

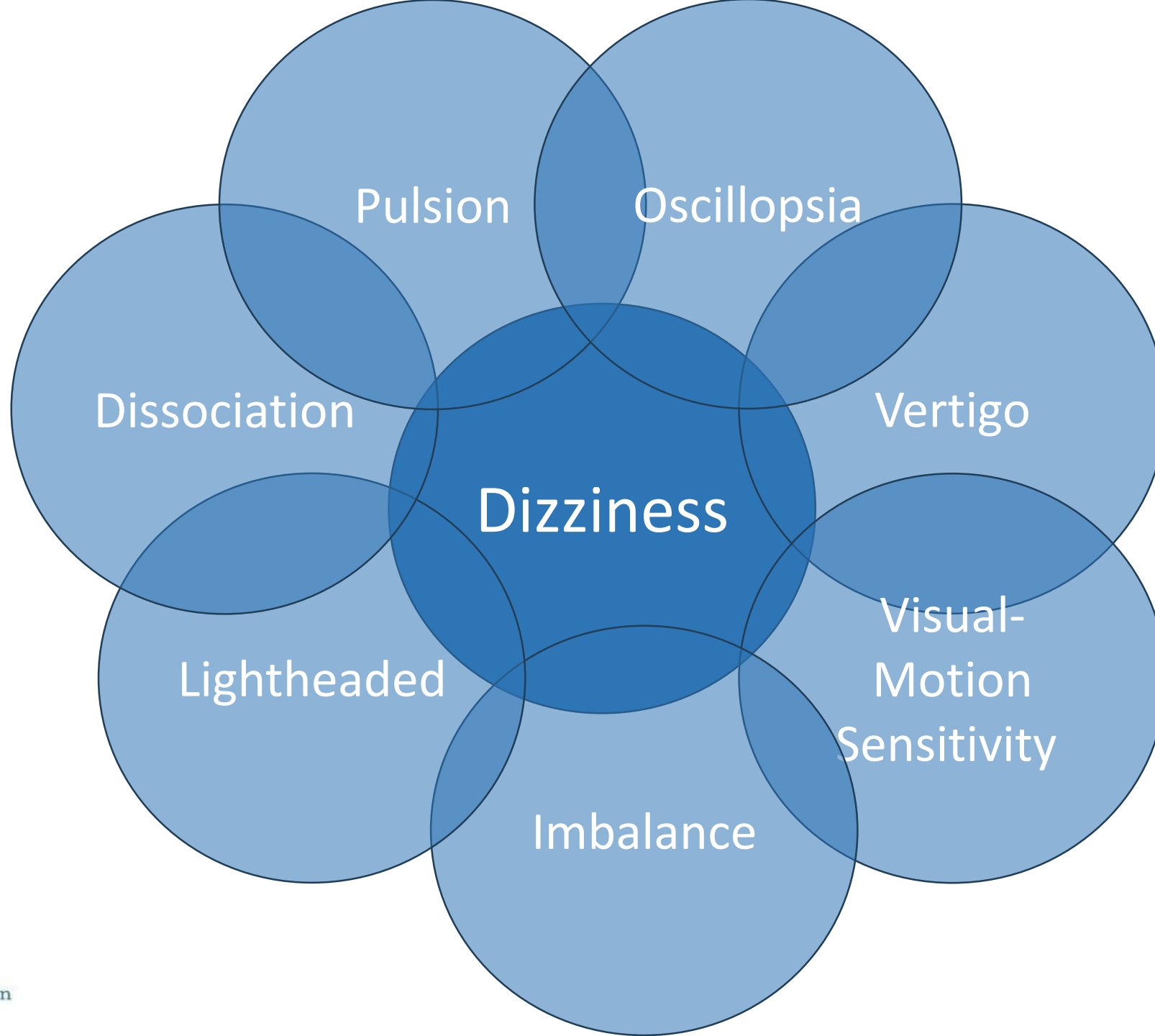


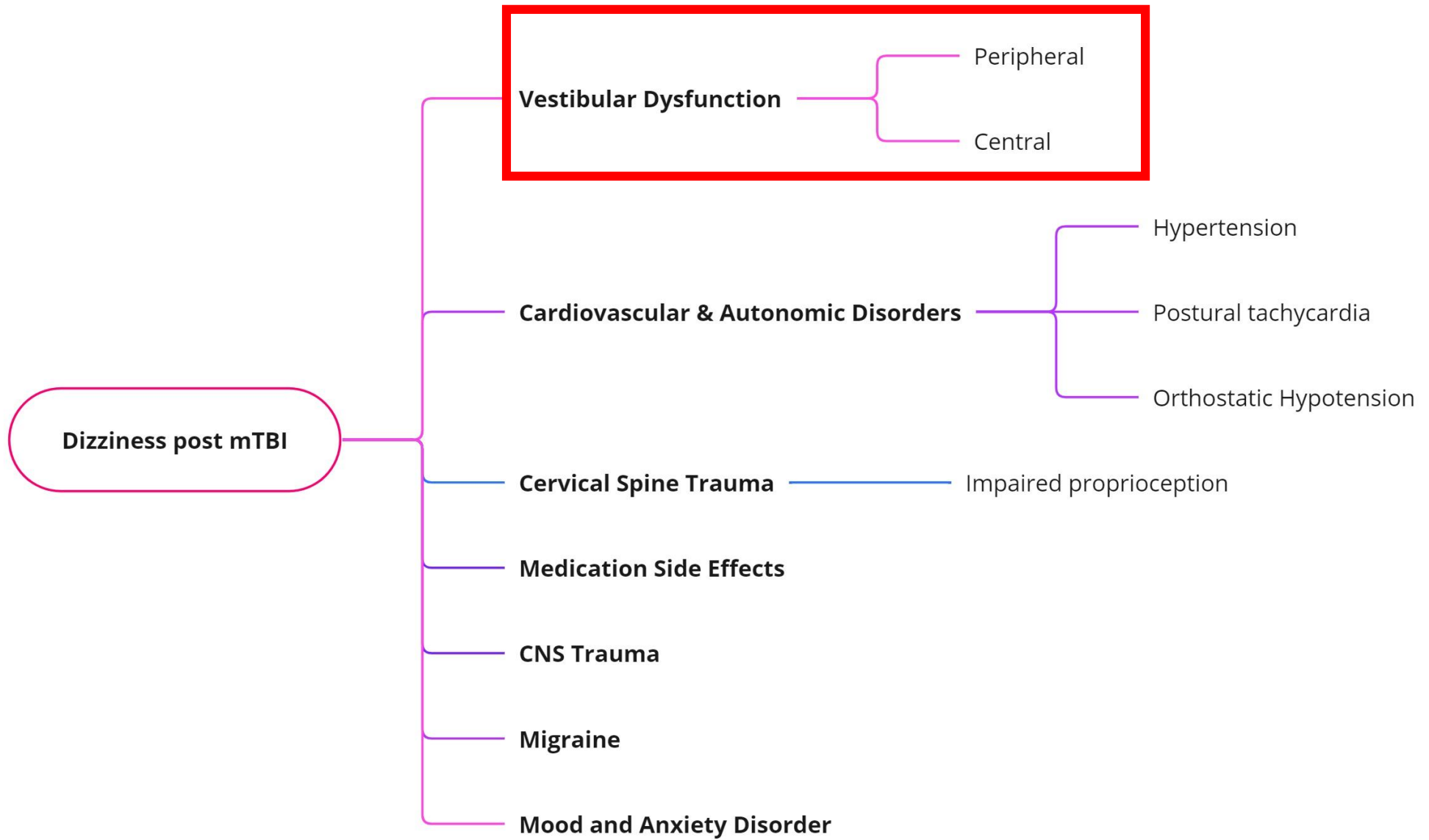
Dizziness Assessment & Treatment Workshop

for Persistent Dizziness Post-Concussion

Alexandra Young, PT, MScPT, MScKin

February 9, 2024





Learning Objectives

Review basic vestibular system structures and application to common vestibular disorders post concussion

- BPPV
- Vestibular Hypofunction
- Visual-Motion Sensitivity

Discuss key vestibular assessment and treatment strategies including:

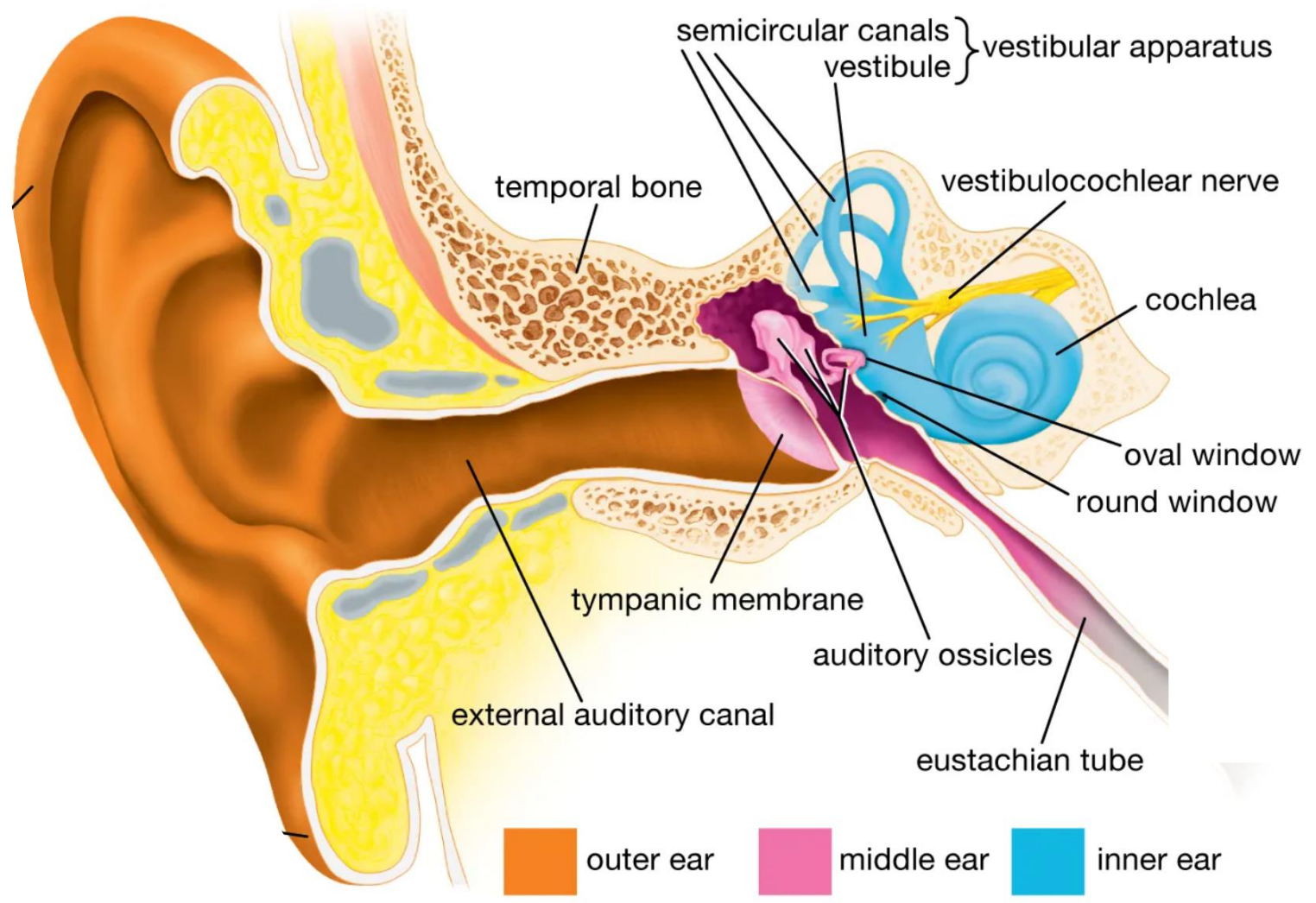
- Dix-Hallpike and Epley maneuver for BPPV
- CNS and Oculomotor Screening
- VOR testing and gaze stability exercises for vestibular hypofunction
- Visual-Motion sensitivity assessment and treatment principles

Understand the role and evidence of vestibular rehab post-concussion

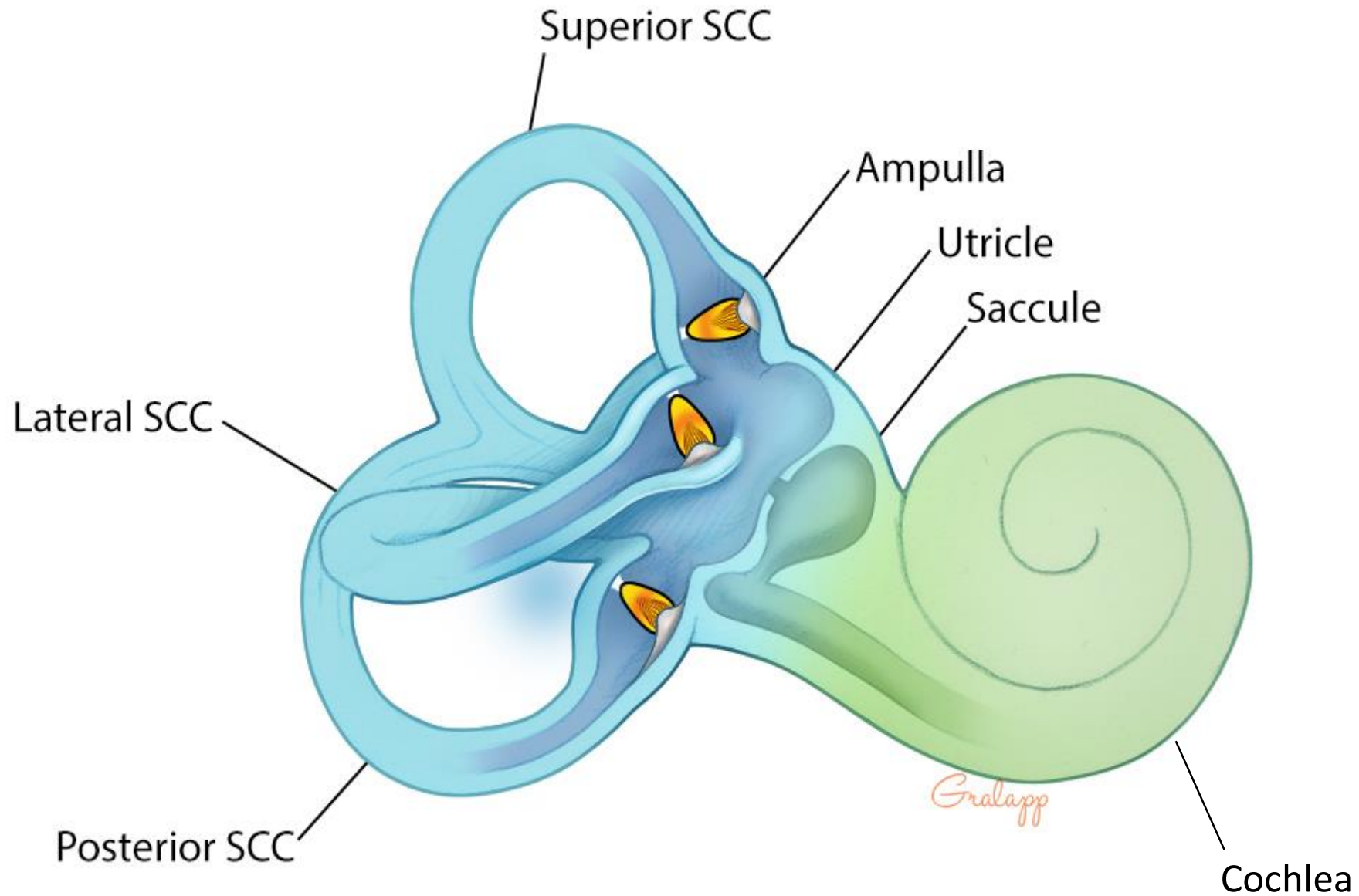
Why is vestibular rehab important post concussion?

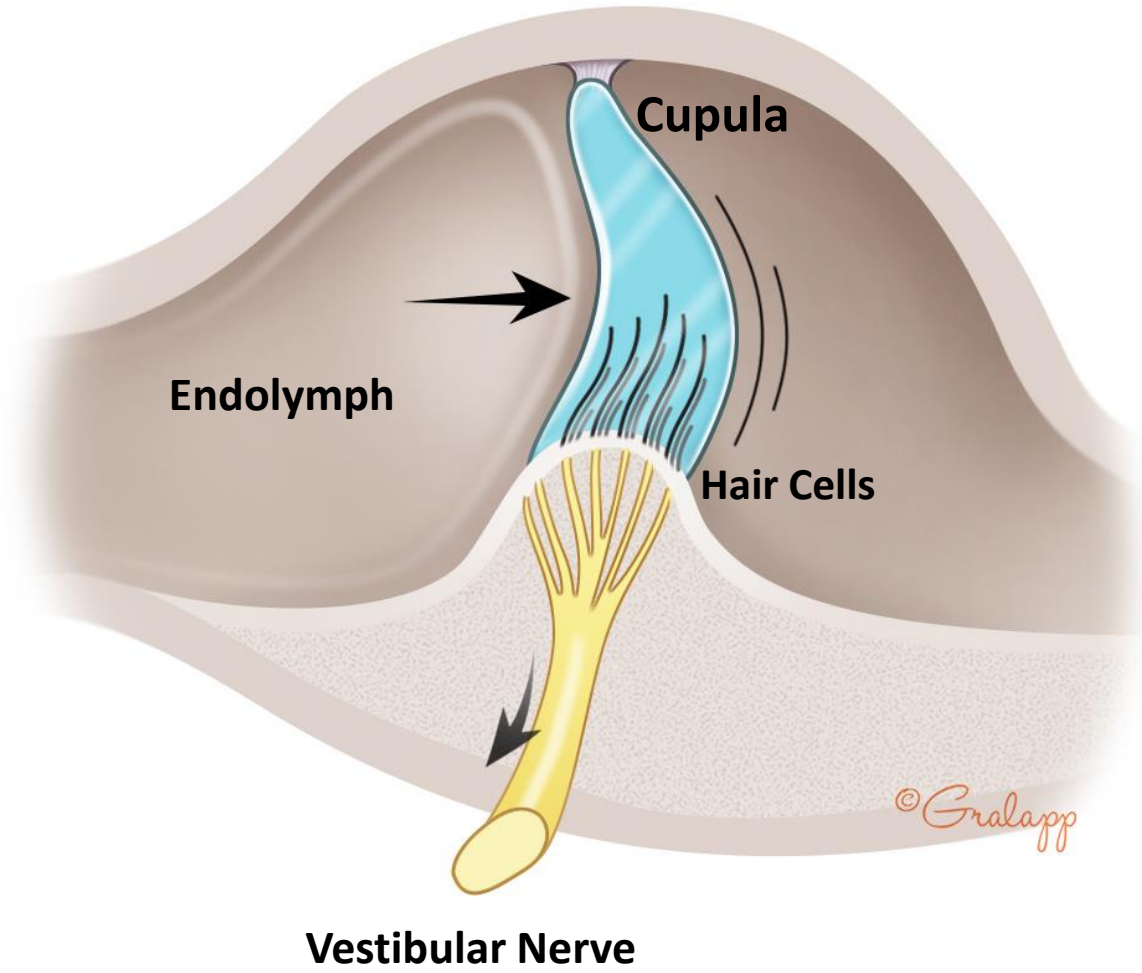
- Post-traumatic dizziness ranks as the second most prevalent symptom following concussion
 - 50-84% of athletes report dizziness post sport-related concussion
- Dizziness presentation and vestibular dysfunction acutely post-concussion has been linked to protracted recovery and persistent symptoms
- Vestibular rehab therapy has been proven to be an effective treatment for patients with persistent dizziness post-concussion

Vestibular System



© Encyclopædia

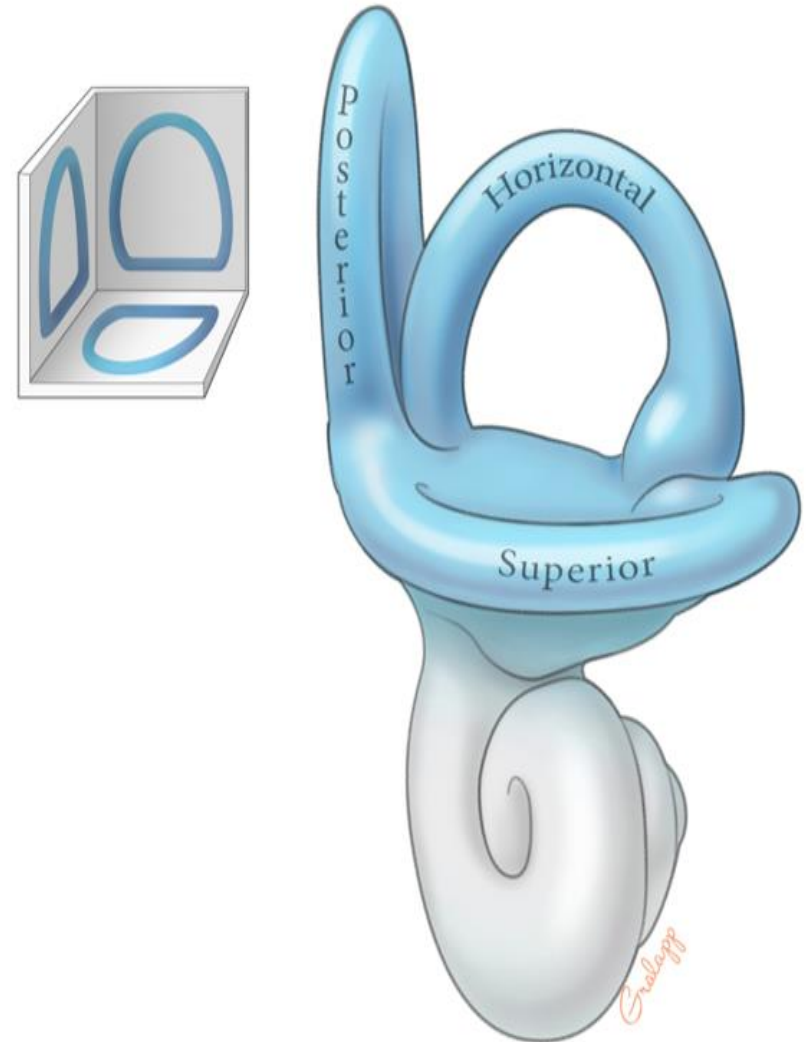




Semicircular Canals

Detect:

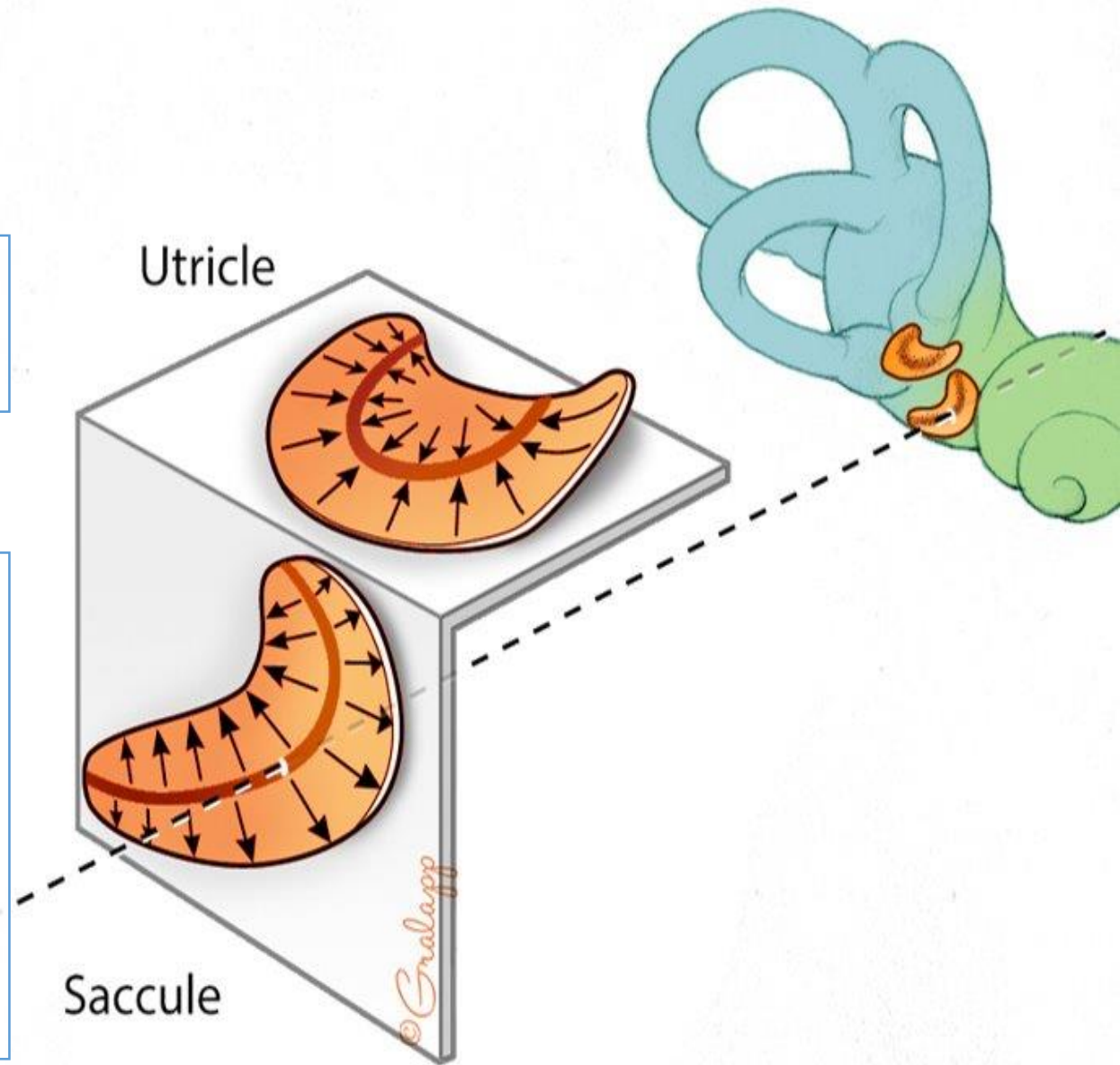
- Head Rotation
- Angular Movement
- Acceleration/deacceleration

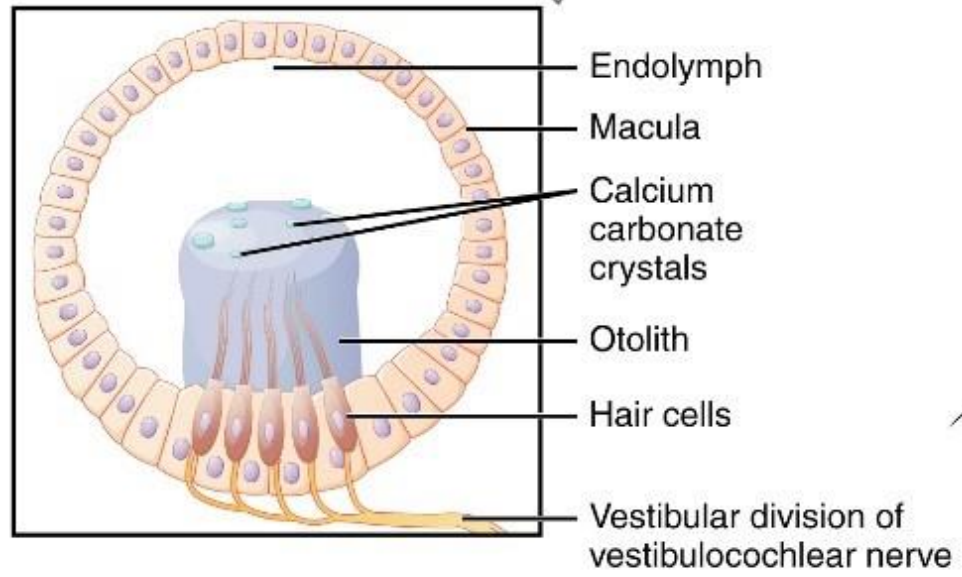
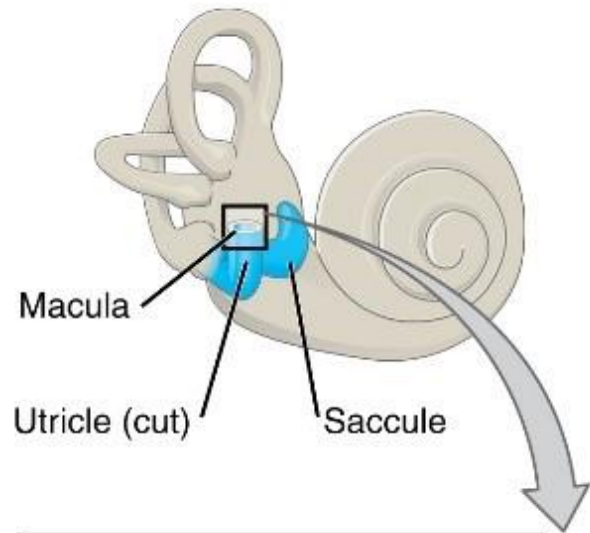


Otoliths

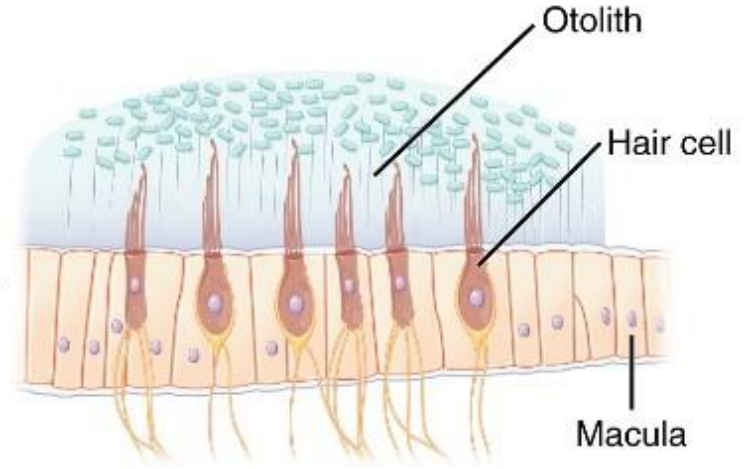
Detect:

- Linear acceleration
- Head movement relative to gravity

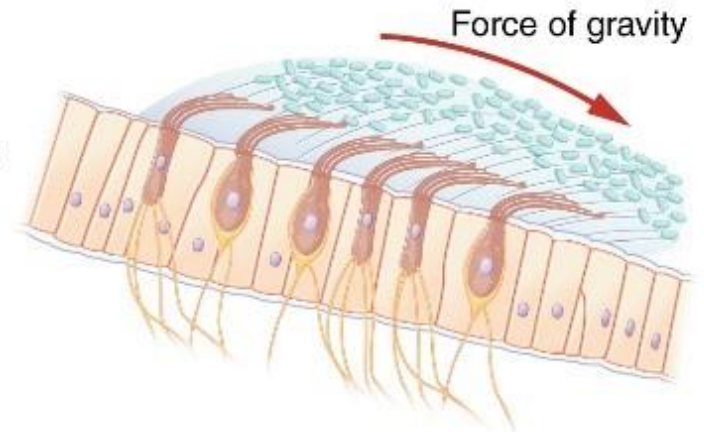




Head upright



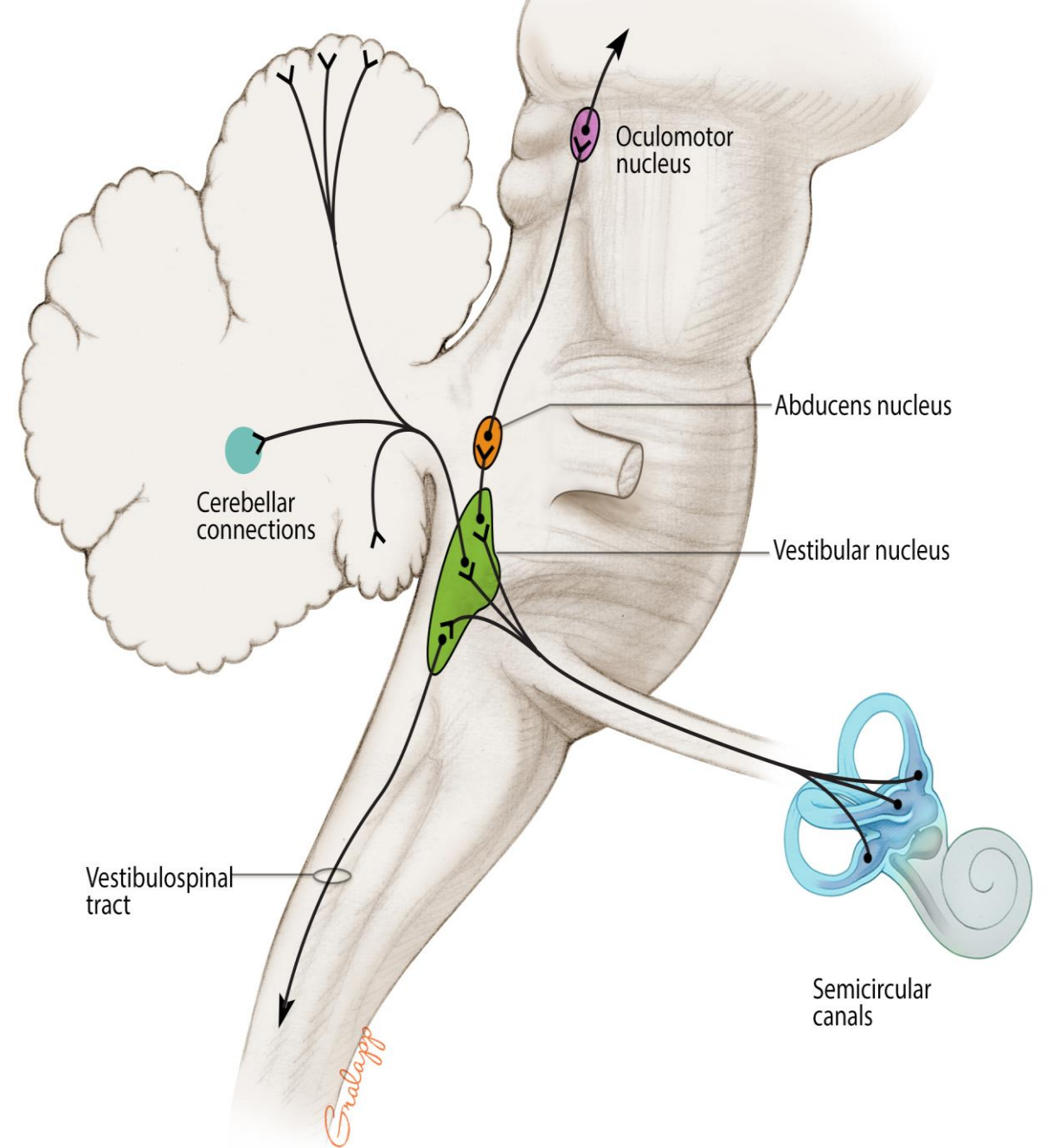
Head tilted forward



Gaze Stabilization

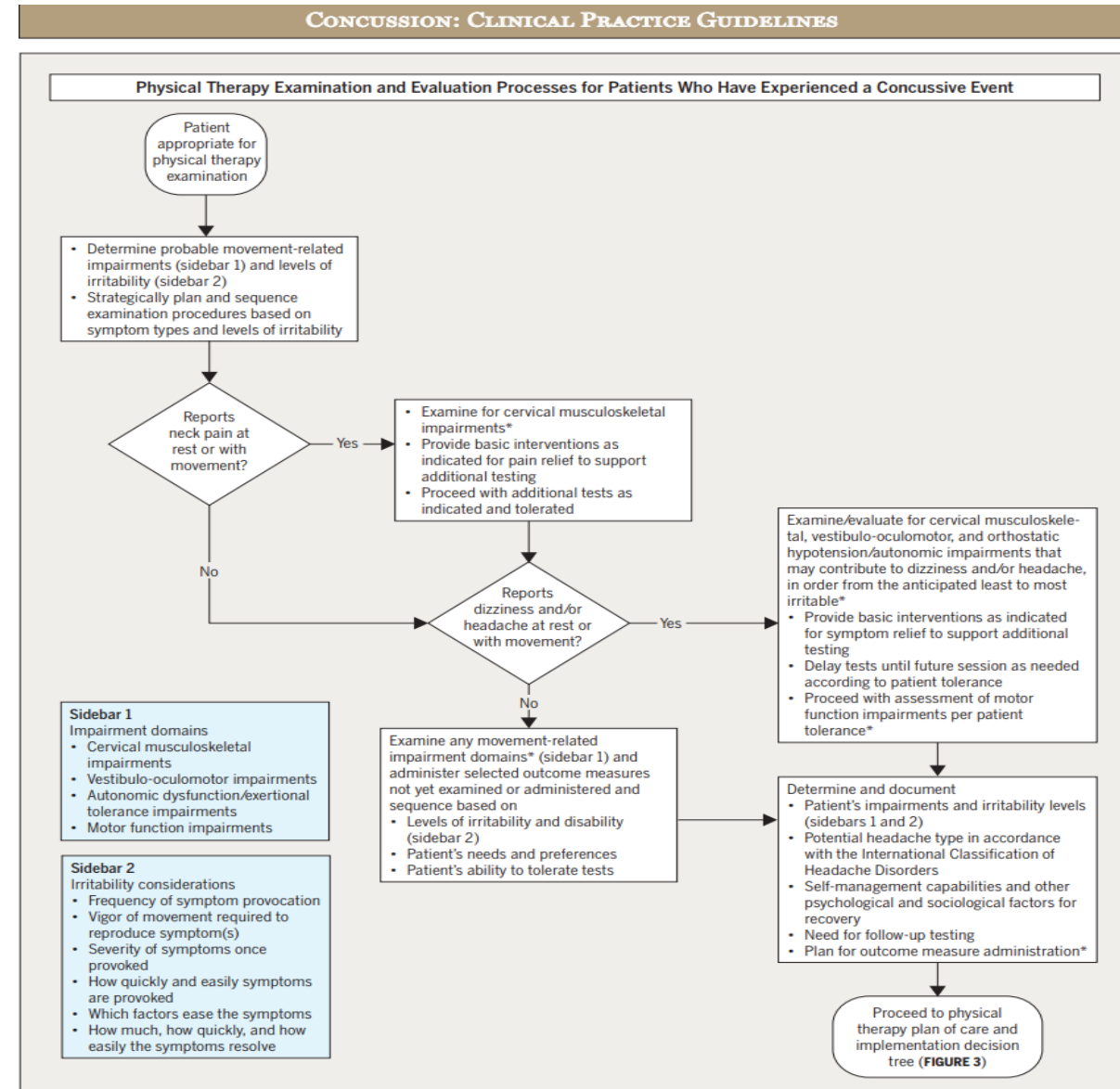
Spatial Orientation

Posture & Balance



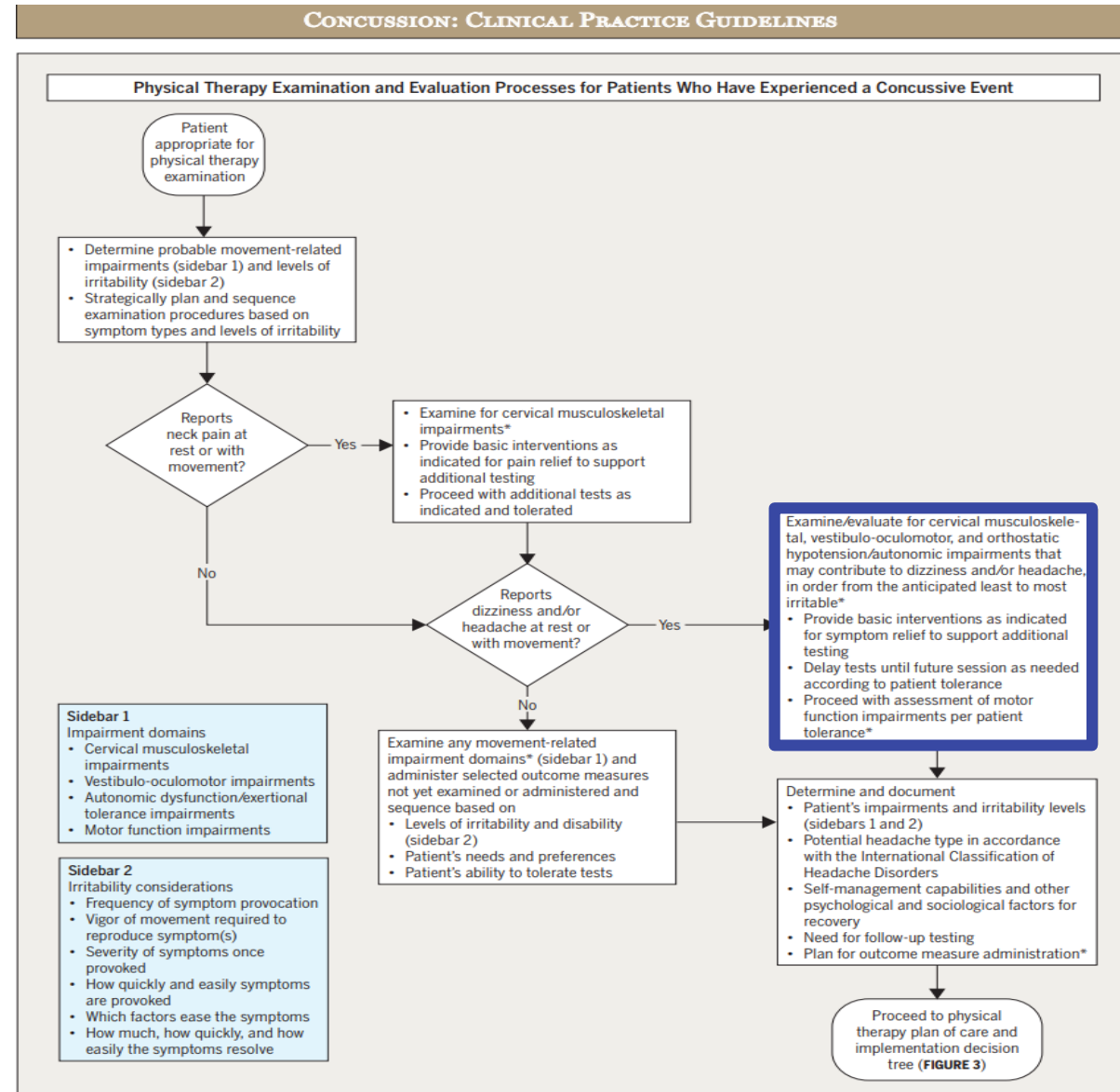
Dizziness Evaluation Post Concussion: Overview

- Interview
 - Subjective OMs: DHI, DCS, ABC
- Clinical Tests
 - Cervical Spine Screen
 - Proprioception & AROM
 - Orthostatic hypotension evaluation
 - BPPV Assessment
 - VOR Evaluation
 - Head Impulse
 - Dynamic Visual Acuity
 - Oculomotor & Cerebellar Testing
 - Balance and Gait
 - Vestibular, somatosensory and visual systems
 - Berg, TUG, DGI, CB&M, mCTSI
 - Visual-Motion sensitivity testing
 - Functional screen based on patient goals
 - RPE scale
 - Autonomic dysfunction (exertional dizziness)
 - Symptom guided exercise testing as appropriate
 - Lower Extremity Testing
 - Sensation & strength



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Dizziness Handicap Inventory (DHI)

- Self-report questionnaire designed to incorporate functional, emotional, and physical impacts of dizziness on disability
- 10+ points indicates further evaluation with balance specialist
- Interpretation (0-100 points):
 - 16-24 points = mild handicap
 - 36-52 points = moderate handicap
 - 54+ points = severe handicap

P1. Does looking up increase your problem?	<input type="radio"/> Yes <input type="radio"/> Sometimes <input type="radio"/> No
E2. Because of your problem, do you feel frustrated?	<input type="radio"/> Yes <input type="radio"/> Sometimes <input type="radio"/> No
F3. Because of your problem, do you restrict your travel for business or recreation?	<input type="radio"/> Yes <input type="radio"/> Sometimes <input type="radio"/> No
F4. Does walking down the aisle of a supermarket increase your problems?	<input type="radio"/> Yes <input type="radio"/> Sometimes <input type="radio"/> No
F5. Because of your problem, do you have difficulty getting into or out of bed?	<input type="radio"/> Yes <input type="radio"/> Sometimes <input type="radio"/> No
F6. Does your problem significantly restrict your participation in social activities, such as going out to dinner, going to the movies, dancing, or going to parties?	<input type="radio"/> Yes <input type="radio"/> Sometimes <input type="radio"/> No
F7. Because of your problem, do you have difficulty reading?	<input type="radio"/> Yes <input type="radio"/> Sometimes <input type="radio"/> No
F8. Does performing more ambitious activities such as sports, dancing, household chores (sweeping or putting dishes away) increase your problems?	<input type="radio"/> Yes <input type="radio"/> Sometimes <input type="radio"/> No
E9. Because of your problem, are you afraid to leave your home without having someone accompany you?	<input type="radio"/> Yes <input type="radio"/> Sometimes <input type="radio"/> No
E10. Because of your problem have you been embarrassed in front of others?	<input type="radio"/> Yes <input type="radio"/> Sometimes <input type="radio"/> No
F11. Do quick movements of your head increase your problem?	<input type="radio"/> Yes <input type="radio"/> Sometimes <input type="radio"/> No
F12. Because of your problem, do you avoid heights?	<input type="radio"/> Yes <input type="radio"/> Sometimes <input type="radio"/> No
P13. Does turning over in bed increase your problem?	<input type="radio"/> Yes <input type="radio"/> Sometimes <input type="radio"/> No
F14. Because of your problem, is it difficult for you to do strenuous homework or yard work?	<input type="radio"/> Yes <input type="radio"/> Sometimes <input type="radio"/> No
E15. Because of your problem, are you afraid people may think you are intoxicated?	<input type="radio"/> Yes <input type="radio"/> Sometimes <input type="radio"/> No
F16. Because of your problem, is it difficult for you to go for a walk by yourself?	<input type="radio"/> Yes <input type="radio"/> Sometimes <input type="radio"/> No
P17. Does walking down a sidewalk increase your problem?	<input type="radio"/> Yes <input type="radio"/> Sometimes <input type="radio"/> No
E18. Because of your problem, is it difficult for you to concentrate	<input type="radio"/> Yes <input type="radio"/> Sometimes <input type="radio"/> No
F19. Because of your problem, is it difficult for you to walk around your house in the dark?	<input type="radio"/> Yes <input type="radio"/> Sometimes <input type="radio"/> No

The Dizziness Catastrophizing Scale (DCS)

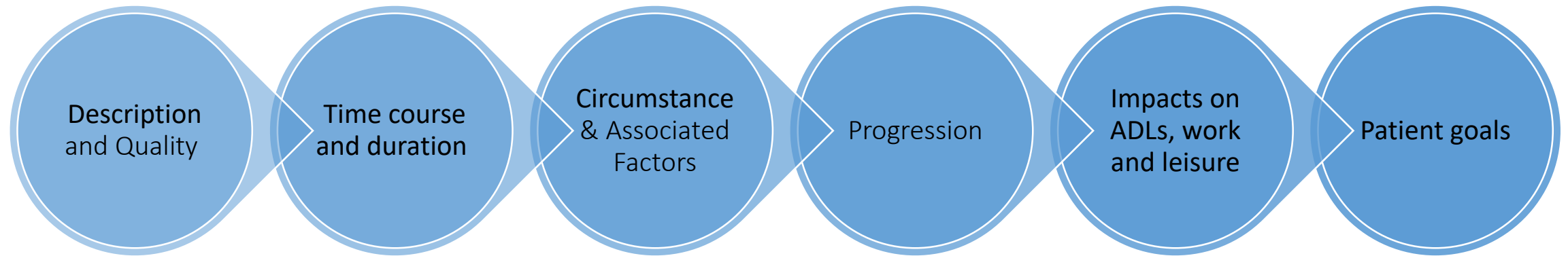
- Self-report questionnaire designed to measure the level of catastrophic thinking associated with dizziness
- 5-point Likert Scale ranging from "not at all" to "all the time"
- Higher scores indicate greater levels of catastrophizing and dizziness-related disability
- Helps inform multidisciplinary referrals and treatment planning

Below you will see a set of statements.
Please rate each statement from 0 to 4 using the list below.
Please answer every question.

0	1	2	3	4
Not at all	To a slight degree	To a moderate degree	To a great degree	All the time

	Statement	Rating
1)	I worry all the time about whether the dizziness will end	<input type="checkbox"/>
2)	I feel I can't go on	<input type="checkbox"/>
3)	It's terrible and I think it's never going to get any better	<input type="checkbox"/>
4)	It's awful and I feel that it overwhelms me	<input type="checkbox"/>
5)	I feel I can't stand it anymore	<input type="checkbox"/>
6)	I become afraid that the dizziness will get worse	<input type="checkbox"/>
7)	I keep thinking of other events of dizziness	<input type="checkbox"/>
8)	I anxiously want the dizziness to go away	<input type="checkbox"/>
9)	I can't seem to keep it out of my mind	<input type="checkbox"/>
10)	I keep thinking about how much trouble my dizziness gives me	<input type="checkbox"/>
11)	I keep thinking about how badly I want the dizziness to stop	<input type="checkbox"/>
12)	There's nothing I can do to reduce the intensity of the dizziness	<input type="checkbox"/>
13)	I wonder whether something serious may happen	<input type="checkbox"/>

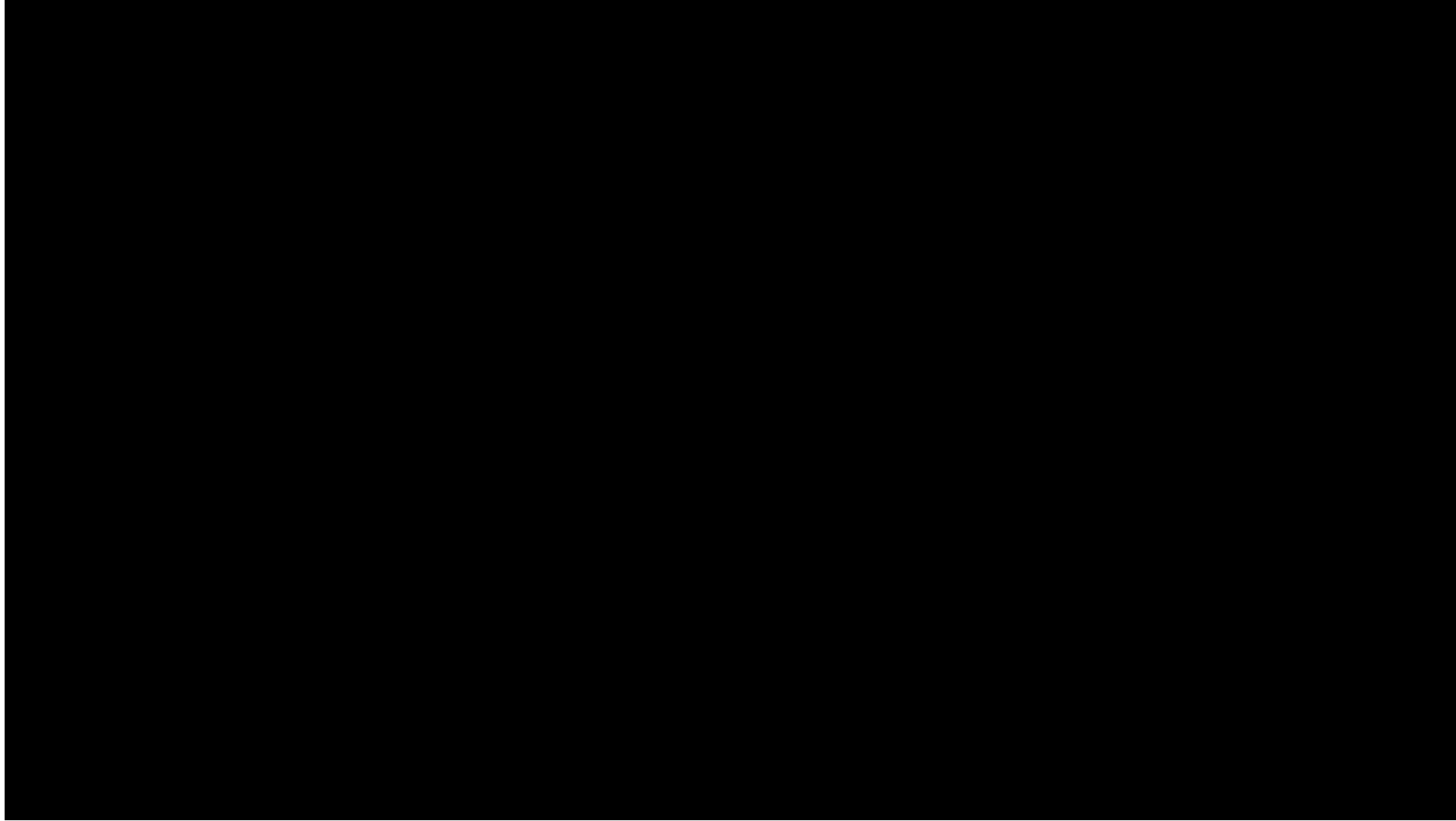
Patient History



Post-Traumatic Benign Paroxysmal Positional Vertigo

- Most common inner ear condition leading to post concussion dizziness
 - Ranging from 10-57% of post-concussion cases
 - Under age 50, the most common cause of BPPV is head injury
- Displacement of calcium carbonate crystals from utricle into semi-circular canal(s)
 - Direct CNS trauma
 - Indirect trauma such as whip-lash or deceleration/acceleration forces
- BPPV contributes to imbalance and falls risk post-concussion

Pathophysiology



BPPV

Benign = not due to serious disorder & favourable prognosis

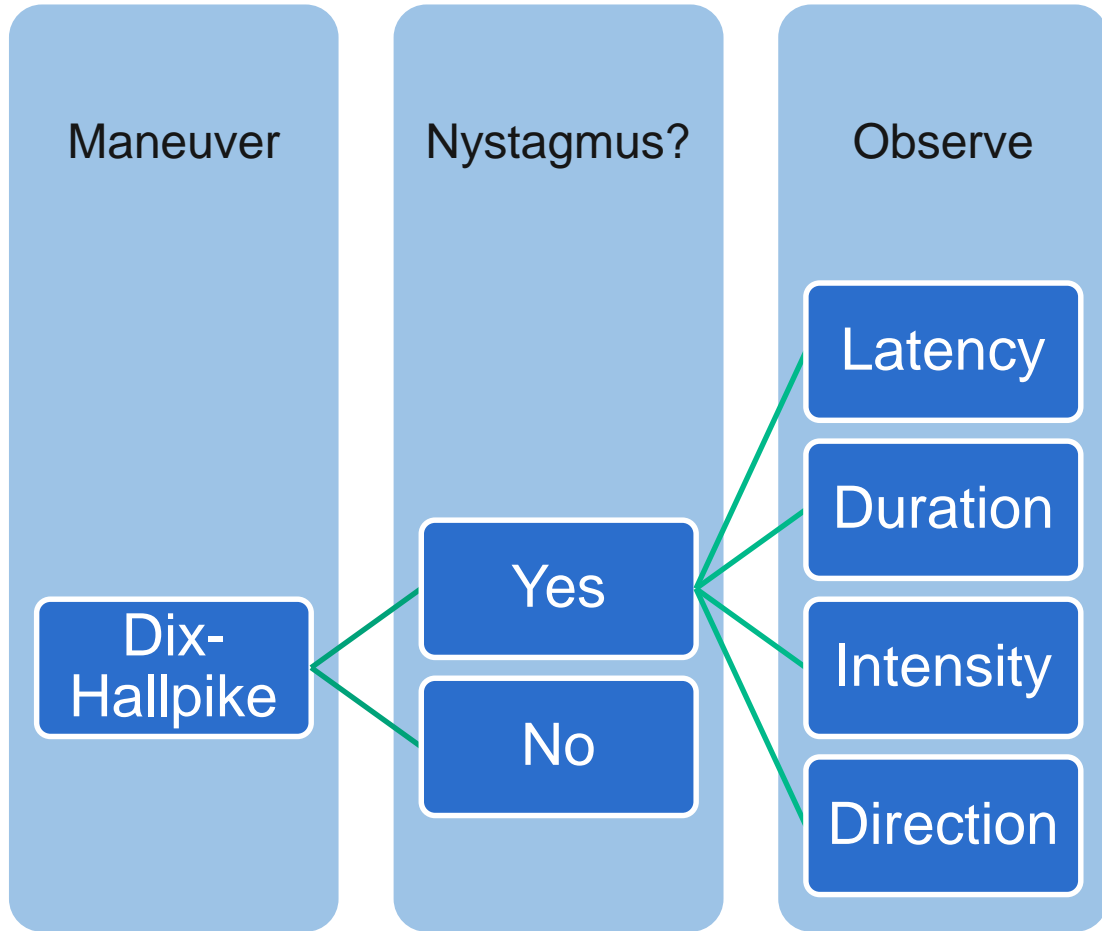
Paroxysmal = sudden & brief (<60 sec) recurrences

Positional = occurs with head position change relative to gravity

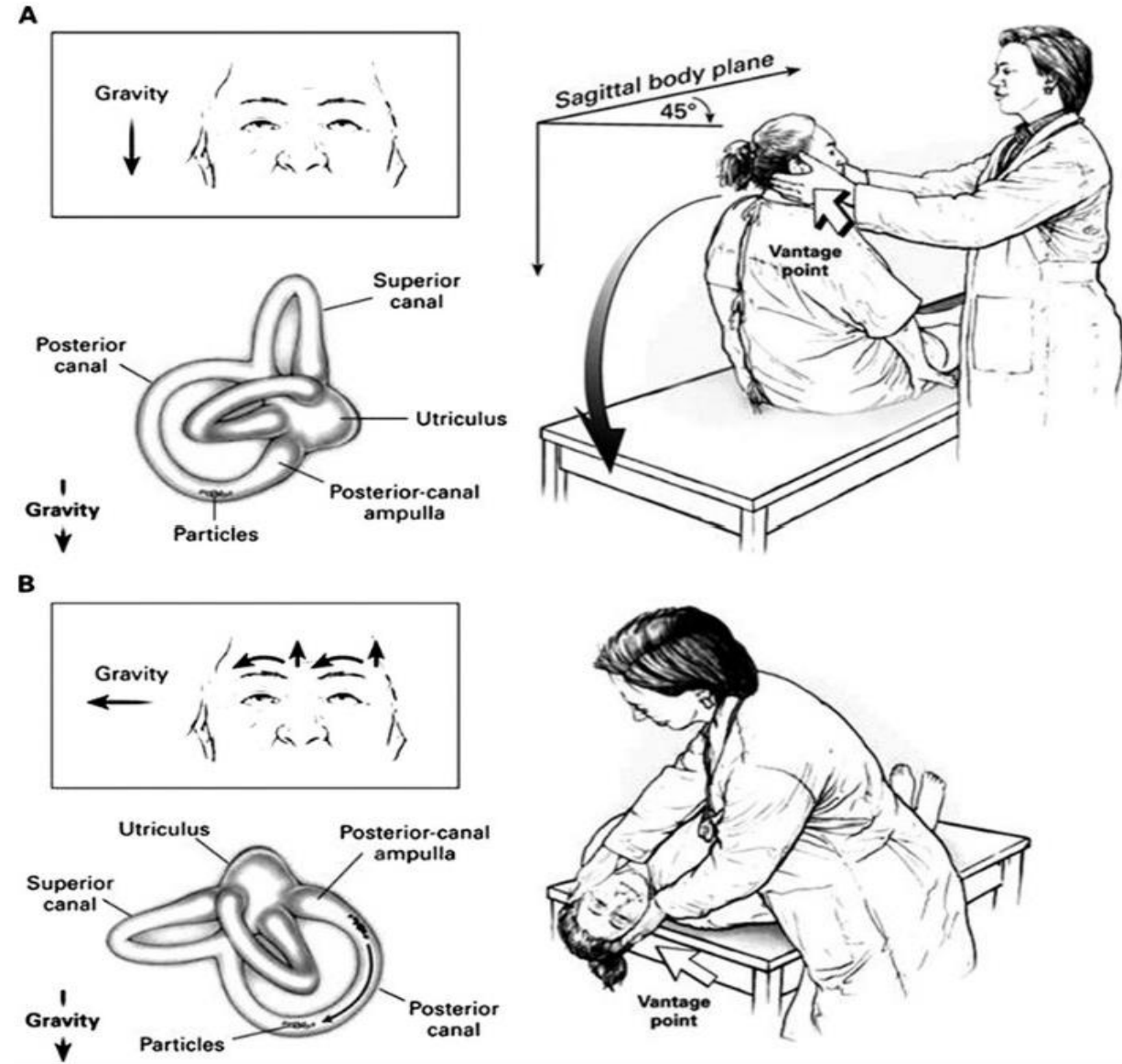
Vertigo = illusory sensation of motion of self or surroundings with head movement or position changes

Often with nausea, vomiting, imbalance, motion sensitivity, & anxiety

BPPV Assessment



Dix-Hallpike Maneuver: Posterior Canal BPPV



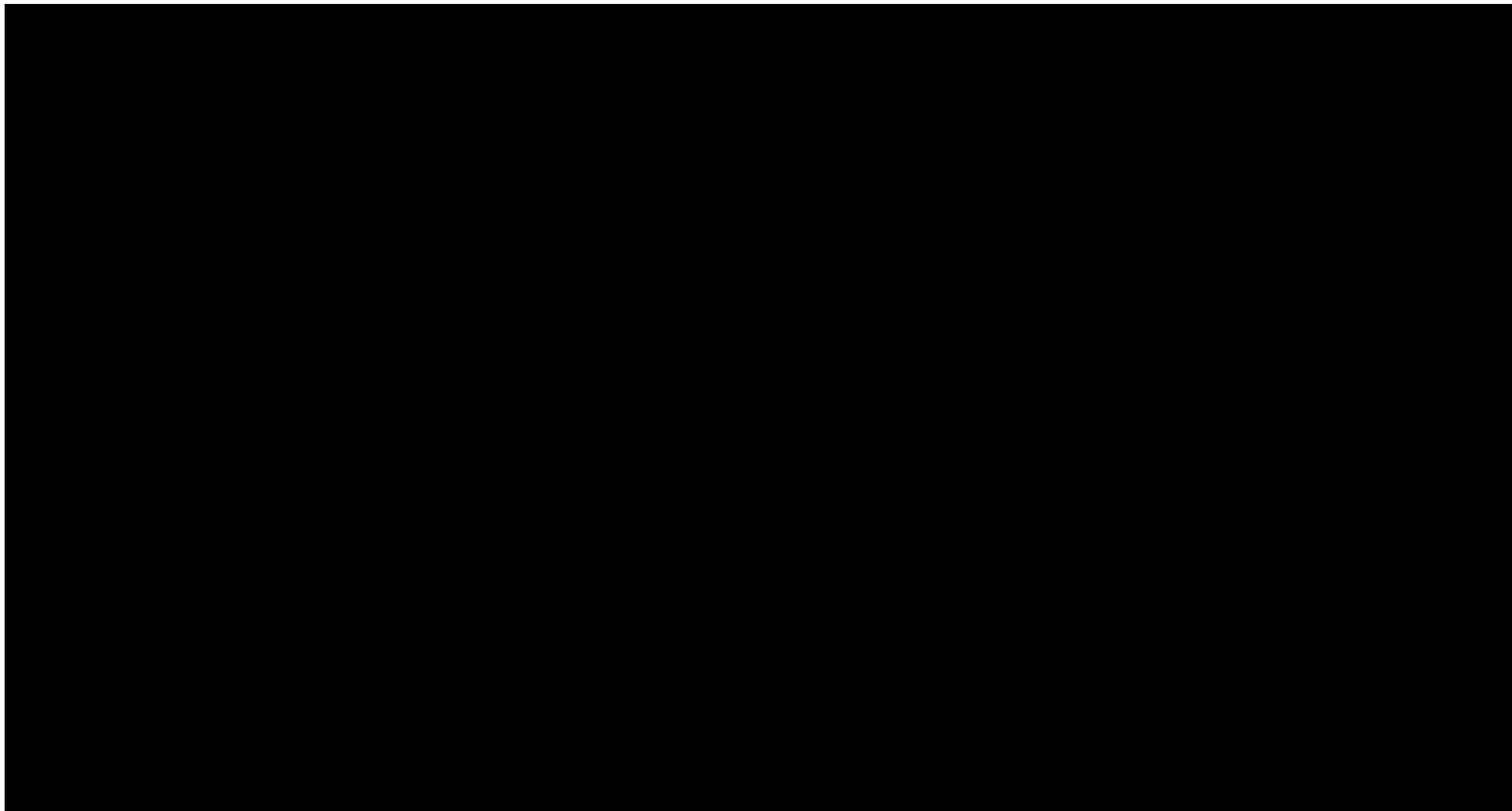
Which canal?

Canal	Pattern of Nystagmus	% of BPPV Cases	Treatment Maneuver	
			Canalithiasis	Cupulolithiasis
Posterior	Torsional & Upbeating towards dependent ear	85-95%	Epley Gans Semont	Semont
Horizontal (Lateral)	Horizontal Geographic type Ageotropic type	5-15%	Lempert (BBQ)Roll Gufoni (Appiani) Forced Positioning	Gufoni (Casani)
Anterior	Torsional & Downbeating towards dependent ear	Very Rare < 3%	Epley Gans Deep Head Hanging	Semont

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Epley Maneuver



Post-Traumatic BPPV

- Compared to idiopathic, post-traumatic BPPV is more likely to:
 - Recur
 - Require multiple treatments
 - Occur bilaterally
 - Involve multiple canals
- **Can effectively be treated**



Treatment: Positional Maneuvers

- Strong evidence to support diagnostic & treatment maneuvers
 - typically >80-90% success rate after one treatment
 - Epley Maneuver is >10x more effective vs. Brandt-Daroff exercises 3x/day
- No serious complications identified in multiple RCTs
- Mild & self-limiting symptoms post maneuver may include:
 - provocation of BPPV symptoms
 - nausea and vomiting
 - postural instability
 - falling sensation
 - canal conversion

Treatment Precautions and or Modifications

Precautions:

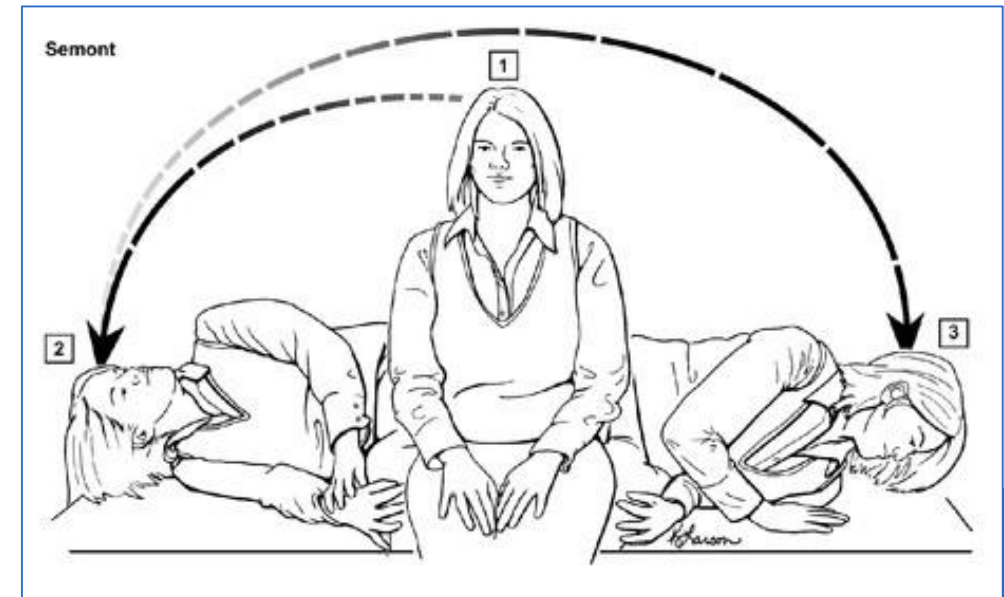
- Cervical stenosis
- Severe kyphoscoliosis
- Limited C-spine ROM
- Down's syndrome
- Severe rheumatoid arthritis
- Cervical radiculopathies
- Paget's disease
- Retinal Detachment
- Ankylosing spondylitis
- Low back dysfunction
- SCI
- CVD

Contraindications (Dix-Hallpike & Epley Maneuver):

- Acute fracture that prevent patient from lying down quickly or rolling over
- Recent neck fracture, surgery or instability
- History of vertebral artery disease or dissection or unstable carotid disease
- Recent retinal detachment, glaucoma, eye surgeries

Modifications:

- Maneuver's that eliminate c-spine extension
 - Tilt table and or reclined hospital bed
 - Semont Maneuver (posterior canal)
 - Gufoni Maneuver (horizontal canal)



Practice

- What do you see?

Practice

- What do you see?

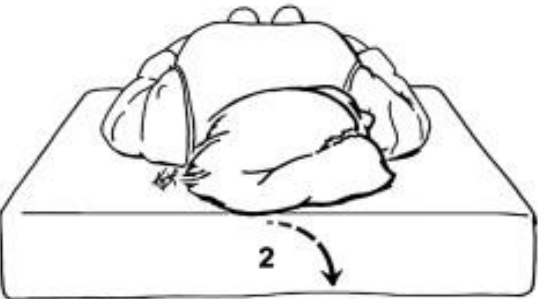
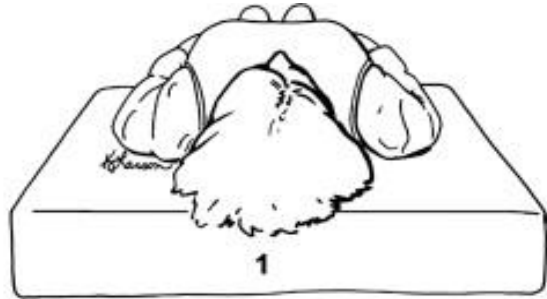
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Practice

- What do you see?

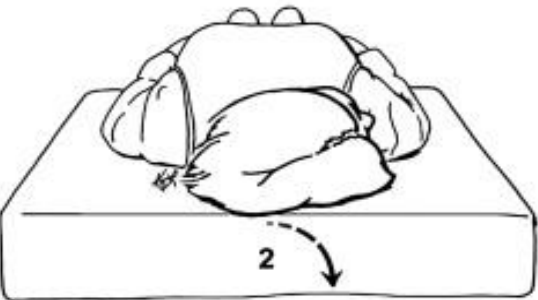
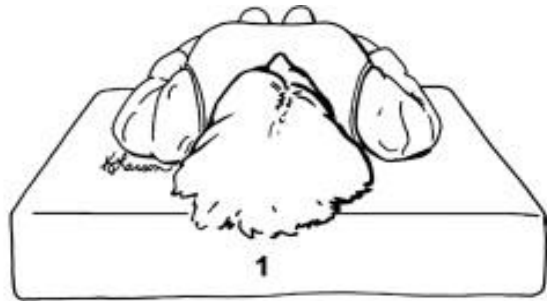
Supine Head Roll Test



Practice

- What do you see?

Supine Head Roll Test



When to refer to ENT

- Vertigo is non-positional or spontaneous
- Drop attacks
- Symptoms of otalgia, tinnitus, hearing loss/fluctuation, aural pressure
- Atypical pattern of nystagmus
- Not responding to treatment maneuvers or vestibular rehab

Case Scenario:

Mr. Smith is a 45-year-old construction worker 3 months post-concussion due to fall from ladder at work.

During clinical interview, Mr. Smith reports:

- Oscillopsia with head movement
 - Eyes do not keep up with head or “lag”
 - Feeling of bouncing, bobbing
 - Blurry vision with walking
- Symptoms of vertigo that last minutes; “I feel like I am on a boat”
- Aggravating activities: head movement, walking, bending
- DHI = 40/100 (moderate handicap; in primary functional and physical domains)
- DCS = 5/52
- Main goal: Return to work

Case Scenario:

Mr. Smith is a 45-year-old construction worker 3 months post-concussion due to fall from ladder at work.

Objective Assessment Findings:

- CT & Neuro Exam– Nil
- Dix-Hallpike: negative for reproduction of symptoms and nystagmus bilaterally

What else could be contributing to Mr. Smith's dizziness?

How would we assess?

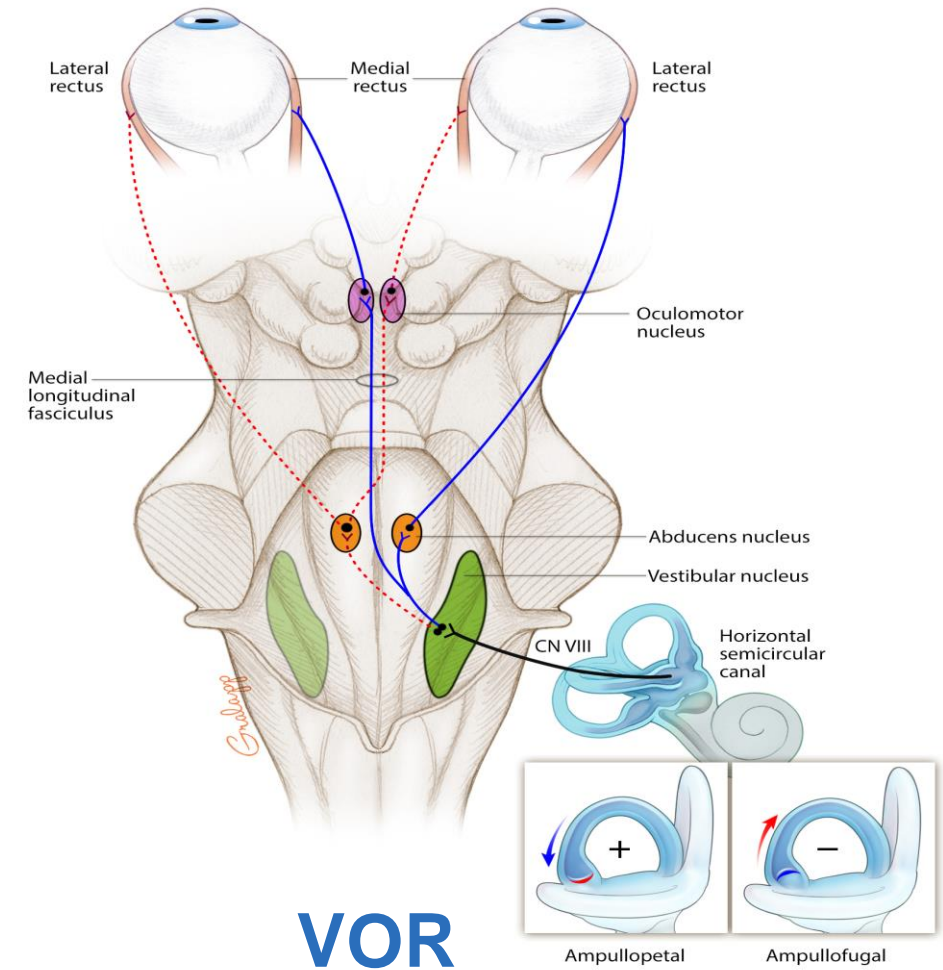
Vestibular Hypofunction (VH)

- Unilateral = partial or complete loss of function of one of the peripheral vestibular sensory organs and/or vestibular nerves
- Unilateral VH (UVH) common causes:
 - Vestibular neuritis
 - **Trauma**
 - Surgical resection
 - ototoxic medication
 - Ménière's disease

Vestibular Hypofunction Post-Concussion

Clinical Features:

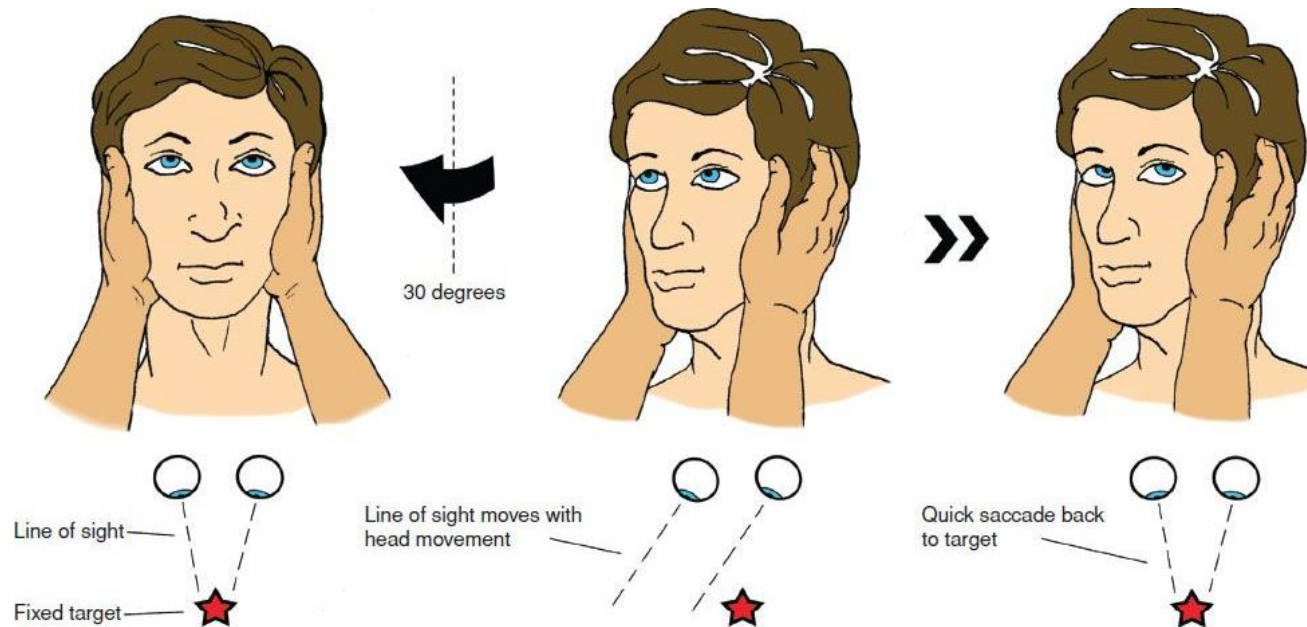
- Unilateral VH more common vs. Bilateral VH post trauma
- Vestibular-Ocular Reflex (VOR) impairment = gaze instability with head movements, walking
- Imbalance with head movement, turning, bending
- Impaired dynamic visual acuity
- Motion sensitivity



VOR

Hall (2022)

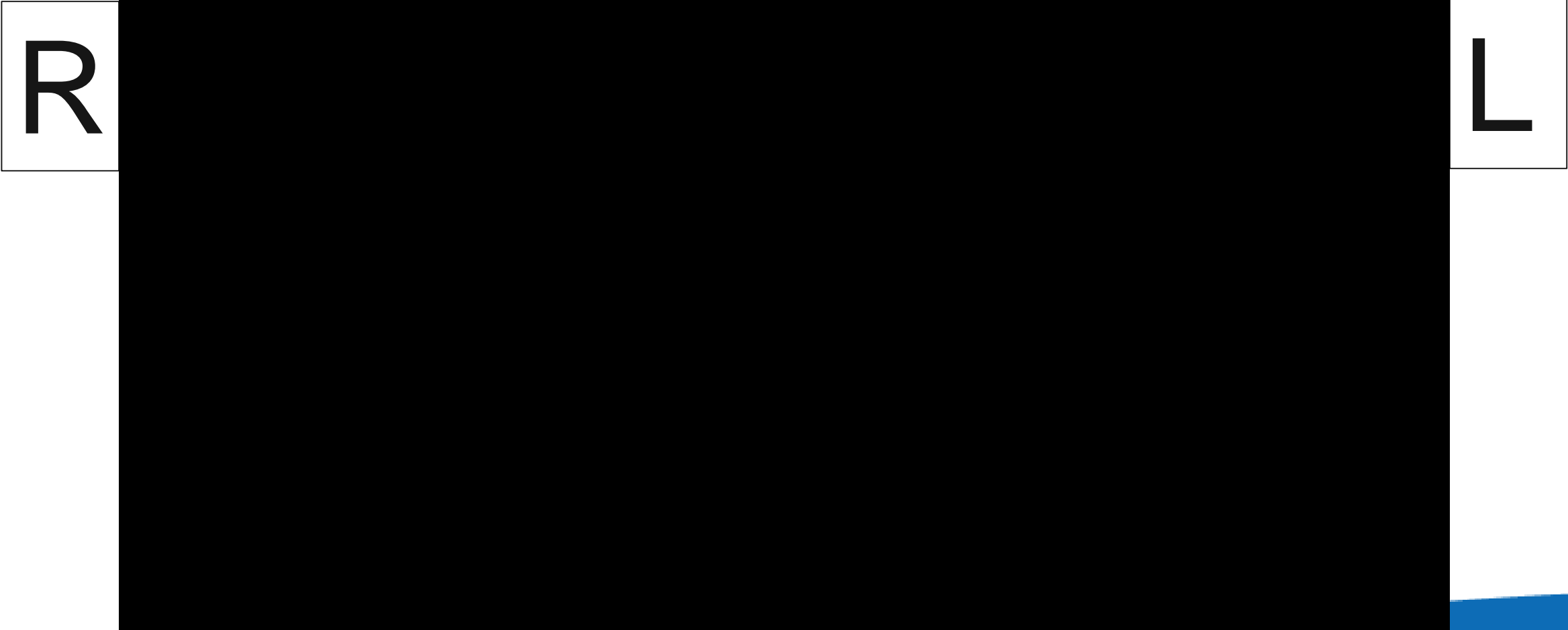
How do we test VOR?



Head Impulse Test (Halmagyi-Curthoys test)

- Normal = eyes remain mixed on target
- Abnormal = eyes slide off target leading to re-fixation saccade

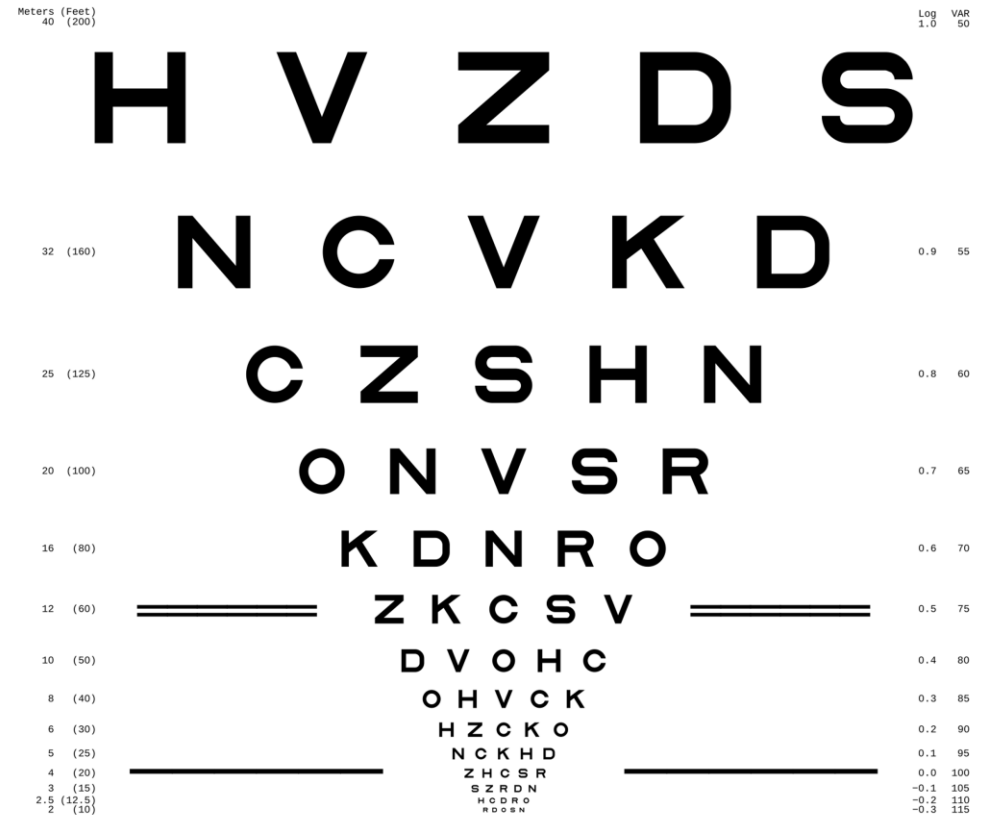
Head Thrust Test



How do we test VOR?

Dynamic Visual Acuity (DVA)

- Vertical and horizontal
- Compare static vs. dynamic (2 Hz)
- Normal = < 2 line loss
- Abnormal > 2 line loss
- Monitor: effort & engagement



LogMAR

Dynamic Visual Acuity Test



Case Scenario

Mr. Smith is a 45-year-old construction worker 3 months post-concussion due to fall from ladder while at work.

Objective Assessment Findings:

- CT & Neuro Exam – Nil
- Dix-Hallpike: negative bilaterally
- **Head Impulse Test: abnormal- left, normal –right**
- **DVA (horizontal): + 3 lines difference (abnormal)**
- **DVA (vertical): + 2 lines difference (normal)**

Case Scenario

Mr. Smith is a 45-year-old construction worker 3 months post-concussion due to fall from ladder while at work.

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- **Head Impulse Test: abnormal- left, normal –right**
- **DVA (horizontal): + 3 lines difference (abnormal)**
- **DVA (vertical): + 2 lines difference (normal)**

Analysis: post-traumatic, left vestibular hypofunction

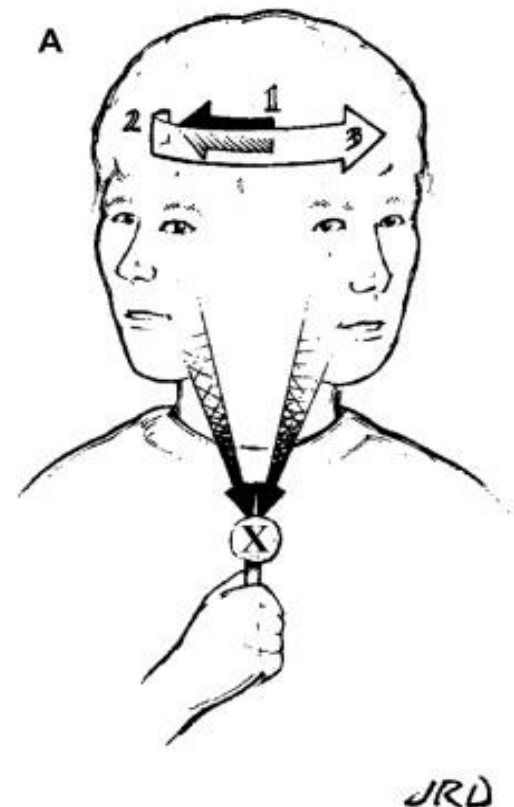
UVH: VOR Treatment

- Gaze Stabilization Exercises (GSEs)
 - Patient moves head while keeping target stable and in focus throughout
- Goal: promote central compensation for asymmetric vestibular signals
 - Reduce retinal slip and desensitize to head movements
 - Through neuroplasticity and change in vestibular system firing rate in response to head movements
 - CNS compensation through cerebellum

UVH: Gaze Stability Exercises

Intensity

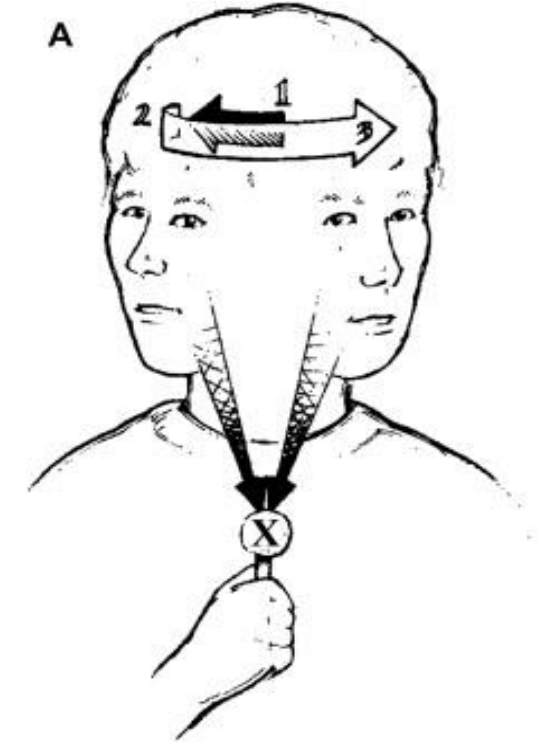
- Acute/Subacute: minimum 3 times per day for a total of at least 12 minutes daily
- Chronic: 3 to 5 times per day for a total of at least 20 minutes daily for 4 to 6 weeks
- Consider patient tolerance



VOR x 1

UVH: Gaze Stability Exercises

- **Speed:** As fast as patient can with the target in focus
 - Avoid blurring or object moving
- **Plane:** horizontal, vertical
 - Consider assessment findings when choosing plane



VOR x 1

Treatment Example: Mr. Smith

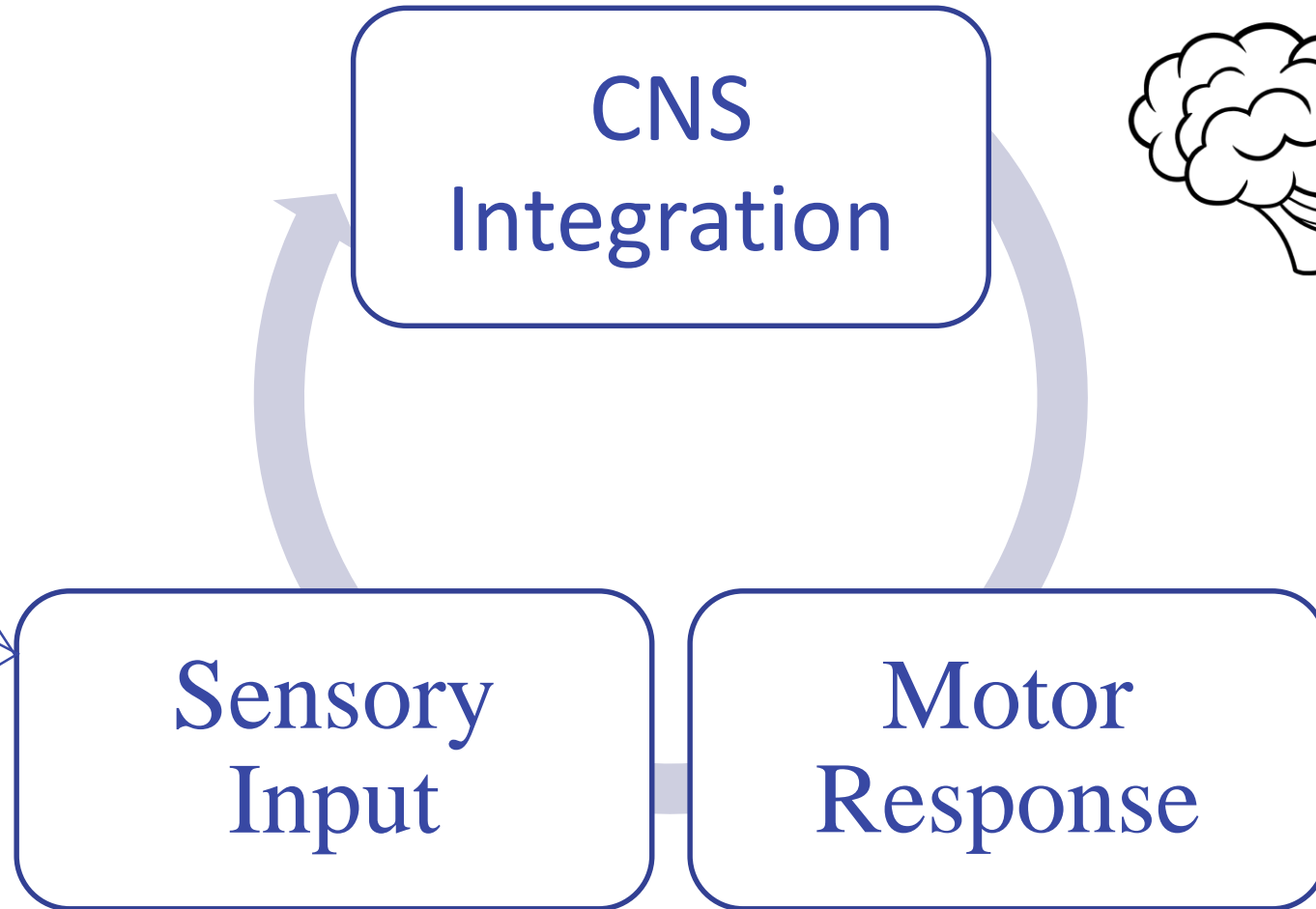
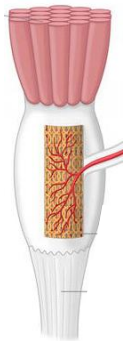
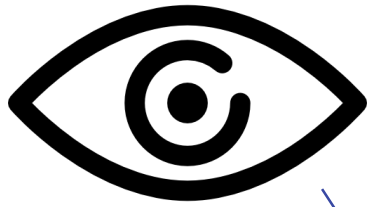
Gaze Stability Exercise Program:

- VOR x 1 with "X" x 1 minute (horizontal) x 3 sets (near)
- VOR x 1 with "X" x 1 minute (horizontal) x 3 sets (far)
- 3 times per day --> progress to 5 times per day as tolerated

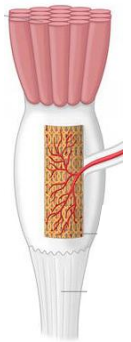
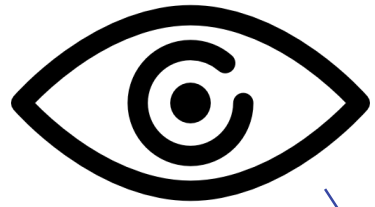
Practice & Discussion

1. What else would you assess and/or include in your treatment program?

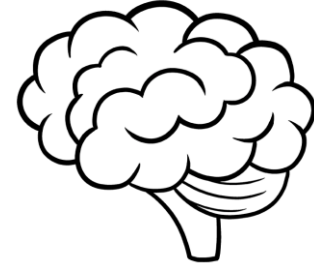
Balance



Vestibular Hypofunction



CNS
Integration



Sensory
Input

Motor
Response



Treatment Program: Mr. Smith

- Balance Assessment
 - Dynamic Gait Index: veering when walking with head turns and turning
 - mCTSIB completed – increased postural sway with eyes closed + compliant surface
- Balance and Gait Training :
 - standing on foam pad, eyes closed, +/- head turns right/left (feet together, progress to tandem), progress to bending from various BOS
 - walking forwards/backwards eyes closed, +/- foam/mat, figure 8 walking
- Reactivation and Reconditioning
 - Walking program x 20-30 min/day
 - Functional strength home exercise program including functional movements required for work (ie. bending, reaching, lunges, squatting)

***Strong evidence supporting vestibular PT
for reducing symptoms, improving gaze and postural stability
and improving function in individuals
with vestibular hypofunction***

Case Scenario

Mr. Smith has started a graduated RTW plan, starting in the sedentary to light physical demand category. He has been modified duties including taking inventory and computer-based tasks.

In follow up:

- Mr. Smith endorses improvement in his oscillopsia, and resolution of bouncing and "eye lag"
- Noting to still feel dizziness and imbalance when bending, standing and taking inventory, working on the computer or scrolling on his phone and when walking on busy job site; when provoked dizziness lasts minutes to hours
- DHI = 23/100 (mild handicap; in primary functional and emotional domains)
- DCS = 30/52
- Main goal: Return to full duties at work

Case Scenario

Reassessment

Objective Findings:

- **Head Impulse Test: abnormal- left, normal –right**
- **DVA (horizontal): + 2 lines difference (normal)**
- **DVA (vertical): + 2 lines difference (normal)**

**DVA normal and Head Thrust Abnormal ?
Indicates central compensation**

Case Scenario

Reassessment

Objective Findings:

- **Head Impulse Test: abnormal- left, normal –right**
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- **DVA (vertical): + 2 lines difference (normal)**

What else can we assess?

Dizziness Specific – Oculomotor & CNS Screen

- Oculomotor
 - Central Gaze
 - Eccentric Gaze
 - Smooth Pursuit
 - Saccades
 - Vergence & accommodation
 - Ocular alignment
- VOR Cancellation
- Coordination (Cerebellar) Testing

CNS & Oculomotor Screen – Why?

- Rule out central cause of dizziness and/or oculomotor deficit (III, IV, and VI)
- Important to inform multidisciplinary referrals
 - Consider referral for neurology, ENT, optometry, neuro-ophthalmology evaluation if abnormal findings
- Important to differentiate subjective symptom provocation vs. objective abnormality
 - Important for patient education and treatment planning

Case Scenario: Mr. Smith

Objective Findings:

- Head Impulse Test: abnormal- left, normal –right
- DVA (horizontal & vertical): + 2 lines difference (normal)
- **CNS & Oculomotor Screen – normal, reported symptom provocation**

What else can we assess?

Visual-Motion Sensitivity

- Heightened awareness of normal visual or motion stimuli
 - Inability to centrally integrate visual and vestibular information
 - Abnormal vestibular inputs
 - Over-reliance on vision
 - Very common post concussion
- Common Description:
 - imbalance, rocking, swaying, floating, disequilibrium
 - dizziness with reading, screens, grocery store, malls
 - Often accompanied with anxiety, nausea
- Onset:
 - often vision and/or motion-provoked
 - Sit to stand, supine to sit/sit to supine, coming up from bent position
 - Busy environments (eg grocery stores), reading
- Duration:
 - often several minutes to hours
- Frequency:
 - multiple times per day depending on activity

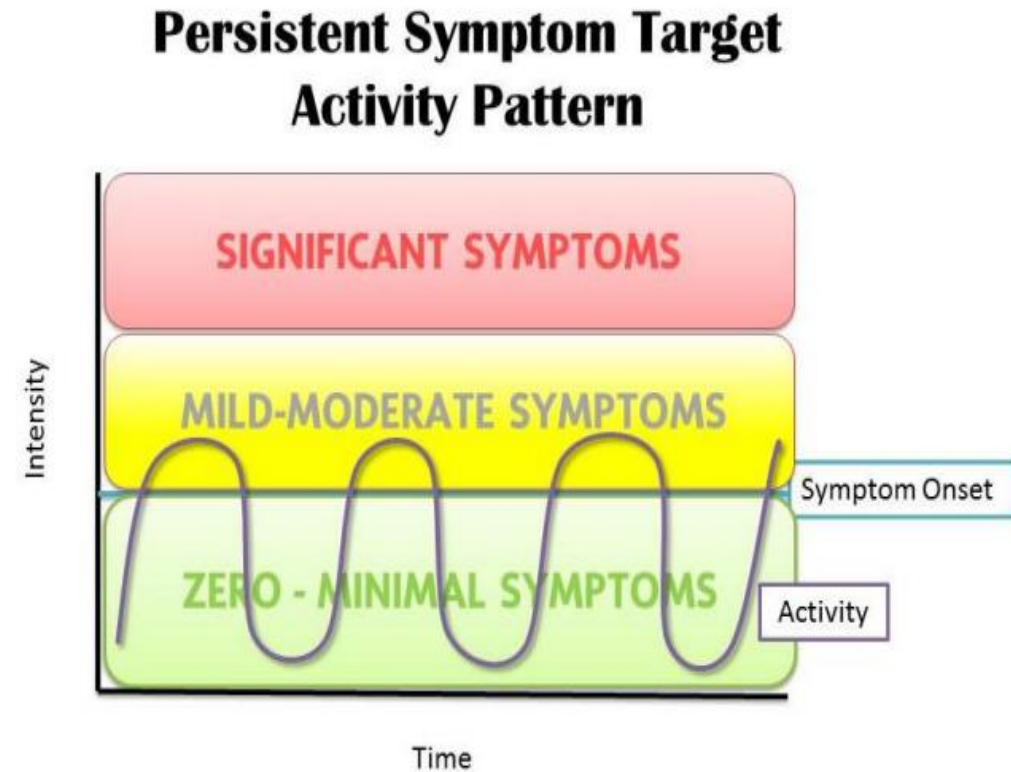


Visual-Motion Sensitivity: Assessment

- Functional Movement Analysis
 - Example: sit to stand/squat, bending (standing sitting), supine to side lying
 - Adapt based on goals and self-report
 - Can also evaluate intensity using RPE scale and duration of symptoms
- Motion sensitivity quotient
 - Limitations: often highly symptom provoking & time consuming
- Balance & Gait
 - Dynamic Gait Index (DGI), Functional Gait Assessment (FGA)
Modified Clinical Test for Sensory Interaction in Balance (mCTSIB)
 - Often see reduced postural control when vision is removed

Visual-Motion Sensitivity: Treatment

- Habituation exercises to specific movements and stimuli that cause symptoms
 - Individualized
 - Goal-specific
 - Dependent on patient tolerance
 - Goal desensitize & build tolerance to provoking movements
 - Safe to stimulate mild-moderate symptom provocation (yellow zone or RPE 2-3/10)
- Desensitization strategies
 - Eyes closed
 - Deep Breathing
 - Cognitive Re-structuring & positive affirmation
- Reactivation and reconditioning
 - Walking program, activity and environment re-integration to promote central compensation
 - Consider limiting stationary aerobic activities such as cycling, recumbent bike, treadmill



Mr. Smith: Habituation Example

- Functional Movement Analysis:
 - most self-identified and observed difficulty with bending, reaching and looking up, and walking on job site (RPE =5-6/10)
- Habituation Program
 - Seated bending down to pick up object and return x 5 reps, 3 times per day
 - Progress to 10 reps, 5 times per day
 - Progress to standing bending with chair behind
 - Progress to stand bend squat and lift overhead
 - ☞ Standing and reaching activity x 1-2 minutes, 3 times per day
 - Various heights
 - Progress to 5 minutes, 5 times per day
 - ☞ Walking outdoors x 20-minutes
 - Progress to busier environments (grocery store, mall)

Mr. Smith: Treatment Program Example

- Balance & Gait
 - Standing eyes closed, feet together → tandem → single leg (+/- head turns)
 - Walking over foam/mat
 - Progress to add with object tracking (ball toss) and head turns (as tolerated)
- Work Simulation
 - Sustained overhead work activities
 - Bending and lifting activities (various surfaces and heights)
- Education
 - Habituation principles & sensory re-weighting
 - Energy conservation: incorporation of when to take breaks at work
 - Desensitization strategies when symptoms are provoked
- Referral to OT and Psychology

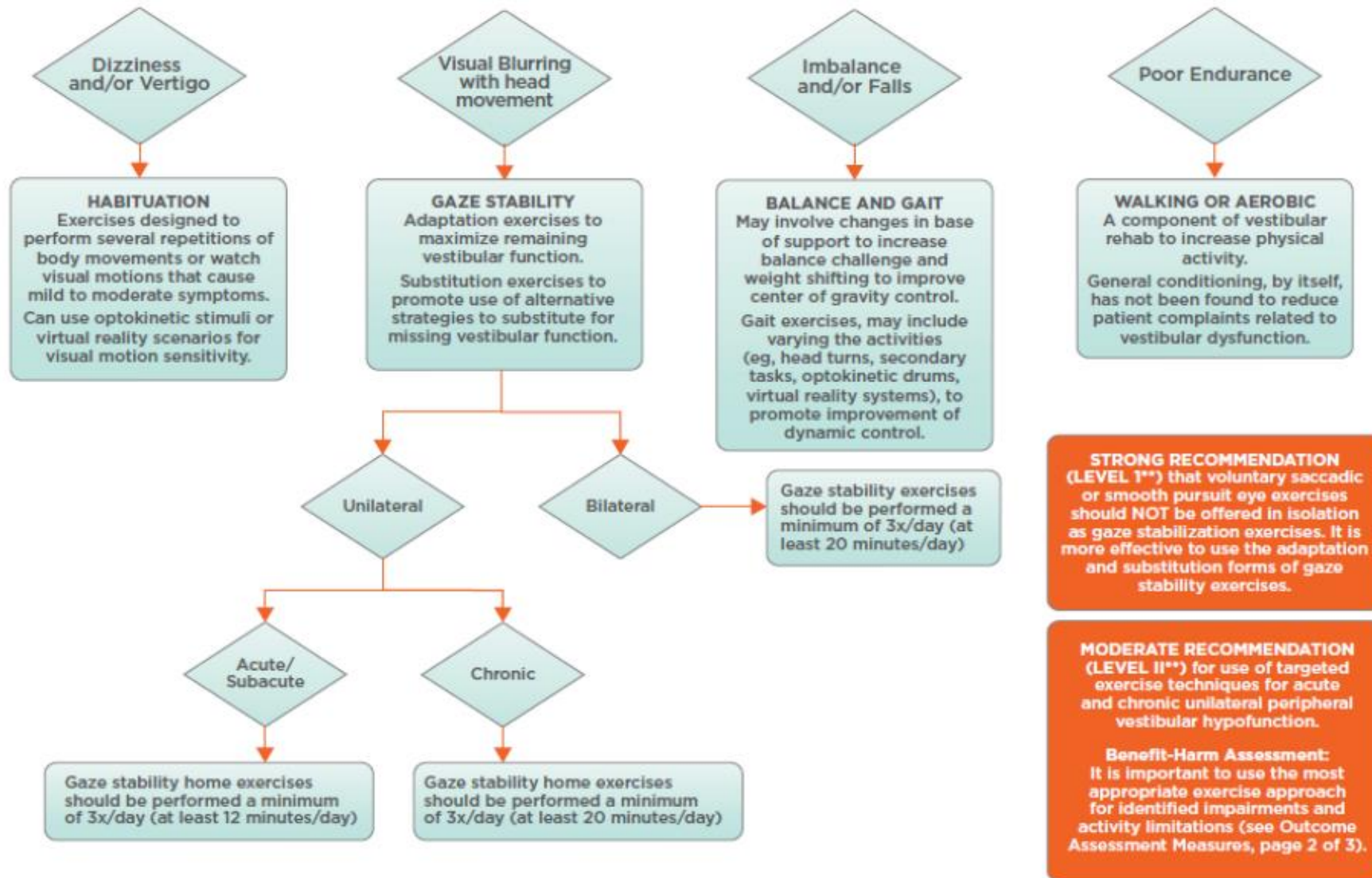
Indications To Stop Therapy

- Achievement of primary goals
- Resolution of symptoms
 - improved symptom-report measures (DHI, DCS)
- Normalized balance and vestibular exam
 - Normal HT, DVA, Dix-Hallpike, movement analysis
- Treatment plateau
 - Risk factors present?
 - Example: Chronic onset, number of symptoms, comorbidities, cognitive impairment, medications, attitude towards recovery, mental health history and post injury depression & anxiety

Summary

- Dizziness is a common and disabling symptom post-concussion and is often accompanied with visual-motion sensitivity and imbalance
- BPPV is the most common inner ear condition causing vertigo post-trauma and can be effectively treated
 - When possible, treat BPPV first
- CNS & oculomotor screen is important to differentiate central vs. peripheral vestibular dysfunction, inform treatment plan & referral decisions
- Vestibular rehab is an effective treatment for vestibular hypofunction and visual-motion sensitivity post-concussion
 - Should be individualized
 - Lead by patient goals and tolerance

TREATMENT DECISIONS BASED ON OUTCOME ASSESSMENT MEASURES



Questions?

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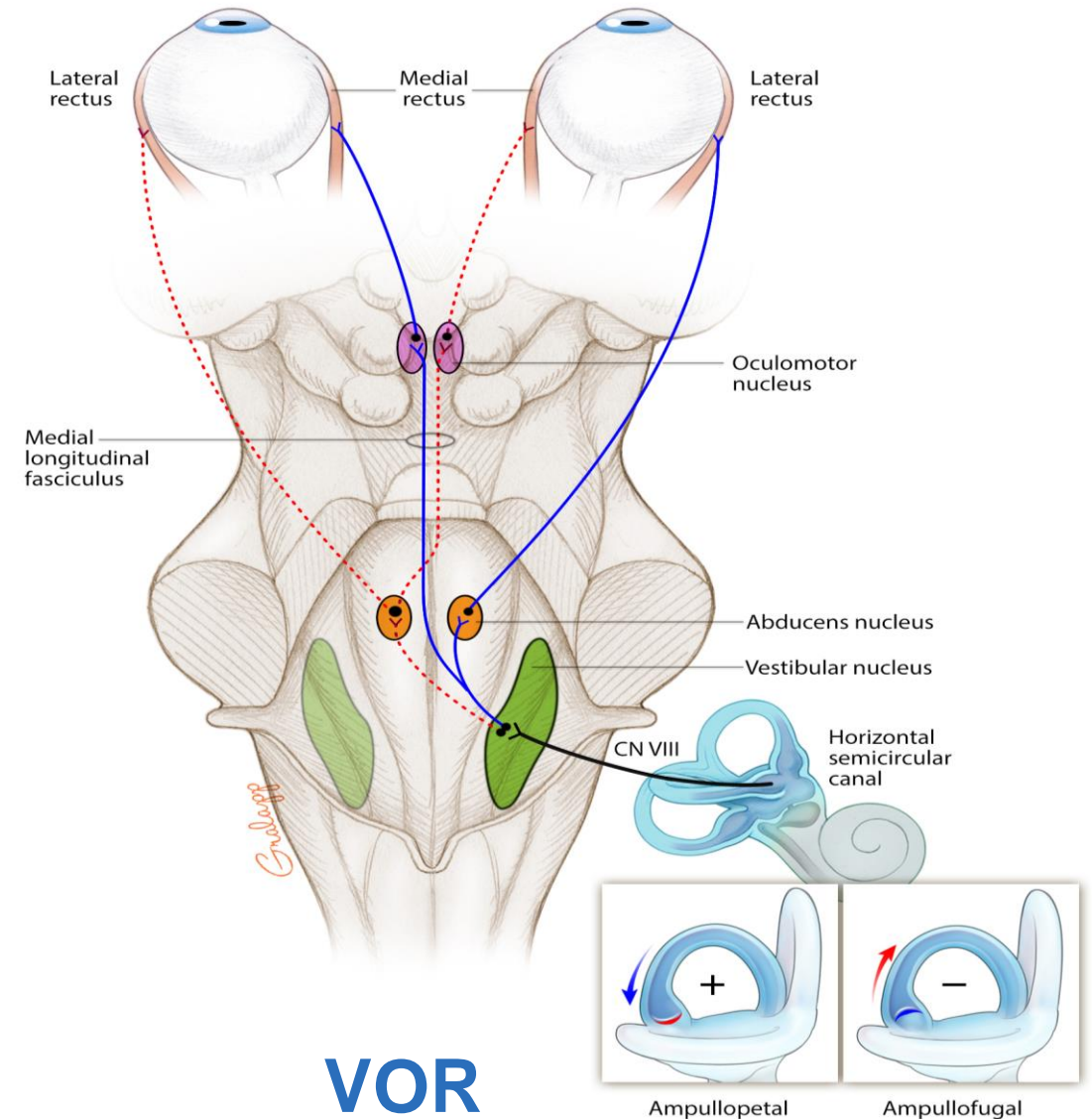
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Supplementary Materials

VOR

- Allows eyes to stay fixed on target with head movement
- Results in eye movements equal & opposite to head movement
- Cerebellum modulation
- $VOR\ gain = \frac{Eye\ velocity}{Head\ Velocity}$
 - Normal= 1.0
 - Vision disruption seen when gain is $< 98\%$
 - Can be adapted through CNS



Haburcakova (2012)

Dizziness Specific - CNS Screen

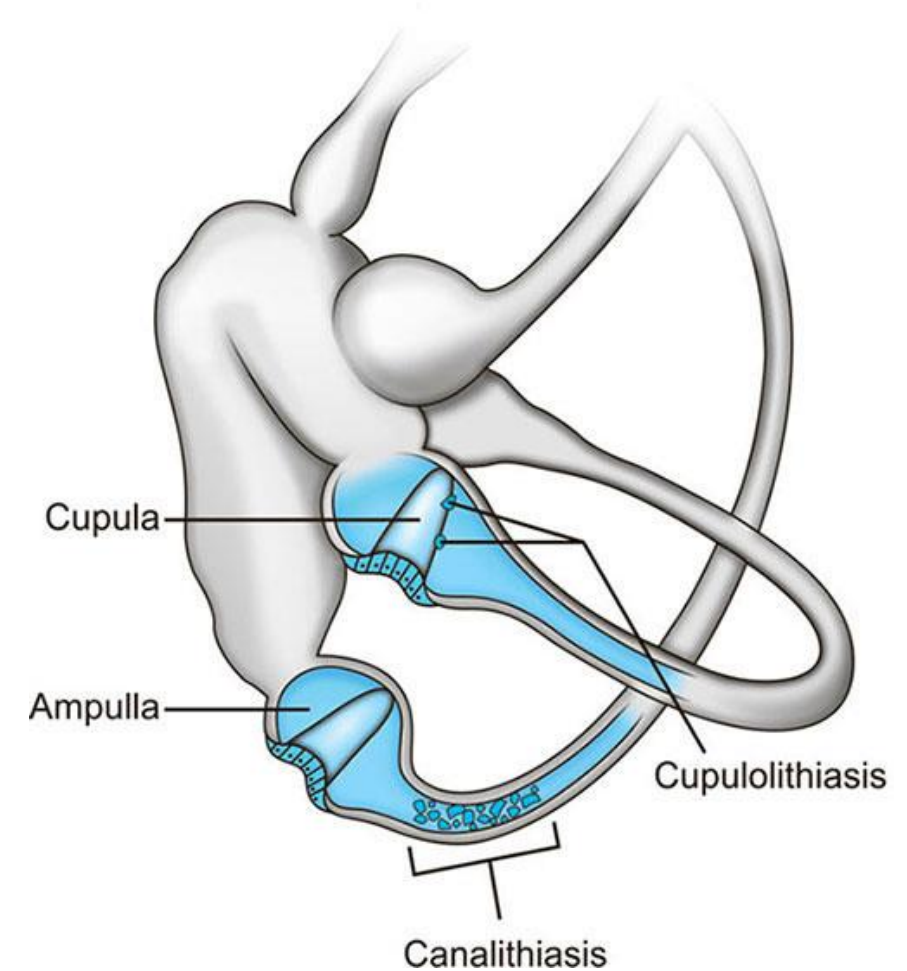
Assessment	Abnormal
Central Gaze	Spontaneous Nystagmus
Eccentric Gaze	Gaze Evoked nystagmus (not physiologic end gaze nystagmus)
Smooth Pursuit	Saccadic (consider age)
Saccades	Dysmetric/hypermetric saccades (consistent)
Vergence & accommodation	Disconjugate eye movements

Dizziness Specific - CNS Screen

Assessment	Abnormal
VOR Cancellation	Nystagmoid Jerking – repetitive refixations
Cerebellum & Coordination - Example: Rapid alternating movements, finger to nose, heel to shin	Dysmetria Dysdiadochokinesia Over or undershooting movement

Canalithiasis vs. Cupulolithiasis

	Canalithiasis	Cupulolithiasis
Duration	Vertigo lasting < 60 sec	Vertigo lasting > 60 seconds
Latency Period	> 1 sec	Immediate onset
Direction of nystagmus	HC: Mostly Geotropic depending on involved canal	HC: Mostly Ageotropic depending on involved canal
Etiology	Free floating otoconia collect near the cupola of affected canal	Otoconial debris attached to the cupola of affected semicircular canal



Peripheral vs. Central Nystagmus

BPPV	Central Vestibular Disorder
Short-Term & Decay Nystagmus	Persistent Nystagmus
Torsional upbeating/downbeating OR horizontal	No Torsion + upbeating/downbeating (vertical)
Fatigable nystagmus with repeated testing	Non-fatigable with repeated testing
Jerk Nystagmus	Pendular Nystagmus
Latency Period (except for cupulolithiasis)	No Latency Period

Differential Diagnosis

Table 3. Basic Differential Diagnosis of BPPV

Otologic disorders	Neurologic disorders	Other entities
<ul style="list-style-type: none">• Meniere's disease• Vestibular neuritis• Labyrinthitis• Superior canal dehiscence syndrome• Posttraumatic vertigo• Perilymphatic fistula• Inner ear lesions	<ul style="list-style-type: none">• Vestibular migraine• Posterior circulation TIA and stroke• Demyelinating diseases• Central nervous system lesions• Vertebrobasilar insufficiency• Central positional vertigo	<ul style="list-style-type: none">• Anxiety or panic disorder• Cervicogenic vertigo• Medication side effects• Postural hypotension• Various medical conditions (such as toxic, infectious and metabolic conditions)

Treatment: Positional Maneuvers

- Risk Factors for lower treatment success
 - ***Post-traumatic***
 - Other inner ear disorders
 - Vitamin D deficiency
 - Older age (>60 yrs)
 - Hypertension
 - Hyperlipidemia
 - Diabetes
 - Cardiovascular disease
 - Osteoporosis/osteopenia
 - Migraine

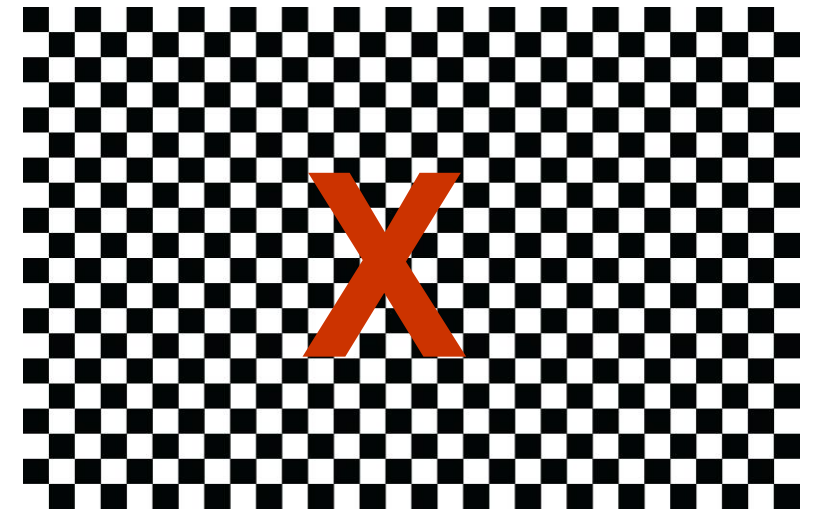
BPPV Patient Education

- Review of vestibular anatomy, BPPV etiology and positional maneuver success rate
- Expected post-procedural symptoms
 - Common to feel imbalance and general unsteadiness immediately post maneuver
 - Often vertigo and imbalance resolution within 24 hours
- Indications for re-assessment & follow up
 - Higher rates of reoccurrence vs. Idiopathic BPPV
 - Importance of symptom monitoring
 - Often benefit from follow up within 4 weeks post treatment & sooner if symptoms persist
- Sleep position
 - limited evidence for post-procedural postural restrictions

GSE: Progressions

- Target → various sizes, letters, patterns
- Distance → near, far
- Speed → slow, fast (target 2hz)

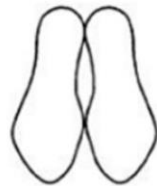
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GSE: Progressions

- Body position → seated, standing
- Base of support → feet apart, together, tandem, walking

Double Leg Stance



Single Non-dominant
Leg Stance

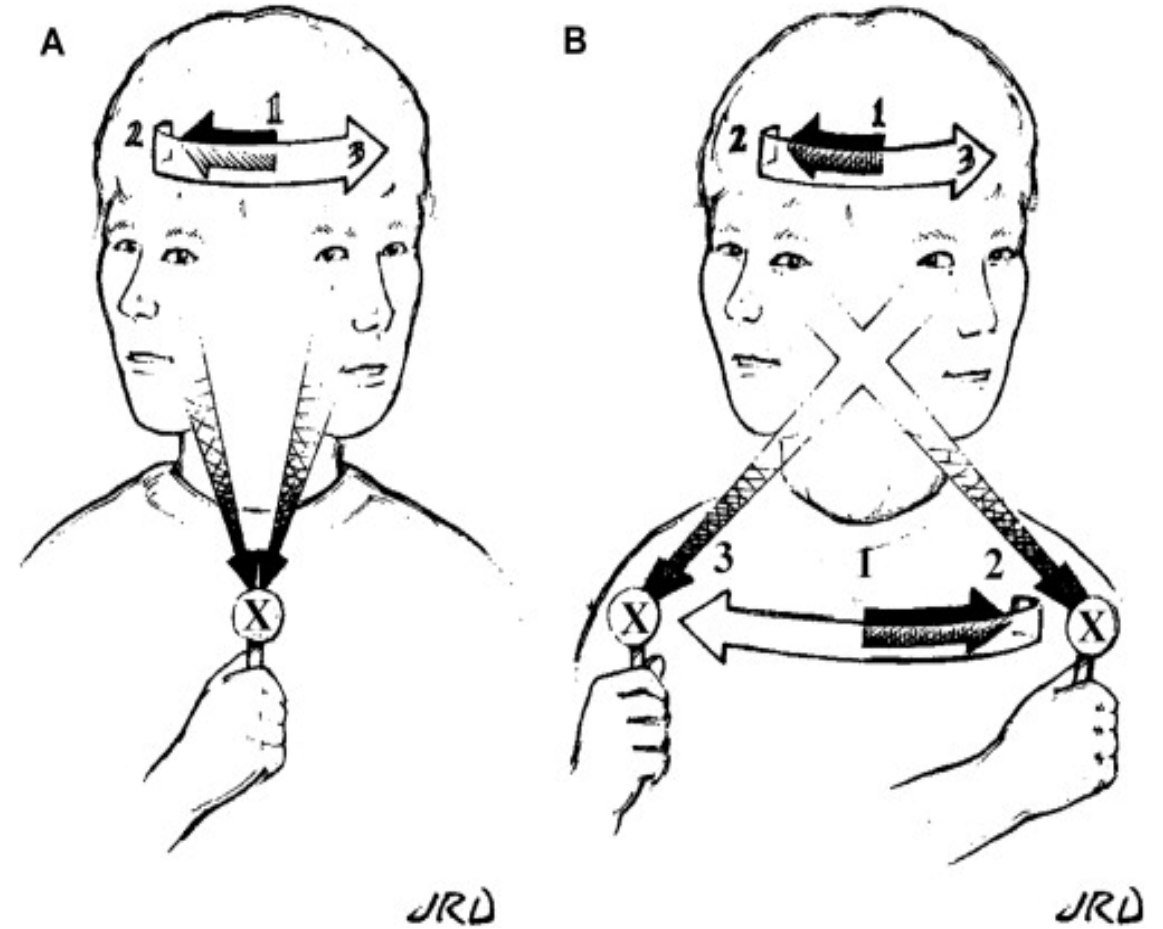


Tandem Stance

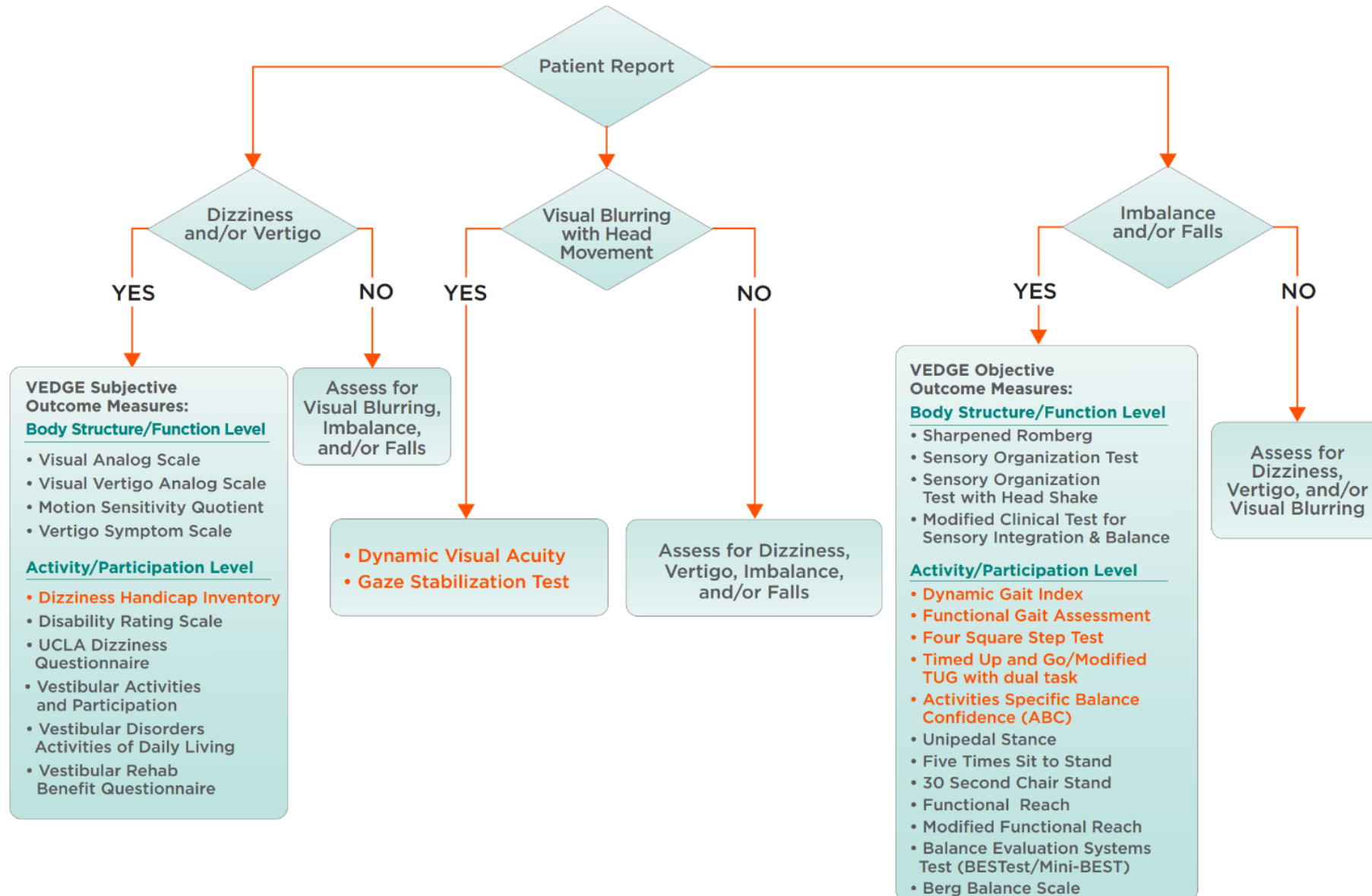


GSE: Progressions

— VOR x 1 → VOR x 2



OUTCOME ASSESSMENT MEASURES BASED ON SUBJECTIVE REPORT IN PERSONS WITH PERIPHERAL VESTIBULAR HYPOFUNCTION



Activities Specific Balance Confidence Scale (ABC)

- Self-perceived balance confidence in performing daily activities
- Scoring ranges from:
 - 0% = no confidence
 - 100% = complete confidence
- Cut-off scores in older adults:
 - < 50%: low level of physical functioning
 - 50-80%: moderate level of physical functioning
 - > 80%: high level of physical functioning

For each of the following activities, please indicate your level of self-confidence by choosing a corresponding number from the following rating scale:

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 tiptoes 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 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? ____%

Persistent postural-perceptual dizziness

