Vision Is More Than Meets The Eye

Focusing on Vision After Traumatic Brain Injury

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Focus of Discussion Today

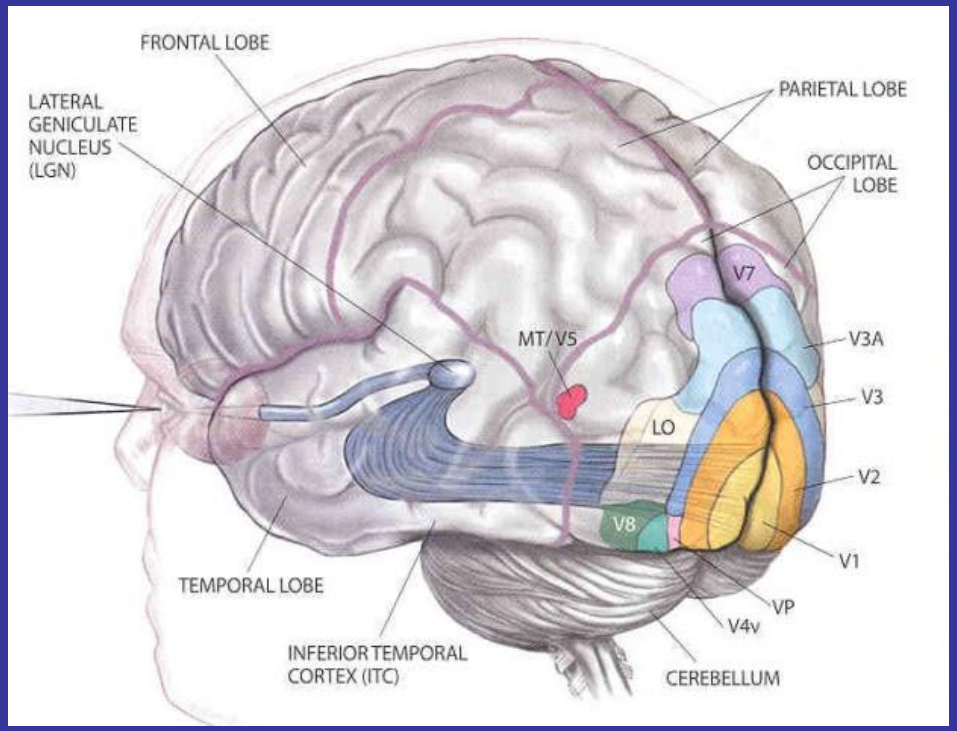
- Vision and Traumatic Brain Injury (TBI)
- Visual Testing
- Visual Rehabilitation Treatment Options
- Questions

Why Are There So Many Possible Visual Deficits After TBI?

- There are over 1,900,000 nerve fibers that exit each eye
- This represents 70% of the sensory nerve fibers in the body
- There are 35 different areas in the brain primarily or totally involved with the processing of visual information

Why so many Deficits after TBI?

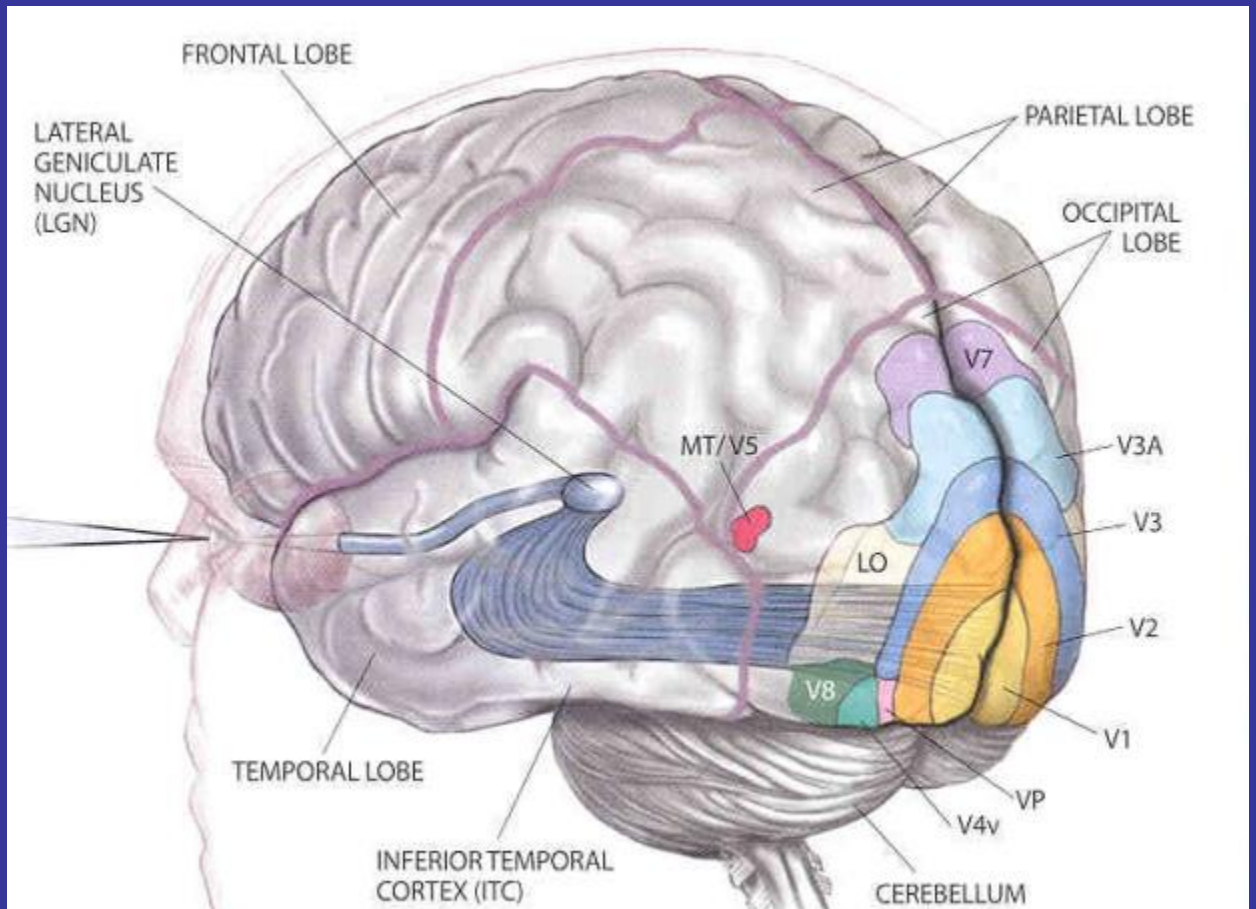
- Every lobe of the cerebral cortex is involved in the processing of visual information
- More area of the brain is dedicated to vision than all the other sense modalities combined



SEEING

"Vision occurs in numerous parts of the brain, illuminated by the eye and informed by other senses."

Leonard Press, O.D., FCOVD



Yoked Prisms: Vision Leads Motor

- Look directly your hand and feel corner of wall. Is it straight? Base right or left yoked prisms are put on.

- What does the corner of the wall look like?
- Look at your hand and feel the corner of the wall. What does it look like? What does it feel like?

- Intellectually one knows that it is straight but their eyes now tell them and their touch agrees that the wall is curved.

- The visual input overrides the kinesthetic, proprioceptive, cognitive and tactile information at hand.

- **Vision guides motor.**

Why are vision deficits following brain injury so underdiagnosed and undertreated?

The Visual System is Mute and Tries to Compensate Through Redundant Subsystems

- Lack of awareness
- Many times you don’t realize vision is impaired until you try to go back to work or drive.
- Vague descriptions of symptoms

Neuro-Optometric Evaluation

- Investigates the relationship between vision and:
  - Balance
  - Coordination
  - Awareness
  - Central/peripheral organization

  Posture
  Orientation
  Perceptual Style

  Movement
  Localization
  Identification

- Prescribes lenses and prisms
  - clarity and comfort
  - enhance performance

  relieve visual stress
  guide visual potential

Post Trauma Vision Syndrome (PTVS) - Characteristics

- Double vision (diplopia)
- Exotropia or high exophoria
  - eye teaming
- Accommodative dysfunction
  - focusing
- Convergence insufficiency
- Poor fixations and pursuits
- Low blink rate
- Photophobia
- Blurred vision

Post Trauma Vision Syndrome (cont.)

- Unstable “Ambient Vision” (loss of visual grounding)
  - Spatial disorientation
  - Objects appear to move
  - Staring behavior
  - Poor concentration and attention
  - Associated difficulties
    - Balance
    - Coordination
    - Posture

Post Trauma Vision Syndrome Symptoms

- Motion sickness, escalators, crowds
- Difficulty/discomfort working under fluorescent lights
- Floor tilt

Visually “Noisy” Backgrounds
Mini-blinds, patterned wall paper, wood paneling, striped, boldly patterned clothing

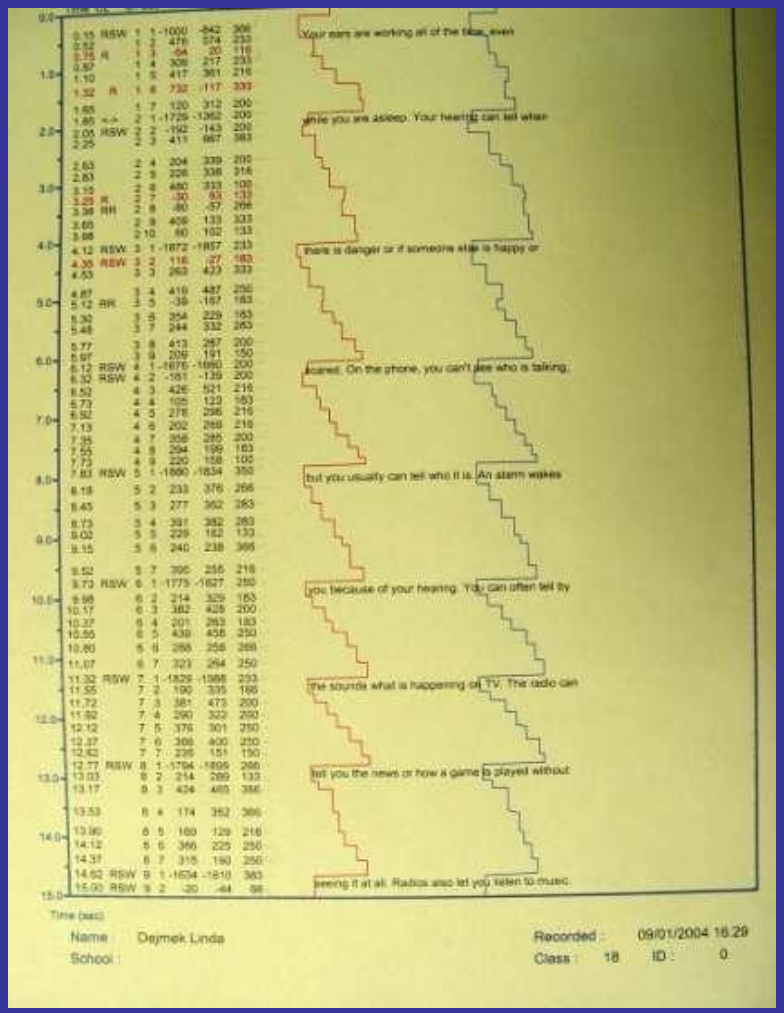
- The abruptness of visual performance deficits from TBI makes compensation difficult.
- Many times the injury is diffuse and minute but no less devastating. It will not show up in x-ray, CT scan or MRI.

Treating The Symptom vs. The Problem

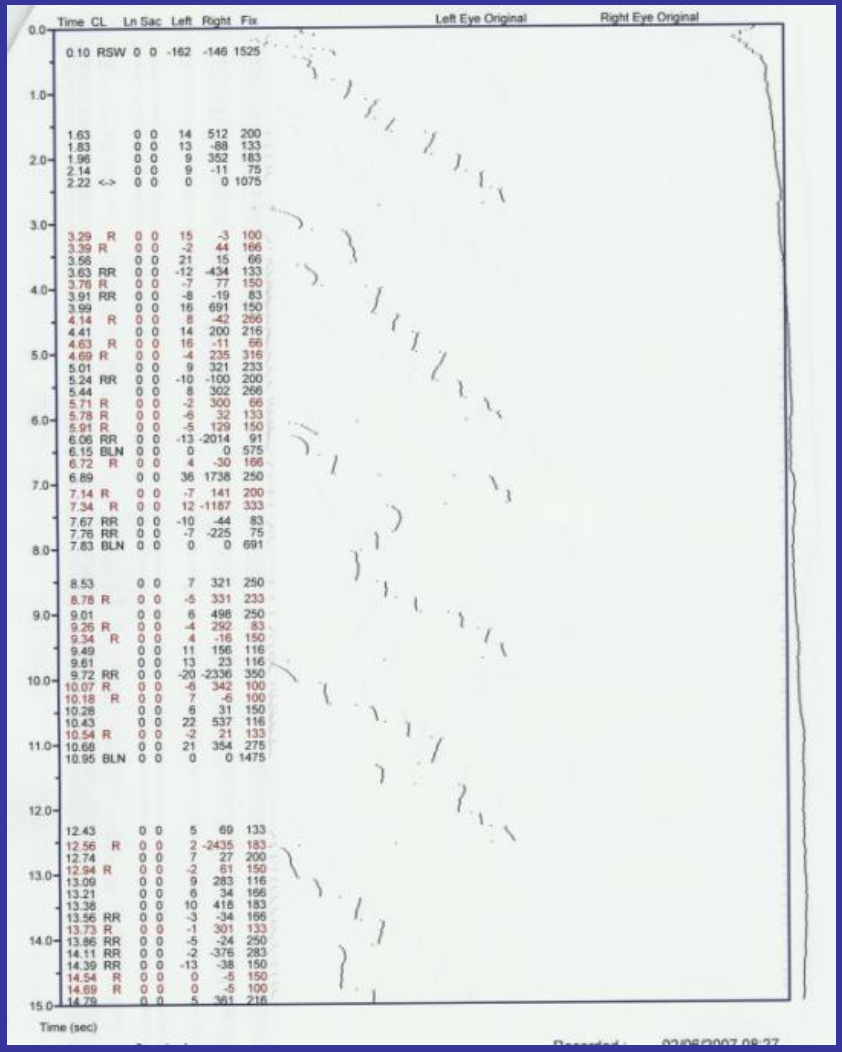
EYE TRACKING
(OCULOMOTOR SKILLS)

Visagraph

Typical



Brain Injury



Eye Movement Dysfunction

Fixations, Pursuits, Saccades, Nystagmus

Symptoms:

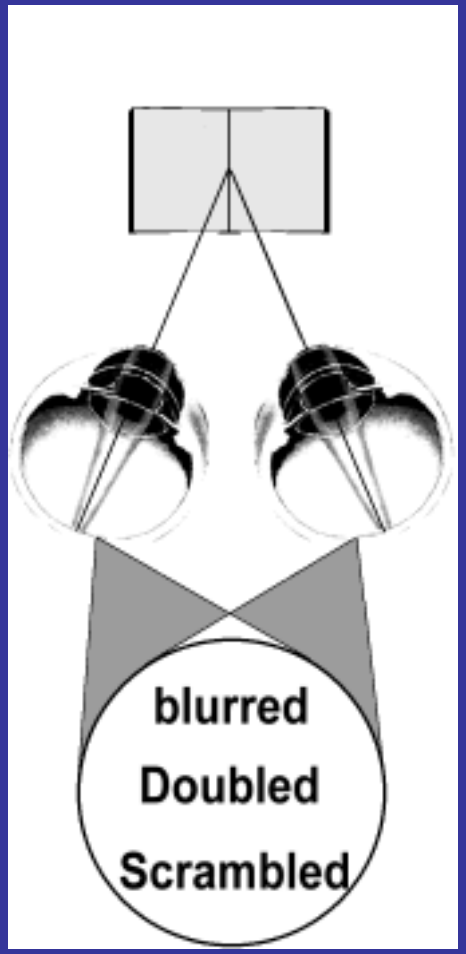
- Inability to follow objects
- Reading problems
  - Skipping or re-reading lines or words
- Needing finger to keep place

Accommodation (Focus)

- Accuracy
- Amplitude
- Facility

Eye Teaming (Binocularity)

- The ability of the eyes to work properly together
- The ability to coordinate and align both eyes to allow the brain to fuse a single image from the info it receives from each eye
- The ability to judge relative distances of objects and have depth perception
- The ability of the eyes to focus on something near by turning towards each other



Eye Teaming (Binocular Dysfunction) Symptoms:

- Head tilt or head turn
- Diplopia
- Depth/Spatial Judgments
- Reading difficulty
- Task avoidance
- Motion or carsickness
- Dizziness after sustained task
- Poor coordination and/or clumsiness
- Abnormal working distance
- Closing an eye
- Headaches
- Tired eyes
- Watery eyes

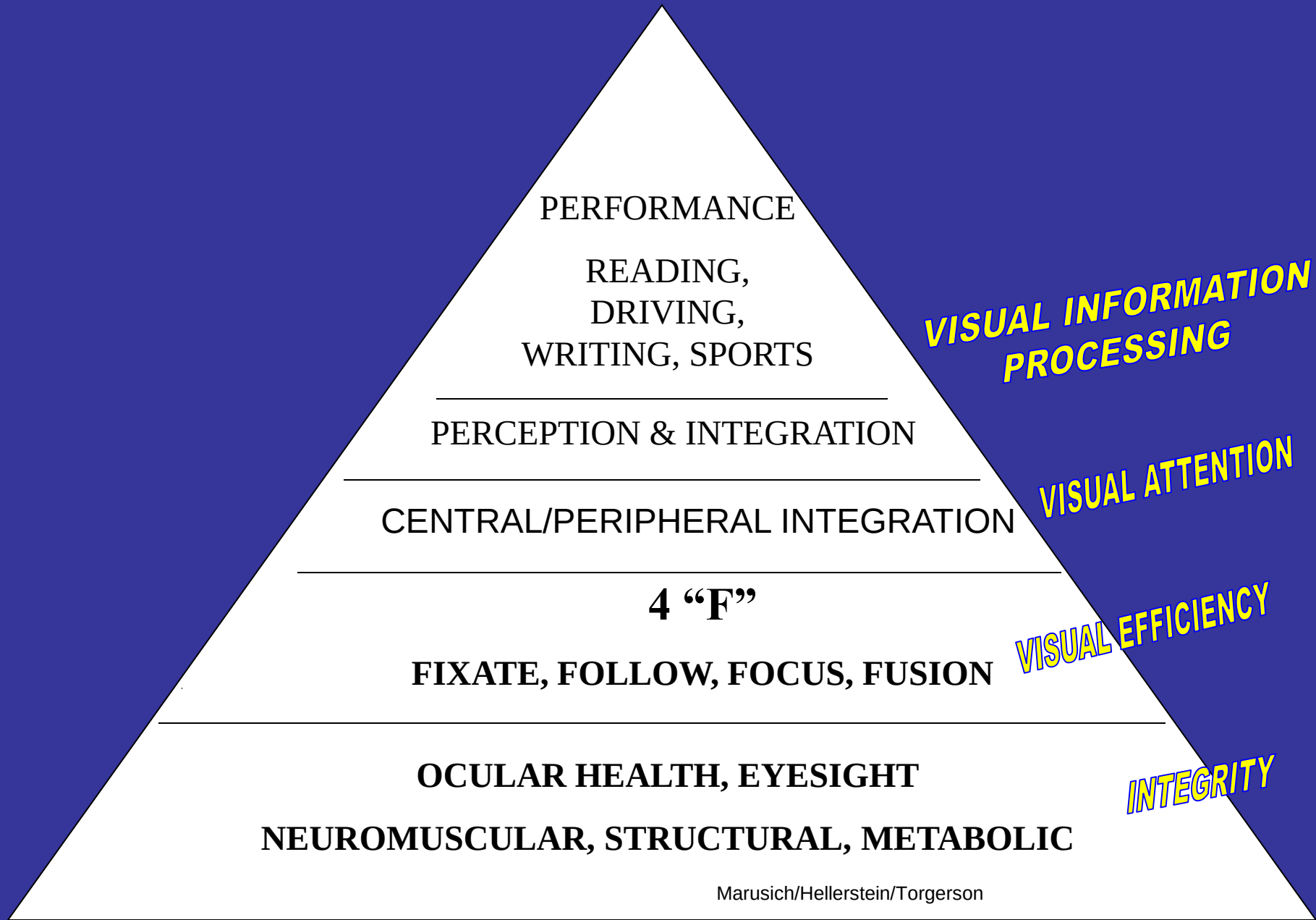
Egocentric Localization

- Mismatch between the perceived visual midline and the actual physical midline

Signs and Symptoms

- Floor may appear tilted
- Walls and/or floor may appear to shift and move
- Veering or leaning during mobility
- Increased extension – leaning backwards
- Increased flexion – bending over forward
- Feelings of imbalance or disorientation, but without vestibular vertigo

MODEL OF VISION



Marusich/Hellerstein/Torgerson

KEY QUESTION

Is the visual system **helping** or **interfering** with your ability to achieve your full potential?

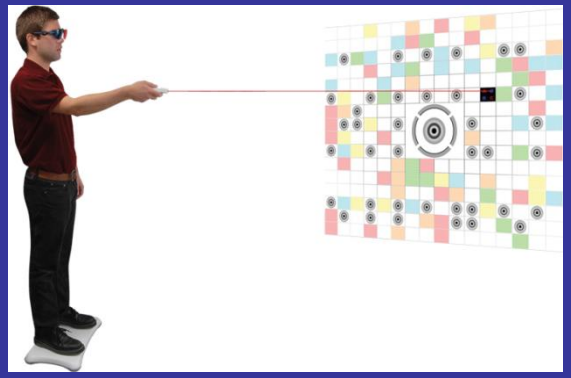
Bob Sanet, OD, FCOVD

Treatment Goals for TBI

Treat and manage any eye health problems

Treat and manage any optical and refractive problems:

- LENSES
- Refractive
- Near point
- Prism (compensatory, yoked)
- Tints
- Field expansion
- Low vision
- Occlusion



- VISION THERAPY

Valuable Websites

- College of Optometrists in Vision Development (C.O.V.D.) – www.covd.org
- Optometric Extension Program Foundation (O.E.P.F.) – www.oep.org
- Neuro-Optometric Rehabilitation Association (N.O.R.A.) – www.nora.cc
- Alderwood Vision Therapy Center – www.alderwoodvisiontherapy.com