



# How to Diagnose Common Peripheral Vertigo

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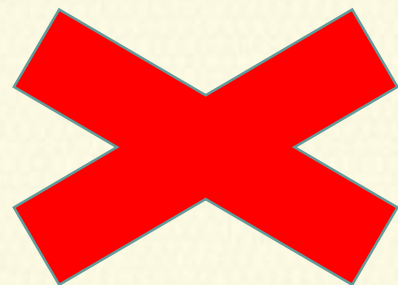
# Vertigo

- Perception delusion of movements
- Physical & psychological consequences
- Quality of life : FOF, avoidance, panics
- **Acute risk of vertigo: falls or traffic accident**
- Vertigo most common complaints in medicine, 20-30% of general pop, F>M 2-3:1, more in elderly
- **Stroke accounts 3-7% among all vertigo**

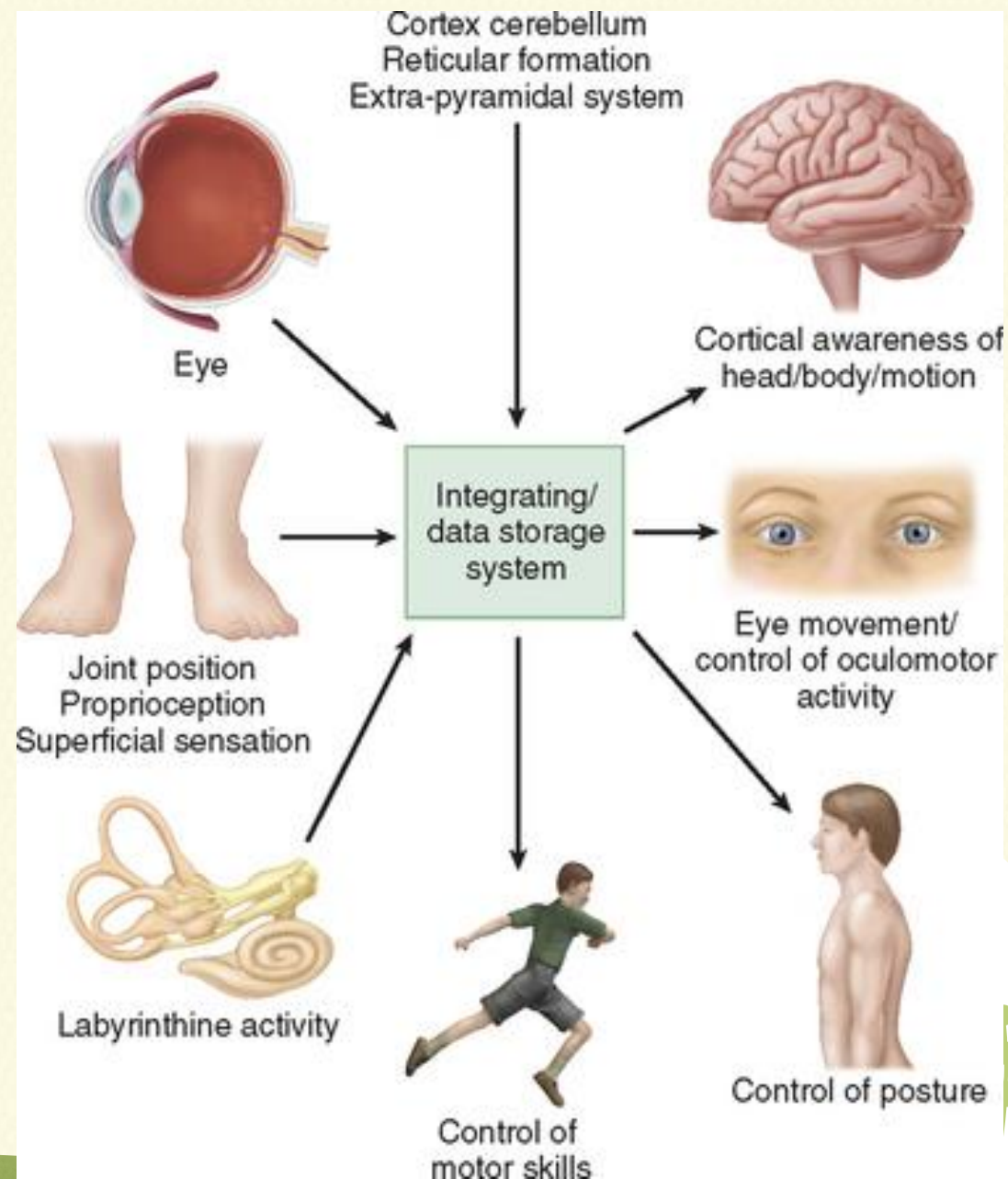


# The balance system

- Humans use three input systems:
  - Visual
  - Proprioceptive
  - Vestibular



**DIZZINESS / VERTIGO /  
IMBALANCE**



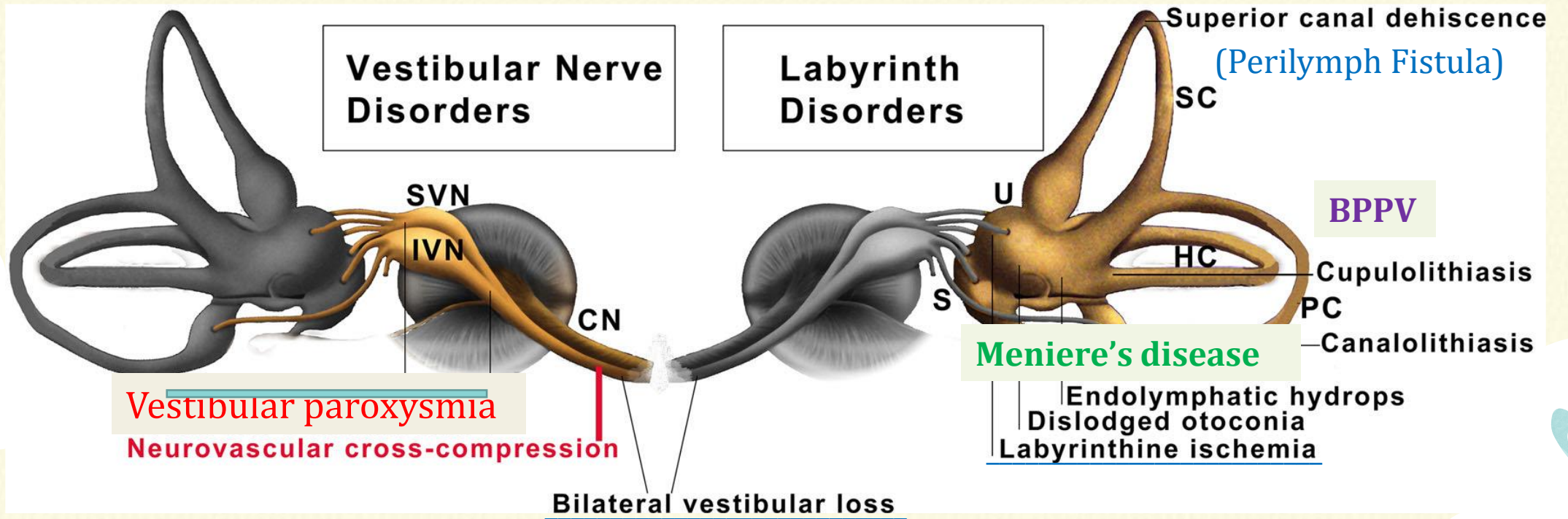


# Common vestibular disorders

## Vestibular Migraine

### Vestibular Neuritis

### Labyrinthitis



Persistent perceptual-postural dizziness

Immune mediate audio-vestibular disorders

Common cause	PVD	CVD	Mixed	Functional
Benign paroxysmal positional vertigo (BPPV)	+			
Meniere's disease	+			
Perilymph fistula, superior dehiscence syndrome	+			
Bilateral vestibulopathy	+			
Vestibular neuritis /labyrinthitis	+			
Vestibular paroxysmia	+			
Labyrinthine ischemia	+			
Vestibular migraine		+	+	
Persistent perceptual postural dizziness (PPPD)	±	±	±	+
PVD=peripheral vestibular disorders, CVD=central vestibular disorders				

	Acute	Chronic
Unilateral PVD		
- SCC	Sudden vertigo	Very little symptom
- Otolith	Sudden disequilibrium (drop attack)	Mild sway
Bilateral PVD	Sudden disequilibrium Severe Oscillopsia Diff walk in darkness	Very little symptom Mild sway (elderly) Oscillopsia (mild)
Central	Sudden all, plus Neuro def	Severe disable, less panic
Functional	Vary, disintegration, task/ situation specific	Severe disequilibrium Dysintegration Panic, anxiety plus

## Box 1

# Glossary of primary vestibular symptom definitions in the International Classification of Vestibular Disorders

**Dizziness** is the sensation of disturbed or impaired spatial orientation without a false or distorted sense of motion.

**Vertigo** is the sensation of self-motion (of head/body) when no self-motion is occurring or the sensation of distorted self-motion during an otherwise normal head movement.

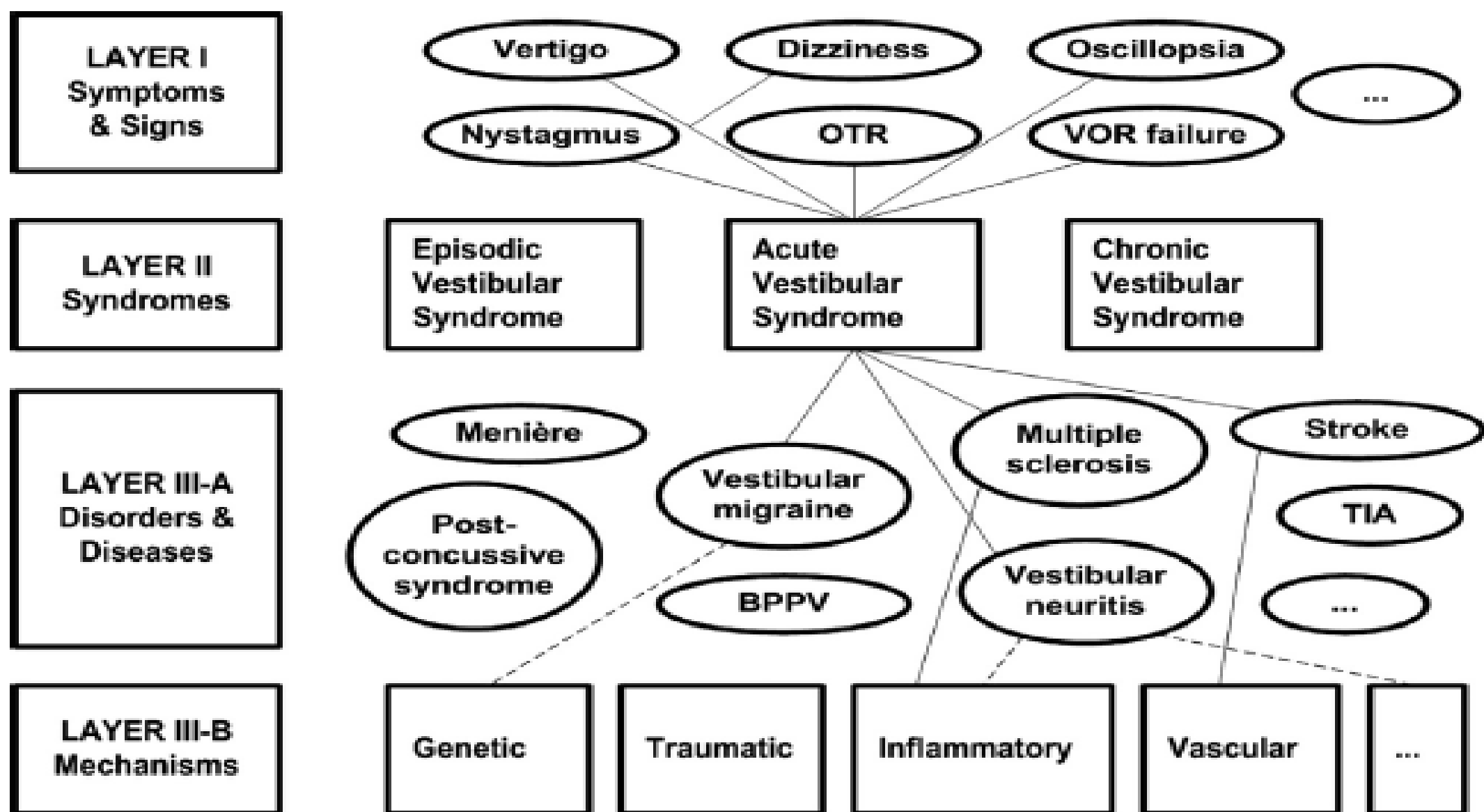
**Vestibulovisual symptoms** are visual symptoms that usually result from vestibular pathology or the interplay between visual and vestibular systems. These include false sensations of motion or tilting of the visual surround and visual distortion (blur) linked to vestibular (rather than optical) failure.

**Postural symptoms** are balance symptoms related to maintenance of postural stability, occurring only while upright (seated, standing, or walking).

Bisdorff AR, Staab JP, Newman-Toker DE.

Overview of the international classification of vestibular disorders.

Neurol Clin 2015;33:541-50.



**Fig. 1.** Four-layer framework of the international classification of vestibular disorders. Links between layers are shown demonstrating, in this case, the conceptual relations between the “acute vestibular syndrome” (layer II), its component symptoms (layer I), its etiologic causes (layer III-A), and their mechanistic underpinnings (layer III-B). Solid lines represent definite links, and dashed lines represent uncertain links. OTR, ocular tilt reaction; TIA, transient ischemic attack.



# Vertigo

- Careful history taking & physical exam: diagnosis 80-90 % causes

## Multifactor causes

- DM: peripheral neuropathy, retinopathy, cataract & glaucoma, audio-vestibular disorders, CNS disorders, small vessel disease
- Elderly: multi-sensory disturbance
- Chronic diseases: CKD, CVD
- Polypharmacy

# History

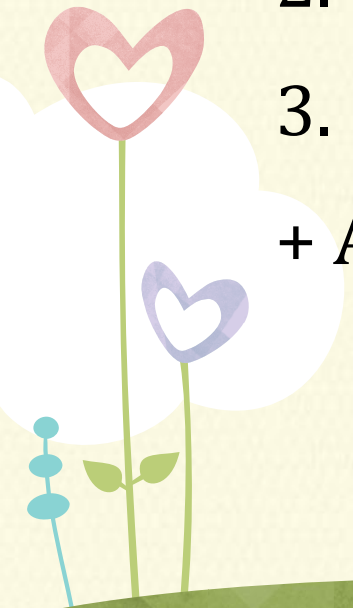
- 3T +A

1. Types: type, mechanism

2. Timing: temporal, duration, frequency

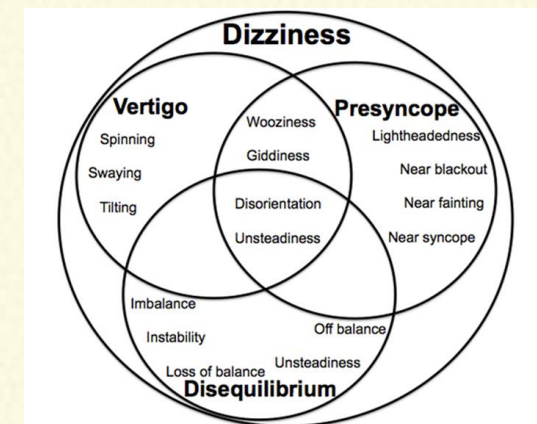
3. Triggers: trigger vs exacerbation

+ Associated: symptoms/ medical conditions



## DIZZINESS:

A nonspecific term that can mean diverse things to various individuals



"The room is spinning"

**True vertigo**



Vestibular

"I might faint"

**Presyncope**



Cardio-vascular

"I might fall"

**Disequilibrium**



Neurologic  
Musculoskeletal

"I'm just dizzy"

**Lightheadedness**



Psychiatric

# History taking in dizzy patients

- Vertigo
- Presyncope
- Disequilibrium
- Lightheadedness

## Type of dizziness

- Paroxysmal
- Chronic
- Acute single attack

## Temporal pattern

### Key items

## Duration of symptoms

- Second - Minute
- Minute - Hour
- Day

## Associated symptoms

- Otologic
- Neurologic
- Autonomic
- Migraine

## Provoking factors

### Triggers/ Exacerbate

- Position change
- Spontaneous
- Stress
- Change ear pressure / loud noise
- Certain foods / drinks
- Certain situation

## Medical history

- Underlying disease
- Drug usage
- Surgery Hx
- Trauma Hx
- Alcohol / Cigarette
- Menstrual cycle
- Environmental Hx
- Family Hx

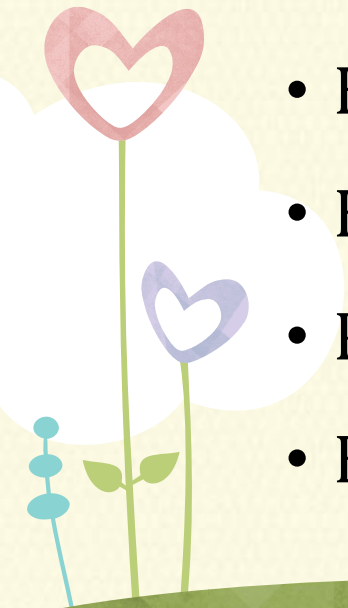


## Provoking factors for different causes of recurrent vertigo

Changes in head position	BPPV; CPA tumor; Multiple Sclerosis (MS); perilymph fistula (PF), cervical vertigo, VBI
Spontaneous episodes	Meniere disease (MD); Vestibular migraine (VM); MS, CVA, TIA
Stress	VM; MD; psychiatric /psychological causes
Changes in ear pressure, Head trauma, excessive, straining, loud noises	PF, anterior dehiscence syndrome
Certain foods, drink	VM, MD
Certain situations	PPPD

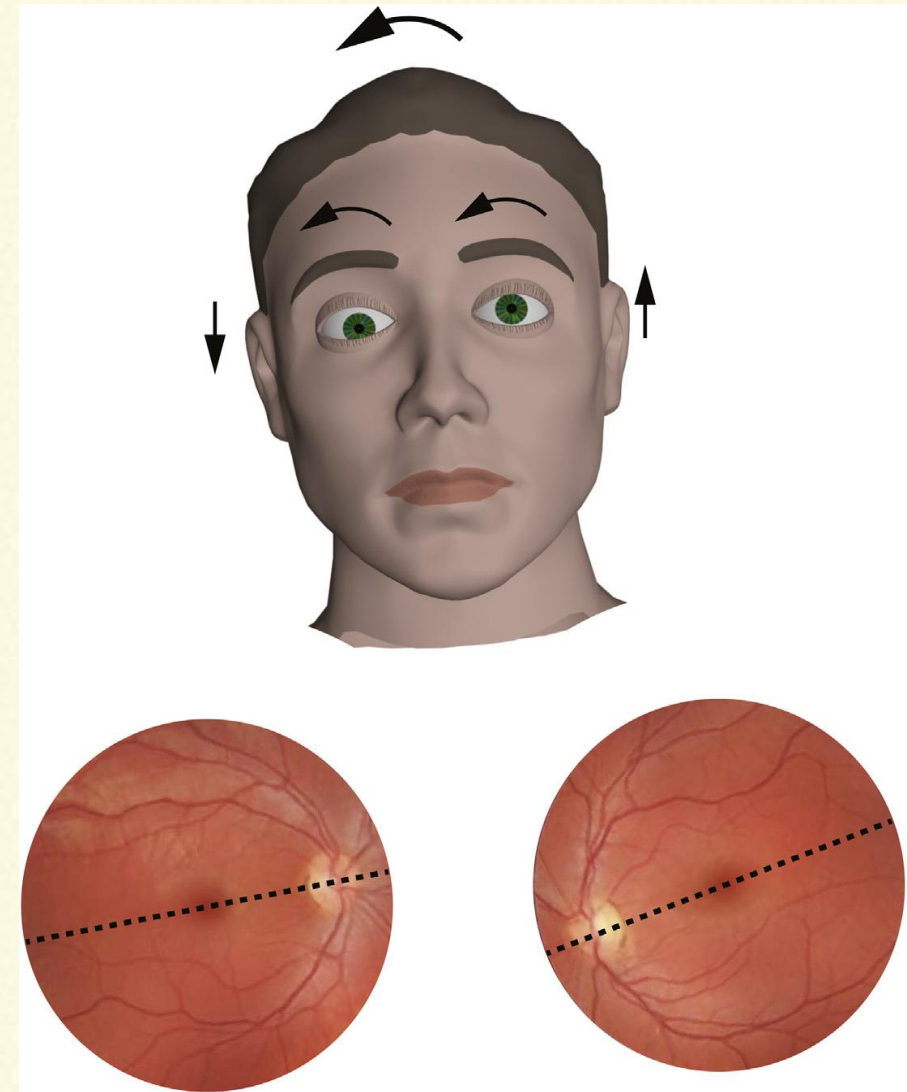
# PHYSICAL EXAMINATION

- General Inspection
- Oculomotor Examination
- Spontaneous and GEN
- Head Impulse Test
- Head-shaking nystagmus
- Provocative Testing for Positional Nystagmus
- Balance and Gait tests: Romberg, sharpen, Tandem, Unterberger

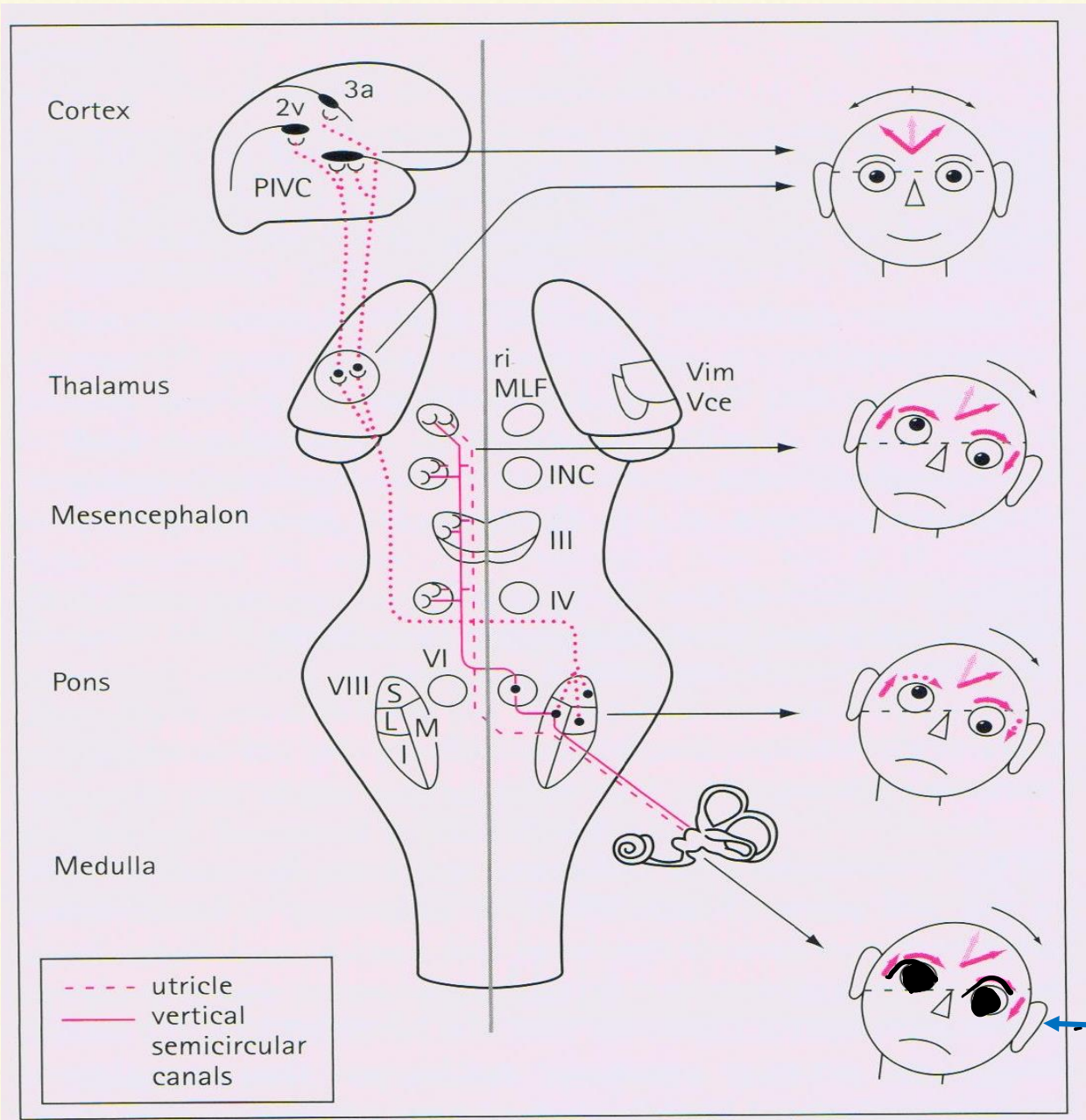


## A right-sided ocular tilt response

- right head tilt,
- skew deviation
- right hypotropia,
- left hypertropia,
- rightward ocular tilt response







## Ocular tilt reaction

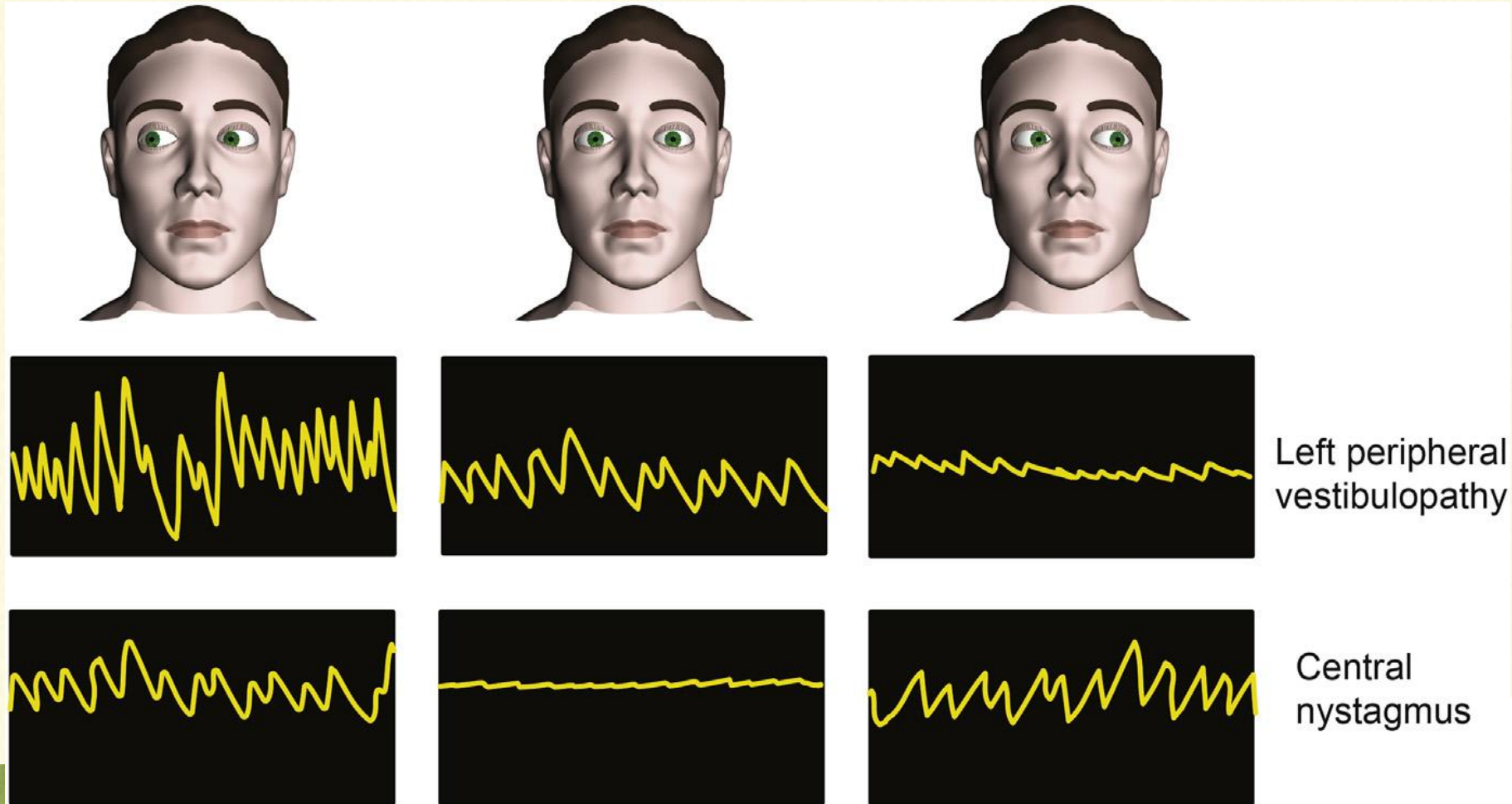
### Lesion:

- ipsilateral utricle, vestibular nerve, nuclei
- contralateral INC, medial thalamus

Head tilt but  
No skew



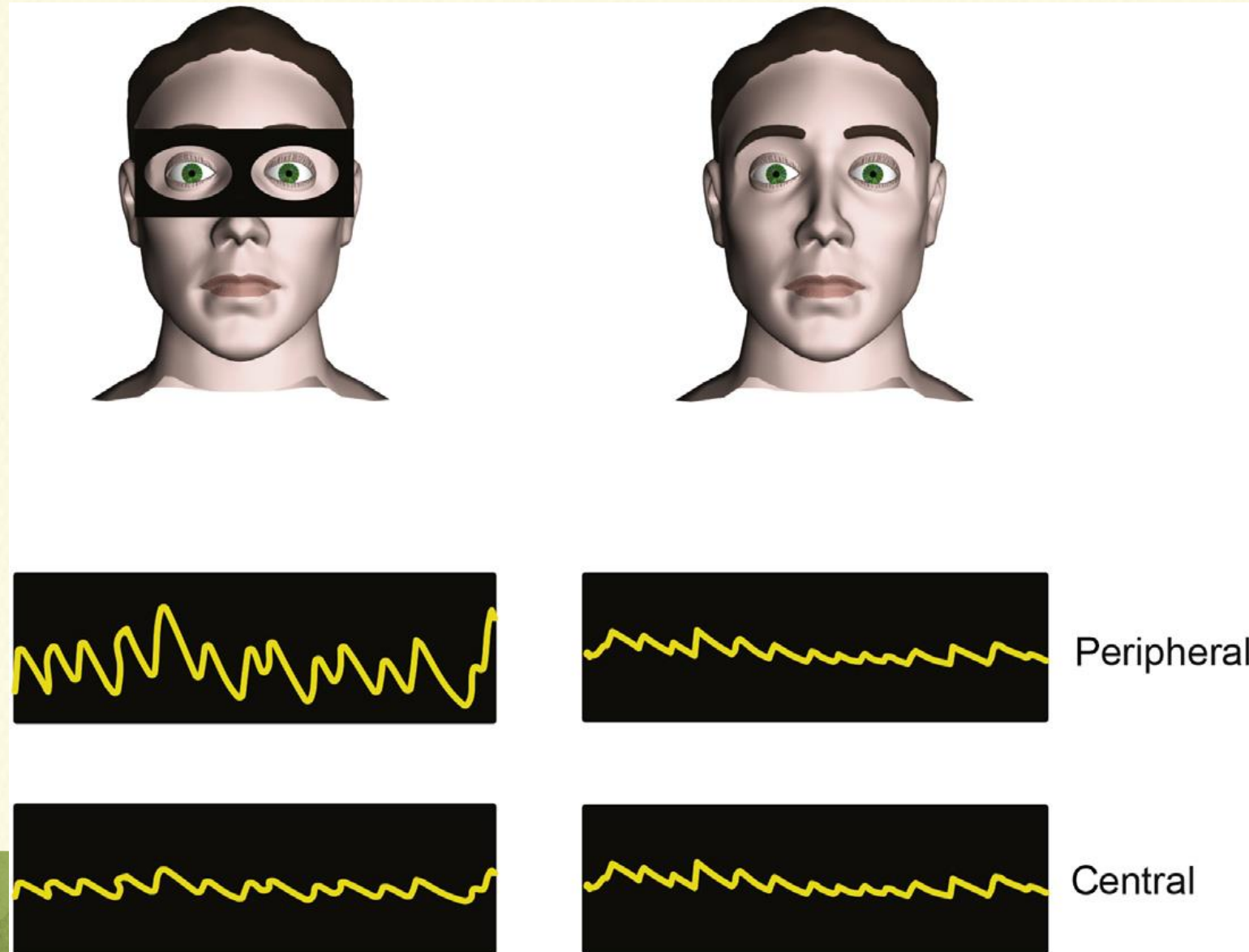
# Spontaneous and GEN



Left peripheral vestibulopathy

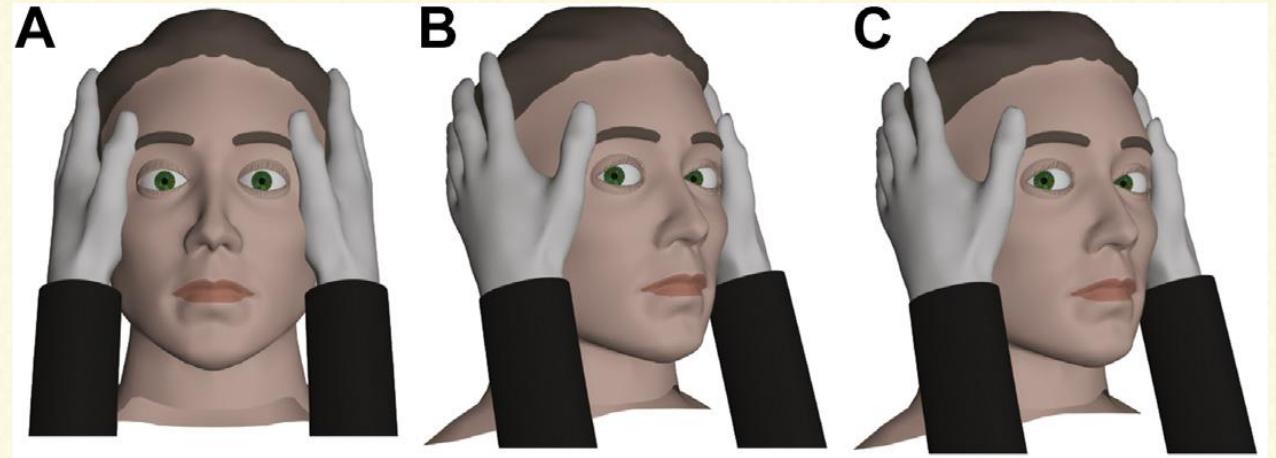
Central nystagmus

# Visual suppression of nystagmus

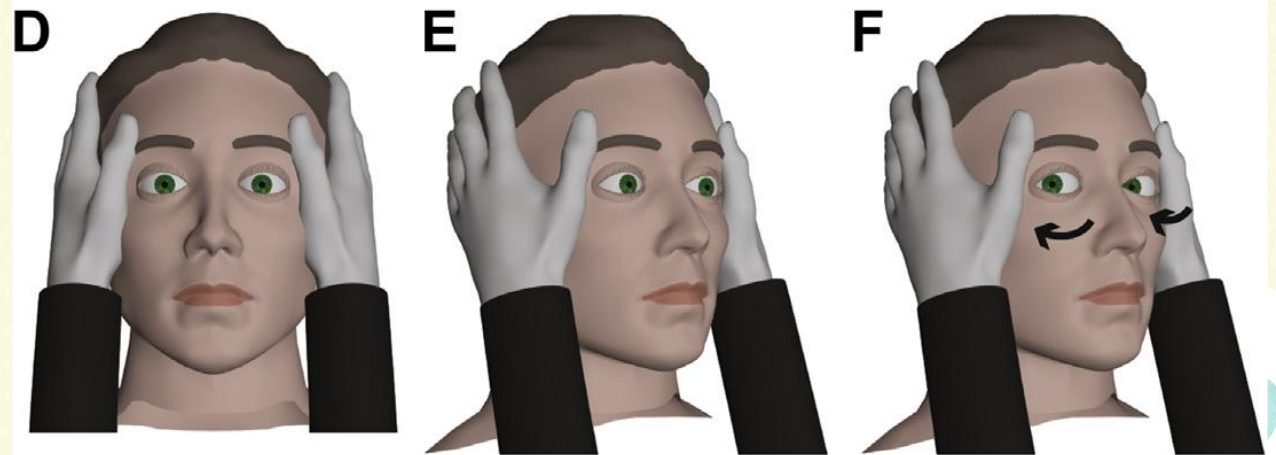


# The head impulse test

- Assess: integrity of hVOR
- Skill acquired practice
- Unpredictable, low-amplitude (10–20), high-acceleration (2000–4000 /s<sup>2</sup>) movement
- Acute vestibular syndrome secondary to superior vestibular neuritis. (**overt saccades**)



Normal leftward head impulse



Positive leftward head impulse



**Table 3** Nystagmus characteristics in key peripheral and central vestibular disorders

Vestibular Condition	Test Maneuver	Nystagmus Duration	Trajectory/ Direction	Variation in Direction
<b>t-EVS</b> (episodic nystagmus triggered by specific positional maneuvers)				
PSCC BPPV	DHP	5 – 30 s	Upbeat-torsional	Direction reversal on arising
HC BPPV	Supine roll	30 – 90 s	Horizontal	Spontaneous reversal during test
CPPV	Any	5 – 60+ s	Any (DB/ horizon)	Any (often direction fixed)
<b>s-AVS</b> (spontaneous nystagmus exacerbated nonspecifically by various head maneuvers)				
Vestibular neuritis or Labyrinth	Gaze	Persistent	Dominant horizon	Direction fixed (acutely)
Stroke	Gaze	Persistent	Any / dominant horizon, occasion vertical / torsional	Direction fixed or direction changing with gaze position



**Table 4** Safe-to-go features for the most common, benign vestibular causes of isolated dizziness and vertigo

Syndrome	Targeted Exam	Benign Dis	Dangerous Mimic	Safe-to-Go Features
t-EVS	<ul style="list-style-type: none"> <li>- Orthostatic vitals;</li> <li>- Positioning tests for nystagmus</li> </ul>	BPPV	Posterior fossa mass	<ul style="list-style-type: none"> <li>- No pain, auditory, neurologic symptoms, or syncope</li> <li>- Symptoms on arising / tipping head forward/back or rolling in bed</li> <li>- Asymptomatic with head stationary, symptoms reproduced by specific positional</li> <li>- <b>Characteristic, canal-specific, peripheral-type nystagmus on positional tests</b></li> <li>- Therapeutic response to canal-specific repositioning maneuvers (PSCC : modified Epley maneuver; horizontal canal: Lempert roll [barbecue] maneuver)</li> </ul>

# cupulolithiasis vs canalithiasis

## Cupulolithiasis

- Shorter/no latency
- The intensity of nystagmus remains steady over a duration usually exceeding thirty seconds
- No fatigability

## Canalithiasis

- Latency : 5-20 seconds
- The nystagmus build in a crescendo pattern, then gradually abate
- A reversal of nystagmus on sitting
- Fatigability

# Diagnostic criteria for BPPV

- *Previously used terms: BPPV, benign positional vertigo, paroxysmal positional vertigo, vestibular lithiasis.*
- *2.1. Canalolithiasis of the posterior canal (pc-BPPV)*
- A. Recurrent attacks of positional vertigo or positional dizziness provoked by lying down or turning over in the supine position
- B. Duration of attacks < 1 min
- C. Positional nystagmus elicited after a latency of one or few seconds by the Dix-Hallpike maneuver or side-lying maneuver (Semont diagnostic maneuver). The nystagmus is a combination of torsional nystagmus with the upper pole of the eyes **beating toward the lower ear combined with vertical nystagmus beating upward (toward the forehead) typically lasting < 1 min**
- D. Not attributable to another disorder

- *2.2. Canalolithiasis of the horizontal canal (hc-BPPV)*
- A. Recurrent attacks of positional vertigo or positional dizziness provoked by lying down or turning over in the supine position
- B. Duration of attacks < 1 min
- C. Positional nystagmus<sup>7</sup> elicited after a brief latency or no latency by the supine roll test, beating horizontally<sup>9</sup> toward the undermost ear with the head turned to either side (geotropic direction changing nystagmus) and lasting < 1 min
- D. Not attributable to another disorder

- *2.3. Cupulolithiasis of the horizontal canal (hc-BPPV-cu)*
- A. Recurrent attacks of positional vertigo or positional dizziness provoked by lying down or turning over in the supine position
- B. Positional nystagmus elicited after a brief latency or no latency by the supine roll test, beating horizontally toward the uppermost ear with the head turned to either side (apogeotropic direction changing nystagmus), and lasting > 1 min
- C. Not attributable to another disorder



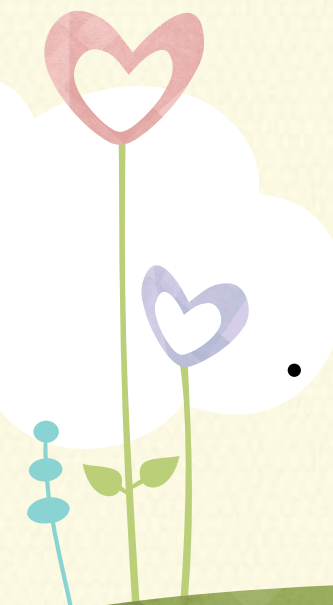


- *2.4. Probable benign paroxysmal positional vertigo, spontaneously resolved*
- A. Recurrent attacks of positional vertigo or positional dizziness provoked by lying down or turning over in the supine position
- B. Duration of attacks < 1 min
- C. **No observable nystagmus and no vertigo with any positional maneuver.**
- D. Not attributable to another disorder



- *3.1. Canalolithiasis of the anterior canal (ac-BPPV)*
- A. Recurrent attacks of positional vertigo or positional dizziness provoked by lying down or turning over in the supine position
- B. Duration of attacks < 1 min
- C. Positional nystagmus elicited immediately or after a latency of one or few seconds by the Dix-Hallpike maneuver (on one or both sides) or in the supine straight head-hanging position, **beating predominantly vertically downward and lasting < 1 min.**
- D. Not attributable to another disorder

- *3.2. Cupulolithiasis of the posterior canal (pc-BPPV-cu)*
- A. Recurrent attacks of positional vertigo or positional dizziness provoked by lying down or turning over in the supine position
- B. Positional nystagmus elicited after **a brief or no latency** by a “half Dix-Hallpike maneuver” beating torsionally with the upper pole of the eye to the lower ear and vertically upward (to the forehead) and **lasting > 1 min.**
- C. Not attributable to another disorder



# Canal Involvement Based on Direction of Nystagmus

Canal	Rt DHP position	Reversal phase (still in DHP position)	Return to sitting position
Rt PSCC	Upbeat, Rt torsional (CCW)	Downbeat, Lt torsional	Downbeat, Lt torsional
Rt ASCC	Downbeat, Rt torsional (CCW)	Upbeat, Lt torsional	Upbeat, Lt torsional
Lt ASCC	Downbeat, Lt torsional (CW)	Upbeat, Rt torsional	Upbeat, Rt torsional

(a) Vertical SC canals

Involved SC canal	Diagnostic maneuver	Paroxysmal positioning nystagmus	
		Vertical	Torsional
P-BPPV R	Dix-Hallpike R (+)	Upbeating	Counterclockwise
	Dix-Hallpike L (-)	No nystagmus	
P-BPPV L	Dix-Hallpike R (-)	No nystagmus	
	Dix-Hallpike L (+)	Upbeating	Clockwise
A-BPPV R	Dix-Hallpike R (+)	Downbeating	Counterclockwise
	Dix-Hallpike L (+)	Downbeating	Counterclockwise
A-BPPV L	Dix-Hallpike R (+)	Downbeating	clockwise
	Dix-Hallpike L (+)	Downbeating	Clockwise



## (b) Horizontal SC canals

		Direction of nystagmus	Intensity of nystagmus	Pathogenetic mechanism
H-BPPV R	Supine roll test R (+)	Geotropic	More intense	Canalolithiasis
	Supine roll test L (+)	Geotropic	Less intense	
H-BPPV R	Supine roll test R (+)	Apogeotropic	Less intense	Cupulolithiasis or canalolithiasis of the short arm of the horizontal SC
	Supine roll test L (+)	Apogeotropic	More intense	
H-BPPV L	Supine roll test R (+)	Geotropic	Less intense	Canalolithiasis
	Supine roll test L (+)	Geotropic	More intense	
H-BPPV L	Supine roll test R (+)	Apogeotropic	More intense	Cupulolithiasis or canalolithiasis of the short arm of the horizontal
	Supine roll test L (+)	Apogeotropic	Less intense	

# Multiple-Canal BPPV

- Bilateral posterior canal involvement
- Bilateral horizontal canal BPPV
  - *Geotropic Bilateral Horizontal Canal*
  - *Apogeotropic Bilateral Horizontal Canal*
- Bilateral anterior canal
- Horizontal and posterior canal : most common
- Horizontal and anterior canal
- Posterior and anterior canal

**Table 4** Safe-to-go features for the most common, benign vestibular causes of isolated dizziness and vertigo

Syndrome	Targeted Exam	Benign Dis	Dangerous Mimic	Safe-to-Go Features
s-EVS	Head, neck, and CN Hx; ear, hearing history	VM, MD Vestibular paroxysmia	TIA	<ul style="list-style-type: none"> <li>- No cardiorespiratory symptoms or transient loss of consciousness</li> <li>- No diplopia or other dangerous D symptoms (dysarthria, dysphagia, dysphonia, dysmetria)</li> <li>- No papilledema, Horner syndrome, cranial nerve signs (eg, facial palsy, if headache)</li> <li>- No sudden, severe, or sustained pain (especially in posterior neck)</li> <li>- Strong/long past Hx dizziness episodes (at least 5 spells over &gt;2 years)</li> <li>- Clear precipitants (eg, stress, food, visual motion) for <b>multiple episodes or ABCD risk score ≤3</b></li> <li>- Migraine: Hx migraine headache; classic visual aura or photophobia with most attacks</li> <li>- MD: Hx unilateral fluctuating HL or tinnitus with most attacks</li> </ul>

**Risk stratification for TIA with ABCD<sub>2</sub> score**

ABCD <sup>2</sup>	Criteria	Points
<u>A</u> ge	≥ 60 years	1
<u>B</u> lood pressure	≥140/80	1
<u>C</u> linical features	Unilateral weakness	2
	Speech impairment without weakness	1
<u>D</u> uration of Sx	>60minutes	2
	10-59 minutes	1
<u>D</u> iabetes	Yes	1

Score	2day-risk for stroke	Recurrence within 90days
0-3	Low	1.0%
4-5	Moderate	4.1%
6-7	High	8.1%

JAMA 2000;284:2901-2906

ABCD <sub>2</sub> -I	Points
ABCD <sub>2</sub> +	7
I = (image) MRI : acute infarction on DWI CT : acute or old infarction	3

Stroke 2010;41:1907-13

# Diagnostic criteria for vestibular migraine

## 1. Vestibular migraine

- A. At least **5 episodes** with vestibular symptoms of moderate or severe intensity, lasting **5 min to 72 hours**
- B. Current or previous history of migraine with or without aura according to the International Classification of Headache Disorders (ICHD)
- C. One or more migraine features with at least 50% of the vestibular episodes:
  - **Headache** with at least two of the following characteristics: **one sided location, pulsating quality, moderate or severe pain intensity, aggravation by routine physical activity**
  - **Photophobia and phonophobia**
  - **Visual aura**
- D. Not better accounted for by another vestibular or ICHD diagnosis





## 2. Probable VM

- A. At least 5 episodes with vestibular symptoms of moderate or severe intensity, lasting 5 min to 72 hours
- B. Only one of the criteria B and C for vestibular migraine is fulfilled (migraine history or migraine features during the episode)
- C. Not better accounted for by another vestibular or ICHD diagnosis

Classification ICHD-3 beta code Diagnosis. International Headache Society Cephalalgia 2013;33(9):629–808.



# Diagnostic criteria for Menie`re's disease

## Definite Menière's disease

- A. **Two or more** spontaneous episodes of vertigo, each lasting **20 minutes to 12 hours**
- B. Audiometrically documented **low- to medium-frequency** sensorineural hearing loss in the affected ear on at least one occasion before, during, or after one of the episodes of vertigo
- C. Fluctuating aural symptoms (hearing, tinnitus, or fullness) in the affected ear
- D. Not better accounted for any other vestibular diagnosis

## Probable Menière's disease

- A. Two or more spontaneous episodes of vertigo, each lasting 20 minutes to 12 hours
- B. Fluctuating aural symptoms (hearing, tinnitus, or fullness) in the affected ear
- C. Not better accounted for any other vestibular diagnosis

# Diagnostic criteria for vestibular paroxysmia

- A. At least **ten attacks** of spontaneous spinning or non-spinning vertigo
- B. Duration less **than 1 minute**
- C. Stereotyped phenomenology in a particular patient
- D. Response to a treatment with carbamazepine/oxcarbamazepine
- E. Not better accounted for by another diagnosis

## Probable VP:

- A. At least five attacks of spinning or non-spinning vertigo
- B. Duration less **than 5 minutes**
- C. Spontaneous occurrence or provoked by certain head-movements
- D. Stereotyped phenomenology in a particular patient
- E. Not better accounted for by another diagnosis

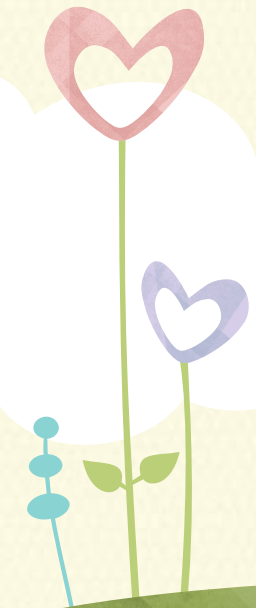


# Diagnostic of AIED:

- No reliable specific tests, based on clinical evaluation and experience
- Suspected whenever patient with **rapidly progressive idiopathic SNHL**
- García-Berrocal et al proposed criteria: confirm dx of AIED
- Rate of auditory recovery after therapy calculated as:

$$rate = \frac{iPTA - fPTA}{iPTA - conPTA} \times 100 \%$$

(iPTA=Initial auditory threshold, fPTA = final auditory threshold, and conPTA = auditory ear contralateral threshold)





# García-Berrocal et al [2005]

## Major criteria:

- (i) Bilateral HL
- (ii) Systemic AI disease
- (iii) ANA title > 1:80
- (iv) Reduction of T-naive lymphocytes (CD4RA)
- (v) Auditory recovery with tx > 80%

## Minor criteria:

- (i) Unilateral HL
- (ii) Young or middle-aged
- (iii) Female
- (iv) Auditory recovery with tx < 80%

At least 3 major, or 2 major + 2 minors

Test	Classification
Red and white cell counts	General blood test
Coagulation test (aPTT, PT)	General blood test
Creatine kinase (CK)	General blood test
Alanine transaminase (ALT)	General blood test
Aspartate aminotransferase (AST)	General blood test
Erythrocyte sedimentation rate (ESR)	Inflammatory markers
C-reactive protein (CRP)	Inflammatory markers
Ferritin	Inflammatory markers
Enzyme-linked immunosorbent assay (ELISA)	Immunologic analysis
Rheumatoid Factor (RF)	Antibody
Anti-cyclic citrullinated peptide antibody (CCP)	Antibody
Anti-nuclear antibody (ANA)	Antibody
Anti-double-stranded DNA (anti-dsDNA)	Antibody
Antiextractable nuclear antigen (anti-ENA)	Antibody
Antisignal recognition particle (anti-SRP)	Antibody
Anti-Mi2	Antibody
Antineutrophil cytoplasmic antibody (ANCA)	Antibody
Lupus anticoagulant (LAC)	Antibody
Antiphospholipid autoantibodies (aPL)	Antibody
Anticardiolipin (aCL)	Antibody
Complement (C3, C4, and B)	Complement
Cryoglobulins	Immunoglobulin

EUROIMMUN		Medizinische Labordiagnostika AG					
ANA-1/ 328-87		La	Co	RIB	HI	NUC	DNA
ANA-1/ 328-87		o	+++	o	o	o	o
Antigen	Intensity	Class	o (+)	+			
RNP/Sm	0	o					
Sm	0	o					
SS-A native (60 kDa)	0	o					
Ro-52 recombinant	2	o					
SS-B	1	o					
Scl-70	0	o					
Jo-1	0	o					
Centromere B	0	o					
dsDNA	4	o					
Nucleosomes	1	o					
Histones	0	o					
Ribosomal-P-protein	0	o					
Control	97	+++					
Label							
Class	Explanation						
o	Negative						
(+)	Borderline						
+	Positive						
++	Strong positive						
+++	Strong positive						

# Diagnostic criteria for Bilateral Vestibulopathy:

A. Chronic vestibular syndrome with following symptoms:

- 1) **unsteadiness when walking or standing** plus at least one of 2 or 3;
- 2) movement-induced blurred vision or oscillopsia during walking or quick head/body movements and/or
- 3) worsening of unsteadiness in darkness and/or on uneven ground

B. No symptoms while sitting or lying down under static conditions

C. Bilaterally reduced or absent angular VOR function documented by

- bilaterally pathological horizontal aVOR gain  $<0.6$ , by video-HIT or scleral-coil technique, and/or
- reduced caloric response (sum of bithermal pSPVmax on each side  $<6^\circ$  /sec), and/or
- reduced horizontal aVOR gain  $<0.1$  upon sinusoidal stimulation on rotatory chair and phase lead  $>68^\circ$

D. Not better accounted for by another disease



# Dx criteria for probable BVP

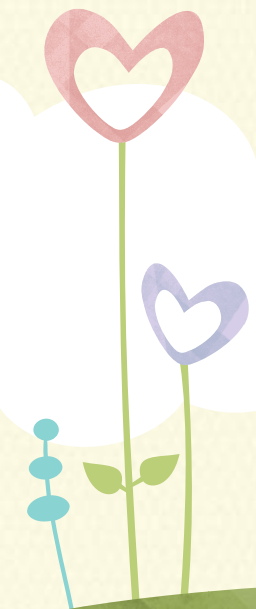
A. Chronic vestibular syndrome with the following symptoms

- 1) unsteadiness when walking or standing plus at least one of 2 or 3
- 2) movement-induced blurred vision or oscillopsia during walking or quick head/body movements and/or
- 3) worsening of unsteadiness in darkness and/or on uneven ground

B. No symptoms while sitting or lying down under static conditions

C. Bilaterally pathological horizontal bedside head impulse test

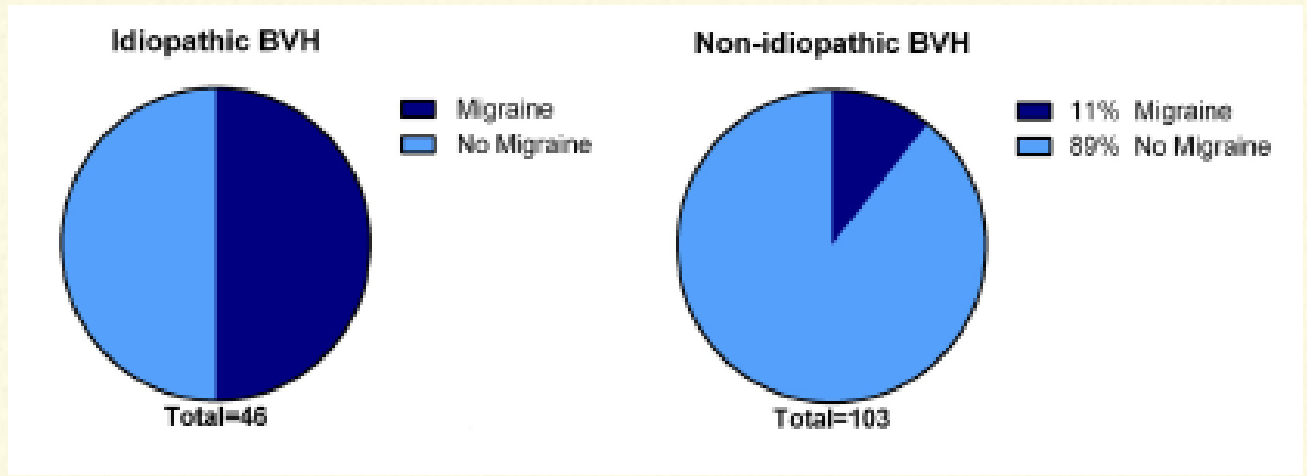
D. Not better accounted for by another disease



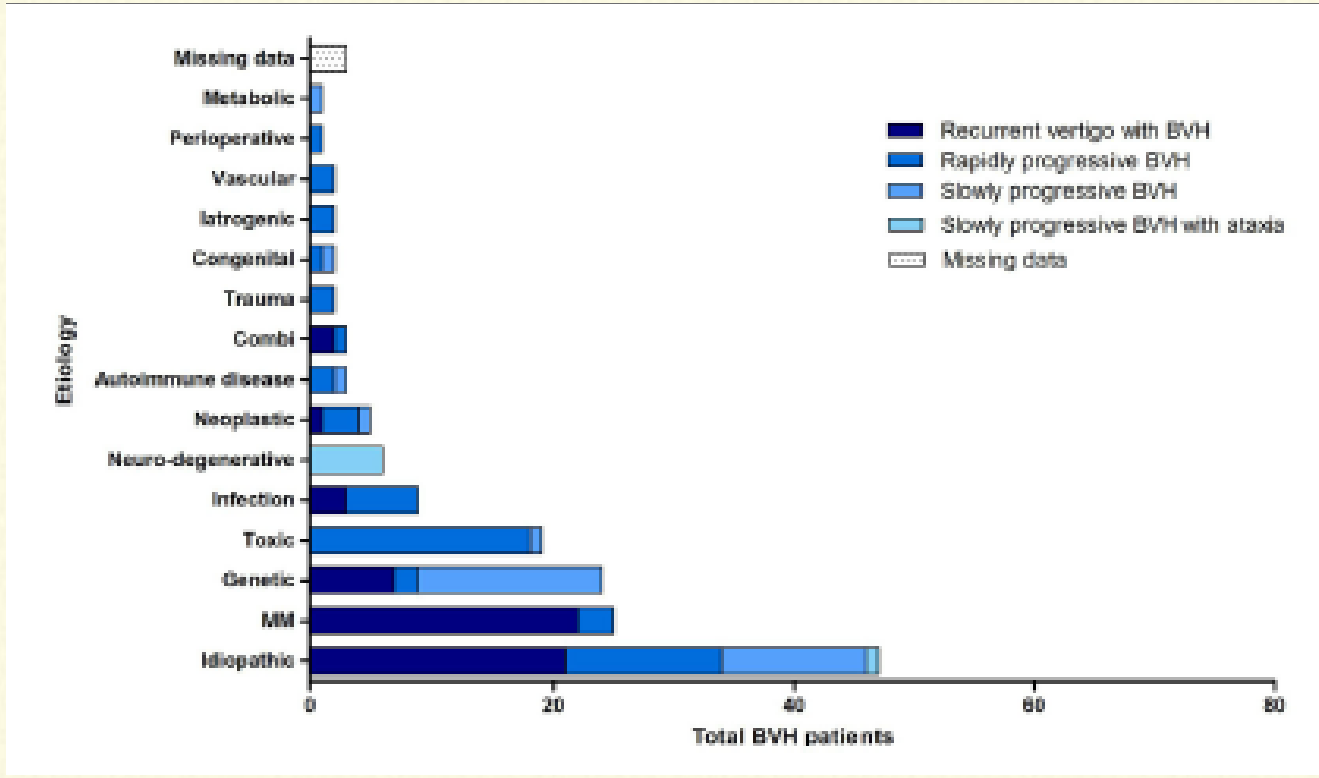


**TABLE 1 | Etiologies of BVH** Bilateral vestibular hypofunction

Idiopathic (51%)	
Toxic/metabolic (13-21%)	Antibiotics, furosemide, cisplatin, aspirin, alcohol, vitamin-B12 deficiency, folate deficiency, hypothyroidism, styrene poisoning, combination non-steroidal anti-inflammatory drug + penicillin
Infectious (3.8-12%)	Meningitis/encephalitis/cerebellitis, Lues, Behçet, Borrelia, Herpes Simplex Virus, bilateral neuritis
Autoimmune (10%)	Cogan, Susac, Sarcoidosis, Wegener's, Sjögren, colitis, celiac disease, polyarteritis nodosa, antiphospholipid syndrome, other systemic diseases
Neurodegenerative	CANVAS, superficial siderosis, episodic ataxia, multiple system atrophy, polyneuropathy, SCA3, SCA6, hereditary sensoric and autonomic neuropathy type IV, other ataxias
Genetic	DFNA9, DFNA11, DFNA15, DFNB4, mutation chromosome 5q, 6q, 11q, 22q Muckle Wells (NLPR3)
Vascular	Supra- or intralenticular lesions, vertebralbasilar dolichoectasia
Neoplastic	Bilateral vestibular schwannoma, Neurofibromatosis type 2, metastasis lymphoma, malignant tumor
Trauma	Head trauma, iatrogenic (e.g., bilateral CI-implantation)
Other ear pathology	Bilateral Ménière's disease, otosclerosis, bilateral labyrinthitis, cholesteatoma
Congenital/syndromal	e.g., CHARGE, Usher, Turner, enlarged vestibular aqueduct syndrome, Alport syndrome
Other	presbyvertigo, vestibular atelectasis, auditory neuropathy spectrum disorders, etc.



Subgroup



# Diagnostic criteria for PPPD

PPPD is a chronic vestibular disorder defined by criteria A-E below. All five criteria must be fulfilled to make the diagnosis.

A. One or more symptoms of dizziness, unsteadiness, or non-spinning vertigo are present on most days for 3 months or more.

- 1) symptoms last for prolonged (hours long) periods of time, but may wax and wane in severity.
- 2) symptoms need not be present continuously throughout the entire day.

B. Persistent symptoms occur without specific provocation, but are exacerbated by three factors:

- 1) upright posture, 2) active or passive motion without regard to direction or position, and
- 3) exposure to moving visual stimuli or complex visual patterns.

C. The disorder is precipitated by conditions that cause vertigo, unsteadiness, dizziness, or problems with balance including acute, episodic, or chronic vestibular syndromes, other neurologic or medical illnesses, or psychological distress.

- 1) when the precipitant is an acute or episodic condition, symptoms settle into the pattern of criterion A as the precipitant resolves, but they may occur intermittently at first, and then consolidate into a persistent course.
- 2) when the precipitant is a chronic syndrome, symptoms may develop slowly at first and worsen gradually.

D. Symptoms cause significant distress or functional impairment.

E. Symptoms are not better accounted for by another disease or disorder.

*J Vestibular Research, 2017*

**GROUP 1**

BPPV, Migraine, Endolymphatic hydrops, Familial conditions (eg, Episodic ataxias)



Stuttering onset

**GROUP 2**

Poorly compensated unilateral peripheral vestibular loss (eg, Vestibular neuritis)



Acute vertiginous

**GROUP 3**

Bilateral vestibular failure, CNS disorder (ataxias, mass lesion, leucoarariosis), psychological



Gradual onset

*Pract Neurol, 2010*

## ***Dx of PPPD***

- Dx made by gathering clinical hx relevant to Criteria A-D
- No findings on PE, lab testing, or dx imaging pathognomonic of PPPD
- PE – If PPPD is the best diagnosis, either alone or in combination with other diseases or disorders (Criterion E)
- PPPD is not a diagnosis of exclusion



# *What is cervicogenic dizziness?*

- Various definitions by Japan Foundation for Equilibrium Research (1987)
- Dx CGD definitions:
- “In many cases, the cause of vertigo lies in C region, as a result of events such as rotation or extension of neck, or abnormalities of equilibrium sensation”;
- “repeatedly occurring vertigo”;
- “symptoms affecting neck, particularly C neuralgia, sympathetic tenderness, and vertigo accompanied by ANS”;
- “vertigo, dizziness, or imbalance caused by abnormal afferent input from neck, in no organic vestibular impairment is observed”;
- “a lack of disorders leading to vertigo involving areas other than C region”

- Imbalance, unsteadiness, disorientation, neck pain, limited cervical range of motion, may be accompanied by a headache (tension type)
- Dizziness should be closely related to changes in cervical spine position or cervical joint movement
- Worse during head movements or after maintaining one head position for a long time
- History of head/ neck injury

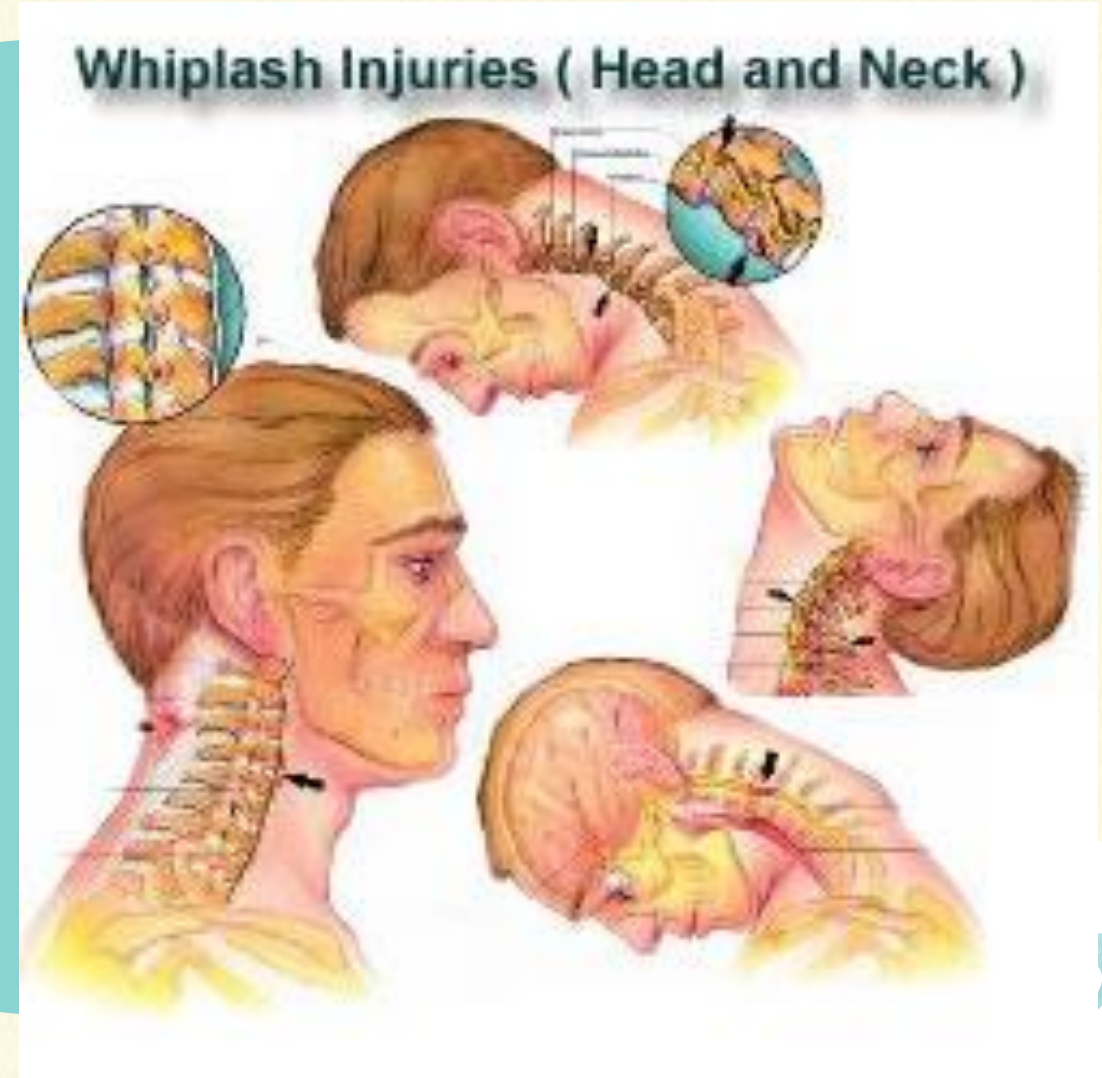
*When to suspect?*





## *Whiplash injury*

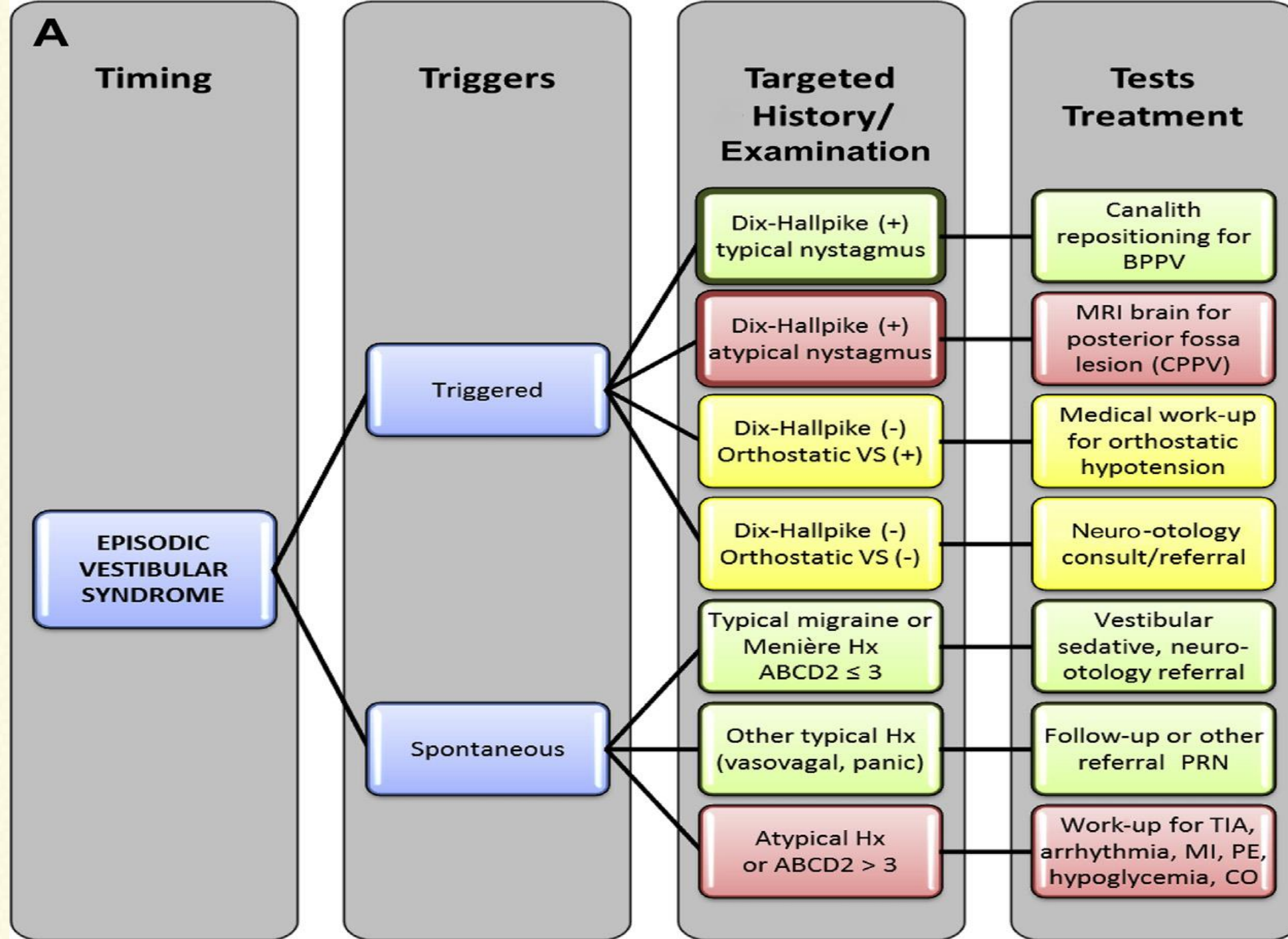
- Every year 0.1% population experiences a whiplash injury
- 20-58% as high as 80–90% of individuals who have sustained a closed head or whiplash injury will experience CGD
- Dizziness, vertigo, and disequilibrium do not frequently occur at the initial presentation



**Table 4** Safe-to-go features for the most common, benign vestibular causes of isolated dizziness and vertigo

Syndrome	Targeted Exam	Benign Dis	Danger Mimic	Safe-to-Go Features
s-AVS	HINTS; ear, hearing exam	Vestibular neuritis	Stroke	<ul style="list-style-type: none"> <li>- Maximum 1 prodromal spell &lt;48 h before onset</li> <li>- No excessive vomiting or gait disorder</li> <li>- No pain, auditory, neurologic symptoms</li> <li>- No papilledema, Horner syndrome, cranial nerve signs (eg, facial palsy), if headache</li> <li>- Stands and walks unassisted (even if unsteady or wide based, unable to perform tandem gait)</li> <li>- <b>HINTS plus hearing/ear examination</b>—<b>SEND HIM ON HOME:</b></li> <li>- SEND—Straight Eyes (no vertical ocular misalignment/ skew), No Deafness</li> <li>- HIM—head impulse misses (unilateral abnormal impulse opposite nystagmus direction)</li> <li>- ON—one-way nystagmus (unidirectional nystagmus worse in gaze toward fast phase)</li> <li>- HOME—healthy otic and mastoid examination</li> </ul>





**B**

**ACUTE VESTIBULAR SYNDROME**

Postexposure  
(traumatic/toxic)

Spontaneous

Head trauma or  
whiplash Hx

Barotrauma or  
blast Hx

Toxin Hx  
(CO, illicit)

Medication Hx  
(AEDs, gentamicin)

HINTS peripheral  
no deafness

HINTS central or  
deafness

No nystagmus  
(normal EOMs)

CT/CTA for skull  
fracture, vertebral  
artery dissection

Otology consult for  
perilymph fistula

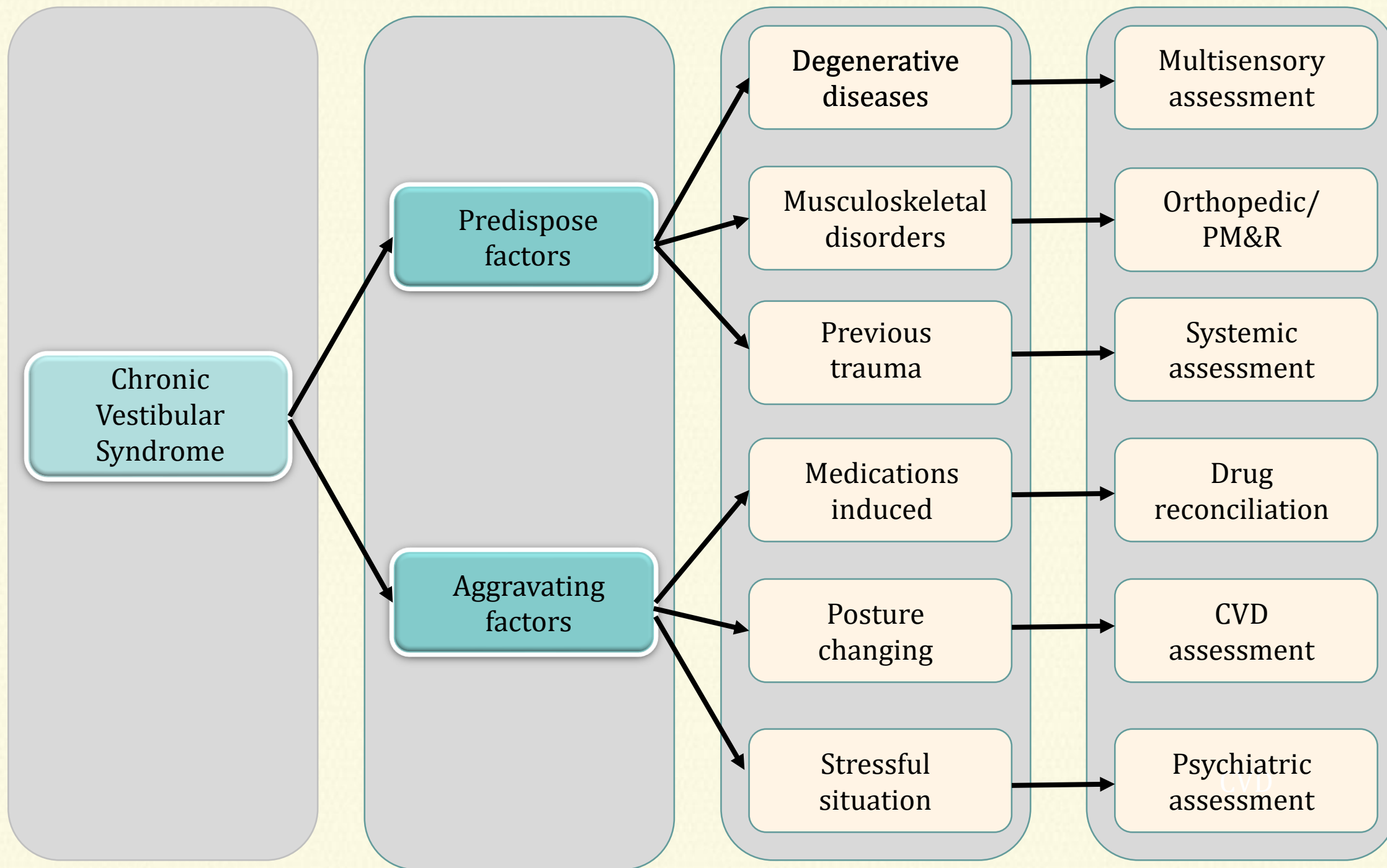
Medical tests or  
treatment PRN

Adjust dose or  
detoxify PRN

Vestibular  
sedative, follow-up

Neurologic work-up  
(stroke > Wernicke  
or encephalitis)

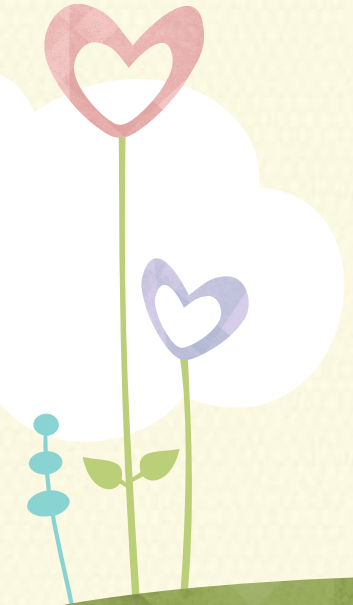
Medical work-up  
+/- neurologic  
work-up





# Laboratory investigation 1

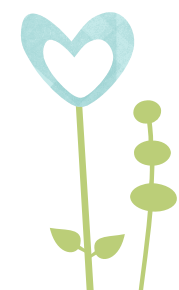
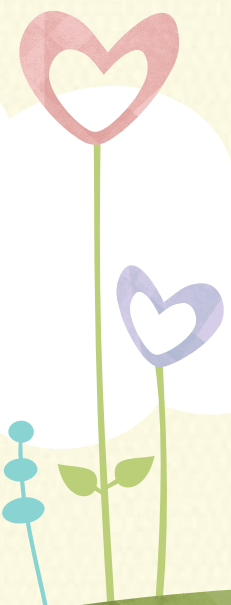
- 3 position Blood pressure
- Basic lab: CBC, ESR, VDRL, FTA-ABS, FBS, lipid profiles, 25OH vit D level
- Clinical adjust: TFT, PaO<sub>2</sub>
- X-ray C-spine: 4 post plus F/E
- EKG & monitoring, Echo
- EEG
- Polysomnogram





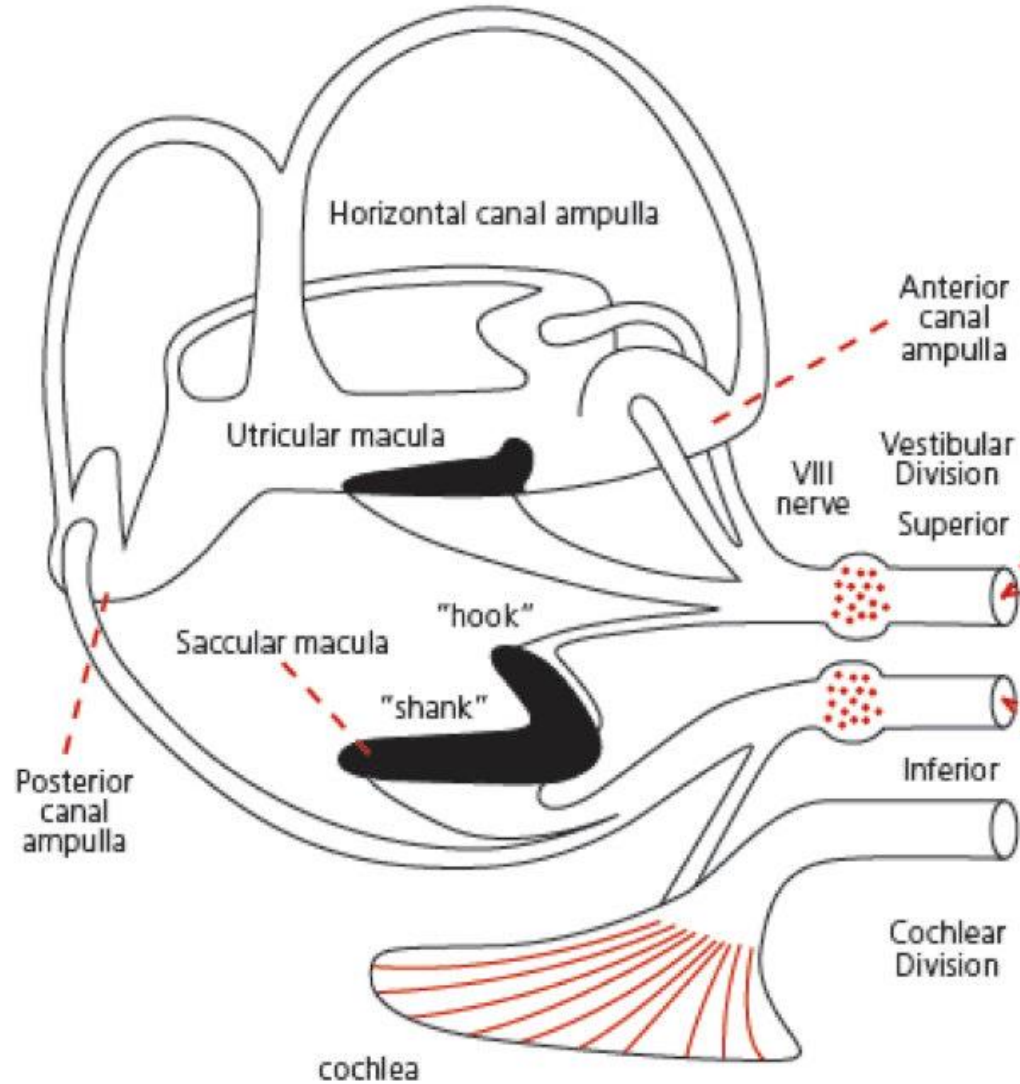
# OSA and dizziness/vertigo

- Obstructive sleep apnoea syndrome (OSAS): effects on the vestibular system. Gallina S, Dispenza F, Kulamarva G, Riggio F, Speciale R. *Acta ORL Ital* 2010;30:281-4.
- Alternobaric vertigo in a patient on positive airway pressure therapy. Endara-Bravo A, Ahoulim D, Mezerhane E, Abreu RA. *J Clin Sleep Med* 2013;9(12):1347-8.
- Vestibular functions were found to be impaired in patients with moderate-to-severe OSA. [Kayabasi S](#), [Iriz A](#), [Cayonu M](#), [Cengiz B](#), [Acar A](#), [Boynuegri S](#), [Mujdeci B](#), [Eryilmaz A](#). *Laryngoscope*. 2015 May;125(5):1244-8.
- A pilot study on the efficacy of CPAP on the manifestations of Ménière's Disease in patients with concomitant OSA Syndrome. Nakayama M, Masuda A, Bhardwaj Ando K, Arima S, Kabaya K, Inagaki A, Nakamura Y, Suzuki M, Brodie H, Diaz RC, Murakami S. *J Clin Sleep Med* 2015;11(10):1101-7.



Lab test 2	Measure	Lesion
Audiometry : - PTA, - SDS	HL threshold CHL/ SNHL LF/ HF Fluctuat/progress	Ext, ME, IE Retrocochlear Central Unilat/ bilateral
Tympanometry	ME pressure Acoustic reflex	ME, IE, Retrocochlear
SISI, TD	HL behavior	Retrocochlear
ABR	Early AEP	Retrocochlear
ECochG	SP/AP	IE, hydrop
OAEs	Acoustic emission	ExtE, ME, IE
Middle, late latency Central P300	Mid, late AEP Cortical P300	Central

Vestibular Tests Lab 3	Measure	Lesion
VNG: caloric	VOR, low frequency	LSCC
VNG: ocular motor	EOM: SC,SP,OKN	Central
Dix-Hallpike	EOM	PSCC
cVEMP	EMG ipsi SCM	Saccule, inf vest nerve
oVEMP	EMG contral OM	Utricle, sup vest nerve
vHIT	VOR, high frequency	SCC all
Dynamic visual acuity	VOR	PVD asymmetry
Dynamic posturography	VSR, interact eyes, PNP	None localized
Computerized rotatory chair	VOR, high-, low-velocity	Bilateral PVD



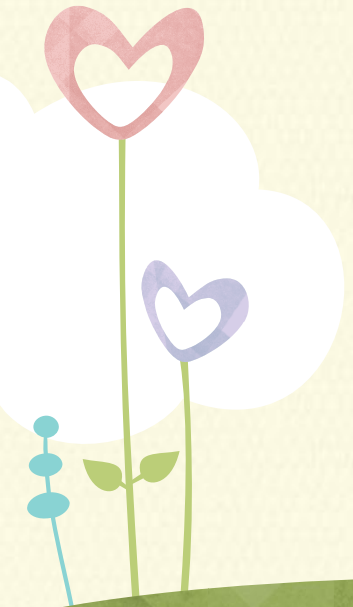
Clinical Test*	Healthy Subjects	Superior Vestibular Neuritis	Inferior Vestibular Neuritis	Unilateral Vestibular Loss
Horizontal head turn to ipsilateral horizontal canal	✓	✗	✓	✗
Pitch head impulse test in the plane of the ipsilateral anterior canal, head turn nose down - tests ipsilateral anterior canal	✓	✗	✓	✗
oVEMP n10 beneath the contralateral eye to bone conducted vibration at Fz, or air-conducted sound of one ear - tests utricular macula of the ear opposite to the eye	✓	✗	✓	✗
cVEMP p13-n23 over ipsilateral sternocleidomastoid (SCM) muscle to bone conducted vibration at Fz, or air-conducted sound of one ear - tests saccular macula of the ear on the same side	✓	✓	✗	✗
Pitch head impulse in the plane of the ipsilateral posterior canal, head turn nose up - tests ipsilateral posterior canal	✓	✓	✗	✗

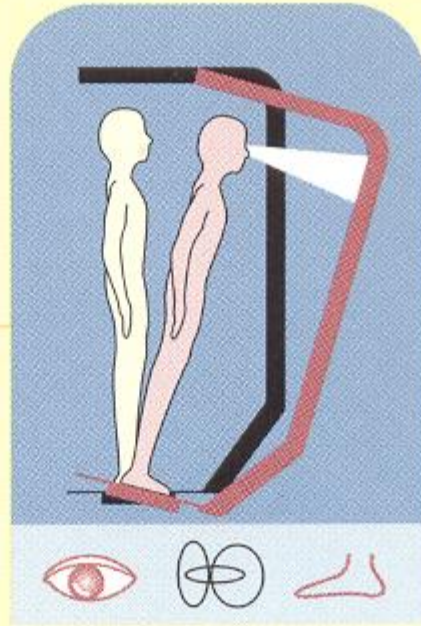
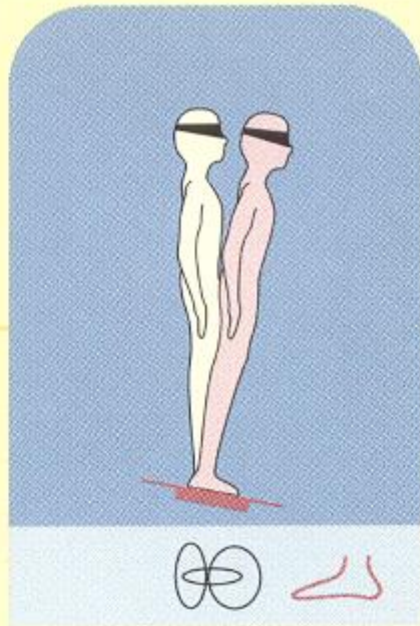
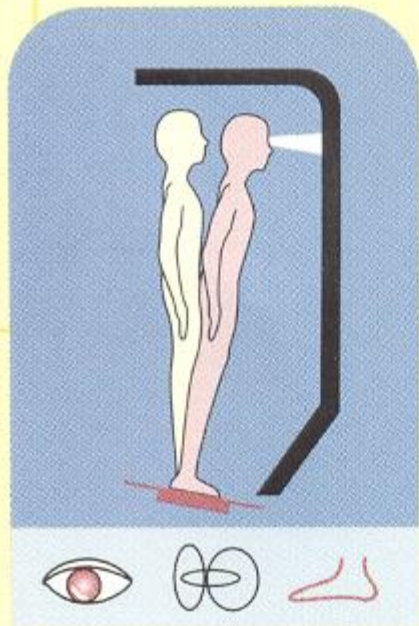
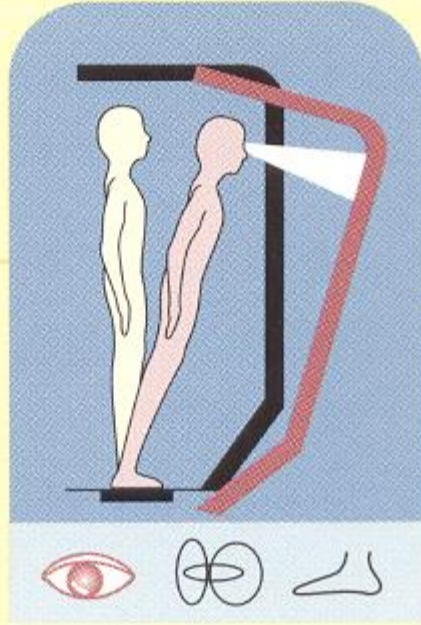
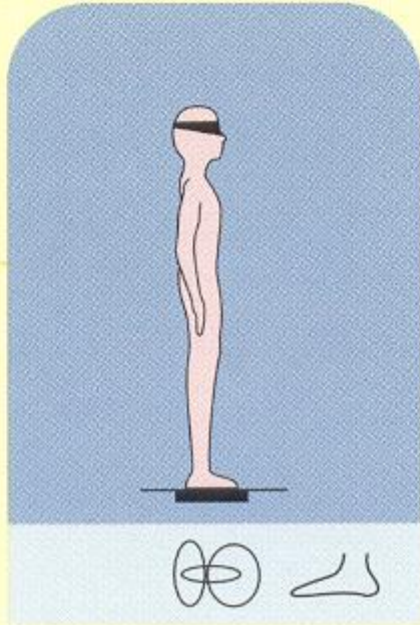
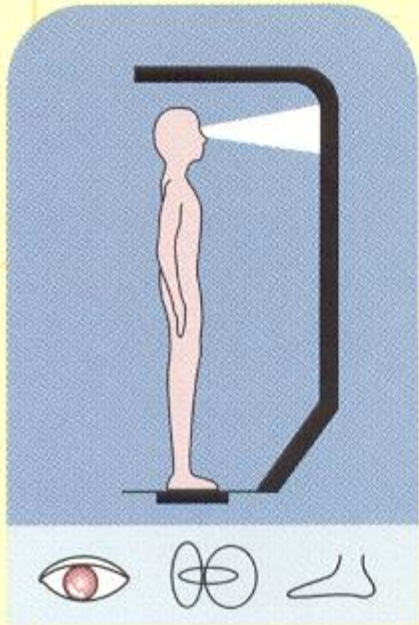
✓ = Normal Response    ✗ = Abnormal Response



## Dynamic posturography:

- Force platform
- Visual feedback
- Weight shifting exercise



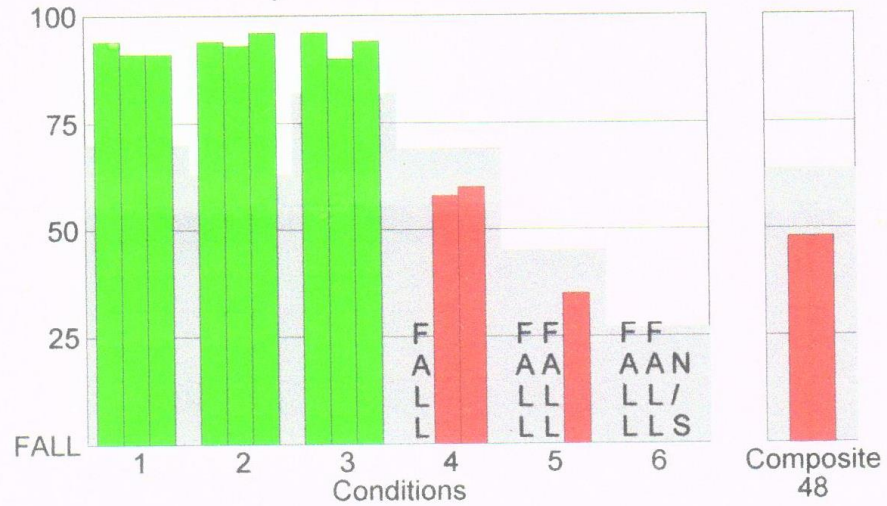




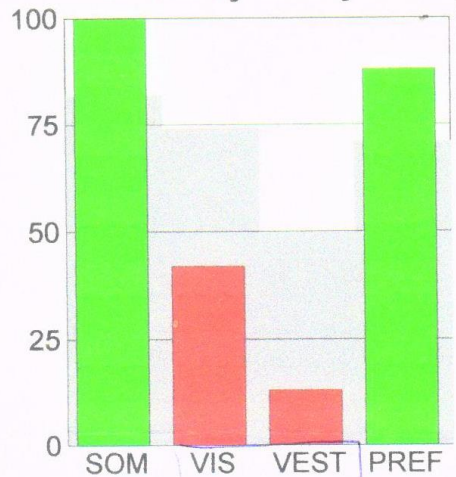
# Sensory Organization Test

(Sway Referenced Gain: 1.0)

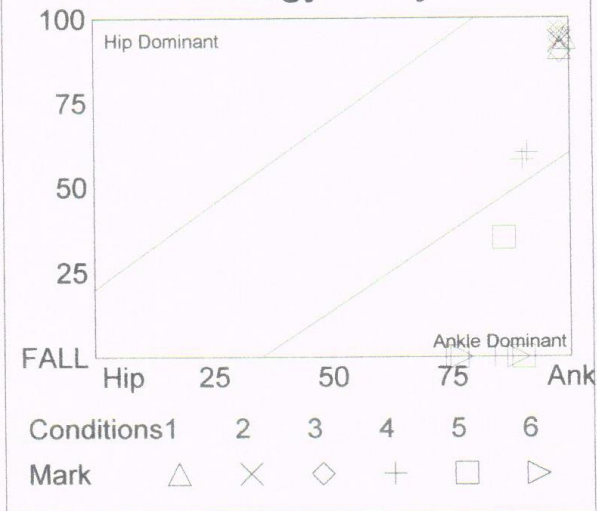
## Equilibrium Score



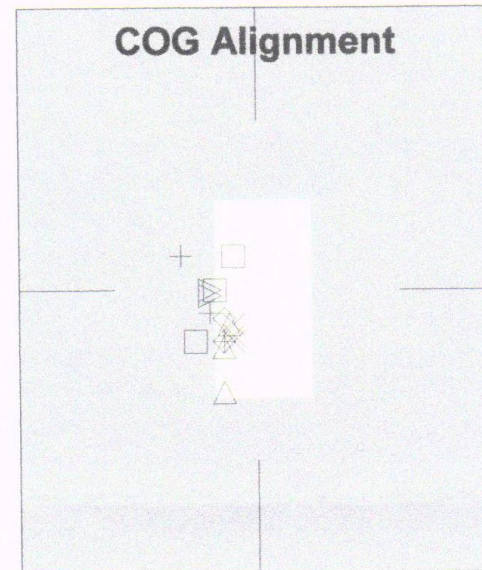
## Sensory Analysis



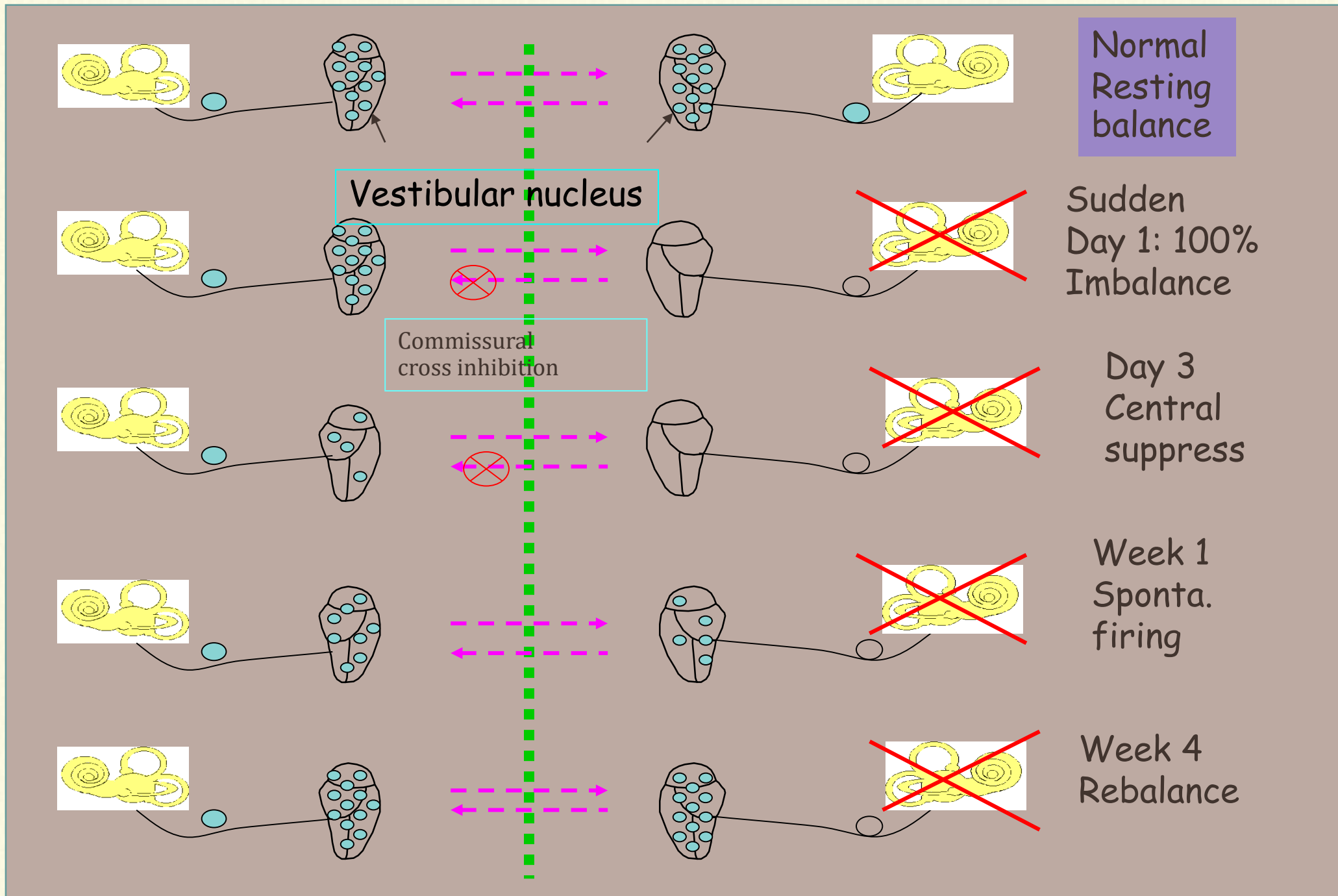
## Strategy Analysis



## COG Alignment

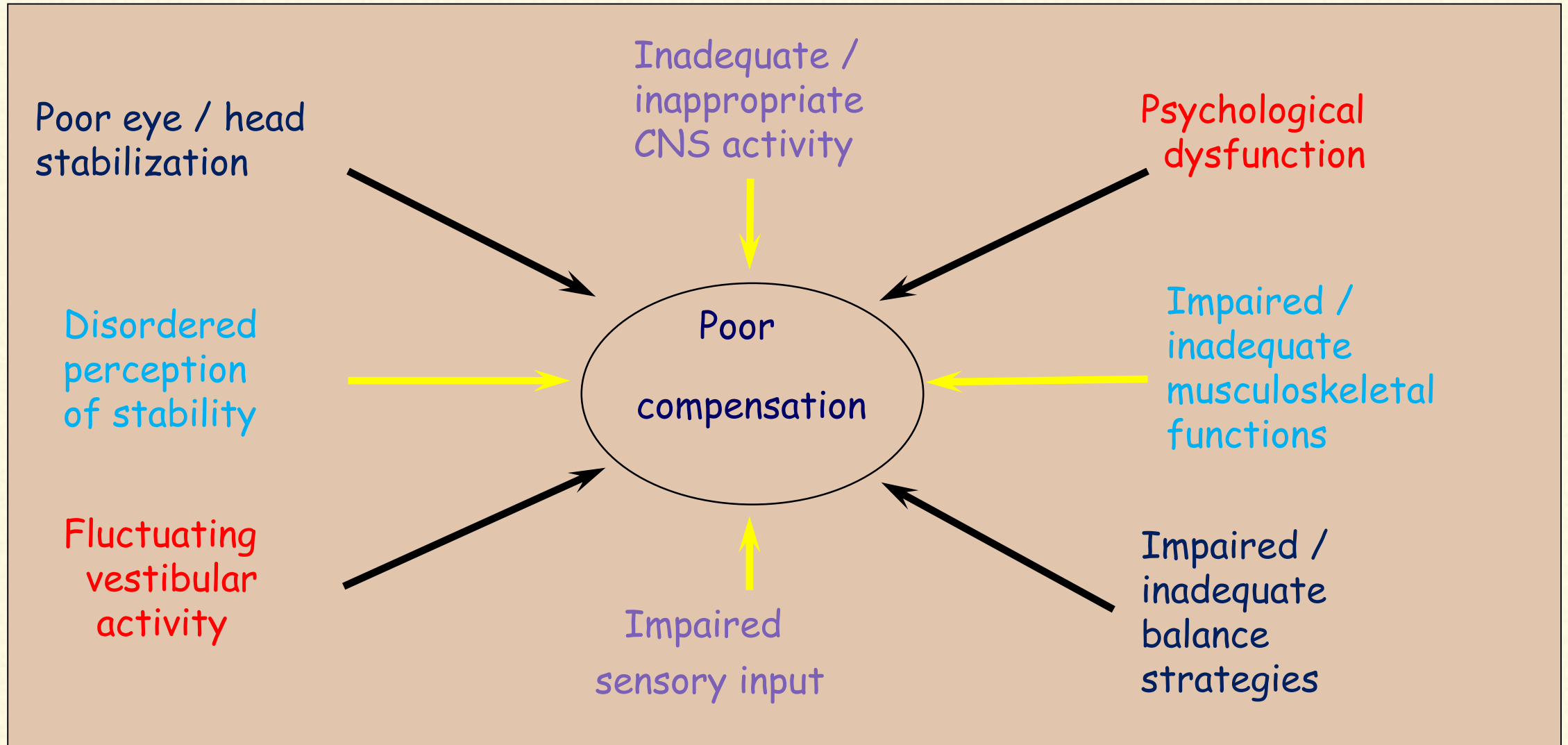


# Compensation mechanism





# Factors Affecting Compensation



# Compensation mechanism

## Condition

- Peripheral lesion: labyrinth or nerve
- Static lesion, non-fluctuate pathology

## Recovery

- Reassurance of compensation w/in 30 days
- Reduction of sedative drugs after 1<sup>st</sup> wk



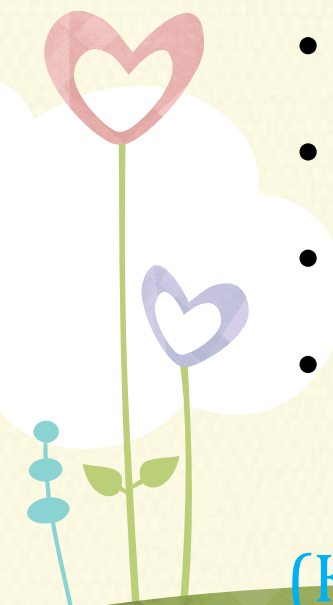


# Psychiatric disorders acting as primary cause in dizziness

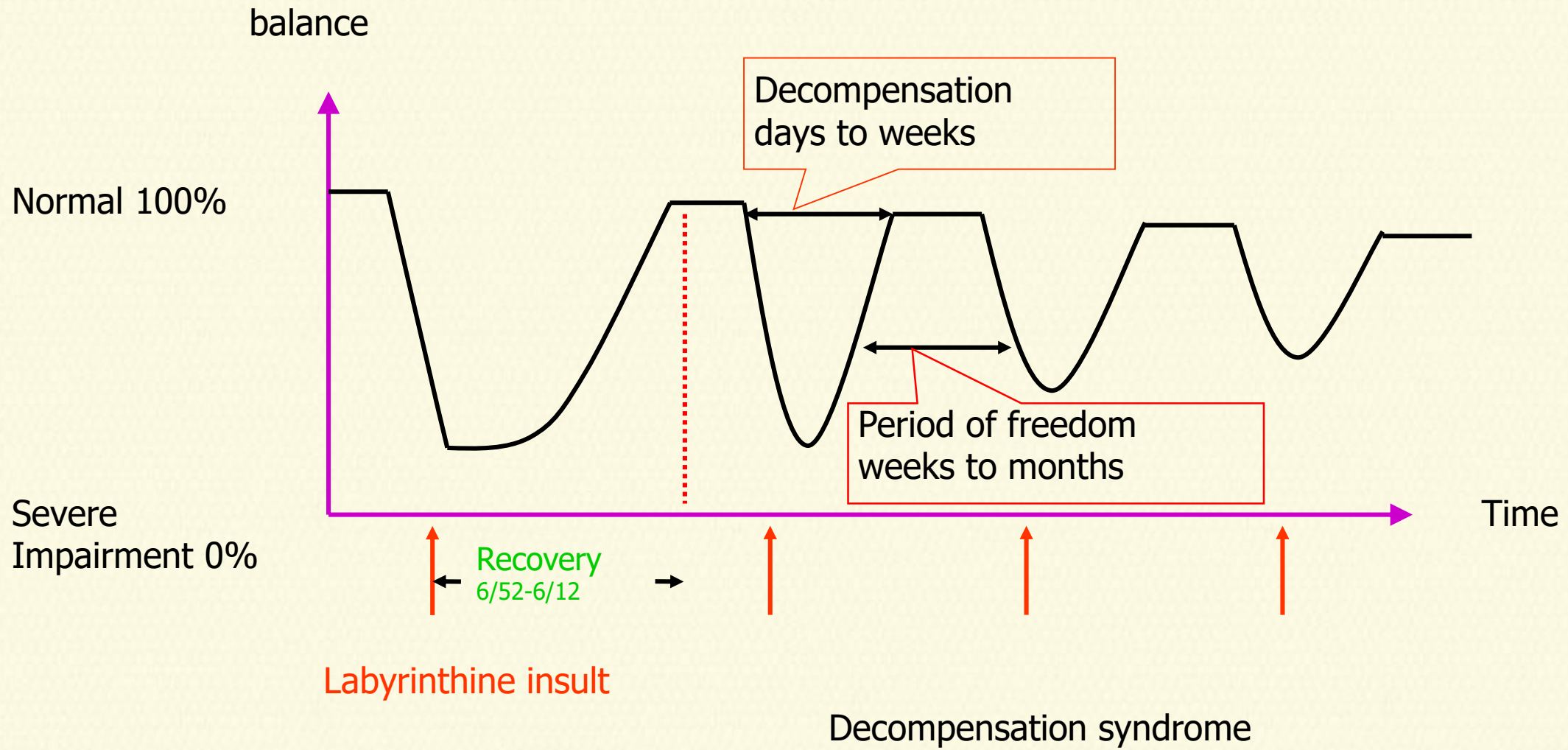
Common psychiatric disorders:

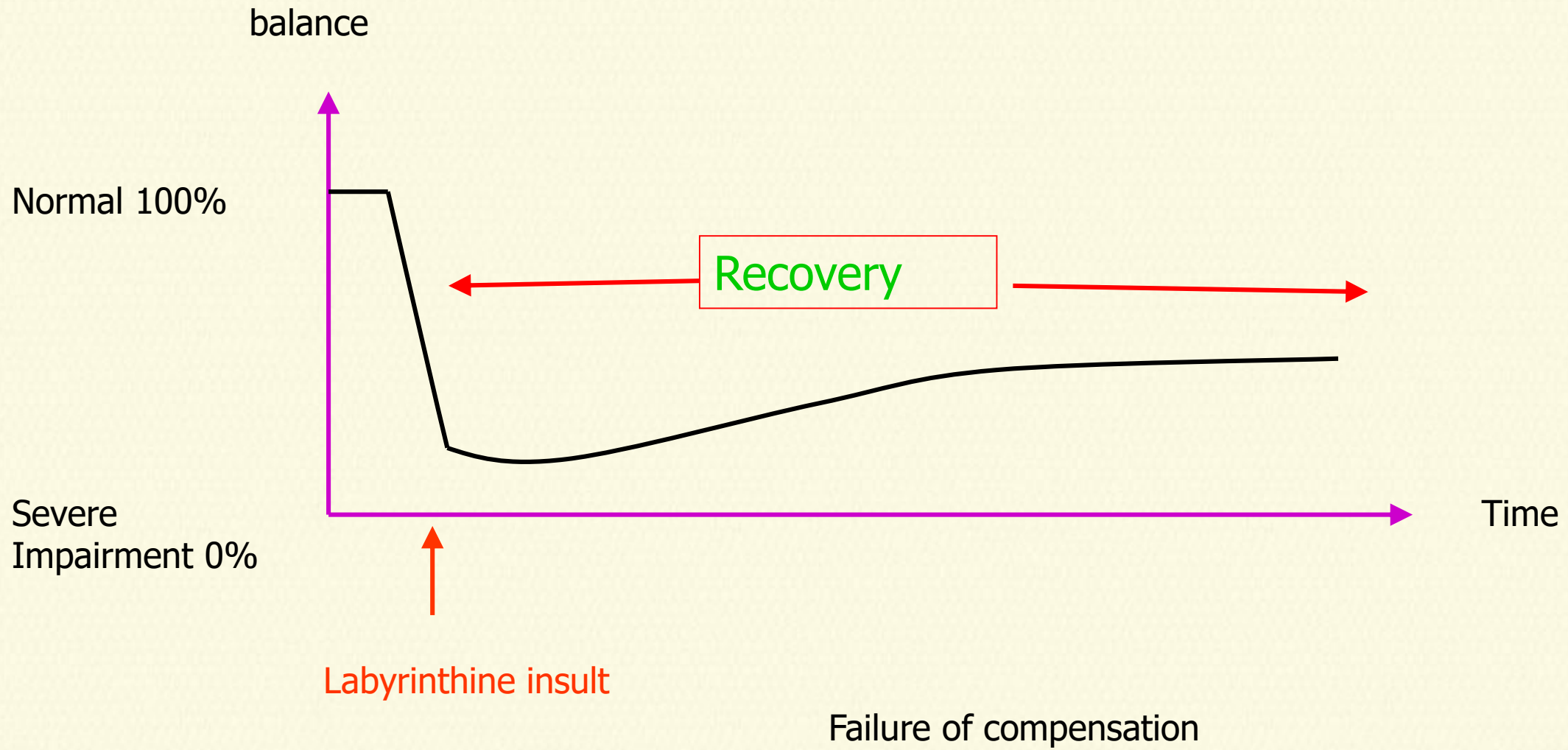
- Primary 40%, Contributory 60%
- Mood disorder: major depression
- Anxiety disorder: general, panic, phobia
- Somatization disorder
- Personality disorder
- Stress

(Kroenke et al, 1992)









ปัจจัยที่มีผลต่อการบริหารการทรงตัว (Bamiou DE, Luxon LM, 2008)

- Incorrect performance of exercises
- Motivation
- Attention
- Effort and interest
- Imagination/effort of spatial localization
- Time of onset of the exercises
- Continuous versus episodic dizziness
- Level of pretherapy disabilities scores
- Head injury
- Central vestibular disorders
- Vestibular suppressants
- Age



# Summary

Common causes of dizziness/vertigo: mostly benign

Chronic cases: QoL, FOF, socioeconomic burden

Start from: syndrome of Acute, Episodic or Chronic pattern

Hx & PE – 3T + A → accurate diagnosis 80-90%

PVD – consensus clinical criteria, few need investigation

Predispose ≠ Provokable, but mostly preventable

Factors effect to Compensation and Psychiatric problems – need attention and assessment

