



Canadian Academy of Audiology
Académie Canadienne d'audiologie

Dizziness and Balance: Clinical Assessment of Adults and Children with Vestibular Deficits

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Objectives

- Anatomy and physiology of the vestibular system
- Human balance and the role of the vestibular system in balance
- Importance, value and goals of objective vestibular assessment
- Vestibular interview
- Analysis of eye movements and nystagmus
- Audiologist's role in vestibular assessment and management
- Testing of balance and vestibular function
 - VNG
 - Calorics
 - Positional/positioning tests
 - Functional Balance tests
 - Rotary chair
 - vHIT
 - VEMPs



Vestibular Assessment and Management

- are within the scope of practice of the Audiologist
- Advanced Competency in BC
- Inter-disciplinary team
- ENT versus Audiologist versus Physiotherapist roles



Vestibular Assessment and Management

The need:

- 35% of US adults 40 yo or older evidence of balance dysfunction based on modified Romberg
- 85% in the 80 + yo group
- 80% individuals needed sick leave and medical consultation
- 27% changed jobs, 21% gave up work, 50% reduced efficacy at work
- 57% disruption social life, 35% family difficulties, 50% difficulties traveling
- 2,6-fold increase in falls, rising to 12-fold increase if symptomatic

Agrawal, Y., BK Ward, and LB Minor. "Vestibular Dysfunction: Prevalence, Impact and Need for Targeted Treatment."

Journal of Vestibular Research-Equilibrium & Orientation, vol. 23, no. 3, 2013, pp. 113-117

H.K. Neuhauser, Epidemiology of vertigo, Curr Opin Neurol, 20(1) (2007), 40–46.

A.M. Bronstein, J.F. Golding et al., The social impact of dizziness in London and Siena, J Neurol 257(2) (2010), 183–190



Vestibular Assessment and Management

The need:

- vestibular dysfunction may be present in up to 70% of children with hearing loss
- about 20–40% have severe bilateral vestibular loss
- up to 48% of children with unilateral deafness had vestibular disorder, often ipsilateral
- significantly poorer balance function than their normal hearing peers
- children and adolescents (7-18) with HL perform significantly worse in gait tasks than hearing peers
- the higher the degree of HL, the worse the performance

Cushing, S Vestibular and balance dysfunction in the pediatric population: a primer for the audiologist. *Can Aud* 2014;1(4).

Sokolov, M., Gordon, K. A., Polonenko, M., Blaser, S. I., Papsin, B. C., & Cushing, S. L. (2019). Vestibular and balance function is often impaired in children with profound unilateral sensorineural hearing loss. *Hearing Research*, 372, 52-61.

Melo, R. d. S. (2017). Gait performance of children and adolescents with sensorineural hearing loss. *Gait & Posture*, 57, 109-114.



Relevance of Formal Vestibular Assessment

- Although history (augmented by questionnaires) and physical examination are the initial steps in the evaluation of vertigo, the current study suggests that they should be complemented by objective testing for evaluation of inner ear origin of vertigo

Gofrit SG, Mayler Y, Eliashar R, Bdolah-Abram T, Ilan O, Gross M. The Association Between Vestibular Physical Examination, Vertigo Questionnaires, and the Electronystagmography in Patients With Vestibular Symptoms. *Ann Otol Rhinol Laryngol*. 2017 Apr;126(4):315-321.

- In younger patients with vertigo, negative results on head impulse tests may not be informative

Cohen, HS, Sangi-Haghpeykar, H, Ricci, NA, Kampangkaew J, Williamson, RA. Utility of Stepping, Walking, and Head Impulses for Screening Patients for Vestibular Impairments. *Otolaryngology-Head and Neck Surgery* Vol 151, Issue 1, pp. 131 – 136, 2016

- Bedside head impulse testing has moderate sensitivity and low positive predictive value even when performed by experienced clinicians

Yip CW, Glaser M, Frenzel C, Bayer O, Strupp M. Comparison of the Bedside Head-Impulse Test with the Video Head-Impulse Test in a Clinical Practice Setting: A Prospective Study of 500 Outpatients. *Frontiers in Neurology*. 2016;7:58.



Vestibular Assessment

- Goal:
 - Is there a vestibular impairment?
 - Is it central or peripheral?
 - What side?
 - How much?

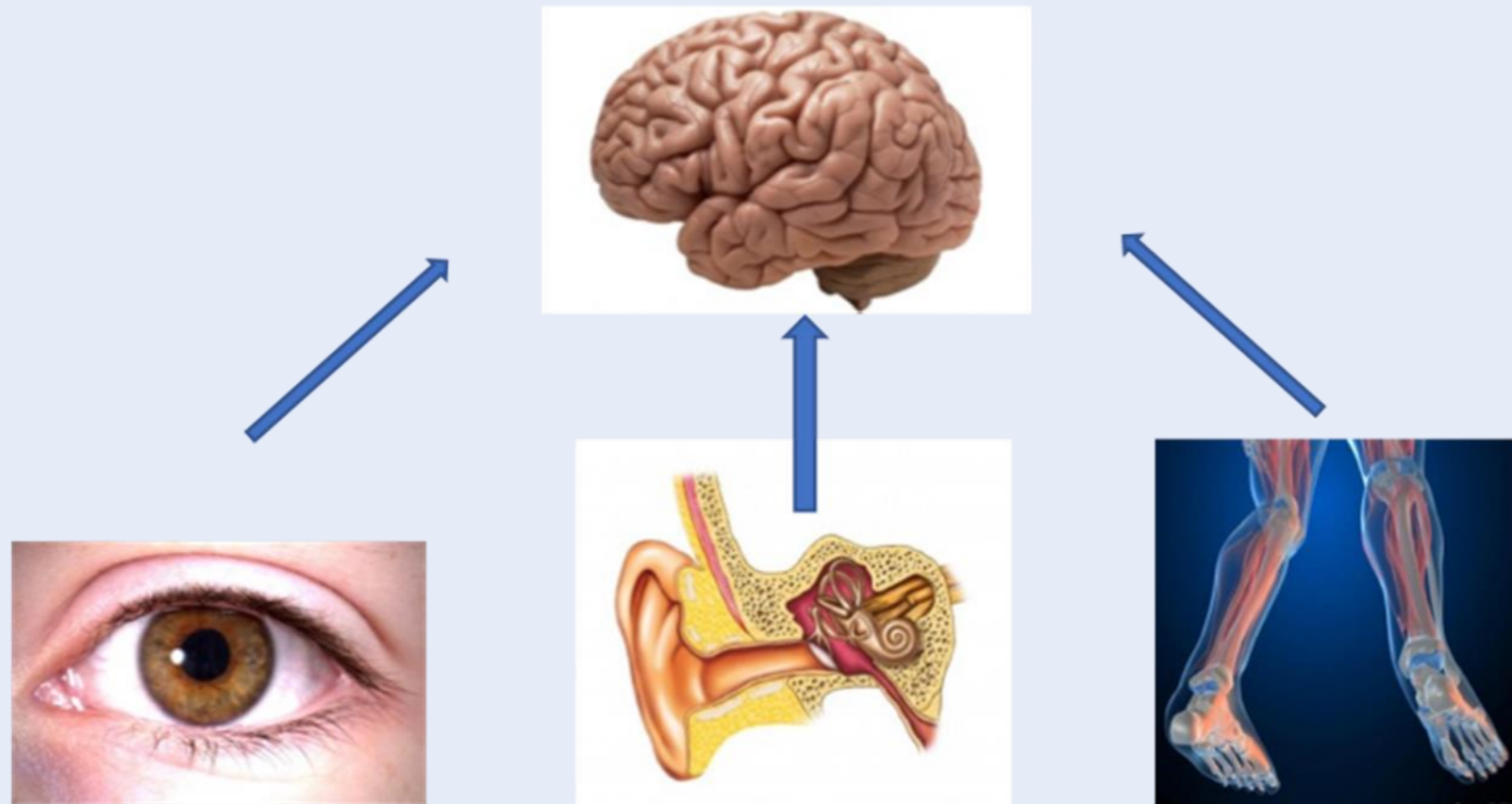
Targeted, effective treatments exist for vestibular disorders with well-defined pathophysiology

- Pharmacological treatment
- Surgical treatment
- Vestibular Rehabilitation Therapy



Balance and the Vestibular System

- Responsible for providing our brain with information about motion, head position, and spatial orientation
- Sense straight and rotational movements of the head



Vestibular System

Maintains gaze stability

Objects stay clear with head movement

VOR (vestibulo ocular reflex)



Maintains postural stability

keep balance when moving in space

VSR (vestibulo spinal reflex)

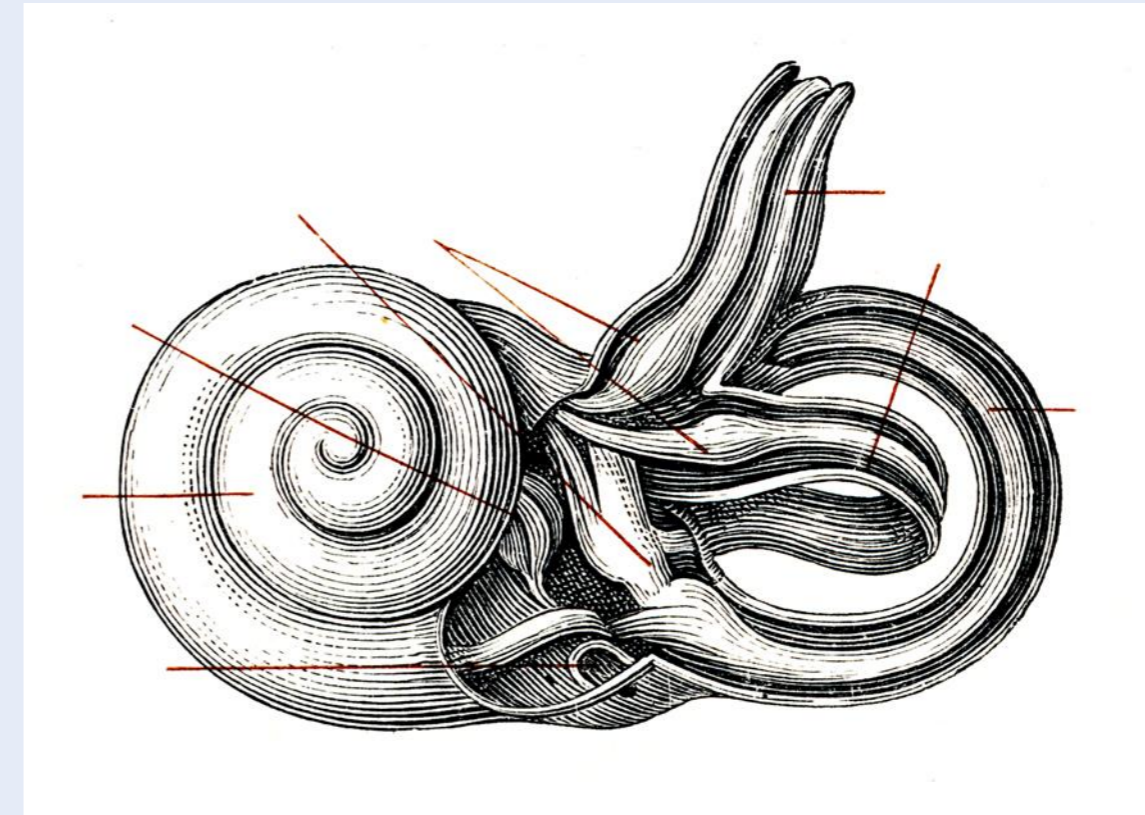
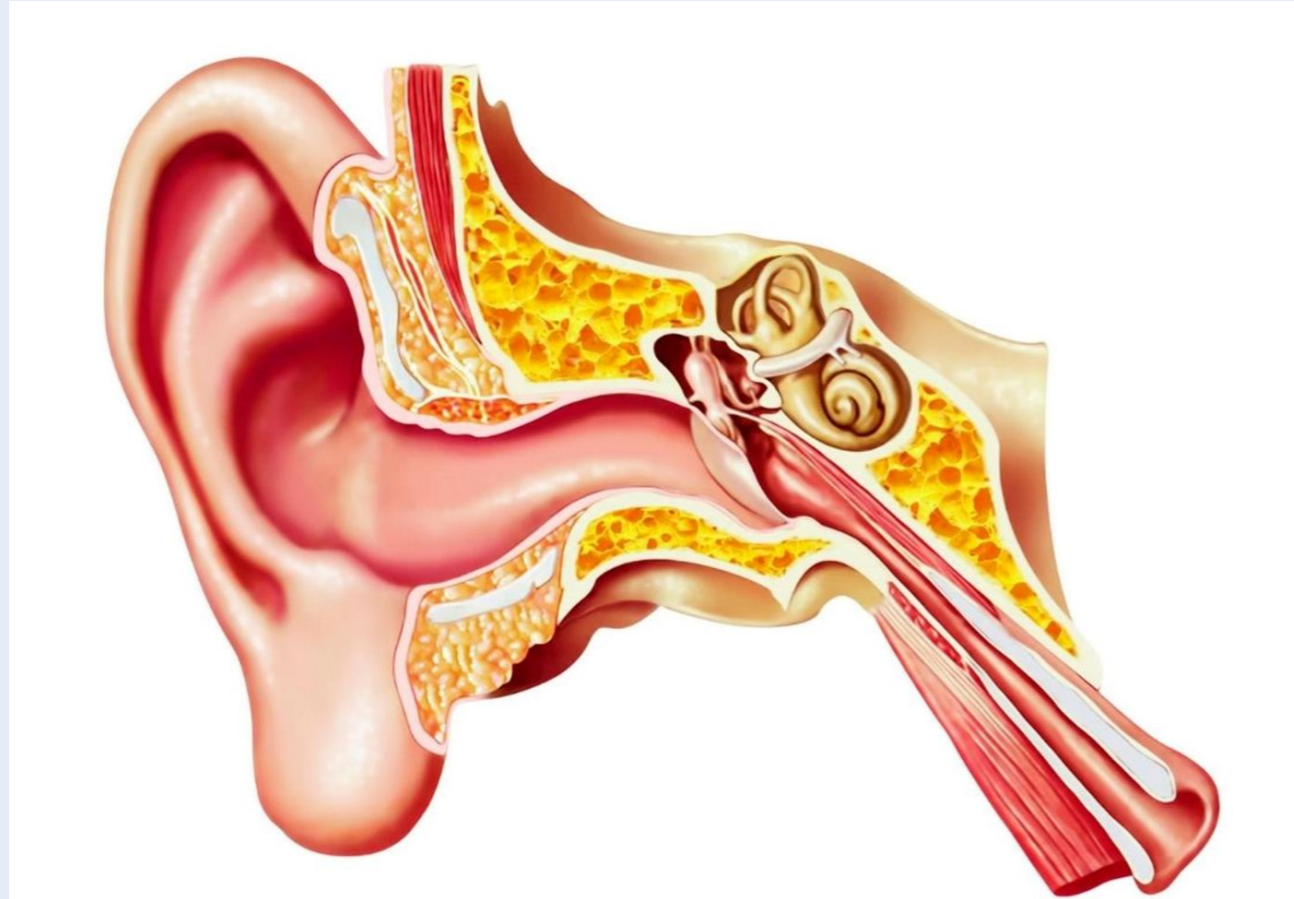


Resolves sensory conflicts

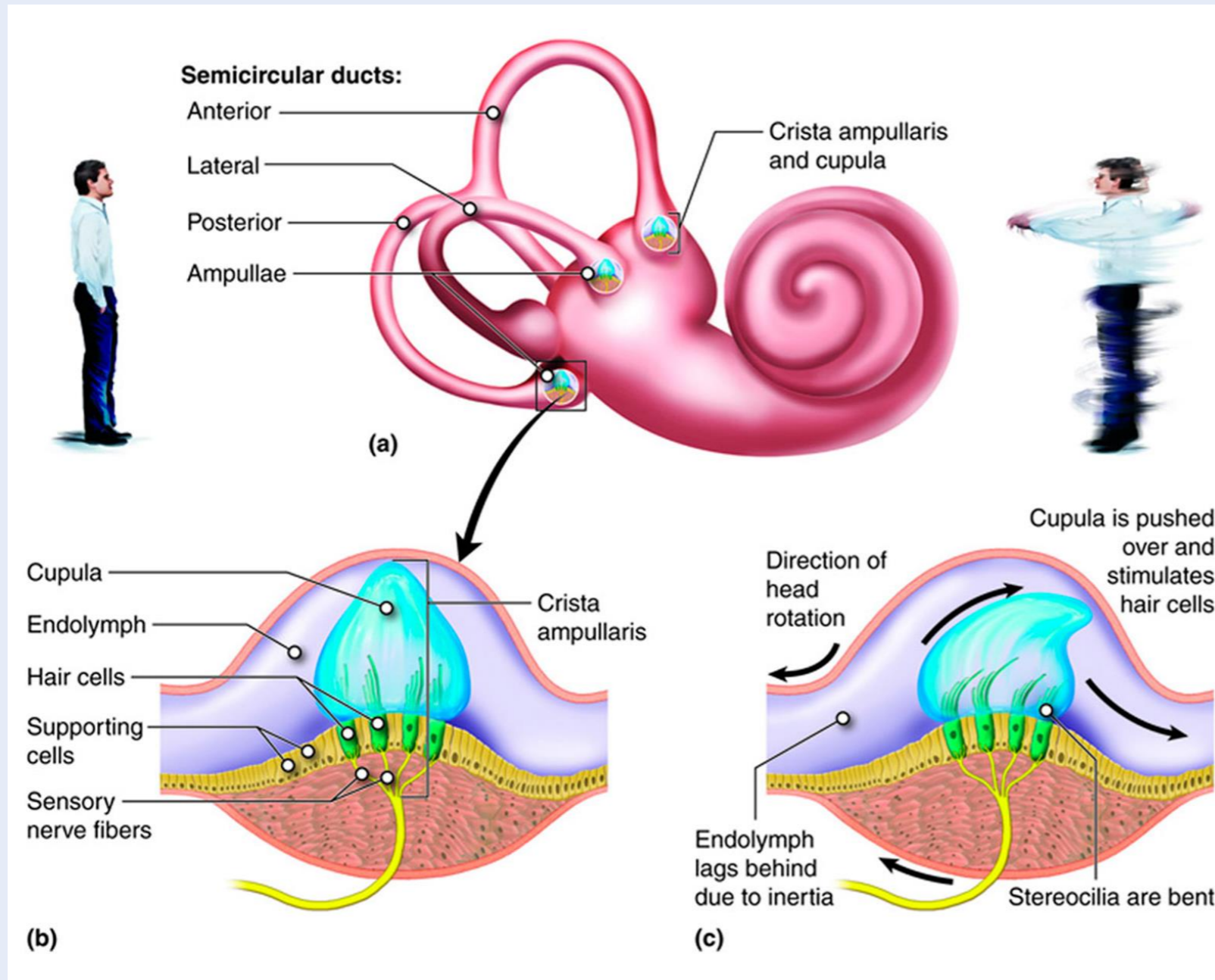
visual and somatosensory mismatches



Vestibular System



Vestibular System

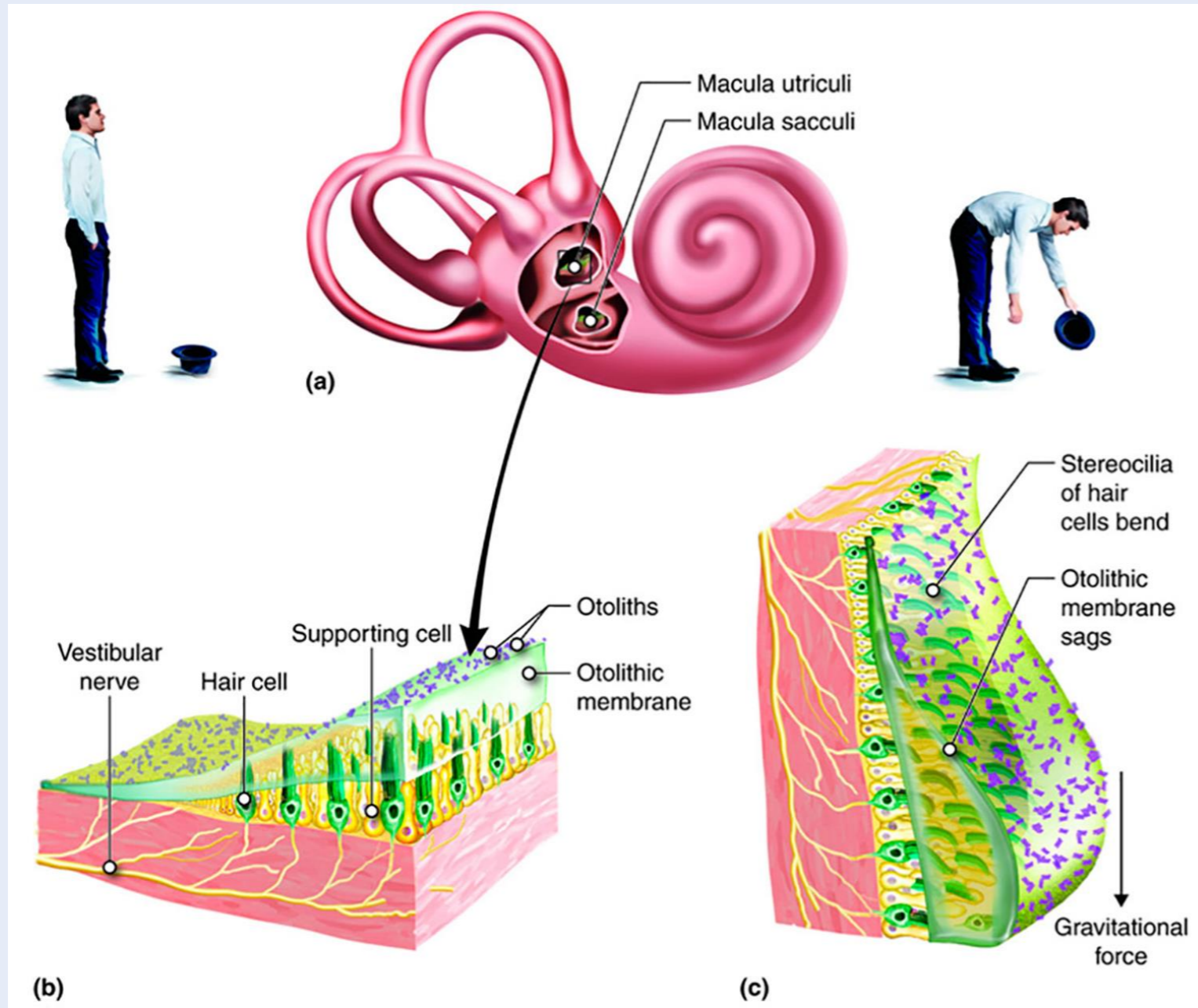


Semicircular Canal Pairs:

- Right and left horizontal canals
- Left anterior and right posterior semicircular canals (LARP)
- Right anterior and left posterior semicircular canals (RALP)



Vestibular System



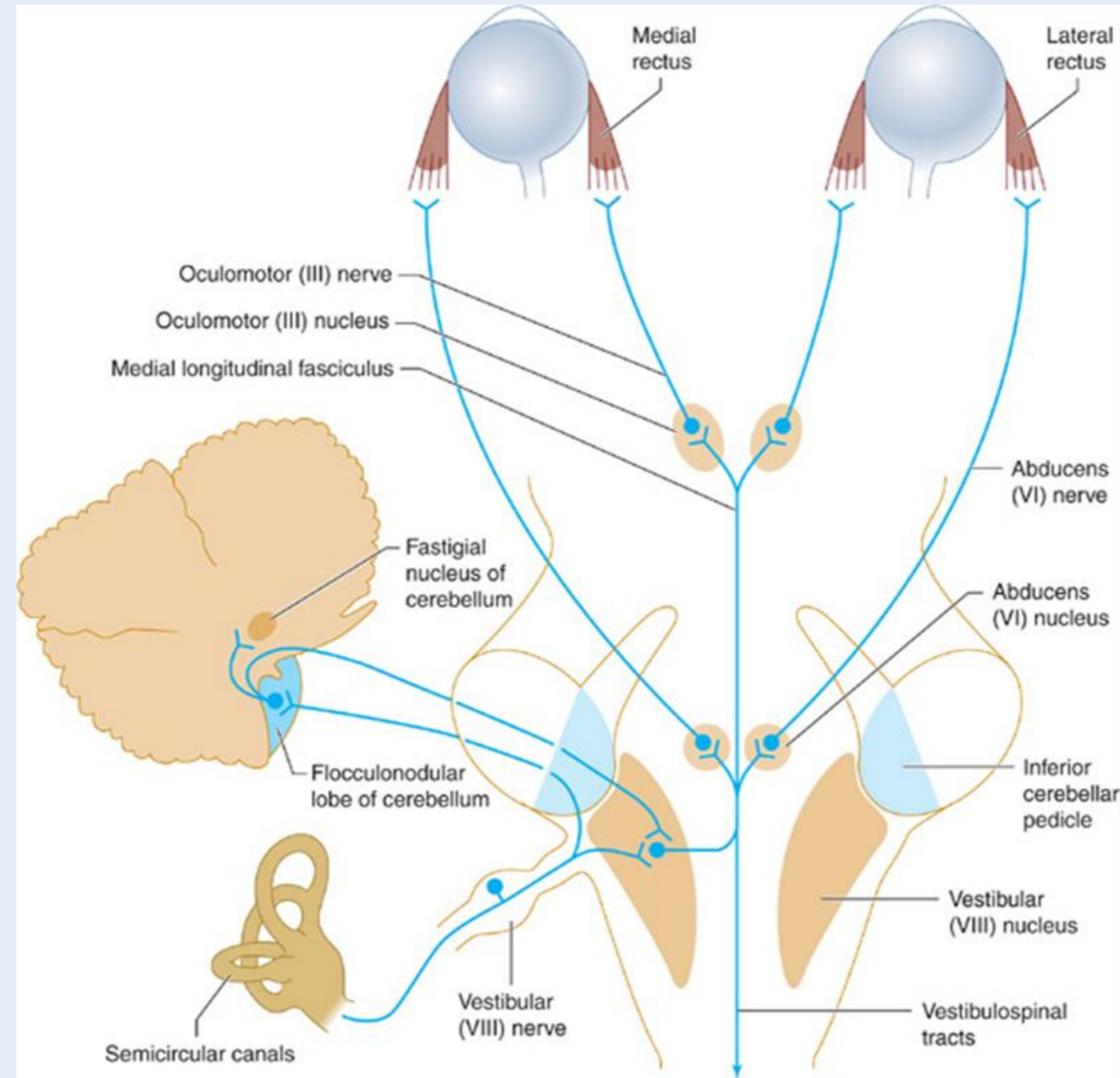
The Otolith Organs:

Respond to linear head movements in all planes

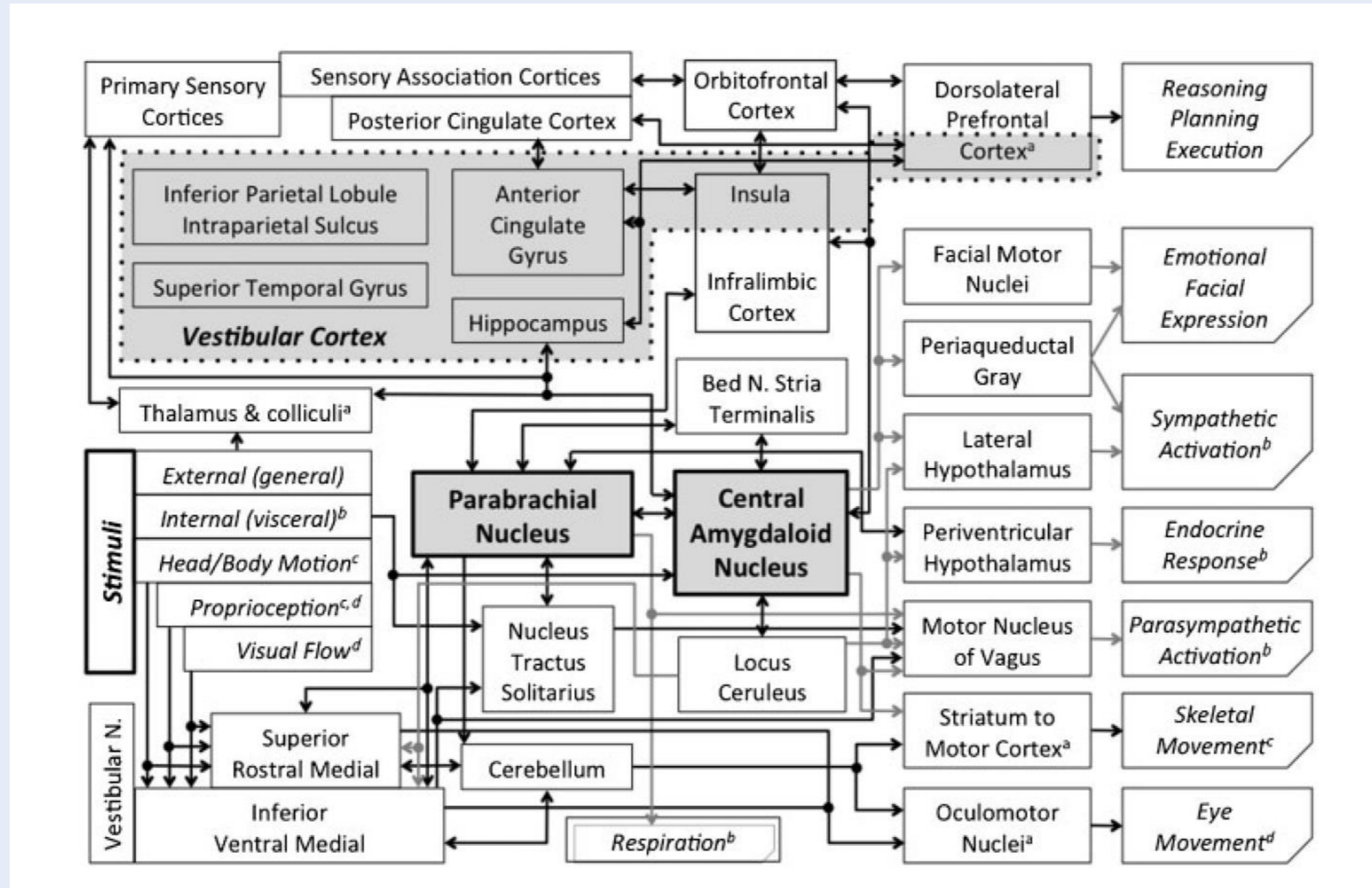
- up and down
- side to side
- back and forth



Central Vestibular Projections



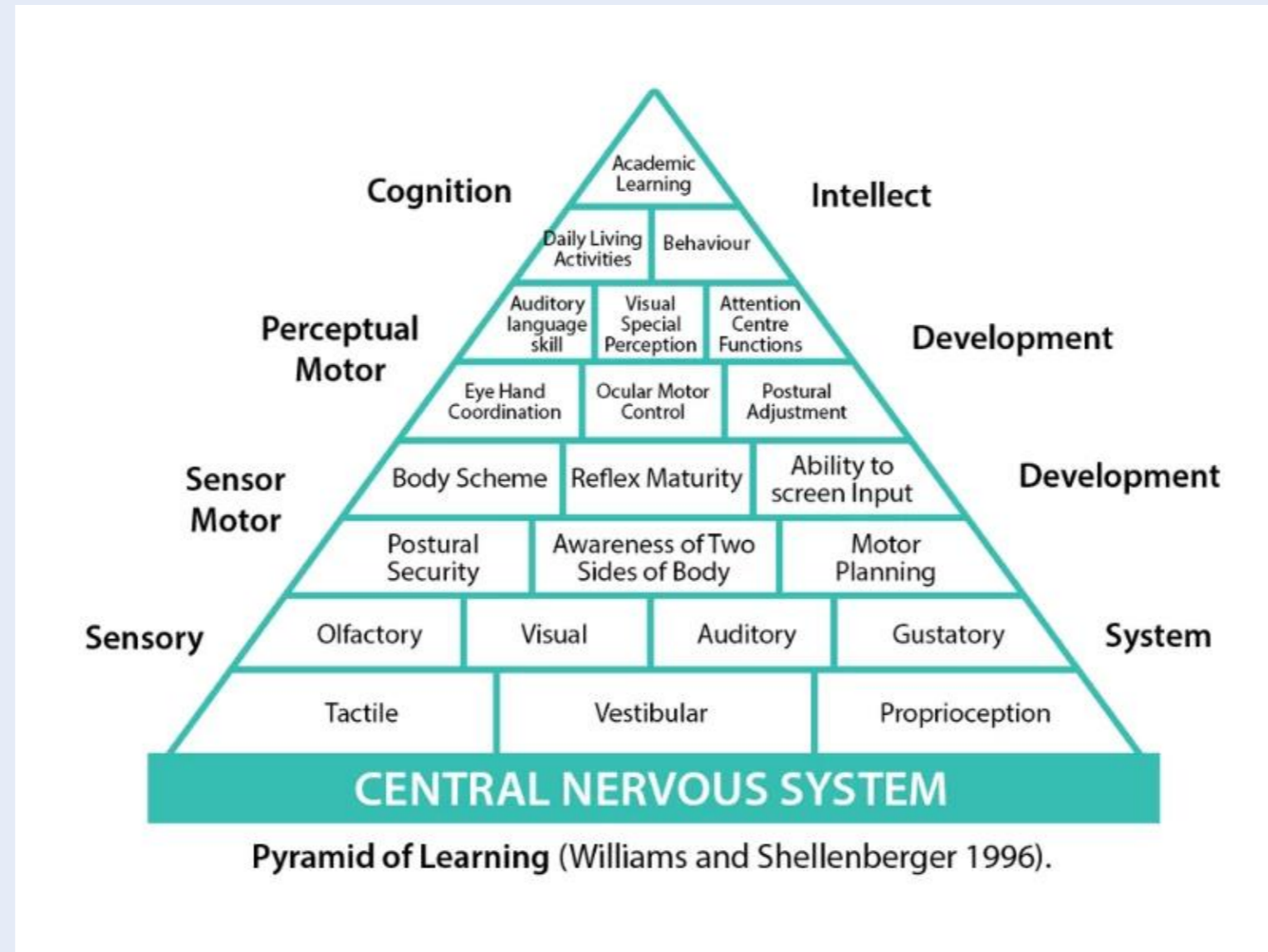
And many more



Staab JP, Balaban CD, Furman JM. Threat assessment and locomotion: clinical applications of an integrated model of anxiety and postural control. *Semin Neurol.* 2013 Jul;33(3):297-306.



Vestibular System in Development



Vestibular Assessment – Case History

- crucial – symptoms are key part of diagnostic criteria
- complex and difficult to describe symptoms
- usually long history
- several, often conflicting opinions from professionals – consult letters
- questionnaires in advance
- keep on track but LISTEN, validate and empathize



Vestibular Assessment – Case History

- TiTrATE: symptom timing, triggers, and targeted bedside eye examinations
- SO STONED: since when, how often, symptom quality, triggers, otological symptoms, neurological symptoms, evolution, duration
- DISCOHAT: darkness worsens symptoms, imbalance, supermarket effect, cognitive complaints, oscillopsia, head movements worsen symptoms, autonomic complaints, tiredness
- 4-step approach
 1. past or current attacks of vertigo and/or dizziness – describe
 2. chronic symptoms – describe
 3. functional, psychological, and/or psychiatric co-morbidity
 4. diagnostic hypothesis, explicitly considering the possibility of multiple co-occurring vestibular disorders

Newman-Toker D.E., Edlow J.A. TiTrATE: A novel, evidence-based approach to diagnosing acute dizziness and vertigo. *Neurol. Clin.* 2015;33:577–599

Wuyts F.L., Van Rompaey V., Maes L.K. “SO STONED”: Common sense approach of the dizzy patient. *front surg. Front. Surg.* 2016;3:32

Paredis S., van Stiphout L., Remmen E., Strupp M., Gerards M.-C., Kingma H., Van Rompaey V., Perez-Fornos A., Guinand N., van de Berg R.

DISCOHAT: An acronym to describe the spectrum of symptoms related to bilateral vestibulopathy. *Front. Neurol.* 2021

van de Berg R, Kingma H. History Taking in Non-Acute Vestibular Symptoms: A 4-Step Approach. *J Clin Med.* 2021 Dec 7;10(24):5726



Vestibular Assessment – Case History

- establish a timeline of events: sudden major attack or insidious; type of dizziness; duration
- triggering/exacerbating and alleviating factors
- treatments tried
- accompanying symptoms
- recurring attacks – compare to initial one
- interictal or chronic symptoms
- medical history
- family history
- medications/drugs



Vestibular Assessment – Pediatric Case History

- may not have language to describe symptoms – caregivers' input
- motor milestones
- hearing loss, cranial nerve abnormalities, headache history
- concussions and other major illnesses

Table 1 Normal developmental gross motor milestones ^{67,68}	
Developmental Motor Milestone	Expected Age to Reach Milestone
Head control	4 mo
Sit without support	6–9 mo
Crawling	6–9 mo
Walking	12–18 mo
Standing on 1 foot	30 months—briefly 36 months—2 s 4 years old—5 s 5 years old—10 s

Data from Gerber RJ, Wilks T, Erdie-Lalena C. Developmental milestones: motor development. *Pediatr Rev* 2010; 31:267-276; quiz 277., Syed MI, Rutka JA, Sharma A, Cushing SL. The 'dizzy child': a 12-minute consultation. *Clin Otolaryngol* 2014; 39:228-234.



Vestibular Assessment – Pediatric Case History

The following questions ask about how often you feel dizziness and unsteadiness. Please circle the best answer for you.

How often in the past month have you felt the following?

1. A feeling that things are spinning or moving around				
3 MOST OF THE TIME	2 SOMETIMES	1 ALMOST NEVER	0 NEVER	? DON'T KNOW
2. Unsteadiness so bad that you actually fall				
3 MOST OF THE TIME	2 SOMETIMES	1 ALMOST NEVER	0 NEVER	? DON'T KNOW
3. Feeling sick				
3 MOST OF THE TIME	2 SOMETIMES	1 ALMOST NEVER	0 NEVER	? DON'T KNOW
4. A light-headed or swimmy feeling in the head				
3 MOST OF THE TIME	2 SOMETIMES	1 ALMOST NEVER	0 NEVER	? DON'T KNOW
5. Feeling of pressure in the ear (s)				
3 MOST OF THE TIME	2 SOMETIMES	1 ALMOST NEVER	0 NEVER	? DON'T KNOW
6. Blurry vision, difficulty seeing things clearly, and / or spots before the eyes				
3 MOST OF THE TIME	2 SOMETIMES	1 ALMOST NEVER	0 NEVER	? DON'T KNOW
7. Headache or feeling of pressure in the head				
3 MOST OF THE TIME	2 SOMETIMES	1 ALMOST NEVER	0 NEVER	? DON'T KNOW
8. Unable to stand or walk without holding on to something or someone				
3 MOST OF THE TIME	2 SOMETIMES	1 ALMOST NEVER	0 NEVER	? DON'T KNOW
9. Feeling unsteady, about to lose balance				
3 MOST OF THE TIME	2 SOMETIMES	1 ALMOST NEVER	0 NEVER	? DON'T KNOW
10. A fuzzy or cotton wool feeling in the head				
3 MOST OF THE TIME	2 SOMETIMES	1 ALMOST NEVER	0 NEVER	? DON'T KNOW
11. Do any of these symptoms stop you doing what you want to do? If yes, which ones?.....				

Pavlou M, Whitney S, Alkathiry AA, et al. The pediatric vestibular symptom questionnaire: a validation study. J Pediatr 2016;168:171–7.e1.



Vestibular Assessment – Pediatric Case History

NAME: _____

DATE: _____

VANDERBILT PEDIATRIC DIZZINESS HANDICAP INVENTORY- PATIENT CAREGIVER (DHI-PC) (AGES 5-12 YEARS)

Instructions: The purpose of this questionnaire is to identify difficulties that your child may be experiencing because of his or her dizziness or unsteadiness. Please answer “yes”, “no”, or “sometimes” to each question.

Answer each question as it pertains to your child’s dizziness problem only.

	Yes (4)	Sometimes (2)	No (0)
1. Does your child’s problem make him/her feel tired?			
2. Is your child’s life ruled by his/her problem?			
3. Does your child’s problem make it difficult for him/her to play?			
4. Because of his/her problem, does your child feel frustrated?			
5. Because of his/her problem, has your child been embarrassed in front of others?			
6. Because of his/her problem, is it difficult for your child to concentrate?			
7. Because of his/her problem, is your child tense?			
8. Do other people seem irritated with your child’s problem?			
9. Because of his/her problem, does your child worry?			
10. Because of his/her problem, does your child feel angry?			
11. Because of his/her problem, does your child feel “down”?			
12. Because of his/her problem, does your child feel unhappy?			
13. Because of his/her problem, does your child feel different from other children?			
14. Does your child’s problem significantly restrict his/her participation in social or educational activities, such as going to dinner, meeting with friends, field trips, or to parties?			
15. Because of your child’s problem, is it difficult for him/her to walk around the house in the dark?			
16. Because of his/her problem, does your child have difficulty walking up stairs?			
17. Because of his/her problem, does your child have difficulty walking one or two blocks?			
18. Because of his/her problem, does your child have difficulty riding a bike or scooter?			
19. Because of his/her problem, does your child have difficulty reading or doing schoolwork?			
20. Does your child's problem make it difficult to successfully do activities that others his/her age can do?			
21. Because of his/her problem, does your child have trouble concentrating at school?			
		TOTAL SCORE	

Devin L. McCaslin, Gary P. Jacobson, Warren Lambert, Lauren N English, Alison J Kempf, The development of the Vanderbilt pediatric dizziness handicap inventory for patient caregivers (DHI-PC), International Journal of Pediatric Otorhinolaryngology, Volume 79, Issue 10, 2015, Pages 1662-1666.



Vestibular Assessment – Diagnostic Hypothesis

Balance and Dizziness Canada www.balanceanddizziness.org

Barany Society Consensus Documents [ICVD Consensus Documents - The Barany Society](#)



Positional and Positioning testing

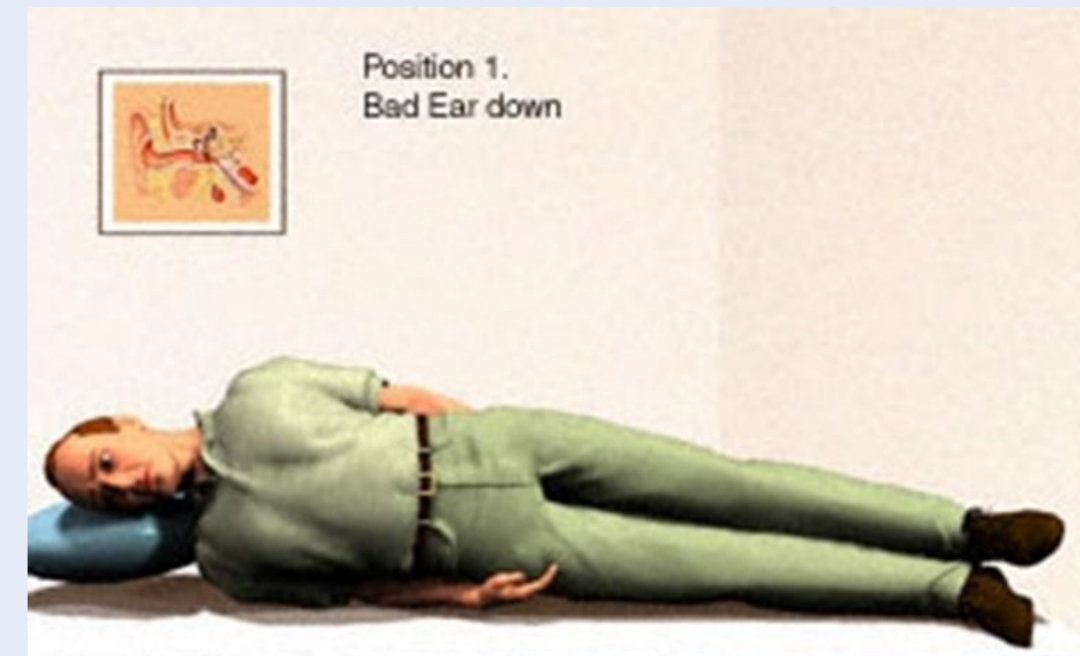


Positional/positioning testing

- Positioning tests: active transition from one position into another



- Positional tests: head remains static



Positional/positioning testing

- Nystagmus
 - Presence
 - **Direction**
 - Duration
 - Latency (onset)
 - Slow phase velocity
 - Fatigability
- Associated symptoms – vertigo, dizziness, nausea



BPPV is what we are looking for

**Understand BPPV
in one minute**

Michael Teixido, M.D.

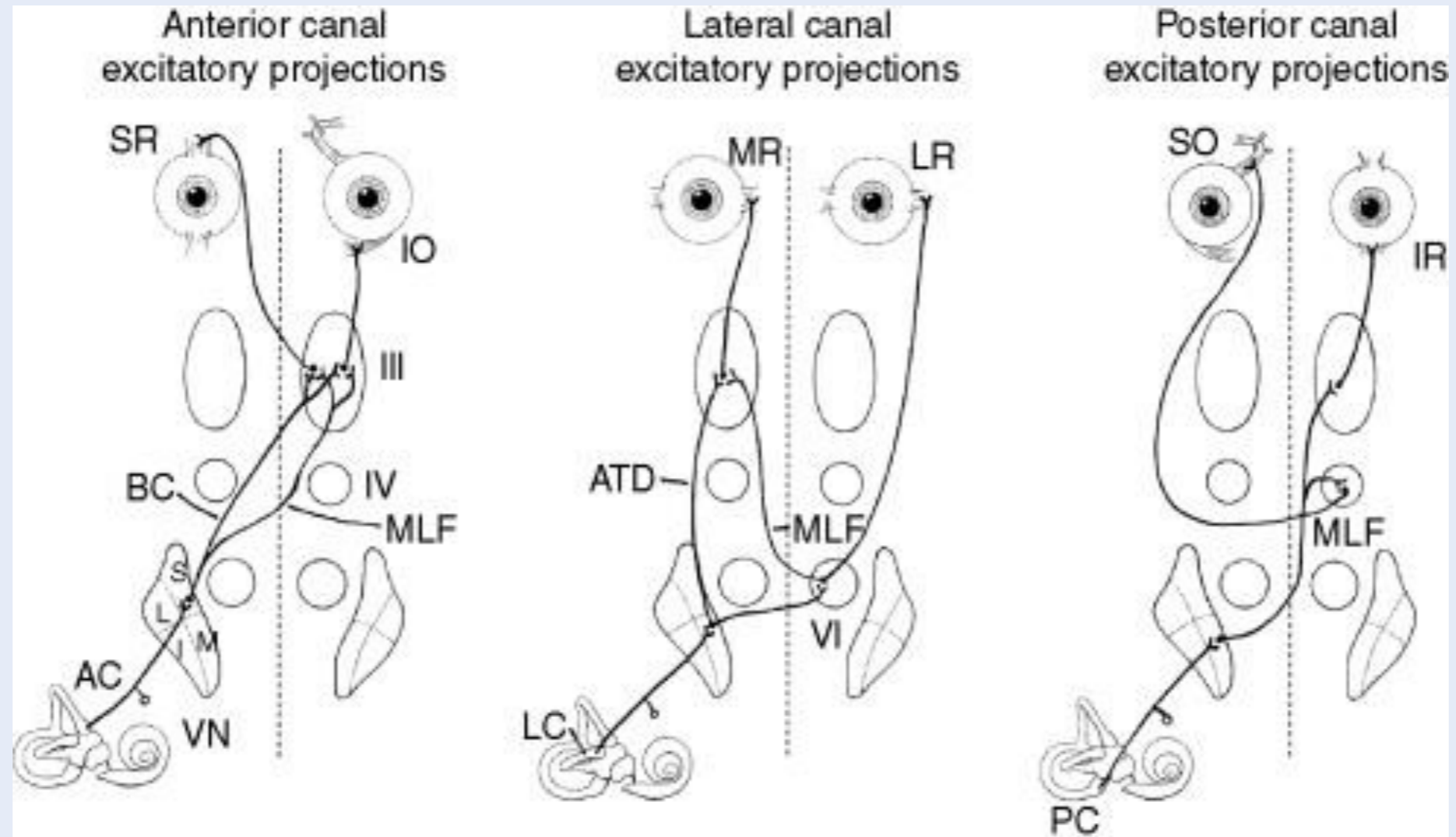


What is BPPV?

- Benign Paroxysmal Positional Vertigo
 - Most common cause of vertigo of vestibular origin
 - Calcium carbonate crystals (otoconia) dislodge from otoliths into one or more semicircular canals
 - Free floating = canalithiasis
 - Adhered to the cupula = cupulolithiasis
 - Vast majority posterior canal
 - About 15% lateral canal
 - Very low occurrence anterior canal
- } choice of canalith repositioning maneuver



How does it work?



Positioning testing - BPPV

- Dix-Hallpike maneuver
 - Fully supported
 - Side lying maneuver

	Posterior canal	Anterior canal
RIGHT	Right torsional up	Left torsional down
LEFT	Left torsional up	Right torsional down



Posterior Canal BPPV



Positioning testing – horizontal canal BPPV

- Supine head roll

	RIGHT	LEFT
canalithiasis (transient delayed onset)	Geotropic, Stronger on right ear down	Geotropic, Stronger on left ear down
cupulolithiasis (persistent immediate onset)	Ageotropic, Stronger on left ear down	Ageotropic, Stronger on right ear down



Positioning testing - BPPV



Positional testing

- Positional Body Test
- slow-phase velocity $> 5^\circ/s$
- spv $< 6^\circ/s$ persistent in 4 or more positions
- spv $< 6^\circ/s$ sporadic in all positions
- direction changing within a given head position (indicates central involvement)
- *** Vertical nystagmus



Peripheral or central?

Lee SH and Kim JS

Table 2. Clinical and differential features of benign paroxysmal positional vertigo (BPPV) versus central paroxysmal positional vertigo (CPPV)

	BPPV	CPPV
Latency	Usual (shorter in HC-BPPV)	Unusual
Duration of attack	Usually less than 60 seconds (longer in HC-BPPV)	Variable, usually longer than BPPV
Direction of nystagmus	Torsional/vertical (PC/AC-BPPV) and horizontal (HC-BPPV); compatible with the stimulated canal plane	Pure vertical (usually downbeat) or pure torsional; not attributable to the stimulated canal plane; possibly mimics BPPV pattern*
Fatigability	Usual (possibly rare in HC-BPPV)	Unusual
Nausea and vomiting	Rare on single precipitating maneuver; not uncommon after several maneuvers; usually associated with intense nystagmus	Frequent even on single precipitating maneuver; not necessarily associated with intense nystagmus
Mechanism	Debris moving in semicircular canal	Damage to central otolith-ocular pathways
Natural course	Spontaneous recovery within several weeks in 70-80%	Spontaneous recovery within weeks possible
Associated neurological signs and symptoms	None	Often cerebellar and other oculomotor signs; possibly none
Brain imaging	Normal	Cerebellar lesions (common in dorsal vermis, nodulus, dorsolateral to the fourth ventricle); cerebellar atrophy; craniocervical anomaly; possibly normal (VBI)

*Apogeotropic nystagmus is common. Other BPPV patterns are also possible.
AC: anterior canal, PC: posterior canal, VBI: vertebrobasilar insufficiency.



Validating and gratifying



Procedure: MRI Head w/o Contrast
Accession Number: 00101MR20240015173
Exam Date: Jul 16, 2024 10:55
Ordering Physician: Williard Johnston
Age at Exam: 64 years

F41 - good call!

Ordered By: Williard Johnston

EXAM TYPE:
MRI Head w/o Contrast

HISTORY:
Vertigo without any classic vestibular symptoms, central cause suspected.

COMPARISON:
No relevant priors available on CareConnect.

TECHNIQUE:
3T brain screen protocol (sagittal MPRAGE axial DWI, axial SWI, axial T2, sagittal 3D FLAIR)

FINDINGS:
There is a 2.2 x 1.7 x 1.3 cm (APxTRxCC) lesion centered in the right cerebellopontine angle, immediately inferior to the traversing right vestibulocochlear and facial nerves. It exhibits intrinsic low T1 signal, with high T2 which nulls on FLAIR sequences. No restricted diffusion. There is subtle mass effect on the anterior aspect of the right cerebellar hemisphere, no expansion of the IAC.

Elsewhere, midline structures are central, and the ventricles and sulci are age-appropriate. Patchy nonspecific T2 FLAIR hyperintensities in the supratentorial white matter may reflect very mild chronic microvascular ischemic changes.

The orbits, paranasal sinuses, mastoid air cells are unremarkable.

IMPRESSION:
2.2 cm arachnoid cyst at the RIGHT cerebellopontine angle, with minimal local mass effect on the inferior margin of the traversing vestibulocochlear and facial nerves and right cerebellar hemisphere.



In Pediatric Population

- Rare but well documented
- Higher female prevalence
- Often secondary
 - Trauma
 - Vestibular migraine (BPVC)
 - Cochlear implant surgery
 - Vestibular neuritis
 - Enlarged vestibular aqueduct
 - CMV*

Benign Paroxysmal Vertigo of Childhood

- Migraine precursor and/or equivalent
- Renamed Vestibular Migraine of Childhood
- May or may not result in BPPV



Canalith repositioning maneuvers

- Posterior canal
 - Epley maneuver
 - Semont
 - Gans
 - Half somersault (Foster)
- Lateral canal
 - Barbeque roll
 - Gufoni
- Anterior canal
 - Deep Head Hanging – Yacovino



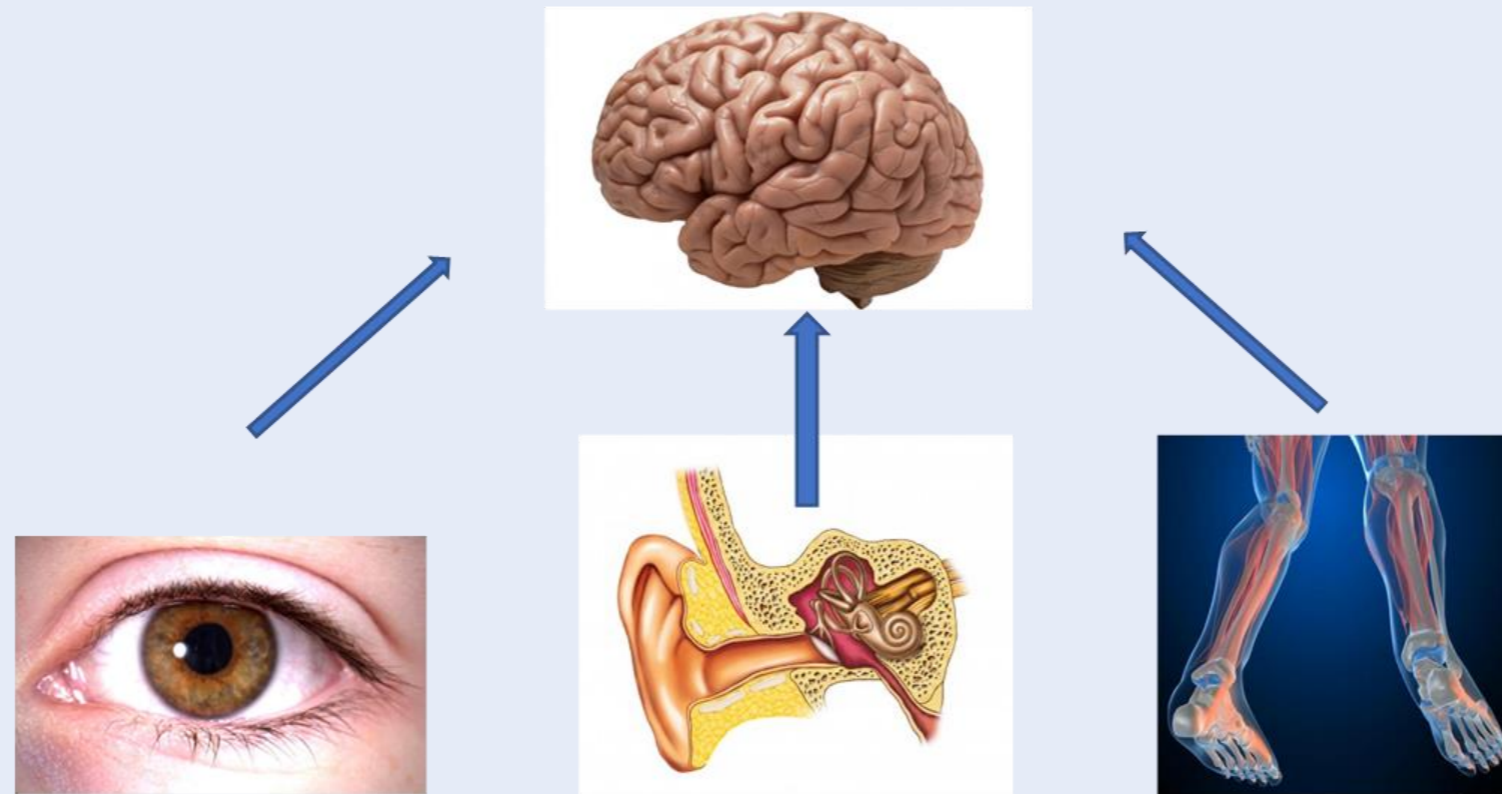
It is time to practice!



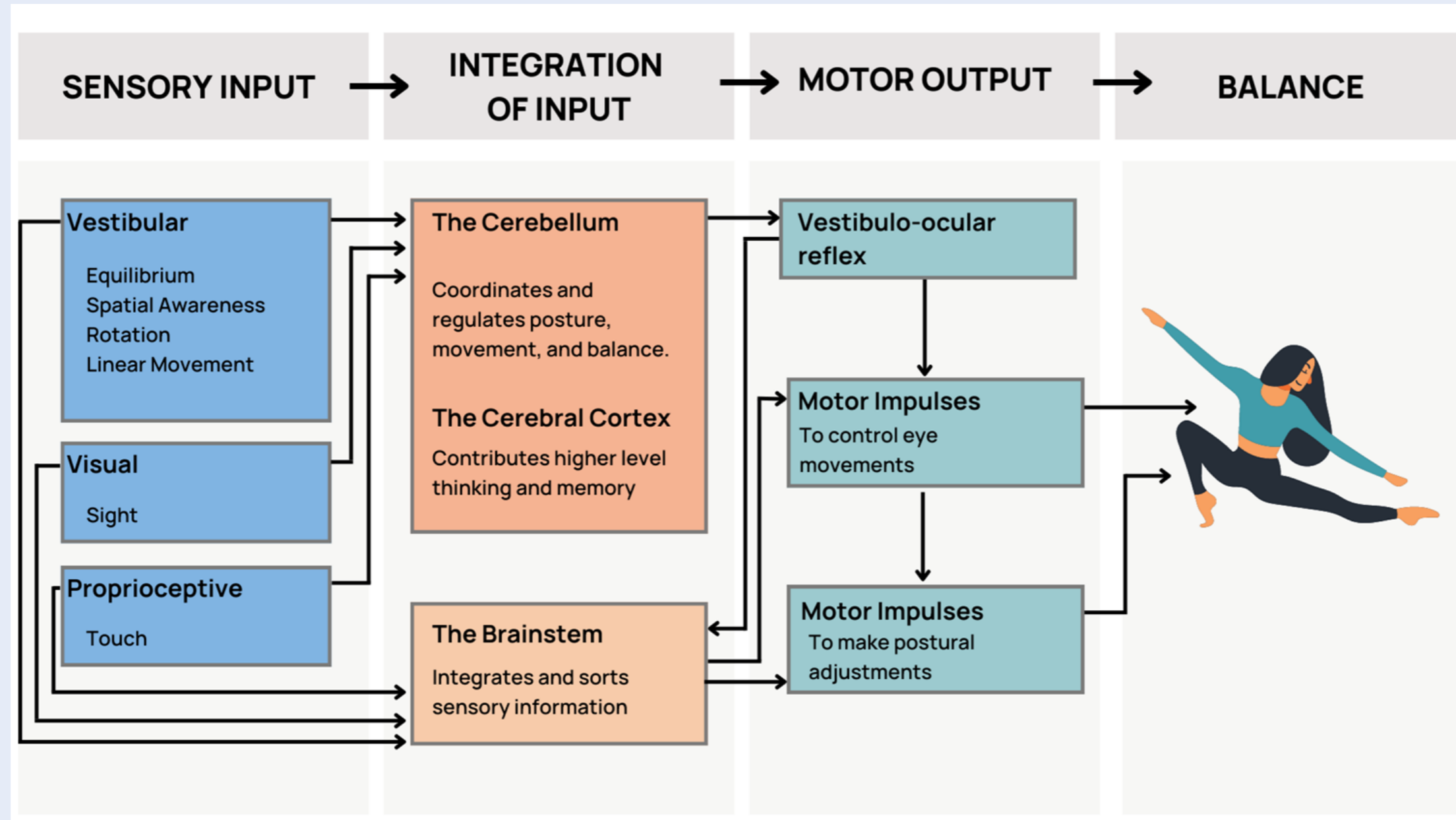
Functional Balance Assessment



Vestibular System and Human Balance



Vestibular System and Human Balance



Vestibular Assessment Tools

- *** Case history
- VNG
 - Oculomotor testing (peripheral and central vestibular pathways)
 - Caloric testing (lateral semicircular canal – physiological response)
 - Positioning/positional tests (for BPPV and central positional nystagmus)
- Rotary chair
- vHIT (all semicircular canals)
- VEMPs (cervical and ocular)

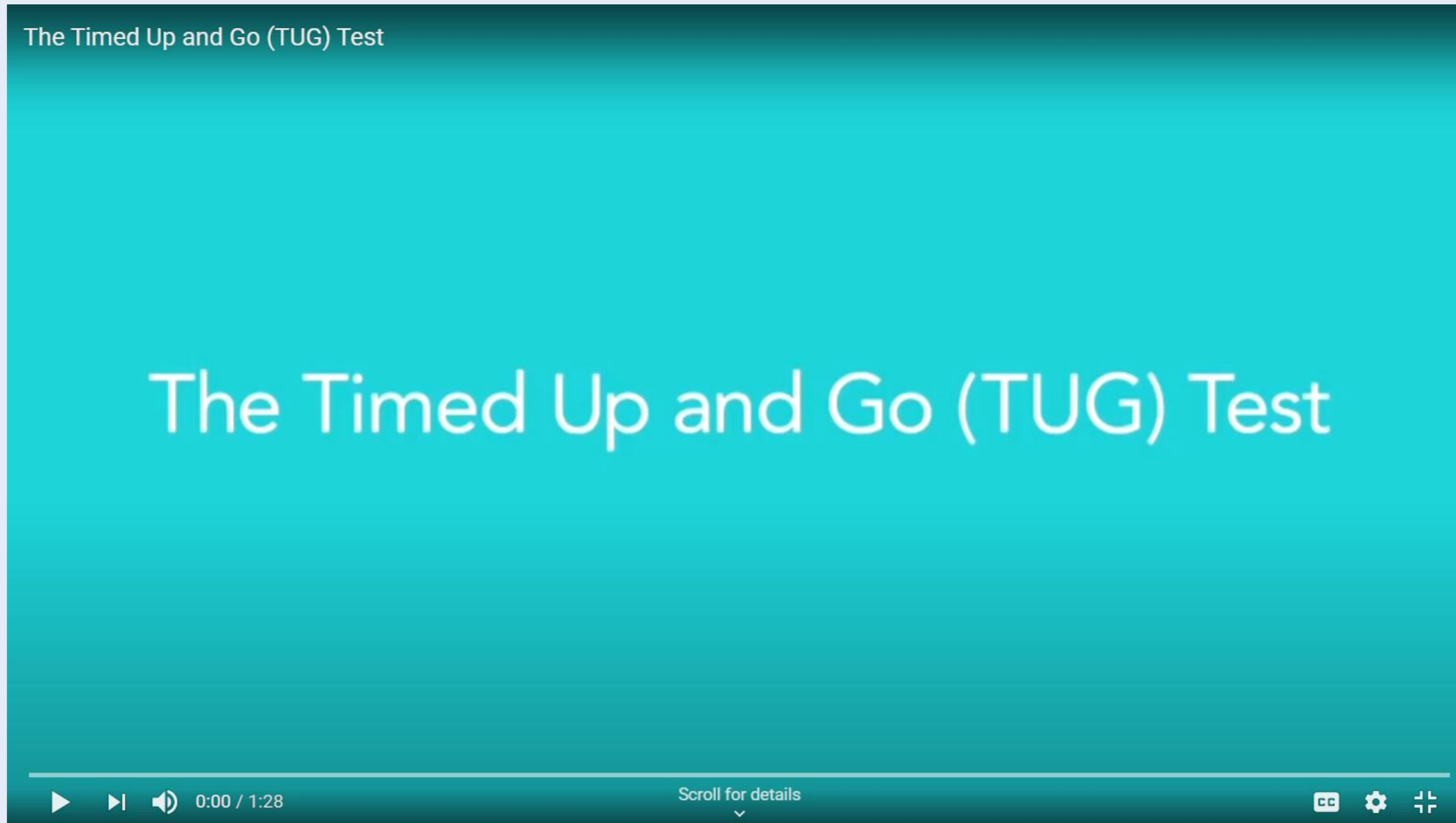


Functional Balance Assessment Tools

- Clinical: rate performance on a set of motor tasks on a point scale on using a stop-watch
 - Berg Functional Balance Scale
 - Timed Up and Go (TUG)
 - One Leg Stance
 - Functional Reach
 - Balance Evaluation System Test (BEST)
 - Dynamic Gait Index
 - Clinical Test of Sensory Integration and Balance (CTSIB)
 - Gans SOP
- Computerized testing: force plate based
 - Computerized Dynamic Posturography – Equitest



Timed up and go



Gans Sensory Organization Performance (SOP) test



1. Romberg open stance (feet shoulder width apart) with eyes open
2. Romberg open stance (feet shoulder width apart) with eyes closed
3. Tandem Romberg (not heel to toe) with eyes open
4. Tandem Romberg (not heel to toe) with eyes closed
5. Standing on foam (CTSIB) with eyes open
6. Standing on foam (CTSIB) with eyes closed
7. Stepping Fukuda – patient marches (standing on floor) in place with eyes closed



Computerized Dynamic Posturography



- Strapped harness for safety
- Standing on a moveable dual-force plate
- Within moveable surrounding
- Alignment
- Tests:
 - Sensory Organization Test (SOT)
 - Motor Control Test (MCT)
 - Adaptation Test (ADT)

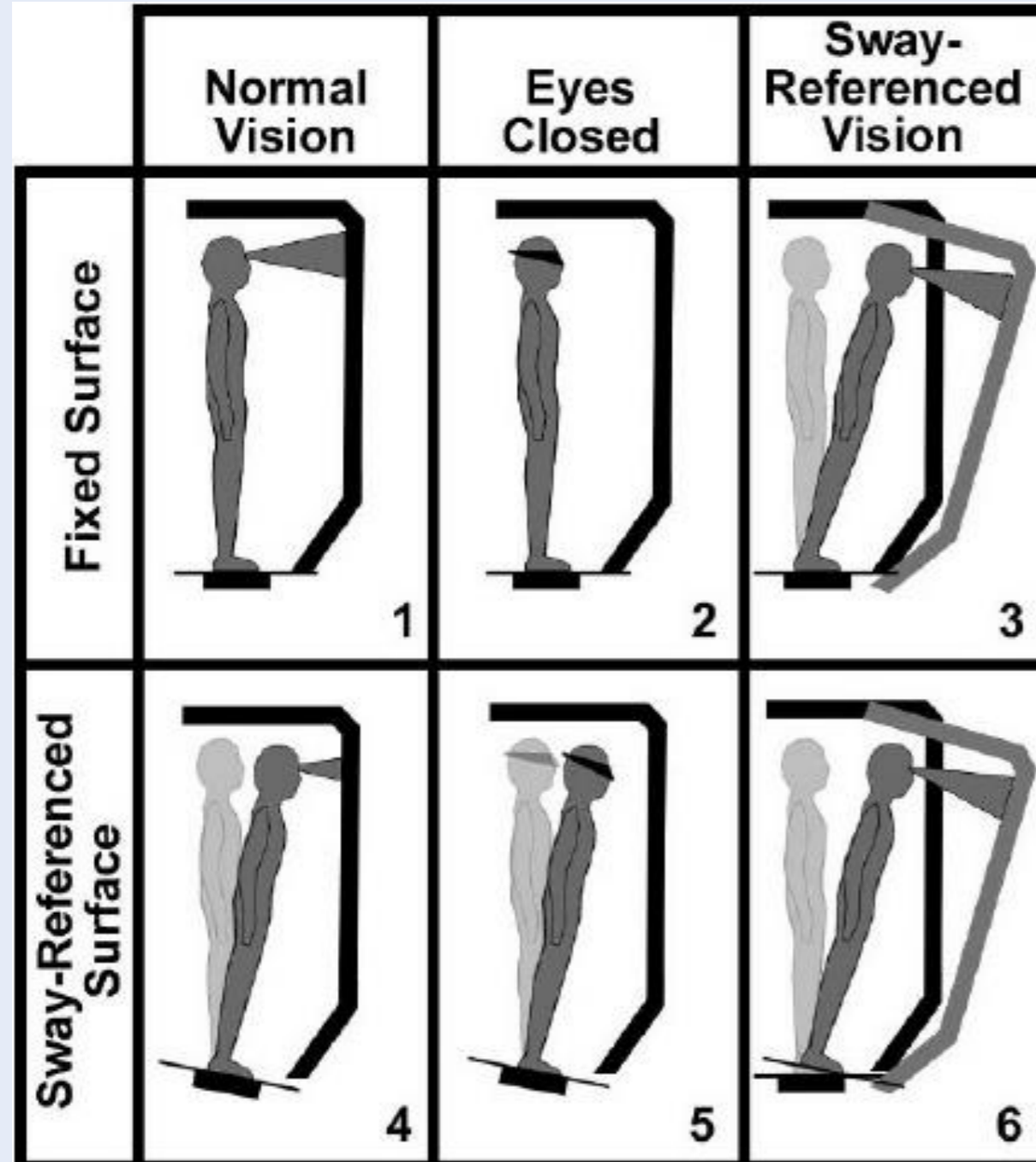


Sensory Organization Test (SOT)

- Assesses the ability of an individual to effectively process individual sensory system input cues to maintain balance control.
- Objectively isolates and quantifies the use of each sensory system and the adaptive (or maladaptive) responses of the central nervous system
- "Falls"
- Centre of Gravity (COG) Alignment
- Equilibrium Score: maximum anteroposterior sway
- Strategy Analysis: ankle, hips and upper body



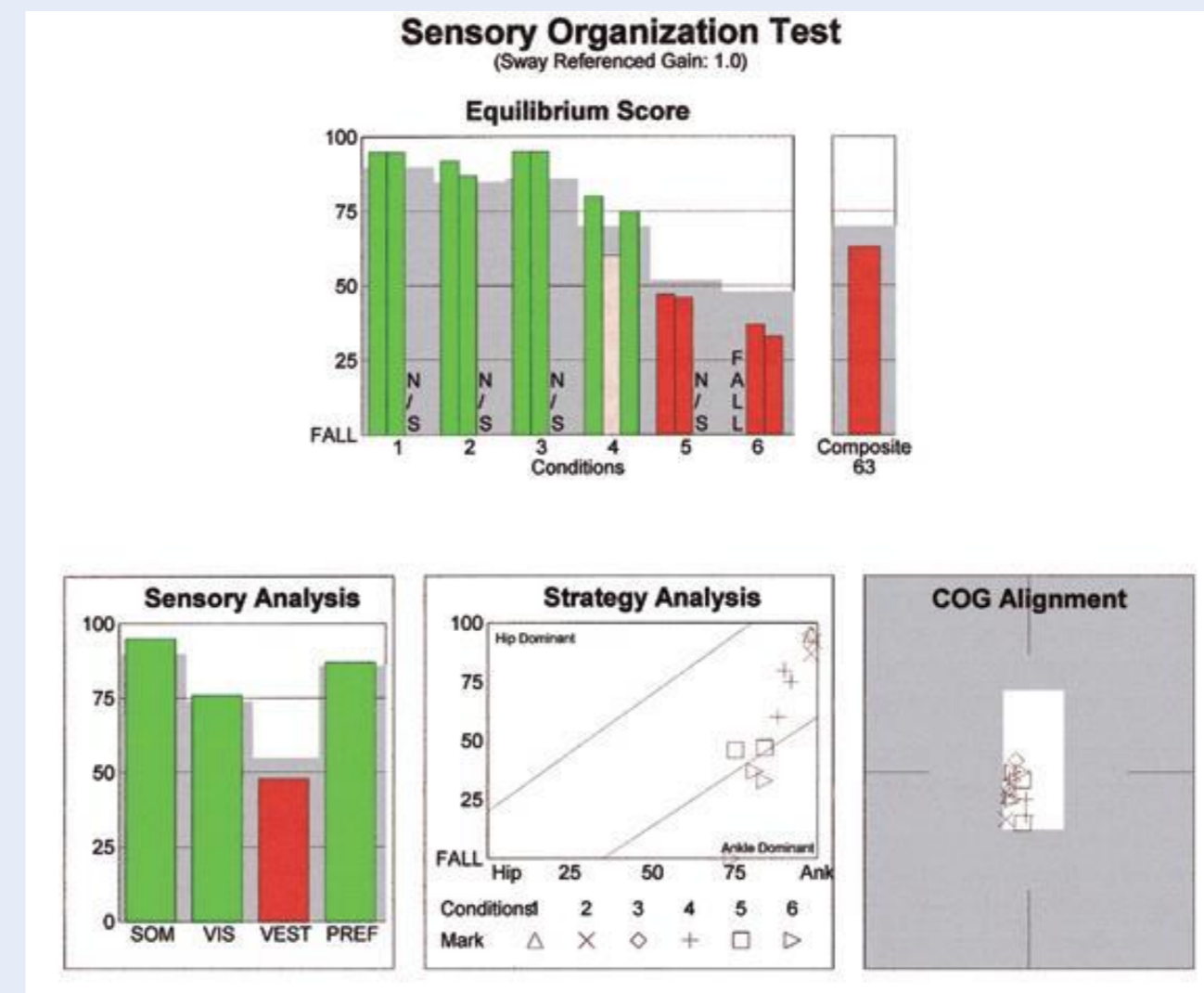
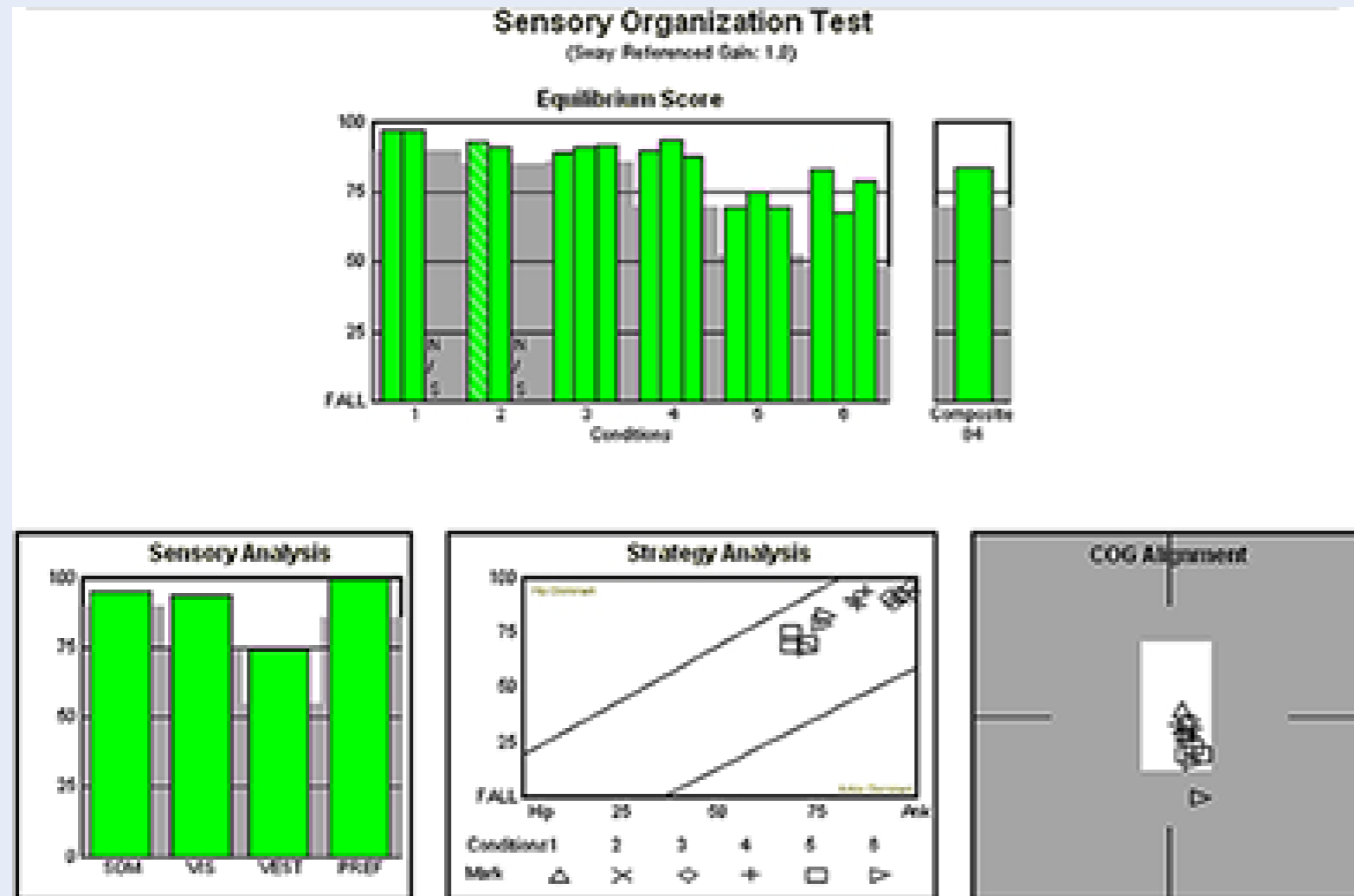
Sensory Organization Test (SOT)



Ratio	Conds.	Functional Relevance
Somatosensory (SOM)	2/1	Pt's ability to use input from the somatosensory system to maintain balance.
Visual (VIS)	4/1	Pt's ability to use input from the visual system to maintain balance.
Vestibular (VEST)	5/1	Pt's ability to use input to the vestibular system to maintain balance.
Preference (PREF)	$3+6/2+5$	The degree to which pt relies on visual info to maintain balance, even when the info is incorrect.



Sensory Organization Test (SOT)



Contraindications

- Weight and height restrictions – 18 to 136 Kg – 76 to 203 cm
- Inability to stand unsupported

Limitations

- By itself, CANNOT diagnose site of lesion or pathology
- Effects of drugs, alcohol
- Weight distribution
- Secondary gain and anxiety



Bertec – Computerized Dynamic Posturography



Virtualis - Interacoustics



Pediatric population

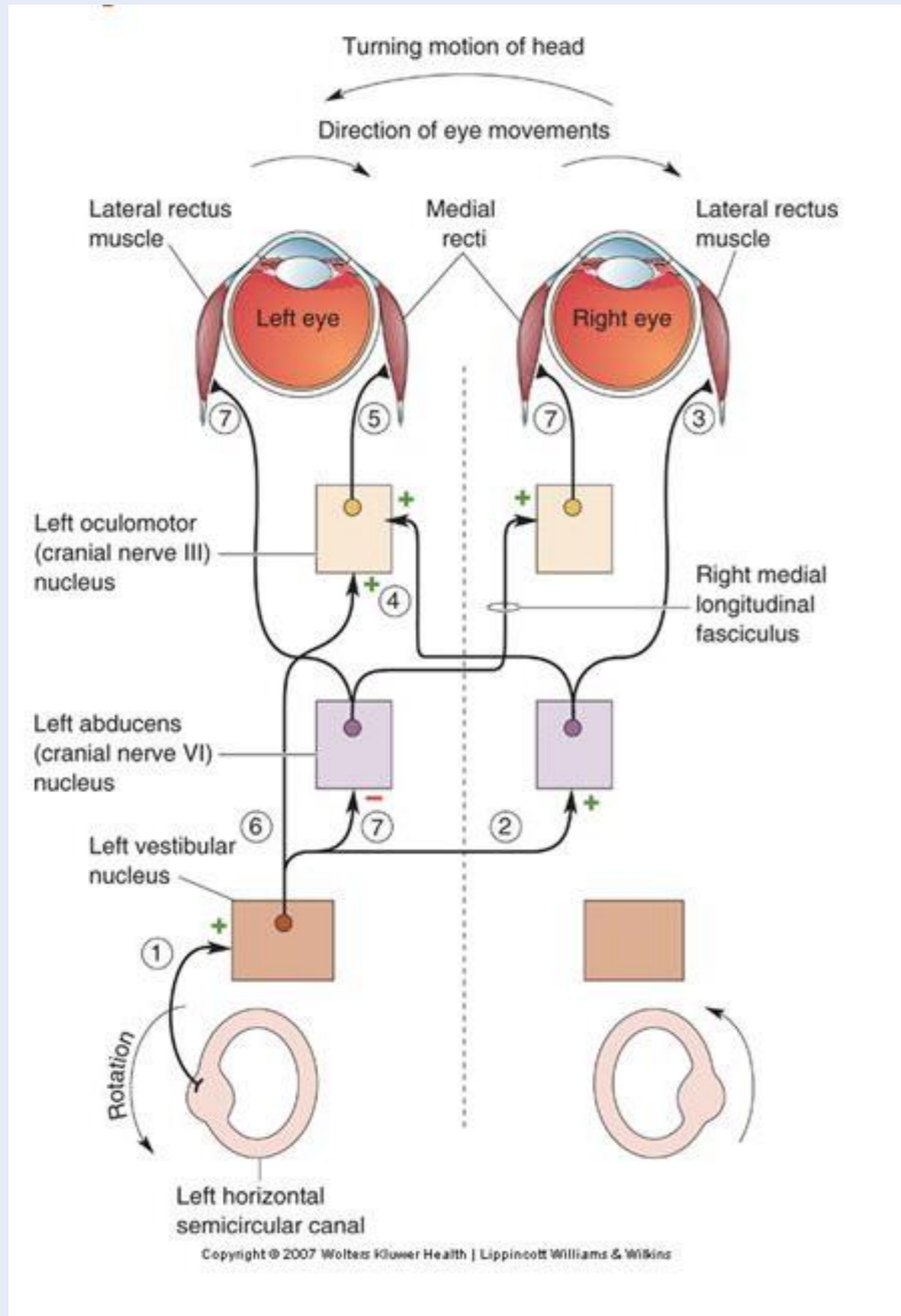


Age	One leg standing
30 months	1 sec (briefly)
36 months	2 secs
4 years	5 secs
5 years	10 secs



Video Head Impulse Test (vHIT)





What is it?

- Objective measure of the vestibulo-ocular reflex (VOR)
- Maintains image stable with head is rotated
- Head rotation → equivalent eye movement in the opposite direction
- Abnormal input → abnormal eye movement = corrective saccade to achieve result



Head Impulse Test

- Halmagyi and Curthoys - 1987 – individual with bilateral Vestibular Schwannomas surgically removed
- Low acceleration head movements → smooth compensatory eye movements
- Fast small unpredictable head turns (15° , $100^\circ/s$) → could not generate eye movements = eye goes with head
- Visual system generates corrective saccades



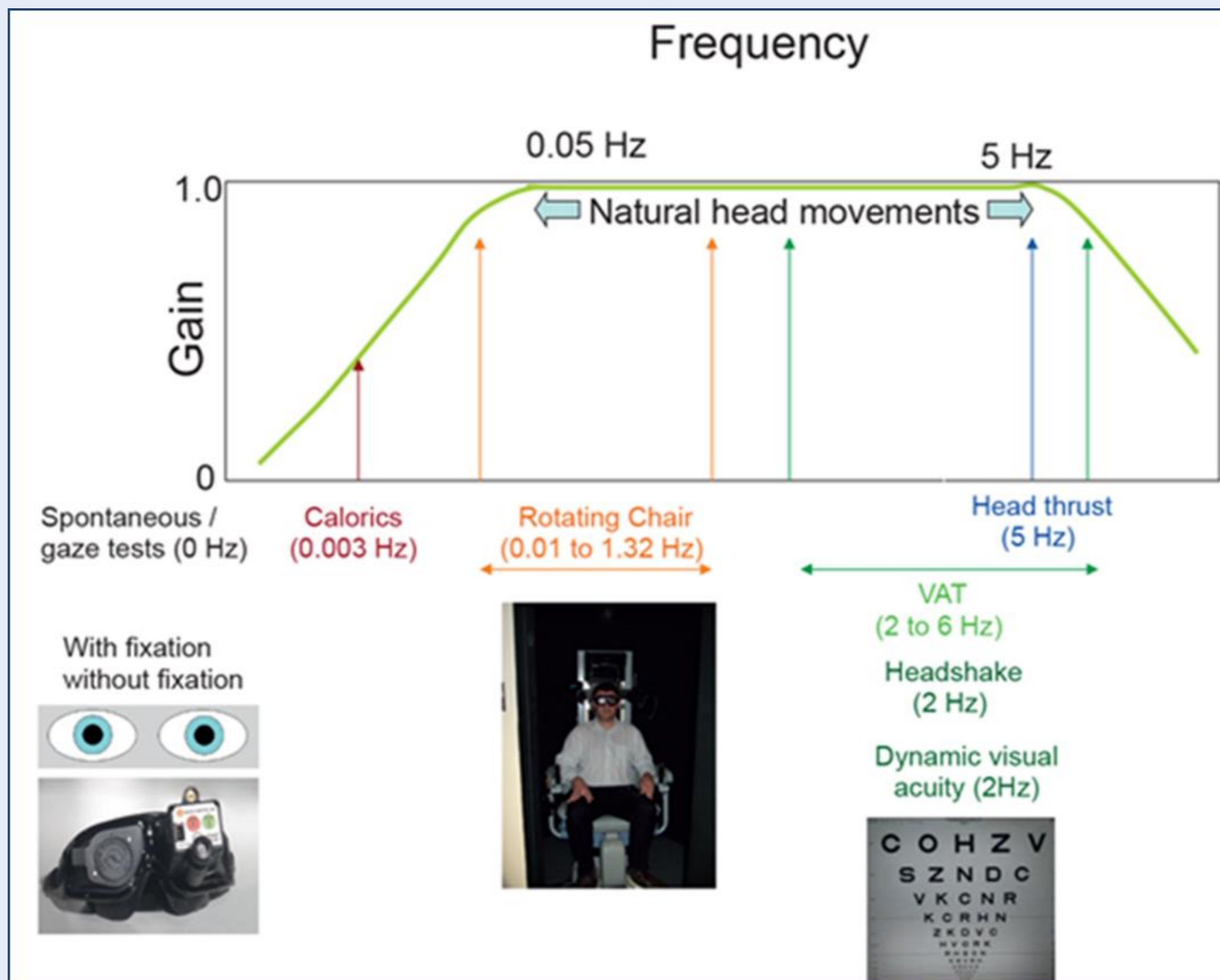
Clinical to video Head Impulse

Bedside head impulse testing has moderate sensitivity and low positive predictive value even when performed by experienced clinicians

Yip CW, Glaser M, Frenzel C, Bayer O, Strupp M. Comparison of the Bedside Head-Impulse Test with the Video Head-Impulse Test in a Clinical Practice Setting: A Prospective Study of 500 Outpatients. *Frontiers in Neurology*. 2016;7:58.



What does it assess?



Testing

- Tightly fitting strap
- Calibration – pupil tracking
- Instruction - gaze
- Head movement technique – hand placement, no overshoot,
- small amplitude, plane of stimulation, unpredictable, speed
 - Lateral: 120 - 300°/s
 - Verticals: 100 - 240 °/s

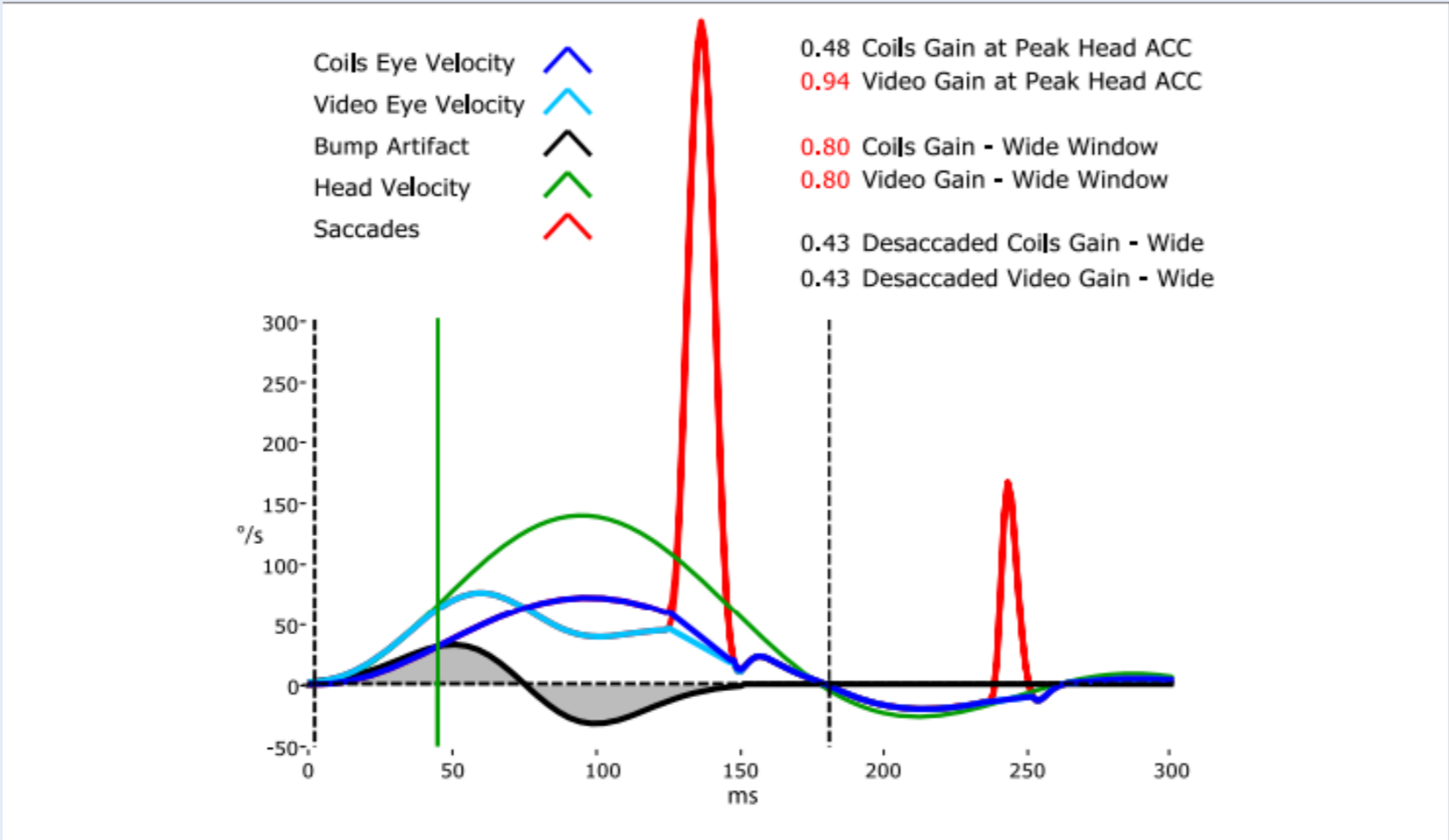
Contraindications

- Neck issues – trauma/fractures, immobility, pain
 - Vision - Right eye (ICS Impulse)
 - Cervical artery dissection
- ***Following instructions - blinking



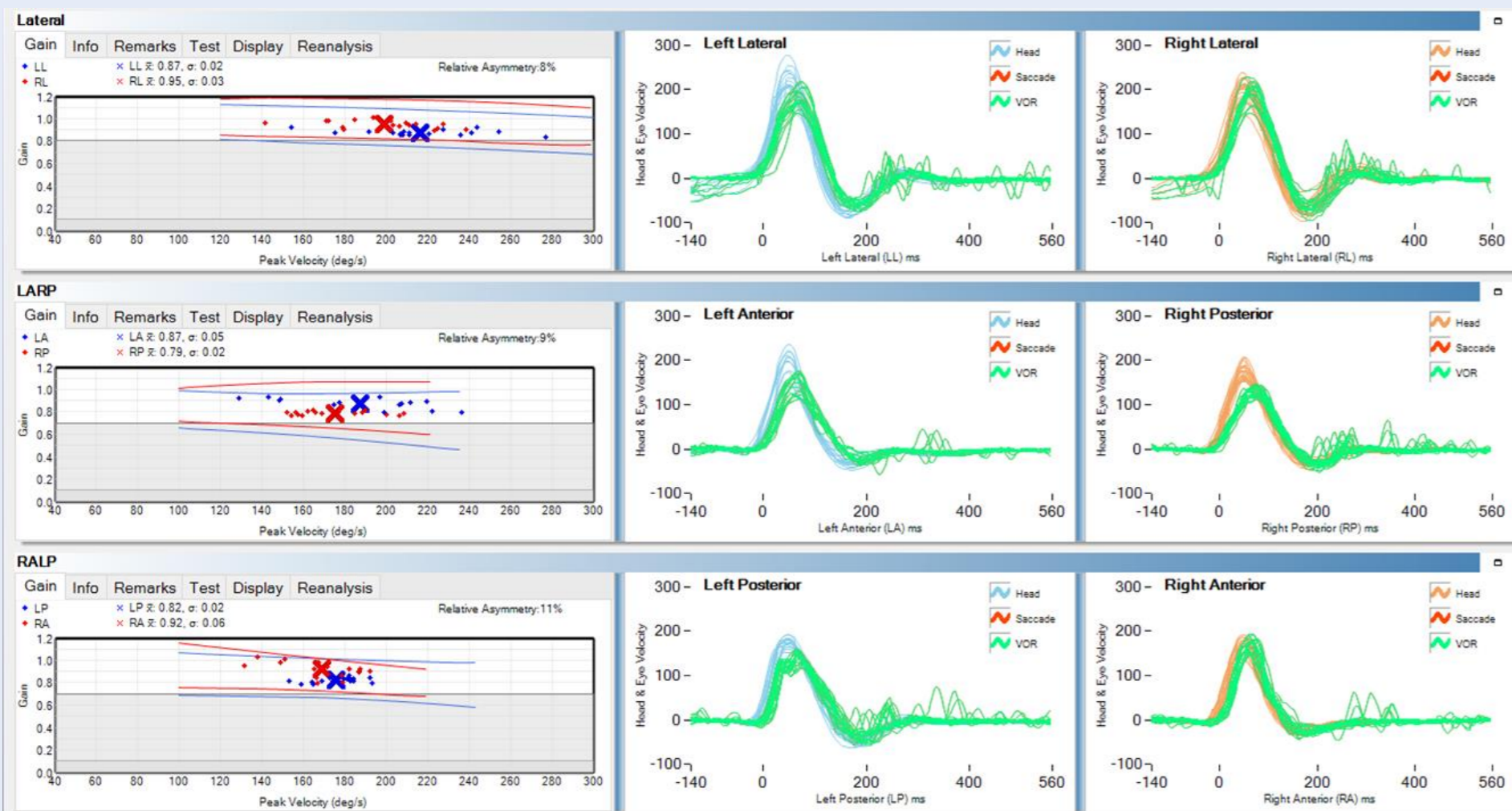
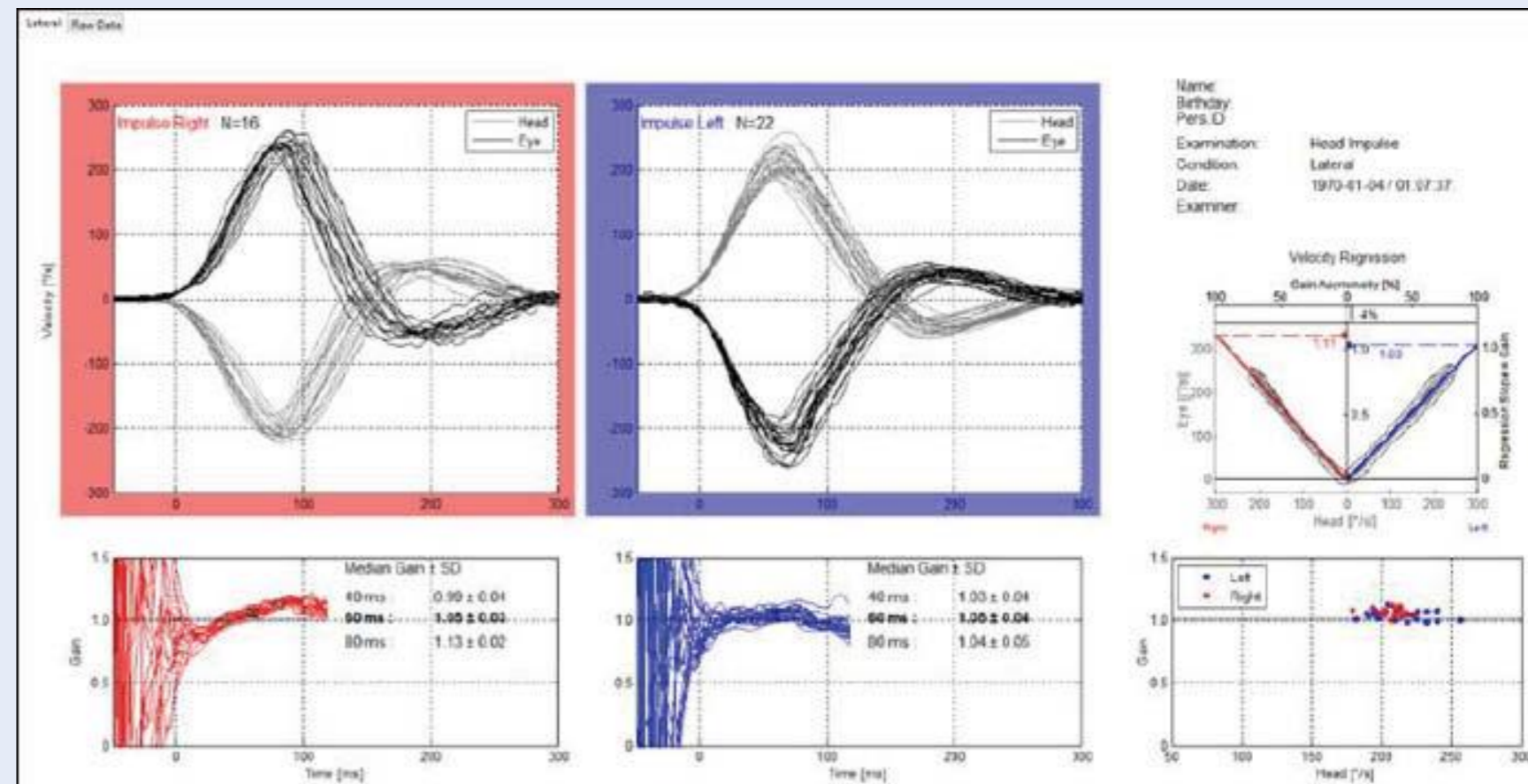
Interpretation - Gain

Ratio of eye movement to the head movement

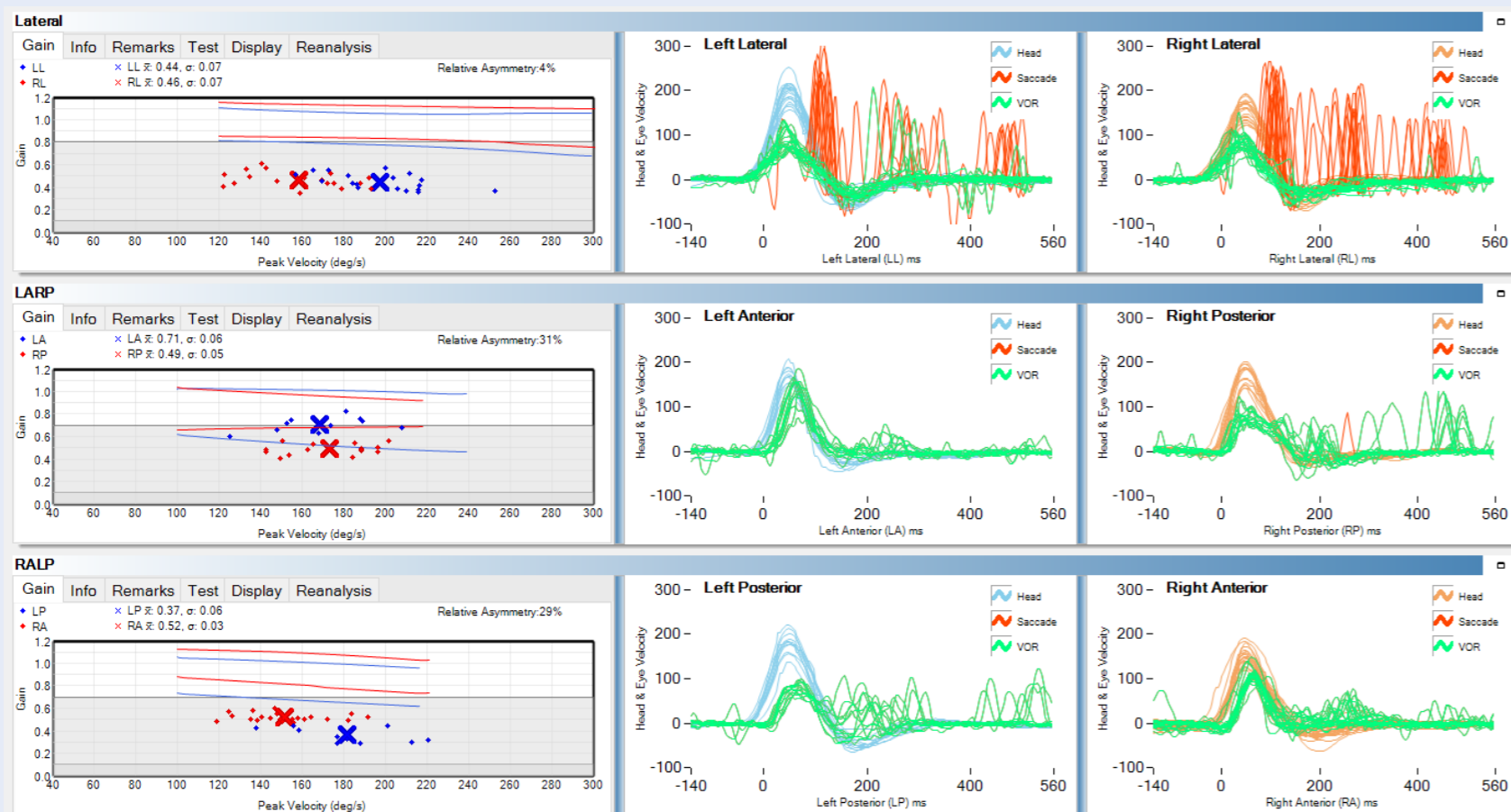
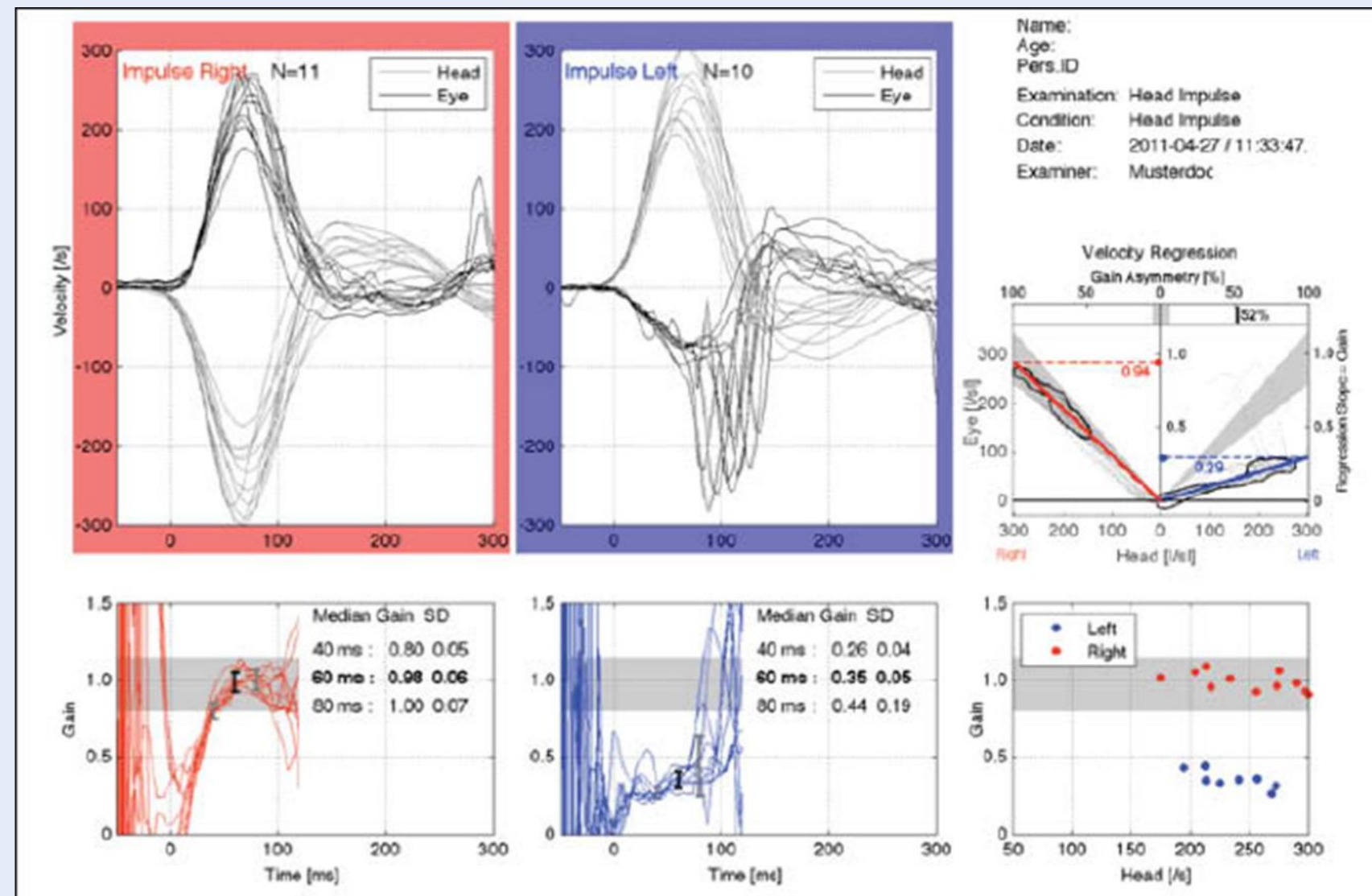


Interpretation

Gain

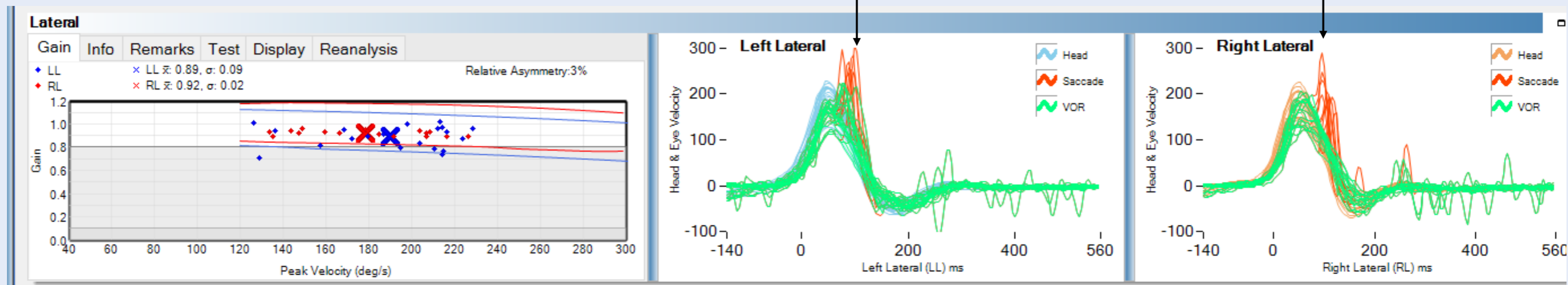


Abnormal vHIT



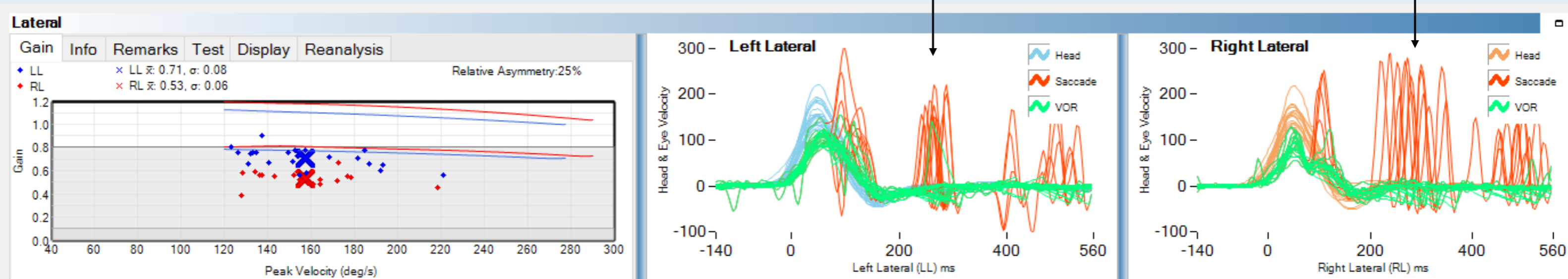
Interpretation

Corrective saccades



overt and gathered

scattered



Pediatric Population

ideal versus real



Case Studies

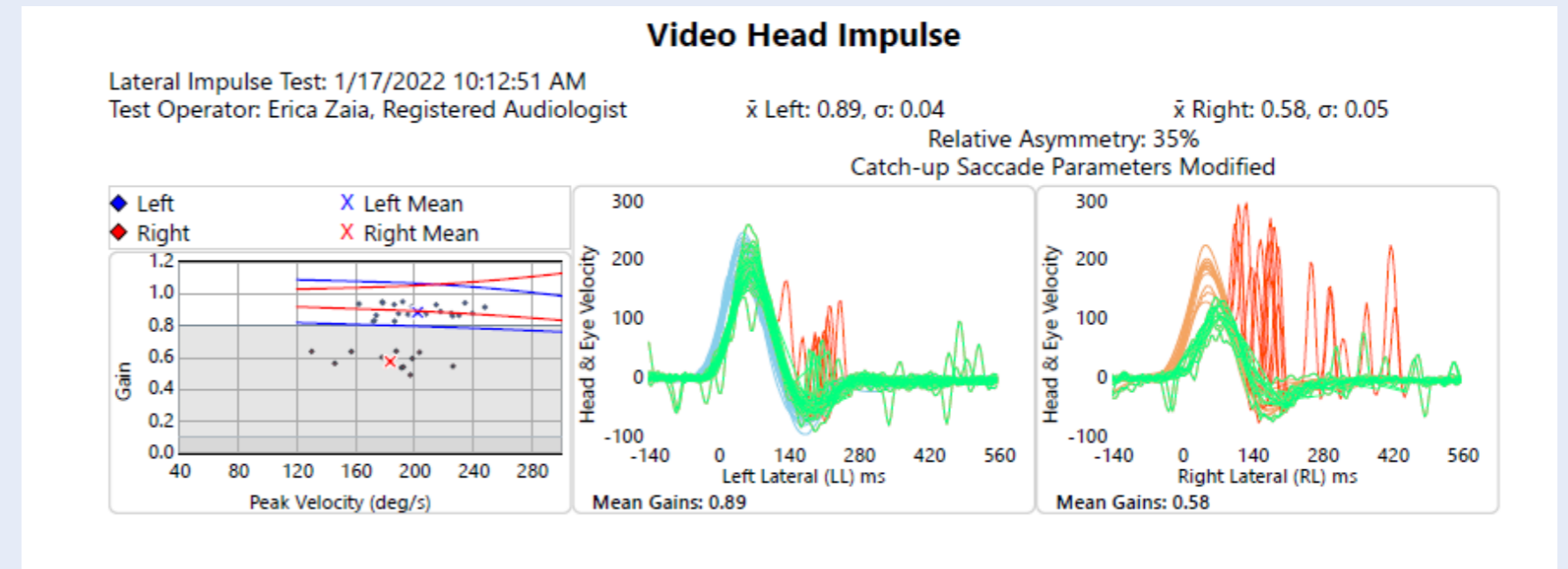
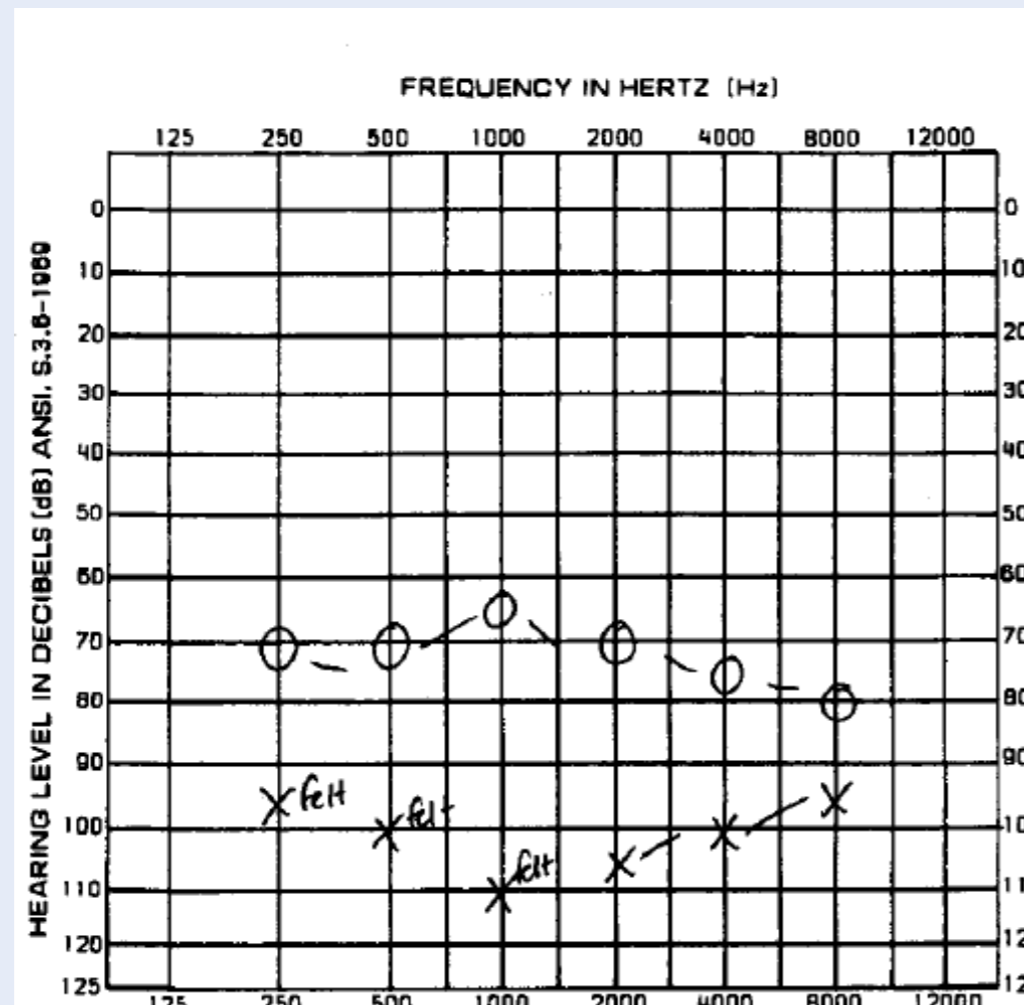


10 yo boy; asymmetric HL identified at birth, progressive; CI left and HA right

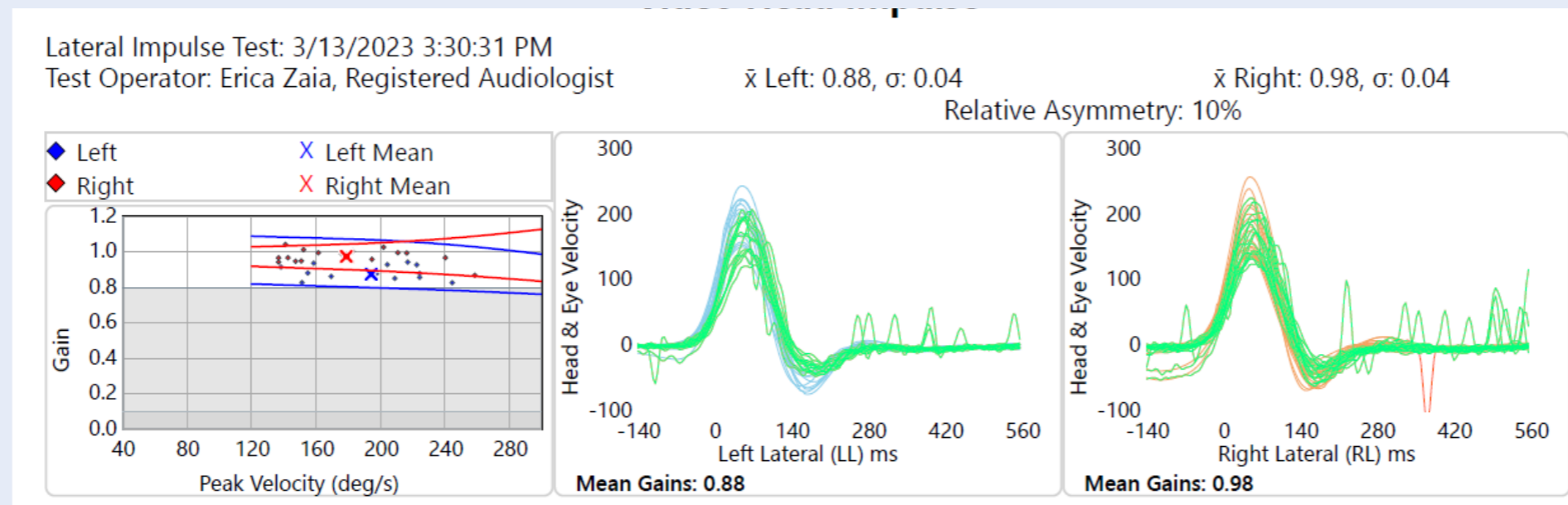
Recently confirmed CMV etiology

Slight delay in motor milestones but now similar to peers

Vomiting when younger; dizziness reported since gr 3; episodes can last up to 6 hours



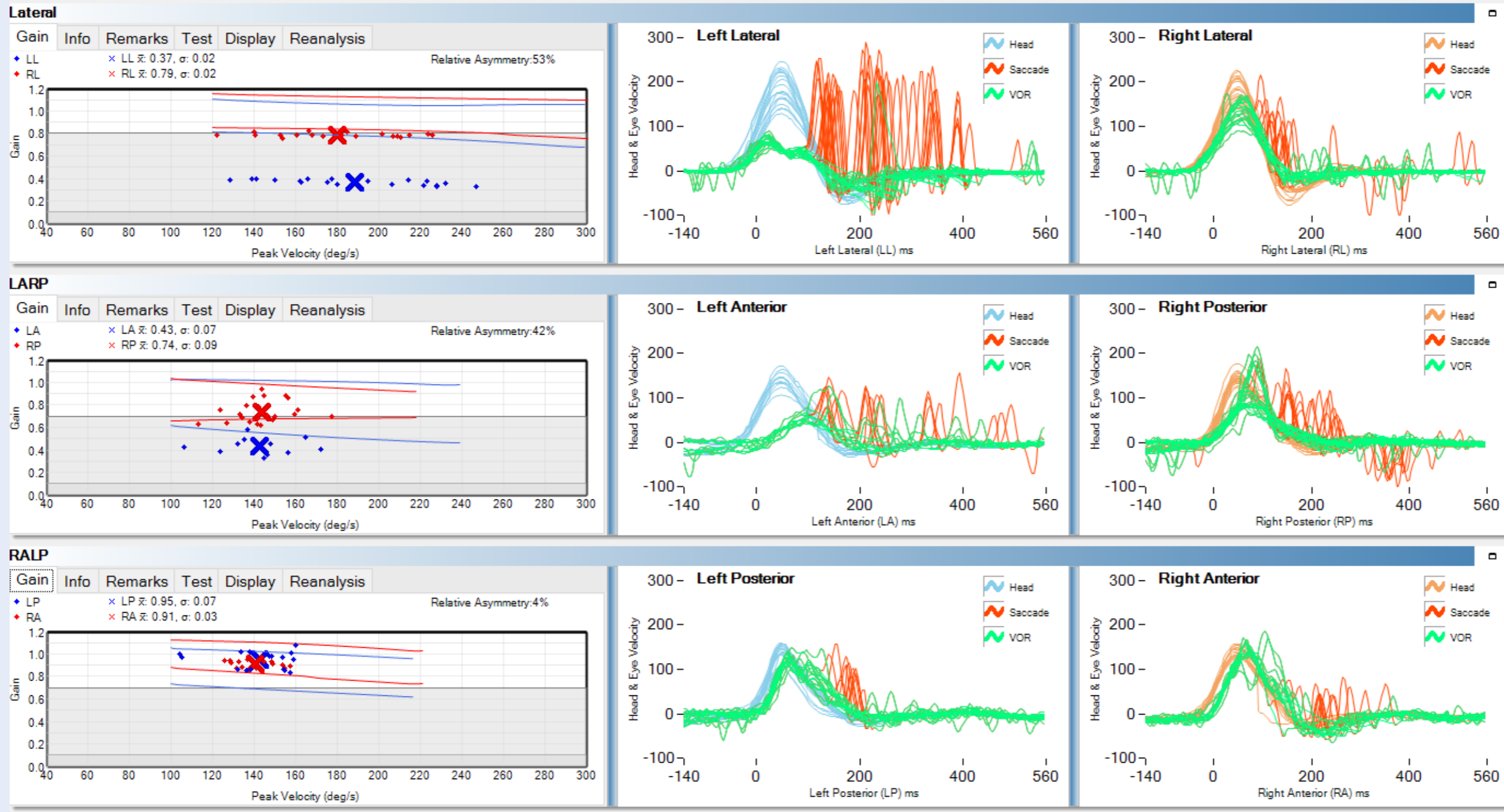
- 15 yo girl; dizziness - imminent fainting, spinning, lightheadedness, swaying and imbalance sometimes with nausea
- Past 5 years but gradually worse in the recent years
- Dizziness is incapacitating when accompanied by migraine headaches, which happen about twice a week; no photophobia but phonophobia
- Vestibular rehabilitation did not seem helpful
- Severe motion sickness since childhood; mother, aunt and grandfather suffer from migraines; mother and father suffer from severe motion sickness
- Stable unilateral notch at 4 kHz; father has exactly same
- Diagnosed with anxiety and ADHD; on Prozac and counselling; struggling, particularly with school



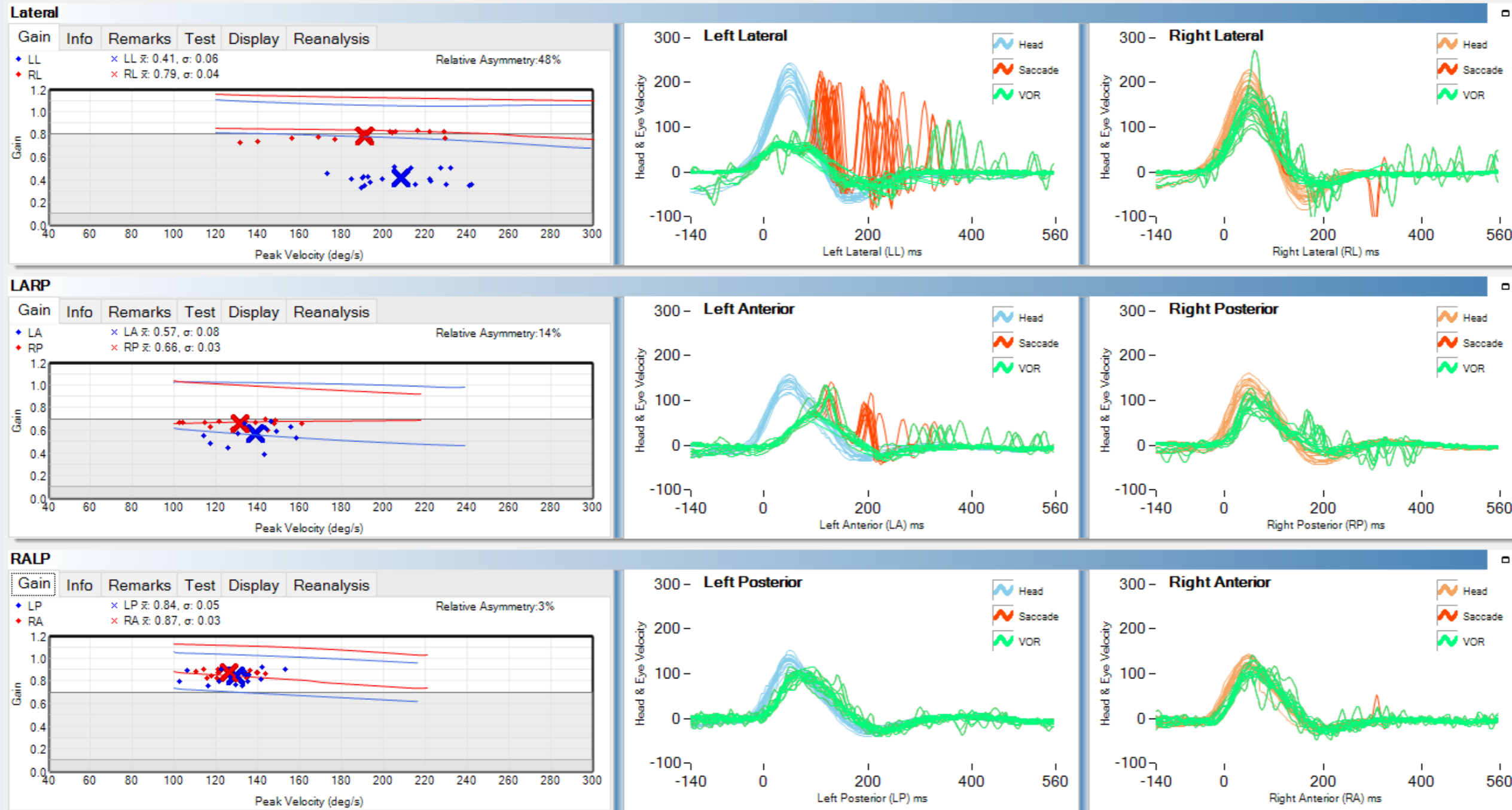
- female, 56 yo
- phone call on a Friday afternoon "I am going to a Physio today and may cancel my appointment with you on Monday"
- kept appointment as Epley maneuver was not helpful
- was playing tennis 11 days ago when symptoms started (Feb 17)
- unwell at first, quickly escalated to severe spinning dizziness, vomiting with any head movement and inability to walk unassisted
- after 3 days started to slowly improve and now can walk by herself
- head movements still provoke a sensation of "lag"



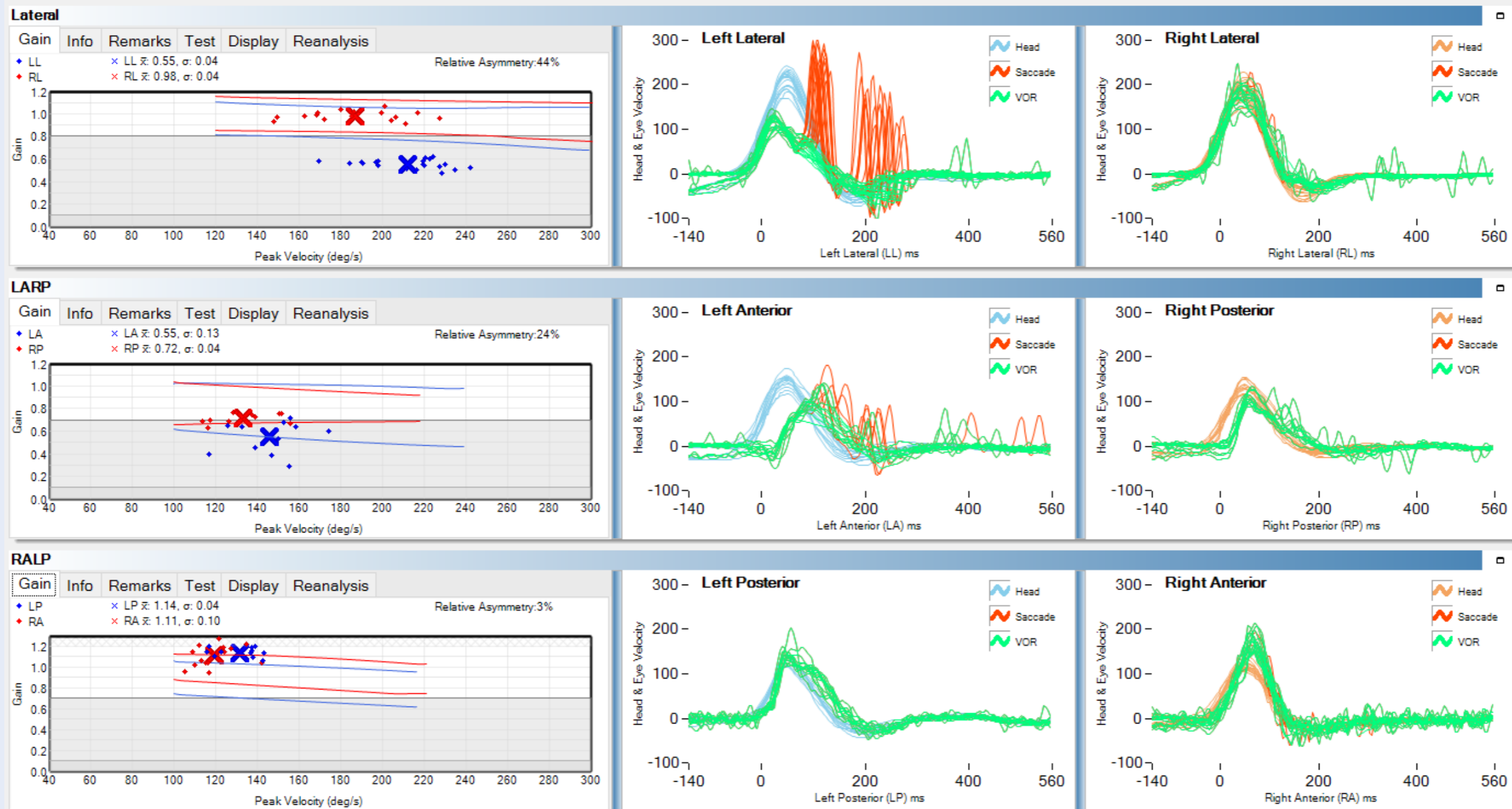
First vHIT – Feb 28



Second vHIT – Mar 24



Third vHIT – Apr 13



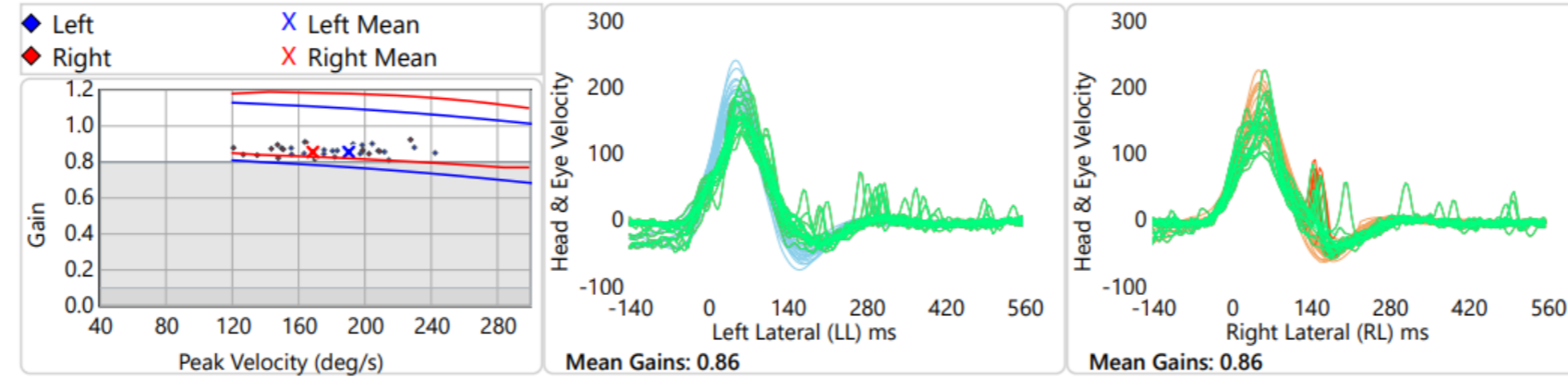
- Migraines since 13 yo, associated with menstrual cycle
- Migraine with aura in her 30`s, about twice a year
- First episode of spinning dizziness and vomiting, with severe headache in Sep, 2017, a day after upside down amusement park rides; episode lasted 24 h
- Second episode in April, 2018 and then recurring every couple of months, with varying duration
- Sensitive to lights and stimulation; eyes feel bruised; grocery stores, head movements, turning in bed are all triggering
- Physiotherapist did Epley and bbq roll maneuvers but they did not stop the episodes from happening
- Came to see me in 2021 ``I am overwhelmed by how debilitating this is. I`ve learned to compensate my moving slowly and cautiously. I`ve been incredibly anxious about anything and everything that can trigger an episode. I am tired of being nauseous and I feel that this has reduced my quality of life in so many ways. I am hoping for an answer``



Video Head Impulse

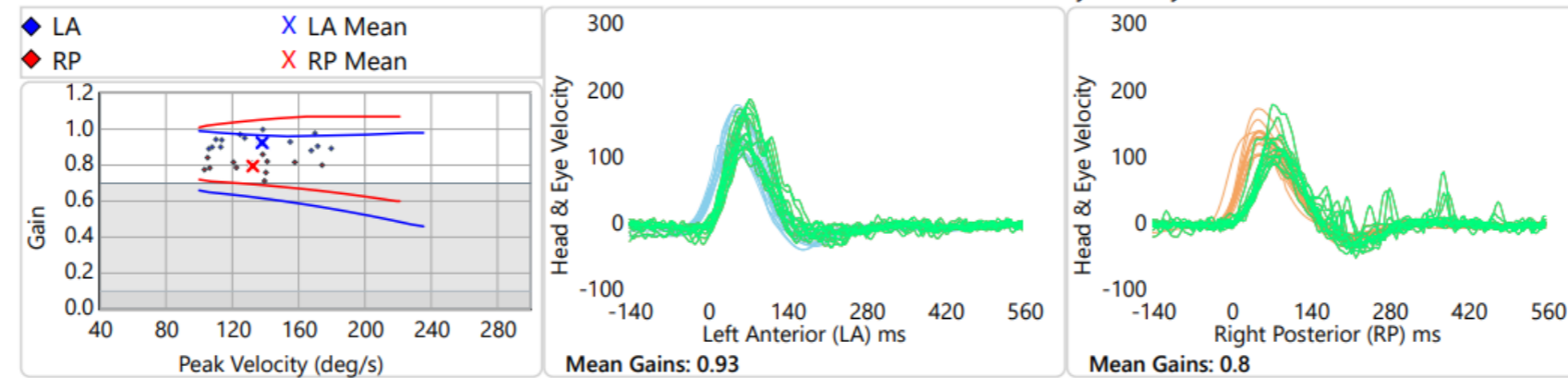
Lateral Impulse Test: 1/19/2021 5:46:45 PM
 Test Operator: Erica Zaia, Registered Audiologist

\bar{x} Left: 0.86, σ : 0.02 \bar{x} Right: 0.86, σ : 0.03
 Relative Asymmetry: 0%
 Catch-up Saccade Parameters Modified



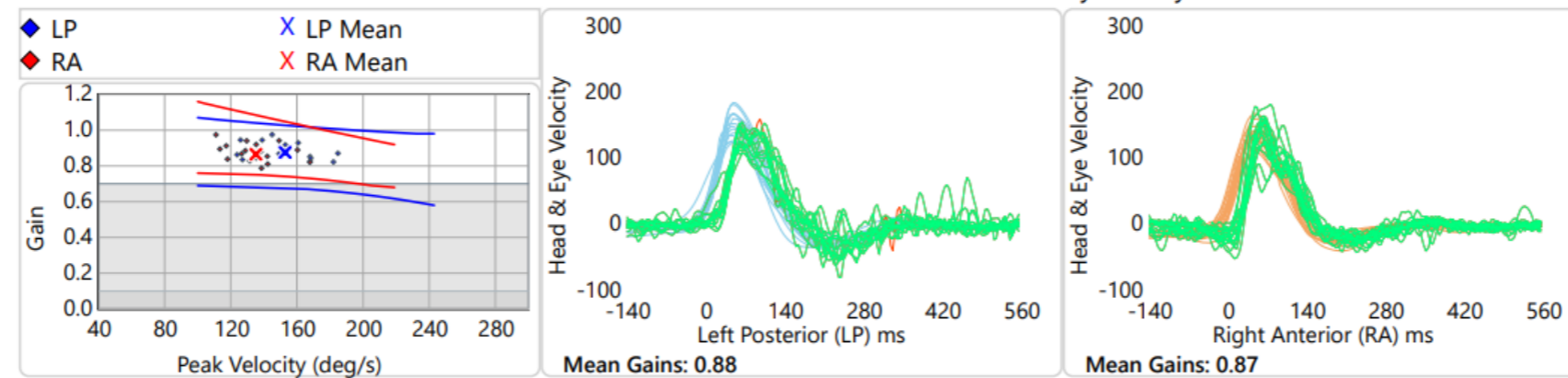
LARP Impulse Test: 1/19/2021 5:48:51 PM
 Test Operator: Erica Zaia, Registered Audiologist

\bar{x} LA: 0.93, σ : 0.03 \bar{x} RP: 0.8, σ : 0.03
 Relative Asymmetry: 14%



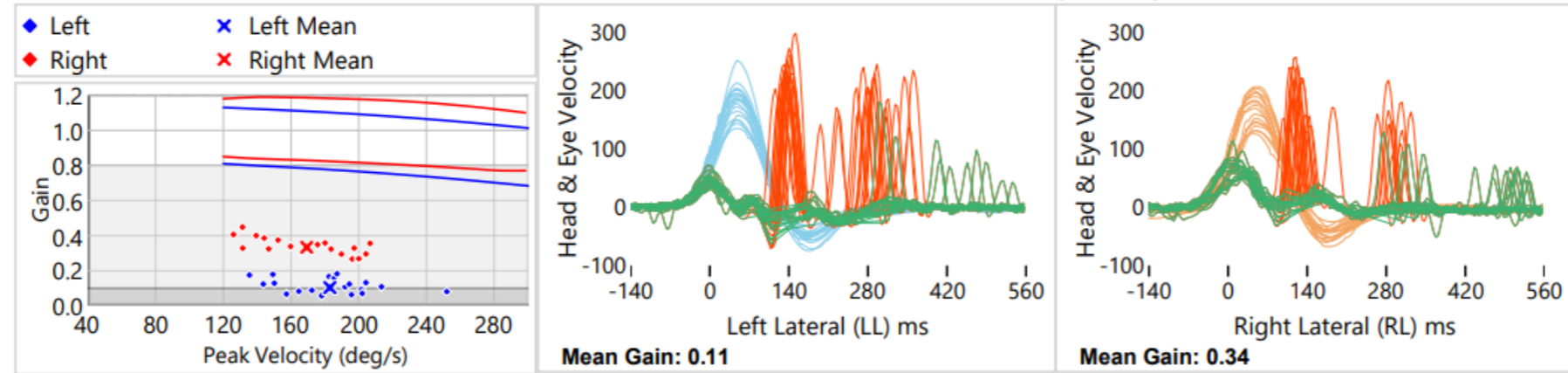
RALP Impulse Test: 1/19/2021 5:50:59 PM
 Test Operator: Erica Zaia, Registered Audiologist

\bar{x} LP: 0.88, σ : 0.05 \bar{x} RA: 0.87, σ : 0.05
 Relative Asymmetry: 1%



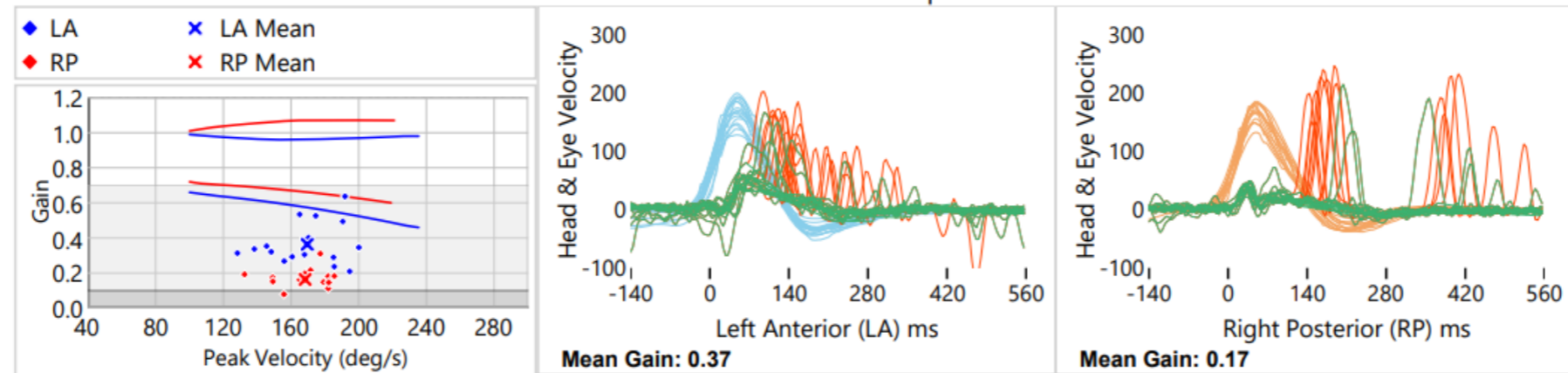
Lateral Impulse Test: 21-Nov-2023 10:06:07 AM
 Test Operator: Erica Zaia

\bar{x} Left: 0.11, σ : 0.04
 \bar{x} Right: 0.34, σ : 0.05
 Relative Asymmetry: 68%



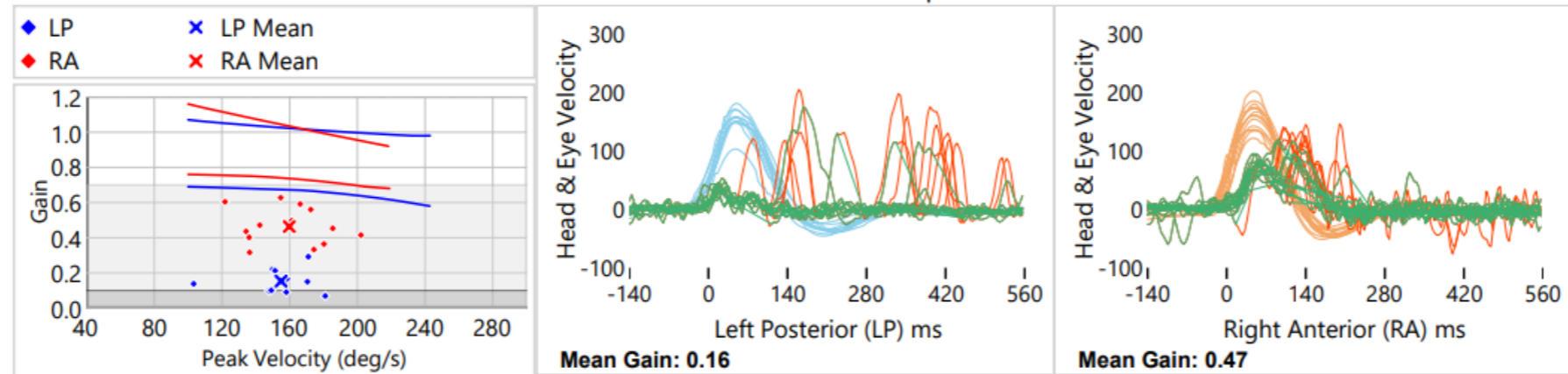
LARP Impulse Test: 21-Nov-2023 10:08:20 AM
 Test Operator: Erica Zaia

\bar{x} LA: 0.37, σ : 0.12
 \bar{x} RP: 0.17, σ : 0.05
 Relative Asymmetry: 54%
 Catch-up Saccade Parameters Modified



RALP Impulse Test: 21-Nov-2023 10:11:25 AM
 Test Operator: Erica Zaia

\bar{x} LP: 0.16, σ : 0.06
 \bar{x} RA: 0.47, σ : 0.1
 Relative Asymmetry: 66%
 Catch-up Saccade Parameters Modified



Thank you!

erica@vestibular.ca

