Vision is more than 20/20

VISUAL DEFICITS AND TREATMENT FOLLOWING ACQUIRED BRAIN INJURY

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Objectives

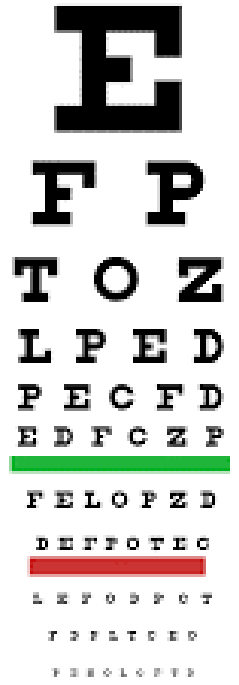
- Describe visual deficits following neurological insult/injury and their impact on visual function
- Discuss treatment strategies and compensatory therapies to aid patients' recovery.

Overview

- What is vision?
- Anatomy
- How Brain Injuries Impact Vision
- Common Vision Problems Following a Brain Injury
- Treatment & Visual Rehabilitation
- Ways to Reduce Visual Stress and Manage Visual Symptoms
- Case Examples

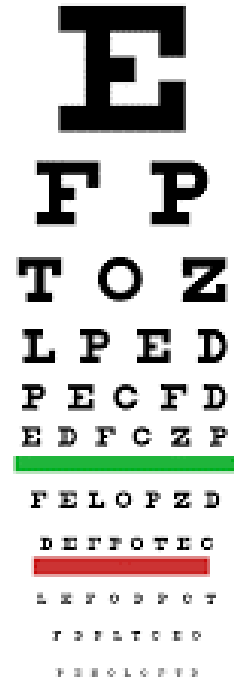
What is Vision?

- Sight (eyes) vs. Vision (brain)
  - Sight we measure by what is called “visual acuity”, what doctors are talking about when they say “20/20”
  - Vision takes place in the primarily in the occipital lobe in the brain, but also in every other lobe of the brain
- Does 20/20 mean I have no vision problems?
  - Not necessarily, it simply means you can see at 20 feet what a normal person can see at 20 feet
- So why do people care about “20/20” acuity?
  - It is an important component of vision to know how clear the image is for your brain to use, but it is only a small component of vision
- Vision is the sensory system we use to guide all movement and use for learning
  - 70-80% of what you learn comes through the visual system



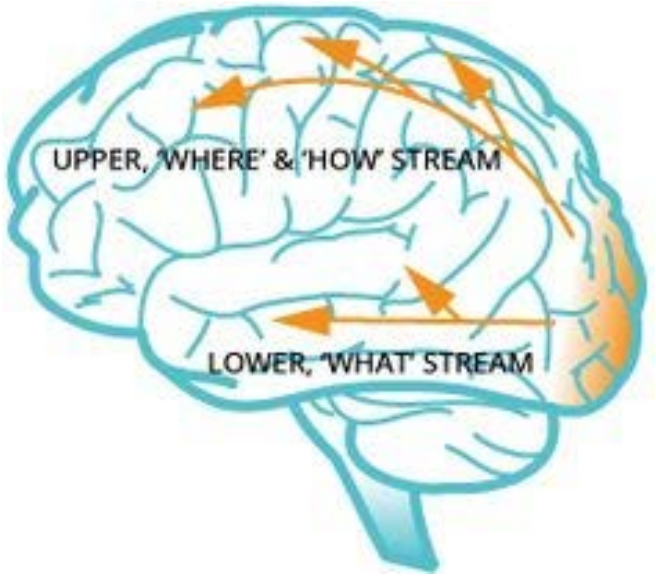
Components of Vision

- EYESIGHT
  - This is the 20/20 component, the ability to clearly see and recognize an object
    - WHAT is it?
- SPATIAL AWARENESS
  - The ability to calculate space or distances between objects.
    - WHERE is it?
- PERCEPTION
  - The ability to analyze and manipulate the information from eyesight and spatial awareness in order to make a movement or decision.
    - WHERE am I? HOW do we respond?



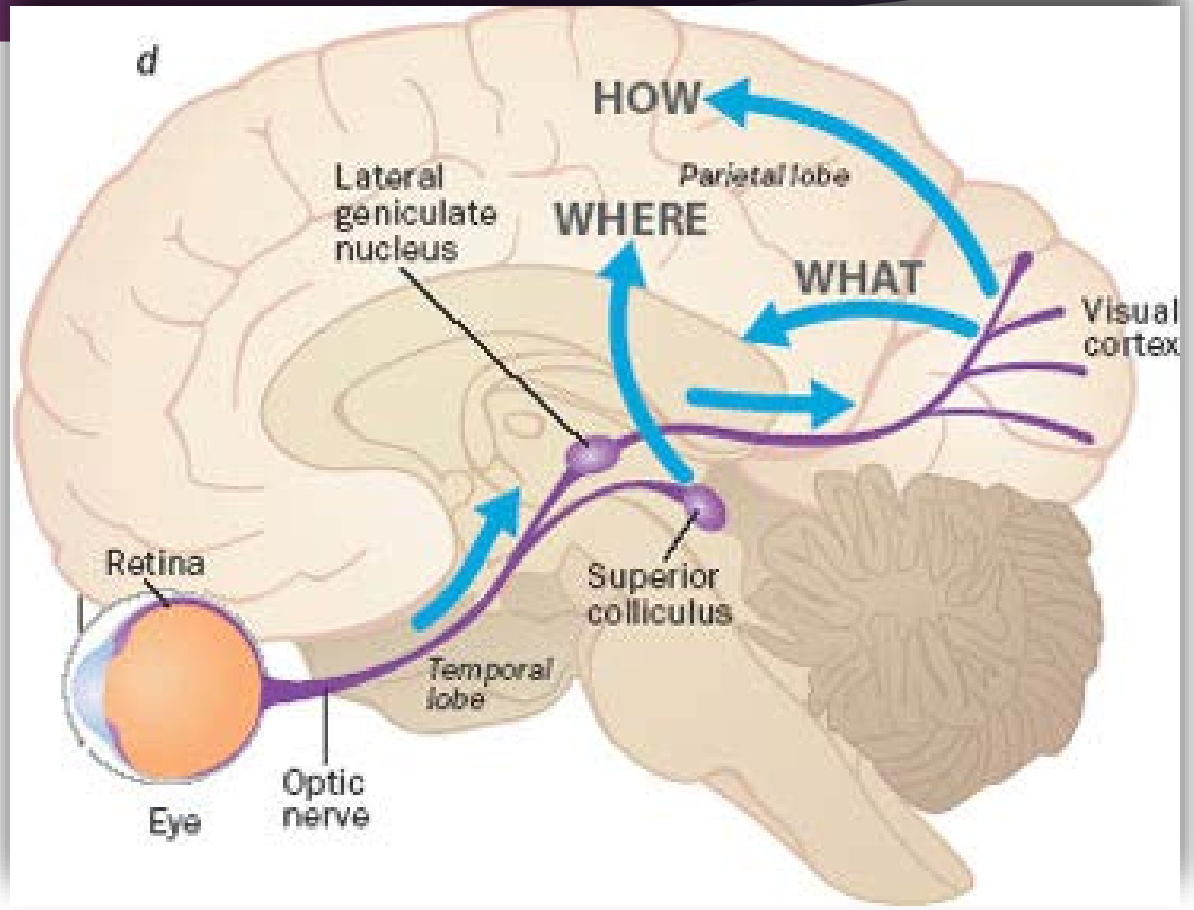
Vision is Bi-Modal

- Focal System: Occurs in the visual cortex
  - What is it? Where is it?
  - Parvocellular & Magnocellular cells are involved
  - Conscious processing
- Ambient System: Occurs in the midbrain
  - Where am I?
  - Magnocellular cells
  - Subconscious processing
  - Sensorimotor matching:
    - Body awareness, midline (sensation of straight ahead), posture & orientation



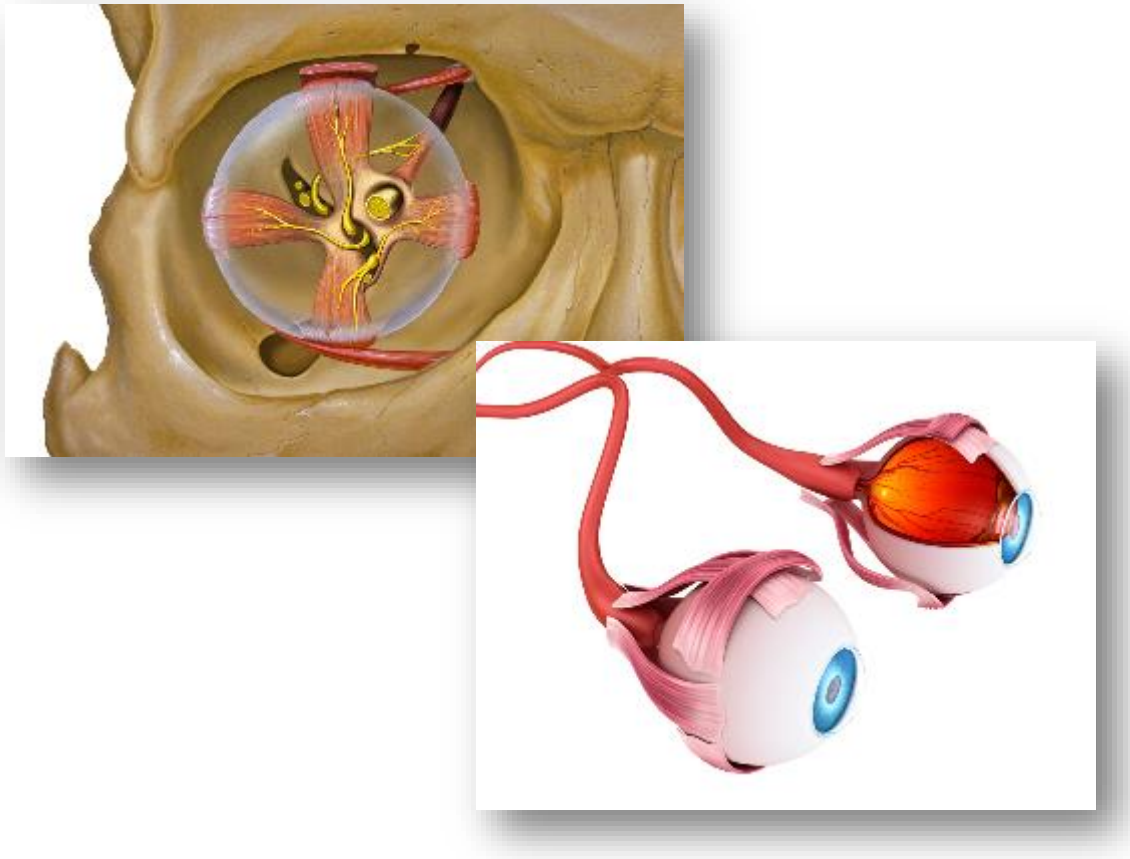
Anatomy of the Visual Process

- 20% of fibers from our peripheral or ambient vision go to the midbrain
  - Used for matching our visual perception of space with kinesthetic, proprioceptive and vestibular information
  - Due to the location of the midbrain, it is often injured in a brain injury
- 80% of fibers from both central & peripheral vision go to the visual cortex



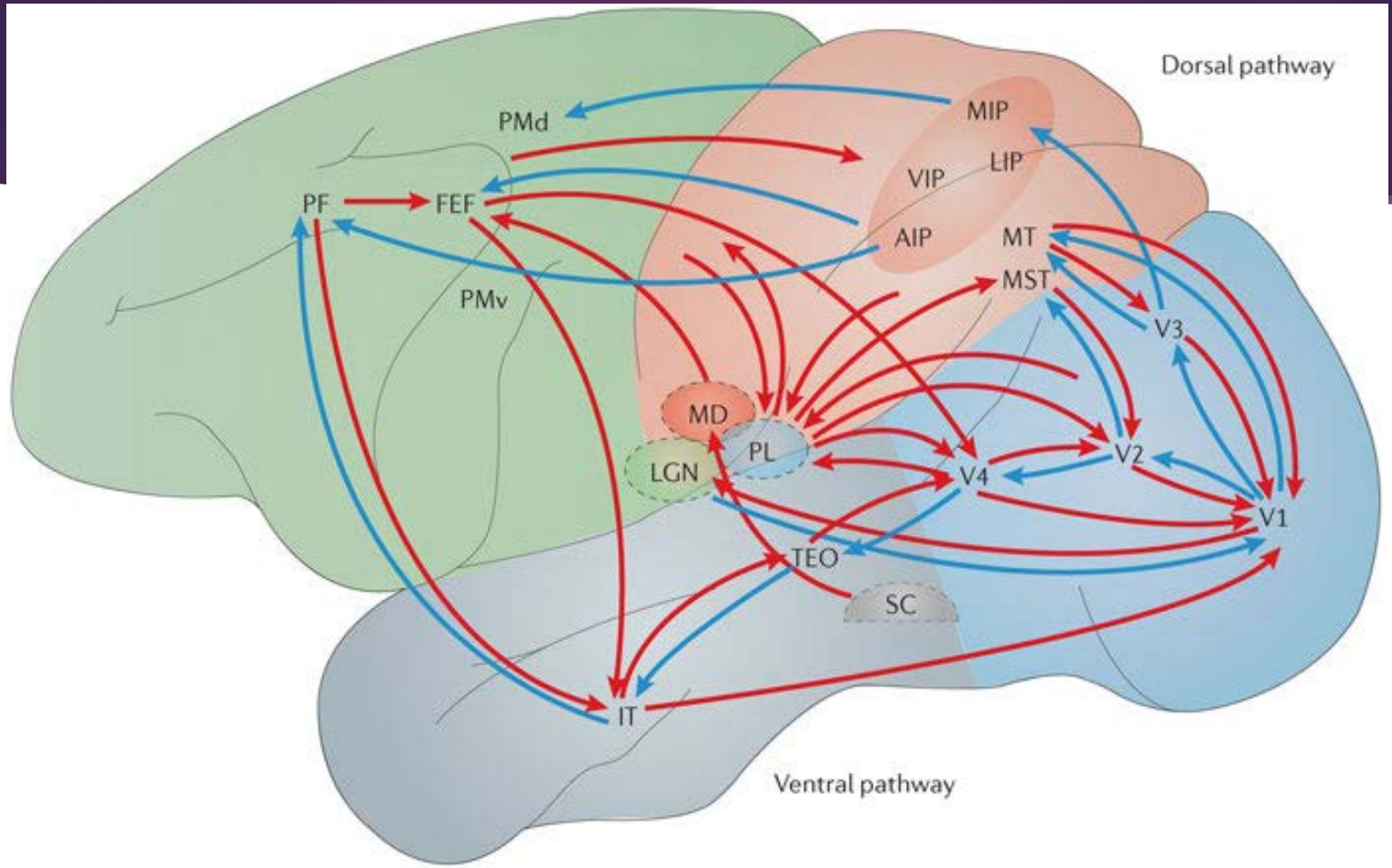
Anatomy of Eye Movements

- Eye movements are controlled by **6 muscles** & **3 nerves**
- Our 2 eyes are the **only parts of the body with separate neural pathways** to control movements, but have to **work perfectly together**
- Vision and signals for eye movements are controlled by both sides of the brain and involve significant communication between the 2 hemispheres



Impact of a Brain Injury on Vision

- 65-85% of all sensory information to the brain is visual
- Disrupts the balance between the focal (central) and ambient (peripheral) systems
- Creates a mismatch between how a person perceives or interprets the world and reality
  - Visual midline shift
  - Visual neglect
  - Poor spatial judgements (localization)
  - Impaired eye movements (saccades, pursuits, convergence)
  - Impaired accommodation (focusing at different distances)
- “But my vision is 20/20…?”



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Common Symptoms of a Visual Problem

- Blurry vision
- Fluctuating or inconsistent vision
- Headaches with or without reading
- Light or sound sensitivity
- Double vision
- Losing place while reading
- Words appear to move or run together when reading
- Bothered by busy places with significant visual information (grocery store, mall, etc.)
- Reduced attention or concentration
- Inability to comprehend reading material
- Eyestrain or tired eyes
- Mental or physical fatigue
- Spatial disorientation
- Dizziness
- Flashes of light
- Dry Eyes
- Poor memory
- Irritability
- Emotional distress/anxiety
- Reduced balance
- Vertigo/nausea
- Car or motion sickness
- Sleep disturbances
- Disordered thinking
- Difficulty walking straight
- Poor depth perception
- Bothered by patterns (like carpet)

Prevalence of Visual Deficits Following a Brain Injury

- "There is an extremely high incidence (greater than 50%) of visual and visual-cognitive disorders in neurologically impaired patients (TBI, CVA, MS, etc.)" (Politzer, 2007)
- More than 72% of patients with Mild TBI screened had visual system deficits (Freed, 1997)
- Visual deficits such as spatial neglect are recognized as causing poor functional and motor recovery as well as decreased ability to profit from therapy (Nys et al., 2005)
- "Without an efficient level of visual function, **the rehabilitation process is adversely affected**" (Zoltan, 2007, p. 47)

Common Visual Problems associated with Brain Injuries

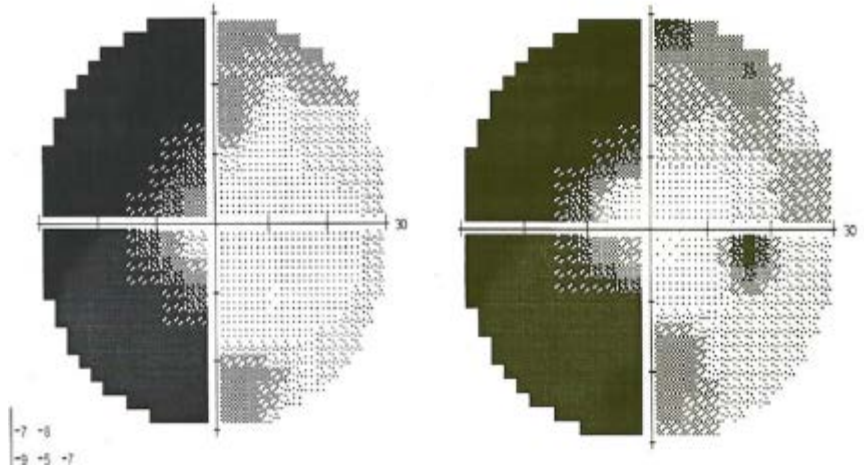
- Post-Traumatic Vision Syndrome
- Visual Field Defects
- Cranial Nerve Palsies
- Visual Midline Shift Syndrome
- Sensory Integration Difficulties
- Visual Perceptual Problems

Post-Trauma Vision Syndrome

- Difficulty converging the eyes up close
  - Print may move, jump, dance or swim
- Double vision
- Blurry vision, especially with near work
  - Difficulty focusing, need excessive time or blinking to get things clear
- Poor eye movement skills
  - Losing place or skipping words reading
- Poor concentration or attention
- Less blinking
  - May have a staring appearance, dry eye problems
- Asthenopia
  - Eye strain, headaches, fatigue with near work
- Unstable peripheral vision
  - Clumsiness, bumping into things, poor awareness of where things are

Visual Field Defects or Visual Neglect

- Loss of vision, can be permanent
- Bump into or trip over objects
- Difficulty seeing at night
- Tunnel vision
- Will hold on to walls, other people, etc.
- Easily lose things or difficulty finding things
- Lose of awareness of things on one side of the body
- Forgetting food on half of plate or not shaving half of face

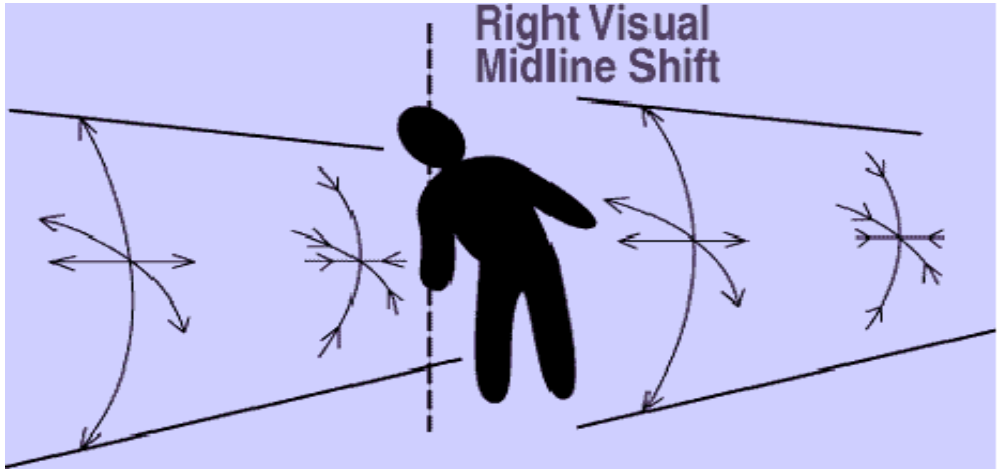


Cranial Nerve Palsies

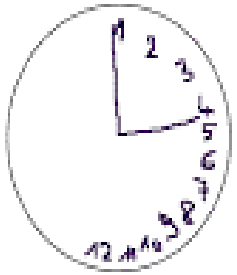
- Eye turn (strabismus)
- Complaint of double vision
- Head tilt or turn
- Closing or covering one eye
- Difficulty judging depth

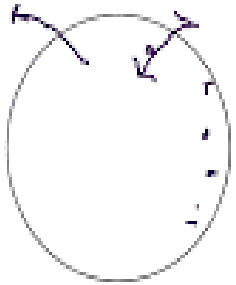
Visual Midline Shift

- Occurs as a result of dysfunction of ambient visual process
- Disorientation of spatial system causing misperception of position in the spatial environment
- Often lean to one side, forward and/or backward



Visual Perceptual Deficiencies





- Poor visual memory
- Difficulty finding objects
  - Especially with crowding
- Difficulty seeing small differences
- Difficulty analyzing space between objects
- Difficulty processing information when there is lots of visual information
- Not only difficulty with these skills, but processing visual information increases symptoms

Treatment

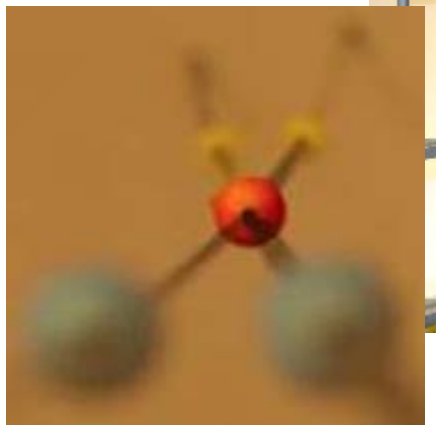
- Complete visual evaluation
  - Passive or Active Neuro-Visual Rehabilitation
    - Lenses/Prisms/Tints vs. Active Therapeutic Activities
- Care Coordination with other Health Care Providers
  - Occupational Therapy, Physical Therapy, Speech Therapy, Physiatry, Neurology, Social Work, etc.
- The goal of treatment is to rehabilitate the visual system to point where a person with a brain injury can comfortably perform their daily activities without significant symptoms or adaptations
  - Unfortunately with a brain injury, you have a new “normal”

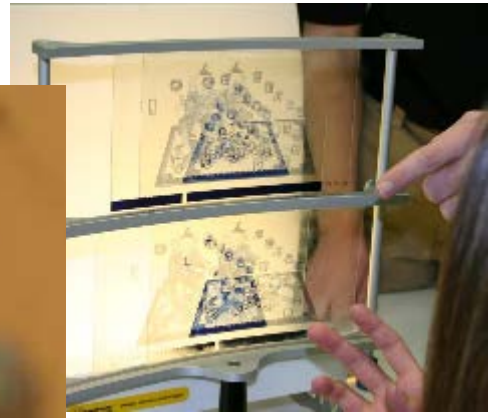
Visual Rehabilitation

- Passive Treatments (goal is to use treatments to allow you to function at your best all the time)
  - Updated glasses prescription
  - Tints & Filters
    - Grey, Blue, FL-41
  - Partial Occlusion
    - To reduce double vision or visual discomfort
  - Corrective Prism
    - For a nerve palsy or muscle imbalance
  - Therapeutic Prism
    - Enhance and stimulate visual special skills
      - Effects the Magno cells and ambient visual process

Visual Rehabilitation

- Active Treatments
  - Goal is to use re-train the brain how to function properly, repair or develop new pathways for proper visual functioning
- Neuro-Visual Rehabilitation (Optometric Vision Therapy)
  - Remember- vision takes place in the brain, so changing the brain with this therapy!
  - Train and enhance visual efficiency deficiencies:
    - Eye movement deficiencies (tracking problems)
    - Focusing problems (blurry vision or difficulty focusing)
    - Eye teaming problems (double vision or visual discomfort)
    - Peripheral Vision Enhancement (“Where am I?” “Where is it?”)





Ways to reduce visual stress

- WORKING DISTANCE
  - All near-point activity should be done at HARMON DISTANCE or slightly further.
    - This is the distance from the center of the middle knuckle to the elbow.
- BREAKS
  - When reading occasionally look off at a specific distance object and let its details come into focus. 20/20/20 Rule
- POSTURE
  - Sit comfortably, relatively erect with feet flat on the floor. The position of the chest and ribcage must allow for full, deep breathing.

Ways to reduce visual stress

- LIGHTING
  - Provide for adequate general illumination as well as good central illumination at the near task.
- WORKING SURFACE
  - Tilt the book up about 20 degrees or use a slant board. This can be used for reading, studying, and writing. This reduces tension/stress on the head, shoulders, neck and eyes.
- SCREEN VIEWING
  - Limit total screen time (TV, computer, hand-helds, and video games) to no more than 2 hours per week.

Helpful Adaptations

- Cover half the page with a blank piece of paper to reduce visual information
- Use larger print with more spacing
- Use a ruler to help keep place when reading
- Use a highlighter to help you isolate important information
- Reduce other distractions (visual and non-visual) when trying to do visually intense activities
- Wear scarf, head band or hat or place hand on neck to make you feel more grounded
- Anchor yourself by looking at an object or place on the wall straight ahead or use place your hand on the wall beside you
- TAKE BREAKS!

Case Example 1- Passive Therapy

- 36 year old female working as a nurse.
- Complaining of severe headaches, daily, worsened with near work and computer work
- She had a concussion 2 years prior.
- Did not have symptoms until recently when she returned to work.
- Took Aleve daily between 10 and noon and symptoms would still worsen towards end of the day.
- Severity of symptoms depended on how much computer work she did that day. Scrolling on the computer screen was very bothersome.
- Fluorescent lights were bothersome.
- Headaches and symptoms were so intense patient was considering quitting her job.

Case Example 1 Continued

- Patient was prescribed therapeutic prism lenses with a light tint.
- She returned 6 weeks later for a follow-up.
- At that appointment she was new person. She was smiling more and obviously more comfortable.
- She had only had 2 headaches since her last appointment when she had a head cold.
- She had not used any Aleve otherwise.
- She was enjoying her job and her family again!

Case Example 2- Optometric Vision Therapy

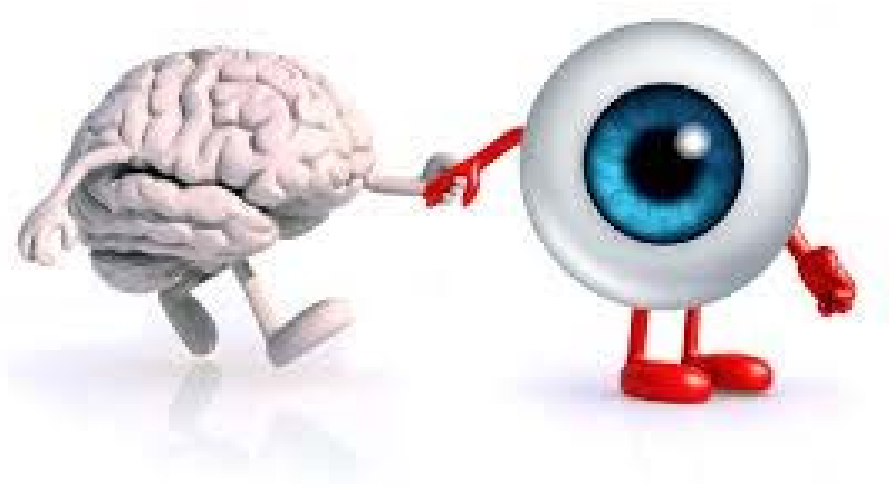
- 29 year old male, professional soccer player
- Had multiple concussions throughout career, but recent concussion 7 weeks ago
- Daily headaches, worsened by reading
- Reduced vision noted in one eye compared to the other
- Frequent dizziness
- Overwhelmed by crowds and going to the grocery store
  - He noted he would be so bothered he couldn't decide what to buy

Case Example 2- Optometric Vision Therapy Continued

- Patient completed 12 sessions of Optometric Vision Therapy over a 6 month period (unable to attend consistently due to travel for sports)
- At the completion of 12 sessions he noted:
  - Still feel dizzy sometimes, but having longer periods of not being dizzy
  - Still got headaches sometimes but very minor
  - Still bothered by busy environments, but improved
- Recommended additional therapy, but patient was moving for new team
- Overall the patient was feeling better and returning to play.

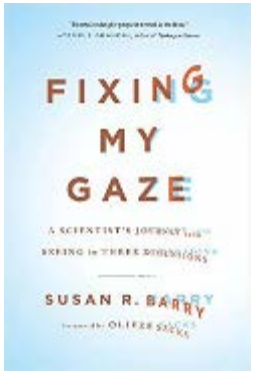
Where to get further information

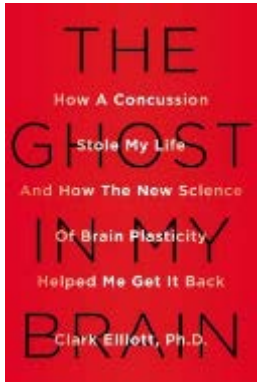
- Neuro-Optometric Rehabilitation Association
  - www.NORAvisionrehab.com
- College of Optometrists in Vision Development
  - www.COVD.org
- Heartland Eye Consultants
  - www.heartland-eye.com or find us on facebook
- www.braininjuries.org

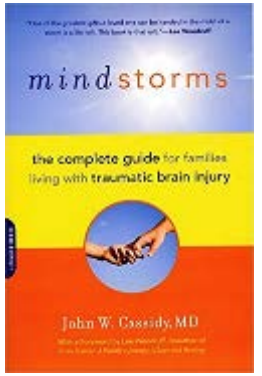


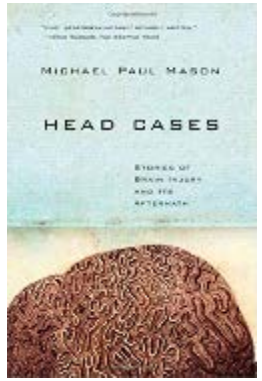
Suggested Reading

- "Fixing My Gaze"
  - By: Susan Barry
- "The Ghost In My Brain"
  - By: Clark Elliot
- "Mindstorms: Living With Traumatic Brain Injury"
  - By: John W. Cassidy, MD
- "Head Cases: Stories of Brain Injury & It's Aftermath"
  - By: Michael Paul Mason
- Adventures in Brain Injury/Feed a Brain
  - Podcast and book by a brain injury survivor (Cavin Balaster)









Recommended Apps/Programs

- Brain HQ (Brain exercises/training)
- Memory Match
- IQ2
- Lumosity
- Vision Tap
- Eyecanlearn.com
- Ultimeyesvision.com
- Read-right
- Novavision.com

Thank you!

Questions?

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