Vestibular Examination and Treatment for the Orthopedic Physical Therapist

Common Causes of Vestibular Dysfunction[7]

Traumatic Brain Injury
BPPV
Vestibular Neuronitis
Labyrinthitis
Meniere Disease
Vertebrobasilar Insufficiency
Vertebrobasilar Migraines
Multiple Sclerosis
Medications
Psychiatric Disorders

Examination Components

History and Medications Review
Red Flags
Neuromuscular Exam
Oculomotor Tests (see Table 1)
Vestibular Tests (see Table 1)
Gait Analysis
Patient Self-Report Measures

Neuromuscular Exam

Range of Motion
Strength
Dermatomes
Cerebellar Tests
- Finger-nose-finger
- Rapid alternating movements

Reflexes

Red Flags[2]

Pupillary asymmetry
Seizures
Repetitive vomiting
Worsening headache
Disoriented to person or place
Appears confused or irritable
Slurred speech
Unsteady on feet
Weak or numb extremities

Refer to Neurology

Common Symptoms

Nausea
Vomiting
Light-headed
Disequilibrium
Rocking/swaying
Vertigo
Oscillopsia
Floating/swimming
Diplopia
Decreased hearing
Fullness in ears
Tinnitus

PT Interventions: Vestibular Rehabilitation

Substitution[8]

Educate patient on visual and somatosensory strategies to replace vestibular loss

Cervical Ocular Reflex
Attach a laser to hat or headband. With eyes closed, patient rotates head away from target on wall, and then returns to target.

Patient Self-Report Measures

Dizziness Handicap Inventory (DHI)
Assess self-perceived disability from vestibular dysfunction
25 items, Normal: <12 points

Activities-specific Balance Confidence Questionnaire (ABC)
Assess balance confidence with particular activities
16 items, Acceptable Range: 80-100%

Habituation[2,9]

Patient repeatedly moves into position that provokes symptoms

Motion Sensitivity Quotient (MSQ)
16 symptom-provoking positions
Scored by duration and intensity of dizziness

The Epley Maneuver for BPPV[2,3]

Patient in final Dix-Hallpike position. Maintain until nystagmus subsides plus additional 30 seconds. Turn head 90° toward unaffected side, hold for the same duration. Maintain head position and roll patient onto unaffected side, hold for the same duration. Return patient to sitting.

Task-Specific Functional Exercises[2]

Balance on varying surfaces
Static and dynamic
With/without head movement
With/without eyes closed
Quick movements, pivots, rolls

Musculoskeletal Exercises[10]

Cervical Stabilization
Posture
Trunk Flexibility

Adaptation[2]

VORx1
VORx2
Gaze stability exercises while head is in motion

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Table 1: Oculomotor and Vestibular Tests[1-6]

Test	Patient Position	Application	Abnormal Findings and Interpretation
Near Point of Convergence	Short sitting	Therapist brings pen tip close to patient's nose; maintaining it at eye-level. Record distance where patient reports seeing double. Therapist then brings pen tip away, records distance where patient reports seeing single, fused object.	Normal values: ≤7.5 centimeters for initial diplopia, ≤10.5 cm for recovery of single image. Abnormal values indicate vergence dysfunction, a common visual issue after mTBI.
Vestibulo-Ocular Reflex	Short sitting	Therapist instructs patient to maintain visual focus on therapist's nose. Therapist slowly turns patient's head in varying directions.	Multiple saccades or difficulty maintaining gaze on therapist's nose indicates a positive test and impaired VOR.
Head Shake Nystagmus	Short sitting, head flexed 30°, eyes closed	Therapist oscillates the head horizontally 20 times, 20° to each side, with a frequency of 2 Hz. After oscillation, the therapist observes for nystagmus in patient's open eyes.	>3 beats nystagmus with quick phase directed towards healthy ear and slow phase directed toward side of lesion indicates unilateral vestibular hypofunction
Head Thrust Test	Short sitting, head flexed 30°	Therapist applies a high-acceleration, low-amplitude head rotation to each side. Patient's eyes are to remain fixated on therapist's nose.	Corrective saccade after head rotation indicates abnormal VOR and UVH/BVH. Positive test result indicates lesion on the side to which the head was rotated.
Dix-Hallpike Positional Test	Long sitting, head rotated 45° toward test side	Therapist lowers patient from long sitting to supine, maintaining the head rotation and bringing the head into 30° of extension.	Vertigo, nausea, and/or nystagmus that resolve within 60 seconds indicate BPPV. Right side posterior canal BPPV: upbeat, right torsion Right side anterior canal BPPV: downbeat, right torsion
Dynamic Visual Acuity Test	Short sitting	Patient is asked to read the lowest line possible on Snellen eye chart. Therapist then horizontally oscillates patient's head with a frequency of 2 Hz while patient again reads the lowest line possible.	Greater than 2 line loss (patient must read larger text on chart with head movement) indicates insufficient VOR and UVH/BVH.
Sharpened Romberg	Standing, eyes closed, feet in tandem, arms crossed over chest	Therapist observes patient for postural sway and/or loss of balance in each position. Patient is asked to reverse foot position for a second test.	Patient unable to balance 30 seconds or excessive postural sway indicates positive test and UVH/BVH. Sharpened Romberg is often negative for central lesions.
Modified Clinical Test of Sensory Interaction and Balance (CTSIB)	1) Stand with eyes open on firm surface 2) Stand with eyes closed on firm surface 3) Stand with eyes open on compliant surface 4) Stand with eyes closed on compliant surface		Unable to balance/excessive sway in one or more positions indicates abnormality. Condition 4 challenges the vestibular system most; allows for differentiation between vestibular and non-vestibular balance issues.

Key: Benign Paroxysmal Positional Vertigo (BPPV), Bilateral Vestibular Hypofunction (BVH), Unilateral Vestibular Hypofunction (UVH), Vestibulo-Ocular Reflex (VOR), 2 Hz = 2 reps/second

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