, lightheadedness.
- Highly unlikely to get true vertigo from lesion in the area of the anterior circulation-carotid arteries. Imbalance, lightheadedness.
- Vascular event: AICA/PICA could be a mix of central ocular and peripheral hypofunction with postural control abnormalities.
- Conversion Disorders (Psychiatric disorders)

Subjective Complaints

- Most of us can experience a delusion of movement at some point in our life such as when we pull up next to a stopped bus at a stop light. Both our vehicles are stopped, the bus next to us starts rolling forward. We think we are moving so we press the brake even harder even though we aren't moving.

- Dizziness can be exacerbated by a moving train going by, light passing through trees when you are driving or a passenger in a car, bending over or looking upward, turning your head quickly to one side after someone calls your name, looking at a computer screen for too long, following a moving target or object, watching a live sporting event, being in a crowd, going grocery shopping, loud noises, etc...
OBJECTIVE EXAM

- Neurologic screening: Upper and lower motor neuron coordination testing, sensation and reflex testing. We use disposable monofilament kit on everyone to test for neuropathy.
- Vision/Oculomotor control screening: Use of Oculography goggles in room light and with fixation removed. (Test for neuritis, labryinthitis, central vs. peripheral signs)
- HINTs Exam (Head Impulse Nystagmus Test of Skew)
- Cover/uncover test
- Cover/Cross Cover test
- VOR cancellation
- Vestibular status and Vestibulo-ocular reflex testing
- Cognitive status
- BPPV all canals

Vestibular Rehabilitation Therapy (VRT)

1. Gaze Stabilization Exercises
2. Balance/Gait training Exercises
3. Habituation Exercises
4. Dizziness/BPPV Treatment/Adaptation Exercises

Vestibular/Ocular Motor Test: Not Tested

Headache 0-10
Dizziness 0-10
Nausea 0-10
Fogginess 0-10

Comments

BASELINE SYMPTOMS N/A

Smooth Pursuits
Saccades-Horizontal
Saccades-Vertical
Convergence (Near Point) (Near Point in cm)
Measure 1:______Measure 2:______Measure 3:______
VOR-Horizontal
VOR-Vertical
Visual Motion Sensitivity

VESTIBULAR/OCULAR-MOTOR SCREENING (VOMS) FOR CONCUSSION

Tester:_______________________________________ Date of Screen:  _____/_____/______
Name:_______________________________________ DOB:_____/_____/___ ___ Male     Female

Objective Exam-System Integration Testing

- Direct Exam
- Test the three systems in our body responsible for balance:
  1. Somatosensation
  2. Vision
  3. Vestibular
- Use of Sensory Organization Test (SOT) of Dynamic Posturography or office technique of Clinical Test of Sensory Interaction and Balance
- Motor Control Test (MCT) or reaction to unexpected perturbations clinical or machine

Objective Exam-System Integration

- Functional use of the VOR (Vestibulo-Ocular Reflex) through testing of Dynamic Visual Acuity and Gaze Stabilization. This can be computerized or done clinically.
- Functional Gait Assessment/ Dynamic Gait Index; Berg (Gait and Balance testing)
- Movement sensitivity via MSD (16 fast movements coding intensity duration).

EVALUATION COMPLETED!

- We would complete an 8-10 page typed evaluation, give it to the physicians and they would not know what to do with it...
- We actually had physician offices calling our office asking us to not send over the SOT results because they did not know how to interpret them, even though we had written the impairments on the report for them.
- Many physicians do not know what we do or even how we do it (yet alone what it means), but they do know their patient do get better.

Gaze Stabilization Test (GST)

Dynamic Visual Acuity (DVA)

- Gaze Stabilization Test
The gaze stabilization test (GST) is a computerized test of the Vestibulo-ocular reflex that reports maximum head velocity while maintaining fixed visual acuity.
In other words it tests to see how fast a person can move their head and still see something accurately without having a retinal slip. The person must focus on an image such as an “E” and perform an ACTIVE head movement horizontally, vertically or diagonally. It is a functional, quantitative test of performance. This test is very effective for concussion patients with return to play.

Dynamic Visual Acuity

Provides an instrumented, objective, behavioral assessment of Vestibulo-ocular reflex (VOR) function in response to rotational or functional head movement stimuli. The Dynamic Visual Acuity Test (DVAT) assesses visual acuity during head movement relative to baseline static visual acuity.
- It gives us a physiologic determination if someone has a unilateral or bilateral hypofunction.
- Reliable and valid shown to reflect changes in patient performance that correlates to their subjective and objective improvements.
- Leads to Gaze stabilization Exercises.
GAZE STABILIZATION

Necessary Head Speeds for Activities

- Walk – 30 degrees/second
- Run– 60 degrees/second
- Drive a car– 85 degrees/second
- Play Sports– 120 degrees/second

Normal is 75 degrees/sec-120 degrees/sec

Vestibular Ocular Reflex (VOR) Exercise x 1

- The primary role of the inner ear and vestibular system is to allow you to keep your eyes stable and focused on objects as you move your head around. The goal of these exercises is to enhance the communication between your inner ears and your eyes.
- The brain uses the inner ear information to determine how much eye movement is needed to allow your eye to stay fixed on an object as you move around. If you move fast enough that the brain perceives difficulty staying fixed and focused, the brain may increase the signal from the inner ear to adjust.
- Over time you will be able to move faster and still maintain visual stability. When you finish an exercise session, you should feel a little uneasy. That means you have pushed the system sufficiently to trigger progress. If you feel perfectly fine, you are probably moving too slow. If you feel very nauseous, you are probably moving too fast. The image must be kept in FOCUS. If not STOP.

VOR Times 1 and Times 2

- The concept is to promote retinal slip in order to improve the use of the VOR for stabilization of a visual target with the head in motion. The patient can be sitting or standing. Typically, they start between 30 and 60 seconds moving the head as fast as they can as they keep the viewing object in FOCUS.
- In the VOR x 2 the eyes now move twice as far as they did in x 1 for the same head movement. Again start with 30-60 seconds.
- Start in sitting and progress to standing position. Start with feet shoulder width apart, then feet closer together with eventually feet in tandem if able. Start with a plain background, progressing to full field stimulus such as checkerboard table cloth or pictures in the background.

Gaze Stabilization Exercises

- VOR x 1
- VOR x 2

VOR EXERCISES

FROM SPORTS TO GERIATRICS

- For those with no defense for VOR exercises (gaze stabilization) do not give it— a VOR deficit by Caloric, Rotary chair, vHIT is NOT a defense for the VOR exercises-It must be a functional deficit in the VOR via DVA/GST or visual analog scale.
Motion Sensitivity Quotient (MSQ)

- **PURPOSE**: Clinical test designed to measure motion-provoked dizziness during a series of 16 quick changes to head or body positions. May also be used as a guide for developing an exercise program for patients with motion provoked dizziness
- **TOOLS NEEDED**: Score Sheet, Stop watch, pencil, couch/table
- **TIME TO ADMINISTER TEST**: 20-30 min
- **AGE RANGE**: Adult: 18-64 years; Elderly adult: 65+
- **POPULATIONS TESTED**: Community dwelling individuals with complaints of motion provoked dizziness during routine movements associated with daily living, Geriatrics, Traumatic Brain Injury, Vestibular Disorders.

**LEADS TO THE USE OF HABITUATION EXERCISES.**

Balance and Gait Assessments-System Integration

- **Timed Up and Go Test (TUG)/Modified TUG (Physical and Mental)** Significant risk for falls for times >10 sec
- **Gait Speed**: there is age-normative data 20-80. Have them walk and talk (Simple and Complex).
- **Berg Balance Scale**
- **ABC- Activity Based Confidence Scale.** There is a direct correlation with DGI improvement and ABC improvement once vestibular function has improved in these patients.
- **Romberg/Tandem Romberg**
- **Reliable and valid.**
- **Functional Gait Assessment (FGA)** (Wrisley et al, 2004)
- **Bess- Good for use with concussion balance testing**
- **4x increase risk of falls if < 15.4 cm (≤6 in) (0-2 points).**
- **8x increase risk of falls if unable to reach head to knee (≥5 points).**
- **It is designed to incorporate those who are not identified in the DGI due to be higher level functioning, yet still has some impairment.**

Motion Sensitivity Quotient (MSQ)

“Visual vertigo is defined as dizziness provoked by full field repetitive or moving visual environments of visual patterns.¹ There are several theories regarding the origin of visual vertigo/motion sensitivity; one theory is motion sensitivity and visual vertigo are due to a sensory conflict or mismatch between the visual, vestibular and somatosensory systems.² It is thought that there is a possible discrepancy between what the person expected and the external stimuli received. Another theory is that the combination of a vestibular disorder and subsequent visual dependence is what causes visual vertigo.¹”


Balance Principles

1. Truericht should be equal as quick as possible
2. The test should be as accurately performed as the first trial with the best (2% margin is ±2 sec).
3. The line should be horizontal. Then do not move the foot for the second trial should be performed. Allow the knee to move with the body, vs. allow the body to move with movement of the body. This is a true step in energy and not a static balance.
4. Less and more energy forces the patient to remain in balance.

Motion Sensitivity Quotient (MSQ)

<table>
<thead>
<tr>
<th>POSITION</th>
<th>INTENSITY</th>
<th>DURATION</th>
<th>SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sitting to Supine</td>
<td>0-5</td>
<td>5-10 sec</td>
<td>1</td>
</tr>
<tr>
<td>Roll Right</td>
<td>0-5</td>
<td>11-30 sec</td>
<td>2</td>
</tr>
<tr>
<td>Dix-Hallpike/Brandt Daroff</td>
<td>0-5</td>
<td>&gt;30 sec</td>
<td>3</td>
</tr>
<tr>
<td>Return to sitting</td>
<td>0-5</td>
<td>5-10 sec</td>
<td>1</td>
</tr>
<tr>
<td>Dix-Hallpike/Brandt Daroff</td>
<td>0-5</td>
<td>11-30 sec</td>
<td>2</td>
</tr>
<tr>
<td>Return to sitting</td>
<td>0-5</td>
<td>&gt;30 sec</td>
<td>3</td>
</tr>
<tr>
<td>Stand/Sit Nose to Left Foot/Knee</td>
<td>0-5</td>
<td>5-10 sec</td>
<td>1</td>
</tr>
<tr>
<td>Stand/Sit Nose to Right Foot/Knee</td>
<td>0-5</td>
<td>11-30 sec</td>
<td>2</td>
</tr>
<tr>
<td>Stand/Sit</td>
<td>0-5</td>
<td>&gt;30 sec</td>
<td>3</td>
</tr>
<tr>
<td>Return to stand/sit</td>
<td>0-5</td>
<td>5-10 sec</td>
<td>1</td>
</tr>
<tr>
<td>Standing 5 Head Rotations</td>
<td>0-5</td>
<td>11-30 sec</td>
<td>2</td>
</tr>
<tr>
<td>Standing Pivot 360 ° Turn to Right</td>
<td>0-5</td>
<td>&gt;30 sec</td>
<td>3</td>
</tr>
<tr>
<td>Standing Pivot 360 ° Turn to Left</td>
<td>0-5</td>
<td>5-10 sec</td>
<td>1</td>
</tr>
</tbody>
</table>

**MSQ DESCRIPTION**

- **Leads to use of habituation exercises.**
- **4x increase risk of falls if < 15.4 cm (≤6 in) (0-2 points).**
- **8x increase risk of falls if unable to reach head to knee (≥5 points).**

Source: Behold Measures Data Base
MSQ CUT OFF SCORES

- Raw score: 0-128
- Mild = 0-10; Moderate = 11-30; Severe = 31-100
- (Sharon and Hullar, 2013)
- Individuals with vestibular migraine and Meniere’s disease scored significantly higher on the MSQ than controls (p < 0.0001)
- Individuals with Motion Provoked Dizziness:
  - (Shepard et al, 1993)
  - 0-10% = mild motion sensitivity
  - 11-30% = moderate motion sensitivity
  - 31-100% = severe motion sensitivity

Motion Sensitivity Quotient

- Pick the top 4 movements to work on
- These tests look at generation of symptoms resulting from head movements in all planes of motion-yaw/pitch/roll
- Leads to Habituation Exercises
- Habituation Exercises: The Goal is to reduce or eliminate response to a specific stimulus with repeated exposure-repeated head movements with or without total body movements
- Need to give specific exercises as they do not appear to generalize.

KEY POINTS

- Vestibular Rehab is symptom driven
- Put the vestibular system back together with exercise
- VNG is useful to determine hypofunction, but it does not drive therapy. Someone may already be compensated (doesn’t require therapy) where as someone else may be symptomatic (does require therapy)
- Not all patients need all categories of exercises-give only that needed
- Pre and post assessments are helpful but it is different than exercises.
- Audiologists can treat BPPV.

TREATMENT IDEAS: Use a head laser