



Vestibular Rehabilitation

Wendy Carender, PT, NCS
Board-Certified Clinical Specialist in Neurologic Physical Therapy
Vestibular PT Clinical Specialist
Michigan Balance Vestibular Testing & Rehabilitation
Department of Otolaryngology, Michigan Medicine



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Vestibular Physical Therapy - VPT

- A specialized form of **evidence-based therapy** designed to alleviate primary and secondary symptoms related to disorders of the inner ear or brain.
- Primary symptoms
 - Vertigo, dizziness
 - Impaired balance
 - Gait instability
- Secondary symptoms
 - Decreased strength, deconditioning
 - Increased cervical muscle tension, headaches
 - Anxiety and fear of falling



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Objectives

- Present the Key Concepts of Vestibular Rehabilitation
- Discuss How Physical Therapists and Audiologists Collaborate at Michigan Medicine
- Provide Clinician and Patient Resources



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Vestibular Physical Therapy

- **Individualized** exercise program involving specific exercises that can reduce or eliminate symptoms of dizziness and disequilibrium by promoting central nervous system compensation. Smith-Wheelock, Shepard, Tellan, 1991
- Main goals of VPT
 - Decrease dizziness and visual symptoms
 - Improve balance and gait stability, prevent falls
 - Increase activity level and conditioning
 - Decrease disability, return to work, driving, daily activities
 - **Improve Quality of Life**



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Michigan Balance Vestibular Testing and Rehabilitation

- Team of 6 audiologists and 3 physical therapists (PTs) with advanced training in vestibular testing and rehabilitation.
- We work side-by-side to evaluate and provide up-to-date, evidence-based testing and treatment.
- We pride ourselves on excellent patient education.
- We work closely with our medical residents and board-certified Neuro-otologist physicians who have specialized training in evaluating patients with dizziness.
- We provide comprehensive evaluation and management for patients with hearing loss, tinnitus, dizziness and balance disorders.



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Common Diagnoses Treated with VPT

- Benign Paroxysmal Positional Vertigo-BPPV
- Vestibular Neuritis/Labyrinthitis – Unilateral vestibular hypofunction
- Bilateral vestibular hypofunction
- s/p Surgical intervention: acoustic neuroma resection, labyrinthectomy, SSCD repair, canal plugging
- Migraine Related Dizziness
- Dizziness of central origin: TBI (concussion), CVA, MS
- Motion provoked dizziness
- Visual vertigo
- Persistent Postural-Perceptual Dizziness (3PD)



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Contra-indications for VPT

- Spontaneous vertigo - Acute Meniere's Disease
- CSF leak
- Cervical instability or fracture (acute stages)

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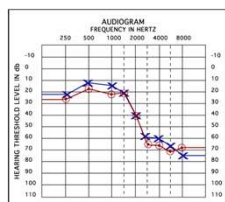
History continued

- Duration
 - Seconds: BPPV, orthostatic hypotension
 - Minutes: Migraine, TIA, Panic Attacks
 - Hours: Meniere's, Migraine
 - Days: Initial Vestibular Crisis, Central
 - Constant: Bilateral Vestibular, Central, Persistent Perceptual-Postural Dizziness (PPPD, 3PD)
- Frequency
 - daily, weekly, monthly
- Precipitating Factors:
 - Change in head position: BPPV
 - Bright lights, loud sounds, visual motion: Migraine

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Vestibular PT Evaluation

- Chart Review: Audiogram, Balance Function Testing Results
- Performed by Audiologists



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History

- Sensation: Have the patient describe their dizziness without using the word dizzy!
 - Spinning: peripheral vestibular disorders, BPPV
 - Lightheaded: cardiac, medications, orthostatic hypotension, TIA
 - Heavy-headed: migraine dizziness or central
 - Floating/Rocking: Mal de Debarquement, anxiety/depression
 - Motion Sensitivity: vestibular Migraine
 - Visual sensitivity to busy patterns/environments: Visual Vertigo
 - Oscillopsia: bilateral peripheral vestibular
 - Disequilibrium/Unsteady Gait: peripheral vestibular and central pathologies, peripheral neuropathy



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Vestibular PT Exam - History

- **Most important part of the Vestibular Exam!**
- Initial onset of symptoms: acute or chronic?
 - Is there a history of a vestibular crisis lasting hours to a few days?
 - OR Did the symptoms come on gradually?
- Nature of symptoms:
 - Continuous: central disorders, anxiety
 - Episodic
 - Motion provoked: common with peripheral or migraine related dizziness
 - Related to change in head position? BPPV
 - Visually provoked
 - Spontaneous: Meniere's, TIA

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History

- Associated Symptoms:
 - **Hearing loss:** Acoustic Neuroma, Labyrinthitis, Meniere's Disease
 - **Tinnitus:** Meniere's, Migraine, Labyrinthitis, Acoustic Neuroma
 - Ear fullness: Superior semi-circular canal Dehiscence, Meniere's
 - Headache: Migraine
 - Photophobia: Migraine
 - Phonophobia: SCD, Migraine
 - Nausea and vomiting: stimulation of the medulla
- Fall History: where, when do the falls occur?
- Impact on Function: academics, work, driving, exercise
- Use of Meclizine/Antivert

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Subjective Questionnaires

- Dizziness Handicap Inventory (DHI)
 - Measure of self perceived disability related to dizziness.
 - 25 questions divided into 3 categories: functional, physical and emotional.
 - The higher the score, the greater perceived disability related to dizziness. (0-30 = mild disability, 31-60 = moderate disability, 61-100 severe disability)
- There is a correlation between DHI scores below 30 likely relating to structural disorders alone, and scores above 60 relating to functional or psychiatric disorders, with or without coexisting structural conditions (Graham, Staab, Lohse, & McCaslin, 2021).

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Treatment Overview

- Patient Education: movement will help you to heal!
- Vestibular Exercises
 - Adaptation
 - Habituation
 - Substitution
- Balance Exercises
- Gait Exercises
- Strengthening: ankle and hip balance reactions
- Conditioning/Aerobic Exercise: WALK

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The Activities-specific Balance Confidence (ABC) Scale®

Instructions: For each of the following activities, please indicate your level of balance confidence by choosing one of the points on the scale below from 0% to 100%.
If you do not currently do the activity, 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. If you have any questions, please ask the administrator.

- | 0% | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100% |
|--|---|----|----|----|----|----|----|----|----|----------------------|
| No Confidence | | | | | | | | | | Completely Confident |
| How confident are you that you can maintain your balance and remain steady 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 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? _____% | | | | | | | | | |

Scores < 67% indicates a risk for falling



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Life-Style Modifications

- Stress/Anxiety Management
- Sleep Hygiene
- Hydration
- Limit caffeine/alcohol
- Exercise- WALK
- Avoid taking Meclizine (Antivert)

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Vestibular PT Exam

- Oculomotor Exam in room light and with videogoggles
 - Saccades and Pursuits
 - Spontaneous, gaze and post head shake nystagmus
- Motion and Visual Sensitivity Testing
- Balance Tests: firm, foam, eyes open, eyes closed
- Gait Tests: Dynamic Gait Index, Functional Gait Assessment
- Leg Strength, LE proprioception and sensation
- Dix-Hallpike and Roll Tests for BPPV




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Adaptation Exercises

- Vestibular Adaptation of the Vestibular Ocular Reflex (VOR)
 - Stimulus that produces an error signal that the CNS attempts to reduce by modifying the GAIN (eye movement/head movements) of the vestibular system.
 - Best stimuli appear to be those that incorporate movement of the head and a visual input
- Gaze Stabilization Exercises: VOR x 1, VOR x 2
- Important Exercise for treatment of Unilateral Peripheral Vestibular Hypofunction!

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Date: ___/___/20__



Vestibular Rehabilitation Gaze Stabilization Exercise VORx1

X

• Do this exercise while holding a target "X" at arm's length away and/or taped to the wall, eye level at 5 feet.

• Follow this exercise progression as you are able to safely:

- Sitting in a chair
- Standing on firm surface progressing to pillow
- Marching in place
- Walking in a hallway

• Move your head as follows in a **SMALL RANGE** of motion while keeping your eyes focused on the letter:

- Side to side, like you're shaking your head to say "No"
- Up and Down, like you're nodding your head "Yes"


• Move your head as fast as possible while keeping the letter **STEADY** and in **FOCUS**.

• Do this exercise for 1-2 minutes (at each distance). Stop sooner if your symptoms reach a 6 out of 10 level of dizziness.

• Rest until your dizziness returns to baseline level plus 30 seconds.

• Perform 1 repetition each.


• Repeat 5 / 4 / 5 times per day.



Research shows that doing this exercise for 12 minutes/day in acute cases (less than 5 months) and 20 minutes/day in chronic cases (greater than 5 months) helps improve your ability to focus your eyes when your head is moving.


Doing your exercises as recommended leads to **POSITIVE** results!

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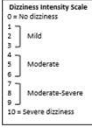



Vestibular Rehabilitation Habituation: Head Motion Side to Side

• The goal of habituation training is to help decrease symptoms of vertigo, dizziness, or nausea that are brought on by specific head and body motions.

• These exercises might make your symptoms worse at first. However, stick with the exercises and work through your symptoms. With repetitions and time, the exercises will help to reducing or eliminating your symptoms.


• Do this exercise with just enough intensity to bring on moderate dizziness. Moderate dizziness = 4-6 on a 10-point scale. Your symptoms should pass within 30 to 60 seconds.





While sitting down in a chair, tilt your head down slightly. Next, quickly move your head left to right 5 times with your eyes open. Wait until your symptoms go away, plus 30 seconds.


Repeat 3 times per session. Do 3 sessions each day.



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Substitution


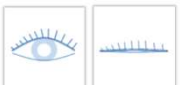

- Exercises that focus on the use of visual and proprioceptive cues as well as central programming in the absence of vestibular input to improve gaze and postural stability.
- Treatment of Complete Bilateral Hypofunction
 - Eye-Head Movements: Eyes move first, then head
 - Balance training: focus on proprioceptive inputs through feet
 - Use of Assistive Device




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Balance Training

- Wide to Narrow base of support
- Head Movements
- Eyes open, eyes closed
- Compliant foam surface, rocker boards
- Walking drills
 - Walking with changing gait speed
 - Walking with horizontal and/or vertical head movements
 - Walking figure 8 patterns
 - Tandem gait
 - Add Cognitive Tasks









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Habituation

- Repeated exposure to a provocative stimulus will result in a reduction of the response to that stimulus
- Motion Sensitivity Testing to guide targeted exercises
- Exercises include repeated head movements and position changes
- Key is to present the stimulus to provoke moderate dizziness, several times per day, using caution **NOT to over stimulate**.
- Typical home program involves 2-3 specific movements performed 3-4 times per day.



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Vestibular Exercises

Diagnosis	Area of Focus	Exercise
<ul style="list-style-type: none"> • Unilateral Hypofunction • Bilateral Hypofunction (incomplete) 	<p>Adaptation</p> <ul style="list-style-type: none"> -Long term changes that occur in the response of the vestibular system to input. -Stimulus that produces an error signal that the CNS attempts to reduce by modifying the gain of the vestibular system 	<p>VOR x 1, VOR x 2</p>
<ul style="list-style-type: none"> • Bilateral Hypofunction (complete) 	<p>Substitution</p> <ul style="list-style-type: none"> -Exercises that focus on the visual and somatosensory cues as well as central programming in the absence of vestibular input to improve gaze and postural stability 	<p>Corrective saccades Imaginary targets Balance focusing on proprioceptive inputs Importance of Vision Education: Use of assistive device, caution when swimming or walking in the dark</p>
<ul style="list-style-type: none"> • Vestibular Migraine • Motion Sensitivity • Visual Vertigo • Unilateral Hypofunction 	<p>Habituation</p> <ul style="list-style-type: none"> -Repeated exposure to a provocative stimulus will result in desensitization. 	<p>Repetitive head movements and position changes that provoke mild-moderate symptoms. *Key is to present the stimulus to provoke moderate dizziness, several times per day, using caution NOT to over stimulate.</p>
<ul style="list-style-type: none"> • Any of the above diagnosis with imbalance 	<p>Balance</p> <ul style="list-style-type: none"> Patients demonstrating difficulty with balance testing. <p>Gait</p> <ul style="list-style-type: none"> Patients demonstrating impaired results with standardized gait assessments: TUG, DGI, FGA. 	<p>Firm/Foam Eyes open/eyes closed Wide base/narrow base Horizontal and Vertical Head Movements</p> <p>Daily walking program Walking with head movements, figure 8 patterns, tandem gait</p>


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BPPV

- **Benign:** not life threatening, symptoms may be intense
- **Paroxysmal:** occurs suddenly
- **Positional:** provoked by change in position of the head
 - Looking up
 - Getting in/out of bed
 - Rolling over in bed
 - Bending forward
- **Vertigo:** sense of rotation or spinning lasting less than one minute


Dix-Hallpike Test

To test the **LEFT** ear:
Turn your head halfway to the left and lie down quickly. Keep your head turned halfway (45 degrees) to the left. Your head should be slightly tipped back. Wait for 30 to 60 seconds.

- If there is no dizziness after 60 seconds, sit back up. Move on to the test for the right side.
- If you feel dizziness, stay in this position for another 30 seconds. After 30 seconds, you should do the Epley Maneuver for the left ear.
- Scan this QR code to see a video demonstration of the left Epley: 



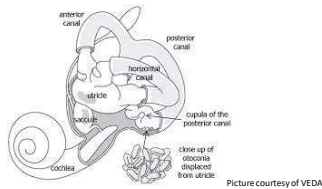
To test the **RIGHT** ear:
Turn your head halfway to the right and lie down quickly. Keep your head turned halfway (45 degrees) to the right. Your head should be slightly tipped back. Wait for 30 to 60 seconds.

- If there is no dizziness after 60 seconds, sit back up. If you feel dizziness, stay in this position for another 30 seconds. After 30 seconds, you should do the Epley Maneuver for the right ear.
- Scan this QR code to see a video demonstration of the right Epley: 



Mechanism

- **Otoconia:** calcium carbonate crystals that are attached to the otolithic membrane in the utricle
- BPPV occurs when otoconia detach from the utricular membrane and migrate into the semi-circular canals.
- Head movement → otoconia shift → endolymph flow → cupular deflection → signal to brain → vertigo and nystagmus.



Picture courtesy of VEDA

Date: ___/___/20__

Vestibular Rehabilitation
Epley Maneuver for the Left Ear

Place a folded blanket on the bed so it is at the level of your shoulder blades when you lay down. This will allow your head to lie back slightly, but remain supported by the back.

1. Begin by sitting on your bed with your legs stretched out in front of you. Turn your head halfway (45 degrees) to the LEFT.

2. Keep your head turned halfway to the left and lie down quickly. Your head should stay turned halfway (45 degrees) to the LEFT and should be tipped slightly back. Wait until your dizziness passes, plus 30 seconds.

3. Keep the back of your head in contact with the bed and slowly turn your head halfway (45 degrees) to the RIGHT. Wait 30 seconds.

4. Roll onto your RIGHT side with your nose pointed diagonally (45 degrees) downward towards the floor. Important: Your forehead should not be resting on the bed. Your head should be in line with your spine. Stay in this position until your dizziness passes, plus 30 seconds.

5. Slowly return to sitting at the edge of the bed. Sit with your head level for 15 minutes. Perform this maneuver 1-3 times per day, as tolerated. If no longer experiencing positional dizziness, then stop doing this maneuver.

For the next few hours, avoid bending over at the waist or tipping your head up or down. You should also avoid lying down flat to rest or to take a nap. However, you can sleep in your normal position when you go to bed at night. Resume all of your normal activities the next day.

Important: Never perform the Epley Maneuver for the RIGHT and LEFT ear within the same 24-hour period.

For a video demonstration of the Left Epley, scan QR Code: 

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Types of Posterior Canal BPPV

Canalithiasis	Cupulolithiasis
Most Common	Less Common
Otoconia float freely in endolymph	Otoconia adhere to the cupula
Latency in onset of nystagmus	Immediate onset of nystagmus
Fluctuation in intensity of nystagmus	Persistent intensity of nystagmus
Typically resolves in < 30 seconds	Typically lasts > 60 seconds
Treatment: Epley Maneuver	Treatment: Liberatory Maneuver

Audiologist and PT Collaboration

- We both utilize the evaluation findings from each other!
- Coordinated Testing/ PT Intervention for pre-op Vestibular Schwannoma Patients
- Treatment of Patients with BPPV
- Multi-disciplinary Otolaryngology Case Conference
- Education of Otolaryngology and Neurology Residents
- Development of Patient Educational Materials
- Research: Somatosensory Tinnitus and Manual Physical Therapy

Resources: Vestibular Exercise Handouts and Videos

- Care Guides at Michigan Medicine:
<https://careguides.med.umich.edu/browse-by-medical-service/balancevestibular>

The screenshot shows a webpage titled "Michigan Balance Vestibular Testing & Rehabilitation" under the "Care Guides" section. It lists various exercise categories: Benign Paroxysmal Positional Vertigo (BPPV) Exercises (Posterior Canal, Horizontal Canal, Anterior Canal), Gaze Stabilization Exercises (Gaze Exercises), Habituation Exercises (Motion Sensitivity, Visual Sensitivity), Static Balance Exercises (Static Balance, On Foam Surface, With Arm Support), Dynamic Balance Exercises (Weight Shifting, Firm Surface, Fresh Surface, Gait Exercises), and Ocular-Motor Exercises (Ocular-Motor Exercises). The Michigan Medicine logo is visible at the bottom right.

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Discussion and Questions?

Wendy Carender, PT
wcaren@med.umich.edu
Michigan Balance Vestibular Testing and Rehabilitation
Phone: 734-936-8051, ext 2



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Resources: Patient Education and How to Find a Vestibular PT

- VEDA: www.veda.org

The screenshot shows the VEDA website homepage. It features a navigation menu with links for Podcasts, VEDA Store, Get Updates, Get Involved, Ways to Give, and Log In. A search bar is also present. The main content area includes a photo of a woman and the text "DISCOVER A LIFE REBALANCED". A "DONATE" button is visible in the top right corner.



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Resources: How to Find a Vestibular PT

The screenshot shows the American Physical Therapy Association (APTA) website. The navigation menu includes links for About Us, For Patients, Professional Resources, Practice Resources, Special Interest Groups, Research, Education / Conferences, and Join. The main content area features a section titled "How to locate a physical therapist that specializes in neurologic conditions?" with a "FIND A PT" button. Other sections include "In This Section" with links to Find a Neurologic Physical Therapist, Neurologic Clinicians, Special Interest Groups of the Academy of Neurologic Physical Therapy, and IAS Tax Benefits. There is also a "CSM 2024" section for Proposals and Abstract Submissions and a "Sign Up, Join a SIG" section.



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