The background is a dark teal color. It features several large, overlapping circles in a lighter teal shade. In the top right corner, there is a small red rectangle.

# Activities and ways to modify them with emphasis on the balance challenged patient: stroke, TBI and Tumor cases

HOUR 5, 6 AND 7

# Why is balance impacted?

- ▶ Mobility is restricted
- ▶ Memory is reduced
- ▶ Injury to cerebellum
- ▶ Poor motor planning, spatial disorientation - Injury to frontal lobe
- ▶ Constricted functional visual field – Parietal dysfunction, sympathetic override, Spatial disorientation
- ▶ Visual midline and horizon distortions (VOR)
- ▶ Diplopia
- ▶ Sensory overwhelm, blur photophobia
- ▶ Fatigue
- ▶ Posture
- ▶ Systems in disagreement
- ▶ Figure Ground

# Nystagmus

## Normal Physiologic nystagmus


- optokinetic nystagmus (OKN)
- vestibular ocular reflex
- caloric nystagmus
- post-rotatory nystagmus
- End gaze

## Acquired Nystagmus

- ▶ Head injury
- ▶ Inner ear disorders such as labyrinthitis or Meniere disease
- ▶ Stroke
- ▶ Thiamine or vitamin B12 deficiency

<https://healthjade.com/wp-content/uploads/2019/01/eye-nystagmus.gif>



A long jumper is captured in mid-air, performing a jump over a track. The athlete is wearing a white singlet and dark shorts. The background is a clear blue sky. The track below has lane markers numbered 4, 5, and 6.

Vision is the ability to  
make meaningful  
interpretation of  
what is seen

TO DIRECT  
ACTION



# Working out of order

- ▶ If you push the compensatory voluntary system to over ride the autonomic status then the outcome will be better function but something will pay the price...
  - ▶ Issues of stamina
    - ▶ Fatigue
  - ▶ Compensatory adaptations
    - ▶ myopia
  - ▶ Issues of comfort
    - ▶ Headaches

# The well adapted

- ▶ Working is engaging and fatigue is transient
- ▶ Fast recovery
- ▶ Can load with all kinds of stimuli

# The not well adapted

- ▶ Progressive myopia
- ▶ Anisometropia a spatial problem
- ▶ Vertical- trochlear nerve? The system that can move will move
- ▶ headaches



# Why would an person with esophoria also be a CI?

- ▶ Esophoria is the posture
- ▶ Convergence is the action – coming in from out
- ▶ The esophoria case has no more “in” to do
- ▶ Many TBI cases have no sense of the Z axis
  - ▶ XYZ pursuits
  - ▶ Mirror activities

# Ataxia and nystagmus

- ▶ Are normal in extreme gaze
- ▶ What happens when you apply BR, BL, BU, BD, BI, BO?
- ▶ Sometimes the nystagmus will go away
- ▶ Use the midline, visual horizon test to guide you
- ▶ What is the field? Work inside the saccade range

# When we need to negotiate balance

- ▶ The reflexive systems activate when gravity is a factor
- ▶ Start supine
  - ▶ Ball angels
  - ▶ Ball watching
    - ▶ Split occlusion
    - ▶ Binasal Occlusion
  - ▶ Eye leads hand, neck
    - ▶ Punch the ceiling
    - ▶ NET



# Eye neck

- ▶ Waist and neck rotations in the mirror
- ▶ Wide binasal activity
- ▶ MAT
- ▶ Eye Leads Body
- ▶ Eye Leads hand
- ▶ Squinchel

# Infinity Walk

- ▶ Choose the target best suited to the state they are in
- ▶ Face of the parent while engaged in conversation
- ▶ Single target
- ▶ Letter chart, arrow chart,
- ▶ Site words, math problems
- ▶ reading

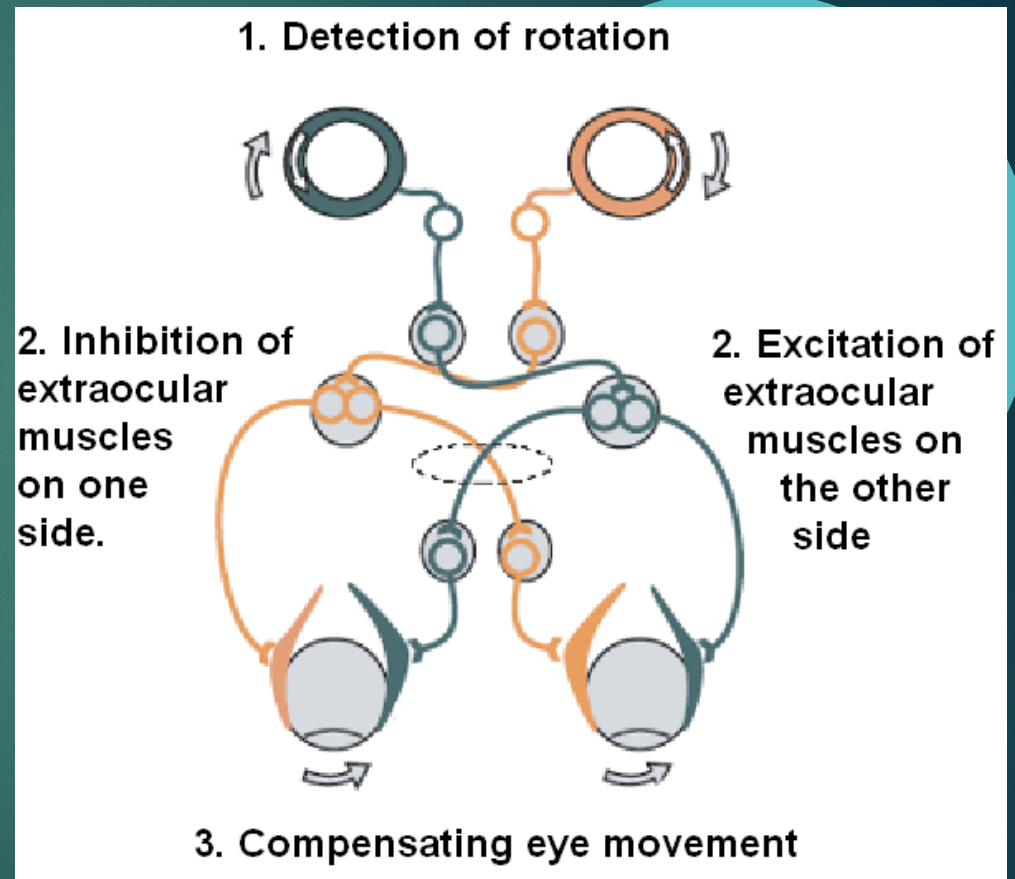
# Eye and vestibular

- ▶ Rolling
- ▶ 4 wall fixations
- ▶ Swing point
- ▶ Long Loose body swings to promote parasympathetic
- ▶ Fixation in mirror
- ▶ Ball dodging



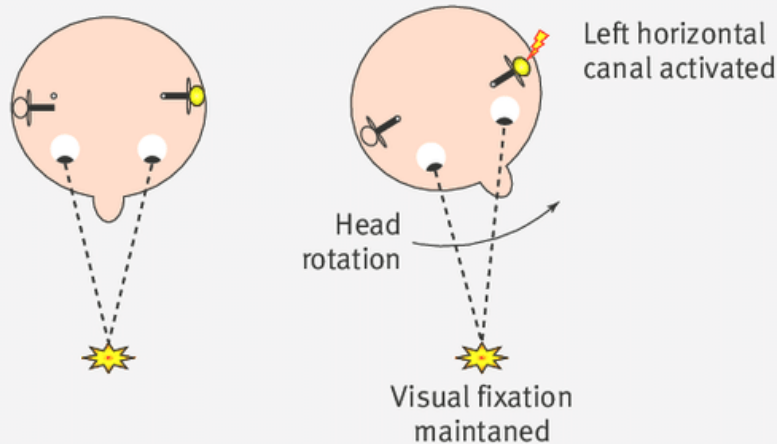
# VOR

- ▶ Vestibulo-Ocular Reflex
- ▶ The vestibulo-ocular reflex (VOR) is a gaze stabilizing reflex: the sensory signals encoding head movements are transformed into motor commands that generate compensatory eye movements in the opposite direction of the head movement, thus ensuring stable vision.
- ▶ From: [Development of Auditory and Vestibular Systems, 2014](#)



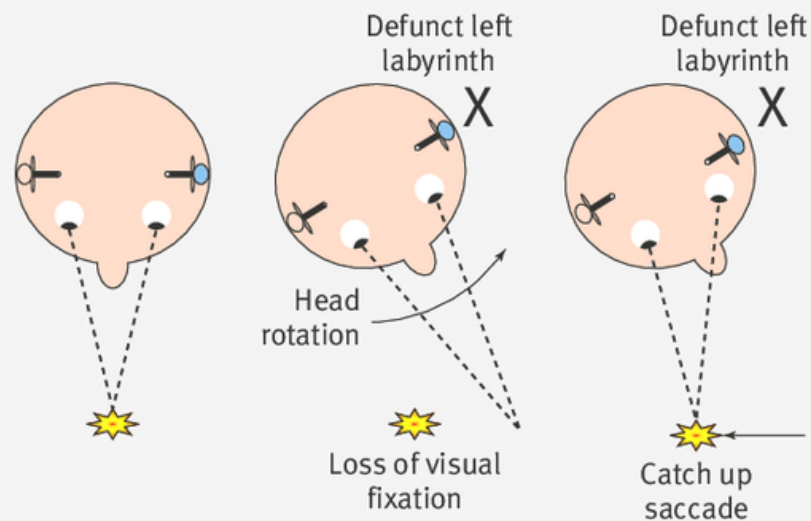
### The normal state

Head movement towards a canal (yellow in figure) will cause activation of that canal, and reflex movement of the eyes in the opposite direction - that is, away from the canal



### The pathological state and the basis of the head thrust test

Head movement towards a defunct canal (blue in figure) will result in failure of activation of the vestibulo-ocular reflex and thus the visual target will be lost from fixation during sudden head movements. In the head thrust test, the examiner turns the patient's head with a high acceleration but low amplitude head thrust, in this case to the patient's left. The test is positive when the patient makes a catch-up saccade to refixate the visual target (usually towards the examiner's nose)



- No need to measure this in the training room
- Train it on everyone.
- Everyone will benefit

The background is a dark teal color. It features several large, overlapping circles in a lighter teal shade. In the top right corner, there is a small red rectangle. The text is centered in the upper half of the image.

# You move their head while they fixate on your eyes

Small movements until they break fixation

Massage the transition

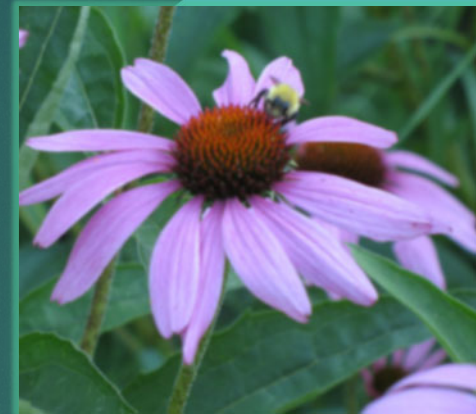
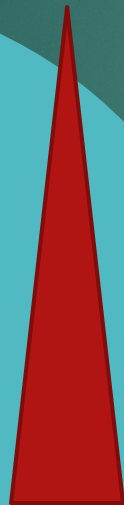
Slow movements



# Fixation - MITT

Do monocular then binocular  
Move the head and keep fixation

# Monocular Adaptation to Loose prism



Note the amount and direction of relative movement  
Add visualization  
Make it peripheral central



# Loose Minus Lenses



This is a central; peripheral activity. Take your time. Ask probing questions. The moment they observe and understand what they see they increase the ability to hold central and use the peripheral information without having to toggle between them.



# Near Far Dowels with split prism

Near far

Add dissociating prism

Taps

Add Dissociating prism

Note the posture and ability to find and hold center.  
What is the head doing?

You can spend an entire session on just this activity

With and without vertical dissociating prism in diplopia



# Prisms and dowels





# Why is balance impacted?

- ▶ Mobility is restricted
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# Partial occlusion

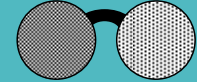
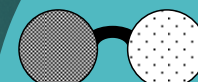
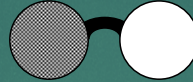
## Partial Occlusion and Patching

### Full Occlusion

One eye covered no light allowed in usually a bandage over the eye



Foils and Tape – a higher degree of occlusion on the preferred eye



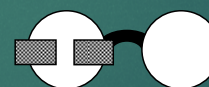
### Split Occlusion



### Binasal Occlusion



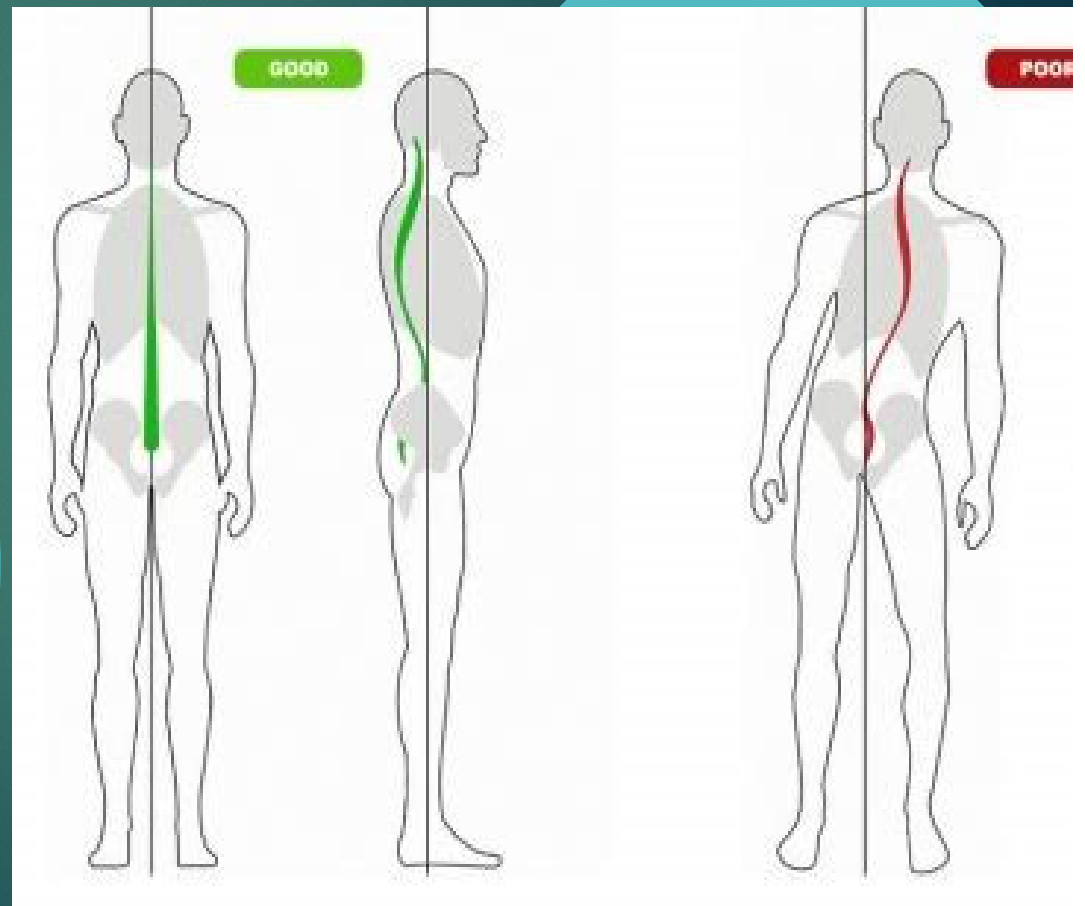
### Variations



# Visualization and Visual Memory for Space

Space above and  
around

Space behind is key  
Walking in the mirror  
Walk backward  
Bund Balance Board





# Space Matching and estimating

- ▶ Tooties
- ▶ Lawn darts
- ▶ Ring toss
- ▶ Grand prize game
- ▶ Corn Hole
- ▶ Add comparisons, speed and timing





# Mirror activities

- ▶ Waist Head and Neck Rotations
- ▶ Matching space in reflection
- ▶ Walking rail looking at their feet in the mirror – add walking rail
- ▶ In and on the mirror accommodation

# Neck, Body and Eye Posture

- ▶ Home base:
  - ▶ Soft knees by pushing navel to spine
  - ▶ Head balanced on spine by popping chest out
  - ▶ Jaw relaxed by placing tongue on roof of mouth
  - ▶ Nose over navel, ears over shoulders, knees over toes
- ▶ Look in the mirror in “Home Base” posture
- ▶ Look at your own eyes in the mirror, keeping your eyes on your own eyes
  - ▶ **Slightly** tip head, chin up and down in the “yes” motion. Repeat 3-10 times
  - ▶ **Slightly** turn head, chin right and left in the “no” motion. Repeat 3-10 times
  - ▶ **Slightly** tilt head, ear to shoulder on each side. Careful not to bring shoulder to ear. Repeat 3-10 times
  - ▶ These are small movements, moving one mechanism at a time keeping the other systems neutral. This is not a strength exercise or a stretch. Avoid stretching the neck. Do this activity 3 or more times throughout the day.

# The eye leads the neck #1

- ▶ Look to the left – keep looking left throughout the sequence with eyes open
- ▶ Place tongue on the roof of the mouth
- ▶ Set teeth in a closed position
- ▶ Drop chin to chest
- ▶ Turn chin to the left
- ▶ Shrug left shoulder up
- ▶ Hold 6-10 seconds, Return to relaxed center. Repeat 6 times
- ▶ Now do the right side



# The eye leads the neck #2

- ▶ Lying down/seated
- ▶ 1. Imagine that you have a neck brace on, so you cannot move your neck at all
- ▶ 2. You are going to tilt your head to the RIGHT, bringing your ear closer to your shoulder
- ▶ 3. Then, look up and to your LEFT with your eyes
- ▶ 4. **Slightly** lift your chin up to follow your eyes
- ▶ Keep tension as you hold this position for 6 sec, 6 times
- ▶ Straighten your head back out in between repetitions. Repeat on the other side.

# Punch the ceiling

- ▶ Lay on the floor
- ▶ Raise your fist in the air balancing the arm straight up
- ▶ Turn the arm so that the crease of the elbow is pointed to your feet
- ▶ Look at the ceiling beyond your fist
- ▶ Punch your fist directly to the ceiling and hold it 6-10 seconds
- ▶ Repeat 3-6 times. Then do the other side
- ▶ **If it is painful stop. If it is difficult, slow down and or break it down into steps, do it smaller**



# Window rock modifications

- ▶ Locating branches on the tree
- ▶ What's in front of what
- ▶ Which direction is the branch running
- ▶ Add minus at near and plus in the distance
- ▶ Add BI at near and BO at distance
- ▶ The size of the space you work in influences spatial organization.

**Go outside. Make use of windows.**



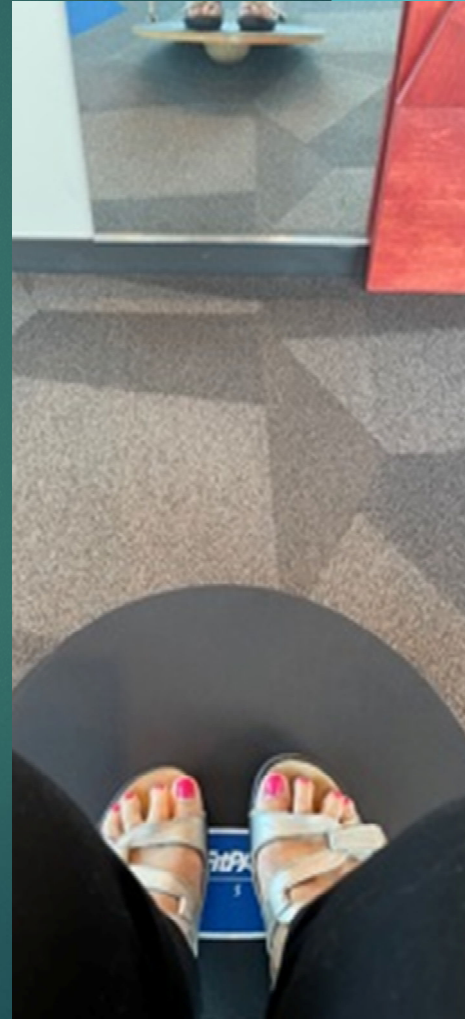


# Eye ankle

- ▶ RBB
- ▶ Teeter board
- ▶ Up on toes down on heels
- ▶ FE FI FO FUM
- ▶ Fit board
- ▶ BOSU Board
- ▶ Stand on foam
- ▶ Teeter board
- ▶ Round Balance board
- ▶ Fit board
- ▶ 60 up
- ▶ Poles and walking
- ▶ Up on toes and feel the heel



# Seated tilt board looking in the mirror





# Look 4 feet out

- ▶ Walk with poles
- ▶ Walker
- ▶ Move the wheel chair
- ▶ Make decisions
  
- ▶ Mazes
- ▶ Monster walk





# Planets and circus

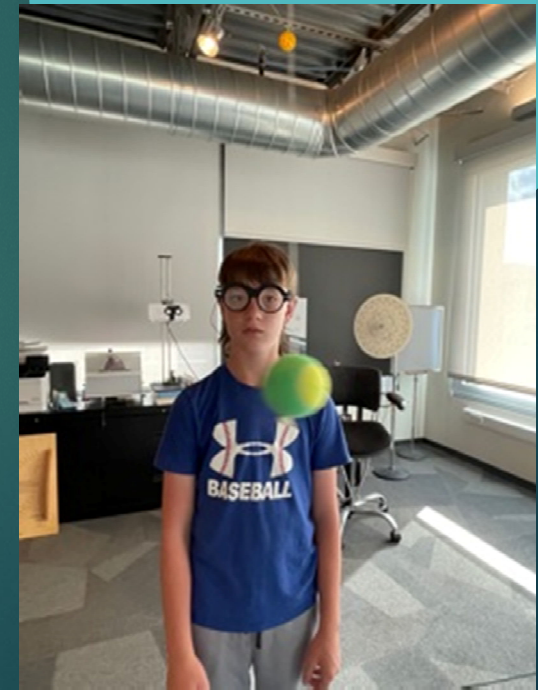
- ▶ Move through the gauntlet
- ▶ Add a walking rail
- ▶ Add Tootie in a bucket and a walking rail





# Ball dodging

- ▶ Manually rotate the ball if they cannot do it at first.



# Peripheral central integration

- ▶ Make all activities an act of central peripheral integration
- ▶ How much central can you take in and not let go of the sense of where you are?





# Vo star

- ▶ Root card
- ▶ Center out



# VOR

- ▶ Slowly in the mirror
- ▶ 4 charts on 4 walls
- ▶ Work up to faster side to side.
- ▶ Wait until the functional visual field is at least 15 degrees.

# Infinity walk

- ▶ As before
- ▶ Add yoked prism
- ▶ Can be done in a wheelchair, with a walker, poles, cane

[www.infinitywalk.org](http://www.infinitywalk.org)



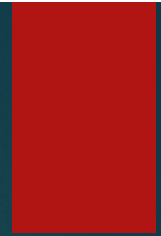
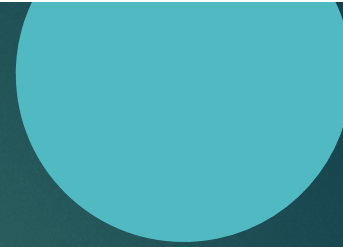


# XYZ fixations

- ▶ The helper holds the spoon. They drive! You place a finger on each side of the spoon so that you can watch the spoon and feel the spoon as the helper moves it.
- ▶
- ▶ Rotate in a circle from up/down and near/far planes
- ▶ Rotate in right/left and near/far planes
- ▶ Rotate obliquely through right/left + up/down + near/ far planes
- ▶
- ▶ Go slowly and randomly change direction.

# Ball activities

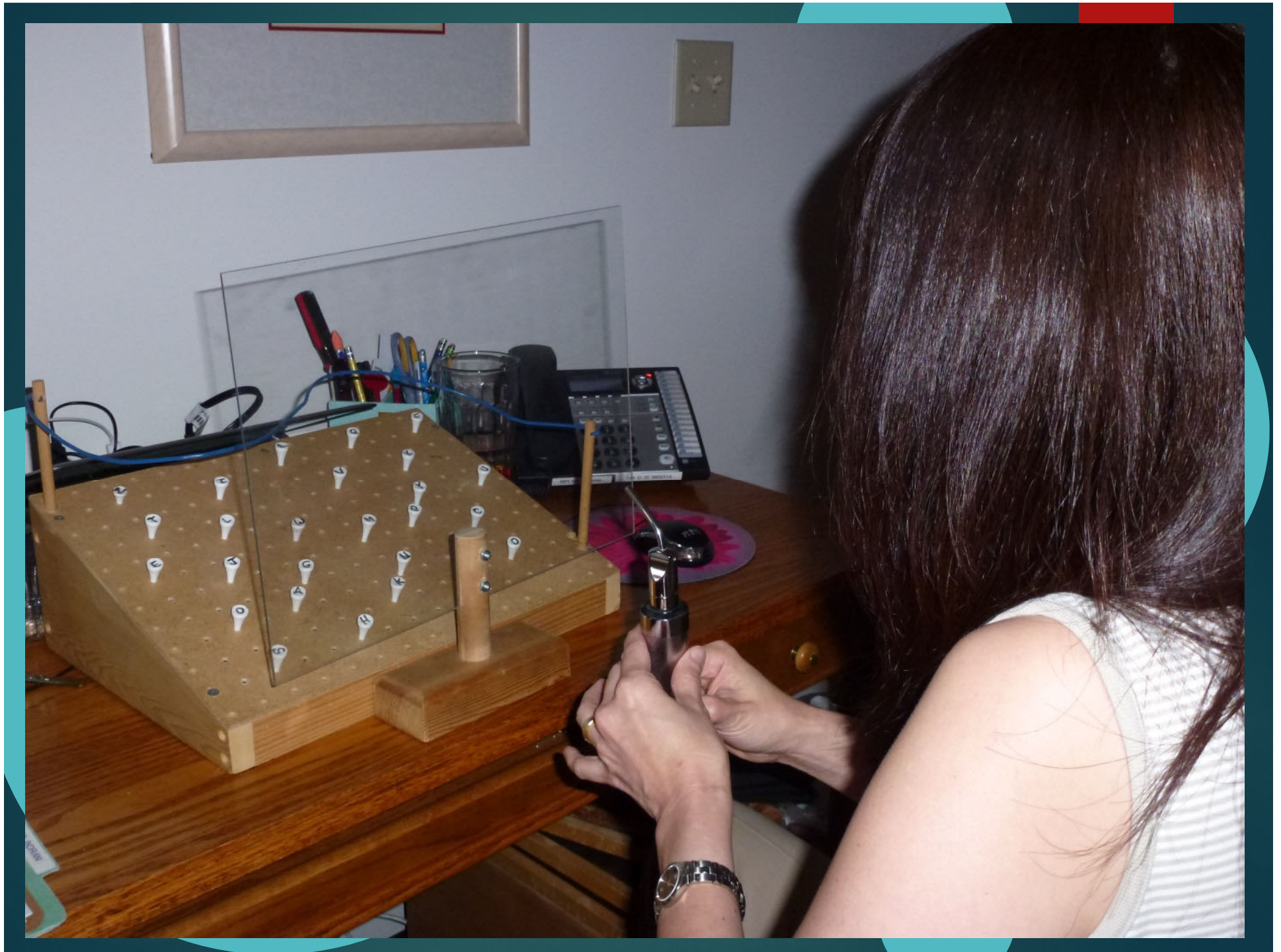
Let's explore this together!





Monocular hoop







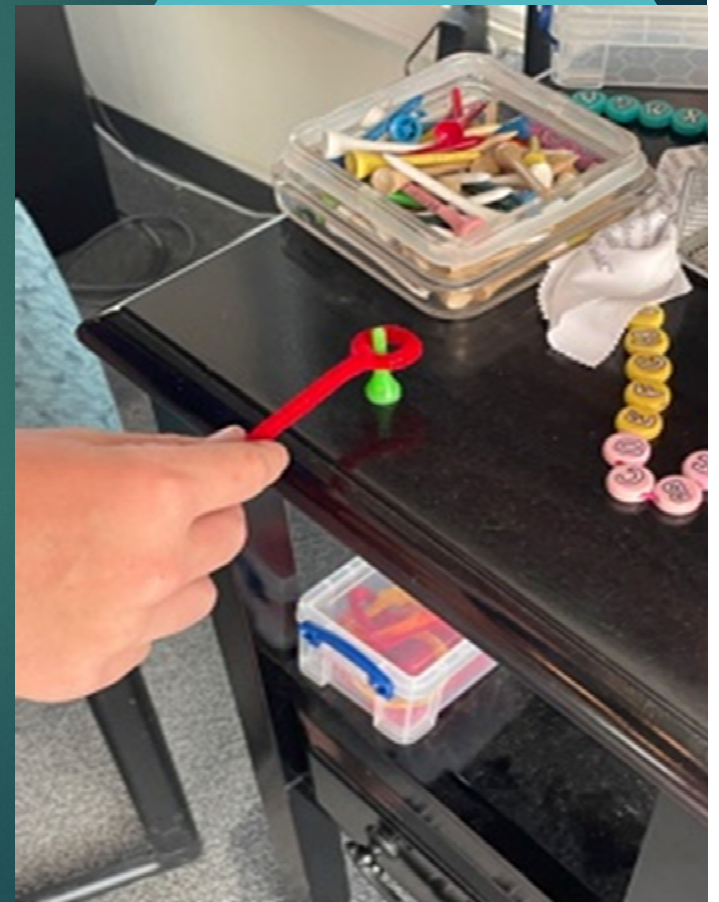
# Ball poking

- ▶ Add split prism
- ▶ Add balance board
- ▶ Add cognitive
- ▶ Can be done seated or standing
- ▶ Alternate front hand
- ▶ Split occlusion



# Peg hooping and pointer straw

- ▶ Add split prism
- ▶ Add split occlusion
- ▶ Come from out of view to in view





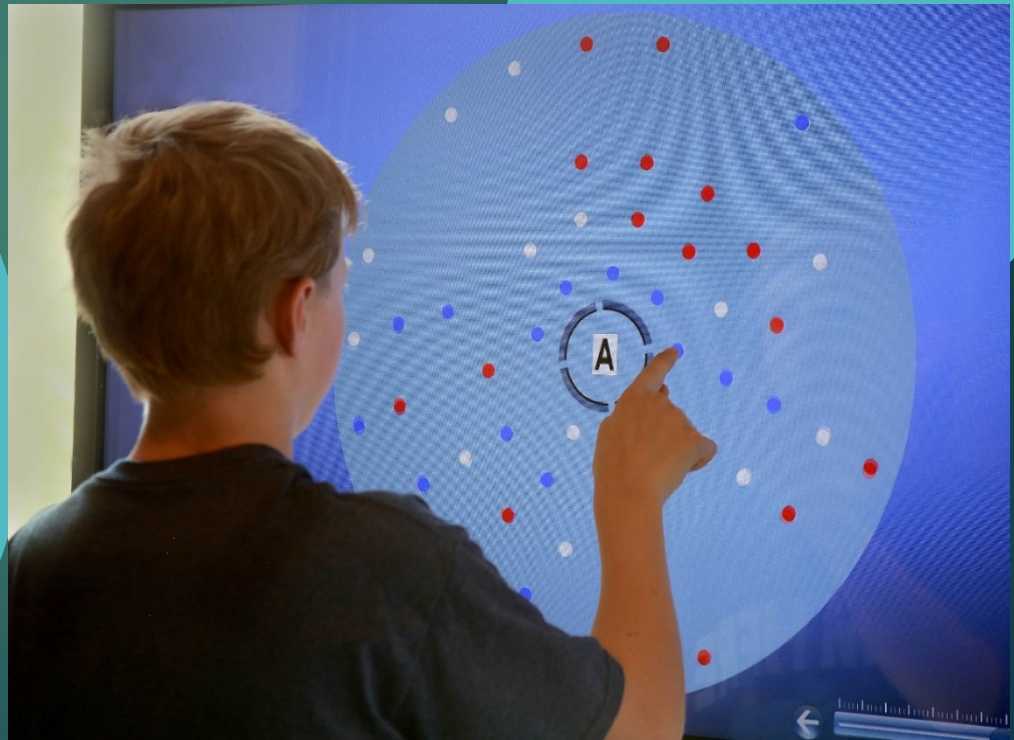
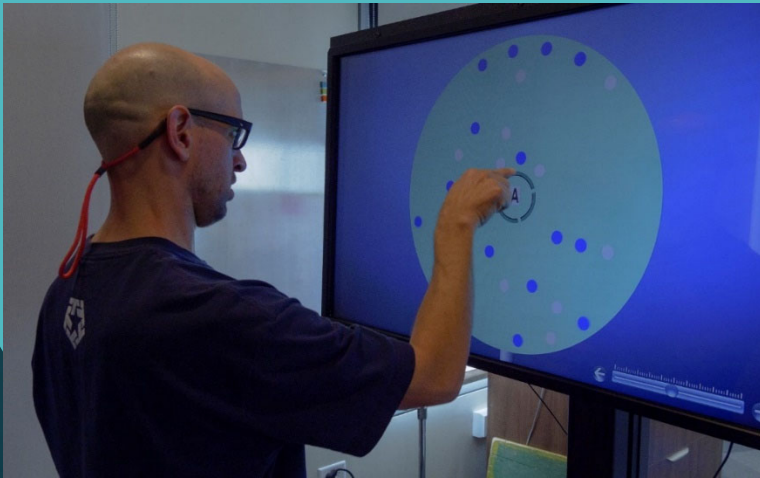
# Joanie Ball Penny Bounce

- ▶ Add cognitive load



# SVI Rotating Pegboard Saccadic fixator

Quantify progress





# Trampoline



# Bagolini – push pulls





# Vectograms in free space

- ▶ In the holder
- ▶ Projected
- ▶ In free space
- ▶ Walking around
- ▶ Off axis



# Kari's story





# Bad ankles and falling



MotionLAB

**Purpose:** Fukuda test is used to diagnose the causes of dizziness.

**Protocol of execution:** Patient should close his eyes, stretch his arms forward and began to walk in place, raising his knees above normal step height (approximately 45-60 degrees). The test is carried out for 1 minute, at about 1 step per second.

**Evaluation of the results:** The Fukuda test is estimated by the degree of deviation from the initial position, offset from the starting point and direction of the offset.

Normally, deviation does not exceed 30 degrees. At the same time, unilateral peripheral defeat of the vestibular system causes turning of the patient during the test in the direction of the affected labyrinth. The central defeat will lead to presence of severe ataxia during the march, and the deviation can be in any direction, also there may be falls or turns in direction of the pathological process when the cerebellum is involved.

The absence of movement or movement to the back, especially in combination with wide swinging, is considered as substantial violation. The direction of movement may indicate on lateralization of the peripheral lesion.

Table to evaluate the test in [MotionLAB](#)

# Ankles and proprioception

- ▶ Sprains
- ▶ Ball kicking
- ▶ Standing one foot go to tiptoe
- ▶ Stand on one foot and increase eye movement
- ▶ Stand on one foot and increase body movement



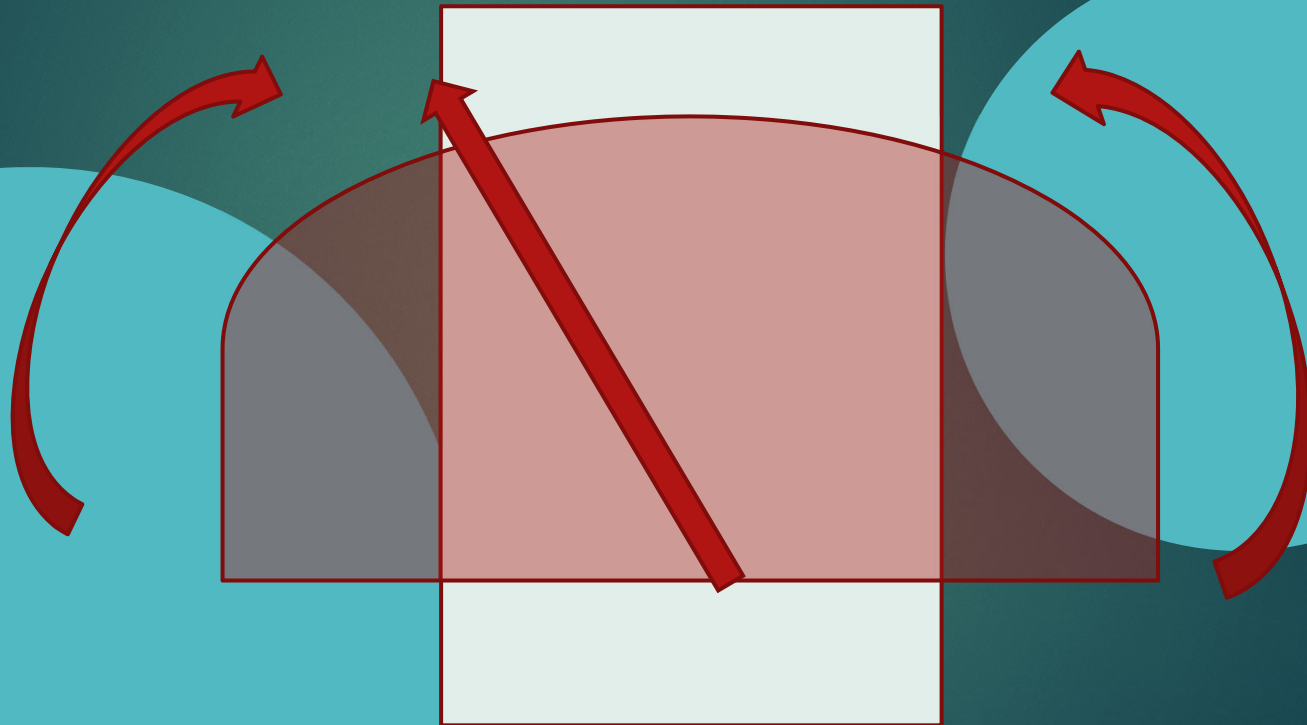
# Eyes dominate balance when in motion

- ▶ In vision training either patient or target is moving
- ▶ To the extent they can move they need to move
  - ▶ Near and far
  - ▶ Up and down
  - ▶ Right and left
  - ▶ Rotationally
  - ▶ Rocking
- ▶ If that isn't possible create movement with lenses.
  - ▶ Yoked prism
  - ▶ Flippers

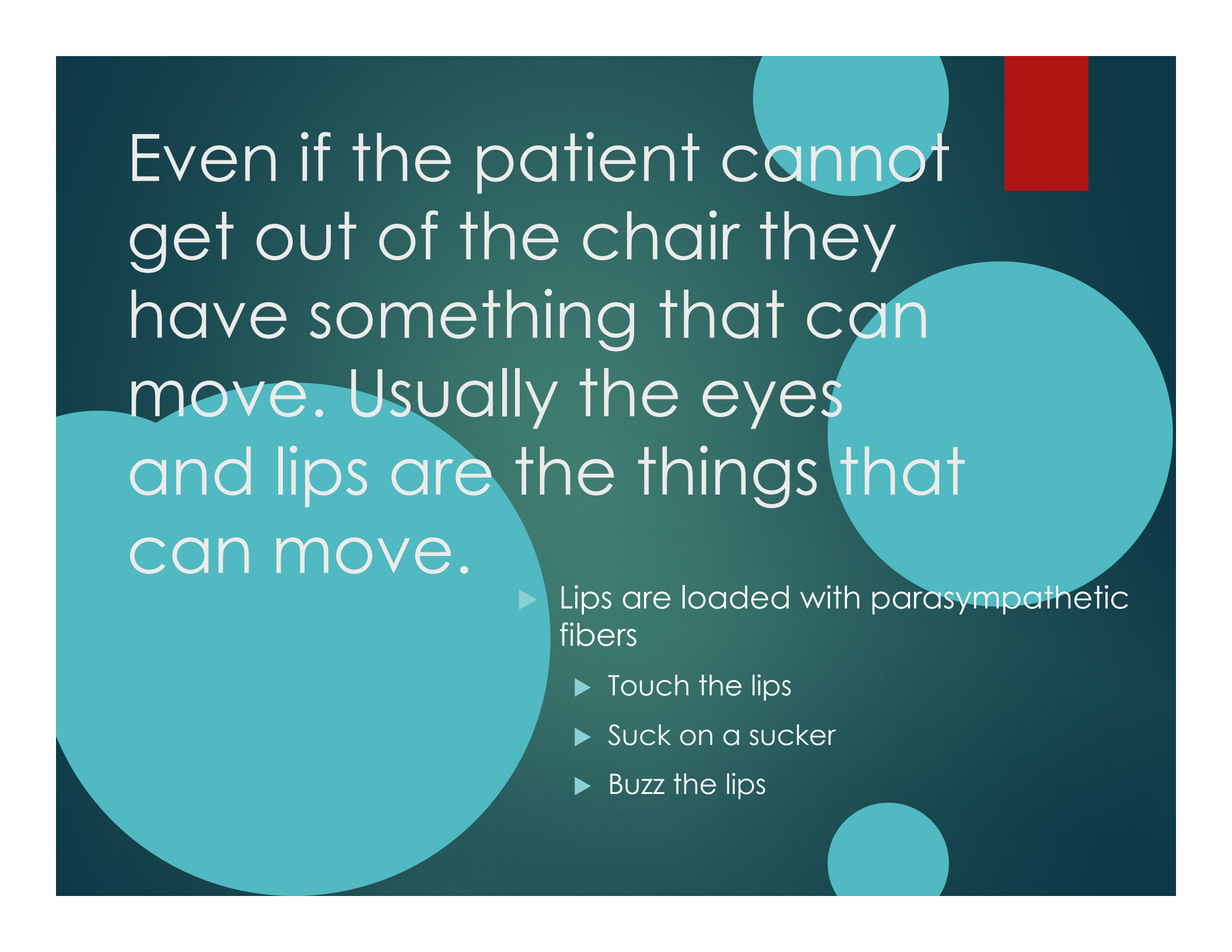
# Directly oppositional

Parasympathetic  
its extreme  
sleep

Sympathetic  
extreme  
fight or flight



Where is the needle stuck? How much can it move?



Even if the patient cannot get out of the chair they have something that can move. Usually the eyes and lips are the things that can move.

- ▶ Lips are loaded with parasympathetic fibers
  - ▶ Touch the lips
  - ▶ Suck on a sucker
  - ▶ Buzz the lips



Thank you!

