A Concussion Discussion

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Disclosures

- None

Goals

- To understand the optometrists role in traumatic brain injury and mild traumatic brain injury
- To feel more comfortable seeing and treating these patients

True or False

- 1. You must lose consciousness to have a TBI
- 2. Brain imaging will show if you had a TBI
- 3. A fall can cause a TBI
- 4. Symptoms of a TBI are always present immediately following injury

Table 2. Criteria used to classify TBI severity

	TBI SEVERITY		
Criteria	Mild	Moderate	Severe
Structural imaging	Normal	Normal or abnormal	Normal or abnormal
Loss of consciousness	<30 minutes	30 minutes to 24 hours	>24 hours
Post traumatic amnesia	0-1 day	>1 and <7 days	>7 days
Glasgow Coma Scale score (best available score in 24 hours)	13-15	9-12	3-8
Abbreviated Injury Scale score: Head	1-2	3	4-6

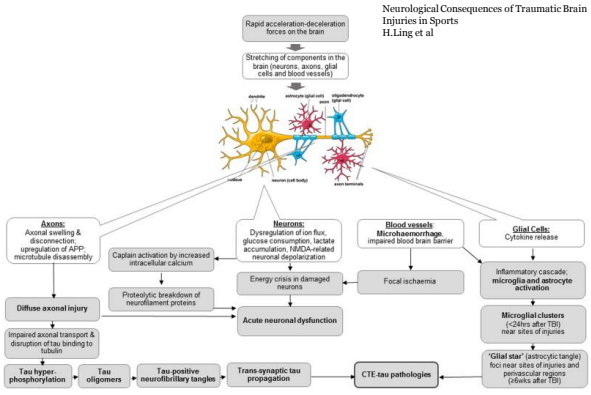
Source: Brasure et al., 2012

My Why

mTBI

- Defined by any one of the following
  - Loss of consciousness less than 30 minutes
  - Loss of memory (anterograde or retrograde)
  - Altered mental state (disorientation, confusion, dazed)
  - Focal neurological deficits (seizures or brain lesions) that may or may not be transient

Neurological Consequences of Traumatic Brain Injuries in Sports
H.Ling et al

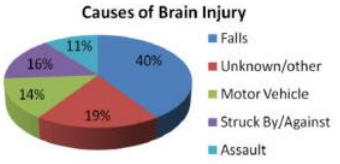


mTBI

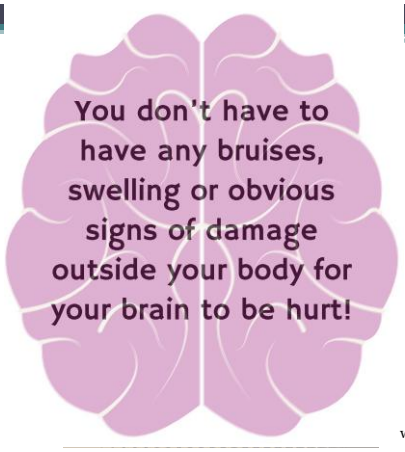
- Estimated 2.5 million TBI related emergency department visits in 2013 alone
  - Likely an underestimation; this does not include military injuries or those at the Veterans Affairs
- Approx. 87% of these are treated and released without hospitalization
- 80,000-90,000 result in a lifelong disability

mTBI

- Children 0-4 years; Adolescents 15-19 years; Adults 75 years+
- 59% males



Source: Centers for Disease Control and Injury Prevention



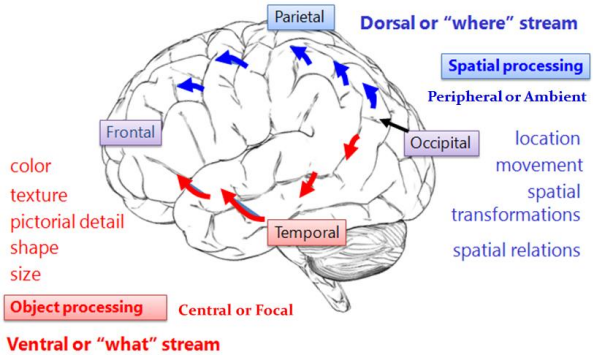
www.odvn.org

mTBI

- Nothing is "mild" about a mild traumatic brain injury. "[I]t is clear that the consequences of mTBI are often not mild."[1] The term "mild" describes only the initial insult relative to the degree of neurological severity. There may be no correlation with short or long-term impairment or functional disability.[2]

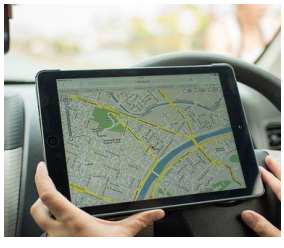
[1] Director for the Centers for Disease Control and Prevention, Dr. Julie Louise Gerberding, M.D., M.P.H. Centers for Disease Control and Prevention, Department of Health and Human Services. Report to Congress on Mild Traumatic Brain Injury in the United States: Steps to Prevent a Serious Public Health Problem. September 2013

[2] Zasler, N. NeuroMedical Diagnosis and Management of Post-concussive Disorders, in Medical Rehabilitation of Traumatic Brain Injury 133–134 (Horn & Zasler, eds. 1995).



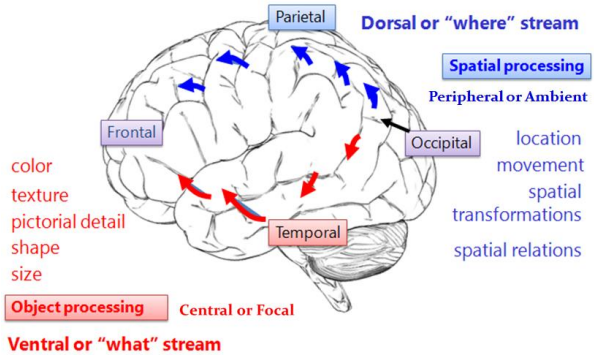
Dorsal Processing Stream

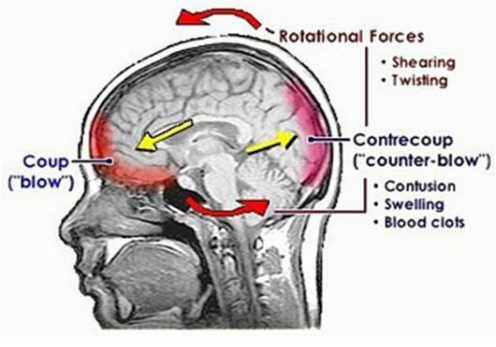
- Ambient
- Balance, spatial localization, posture
- Magnocellular
- 80% of retinal fibers
- 20% of visual fibers
- Integrates with vestibular and other sensory systems



Ventral Processing Stream

- Central
- Identification
- Parvocellular
- 20% of retinal fibers
- 80% of visual fibers
- Higher order cognitive function/processing
- Conscious function





BIVSS CHECKLIST (Brain Injury Vision Symptom Survey)

Patient Name: ______________________ Today's date: ________

My brain injury was: ____ years ago My age is: ____ years today's date: ______________

☐ I have had a medical diagnosis of brain injury (check box if true) Cause of injury: ______________

☐ I sustained a brain injury without medical diagnosis (check box if true) ______________

☐ I have NOT ever sustained a brain injury (check box if true)

Please check the most appropriate box, or circle the item number that best matches your observations. All information will be held in confidence. Thank you for your help!

SYMPTOM CHECKLIST *Circle a number below:*

Please rate each behavior. How often does each behavior occur? (circle a number)	Never	Seldom	Occasionally	Frequently	Always
EYESIGHT CLARITY					
Distance vision blurred and not clear -- even with lenses	0	1	2	3	4
Near vision blurred and not clear -- even with lenses	0	1	2	3	4
Clarity of vision changes or fluctuates during the day	0	1	2	3	4
Poor night vision / can't see well to drive at night	0	1	2	3	4
VISUAL COMFORT					
Eye discomfort / sore eyes / eyestrain	0	1	2	3	4
Headaches or dizziness after using eyes	0	1	2	3	4
Eye fatigue / very tired after using eyes all day	0	1	2	3	4
Feel "pulling" around the eyes	0	1	2	3	4
DOUBLING					
Double vision -- especially when tired	0	1	2	3	4
Have to close or cover one eye to see clearly	0	1	2	3	4
Print moves in and out of focus when reading	0	1	2	3	4
LIGHT SENSITIVITY					
Normal indoor lighting is uncomfortable – too much glare	0	1	2	3	4
Outdoor light too bright – have to use sunglasses	0	1	2	3	4
Indoors fluorescent lighting is bothersome or annoying	0	1	2	3	4
DRY EYES					
Eyes feel "dry" and sting	0	1	2	3	4
"Stare" into space without blinking	0	1	2	3	4
Have to rub the eyes a lot	0	1	2	3	4
DEPTH PERCEPTION					
Clumsiness / misjudge where objects really are	0	1	2	3	4
Lack of confidence walking / missing steps / stumbling	0	1	2	3	4
Poor handwriting (spacing, size, legibility)	0	1	2	3	4
PERIPHERAL VISION					
Side vision distorted / objects move or change position	0	1	2	3	4
What looks straight ahead--isn't always straight ahead	0	1	2	3	4
Avoid crowds / can't tolerate "visually-busy" places	0	1	2	3	4
READING					
Short attention span / easily distracted when reading	0	1	2	3	4
Difficulty / slowness with reading and writing	0	1	2	3	4
Poor reading comprehension / can't remember what was read	0	1	2	3	4
Confusion of words / skip words during reading	0	1	2	3	4
Lose place / have to use finger not to lose place when reading	0	1	2	3	4

total score for all 28-items: ____________

ICD10: F07.81

Post-Trauma Vision Syndrome (PTVS)

- Dorsal processing becomes inhibited and is unable to sync with other sensory and motor feedback
- If not treated appropriately, can persist for life
- Ventral processing takes over and tries to do both ventral and dorsal processing
  - Very inefficient

PTVS

- Overwhelmed by movement
  - Visually confusing places i.e. grocery store
  - Can become very anxious
- Difficulty with changes in flooring
- Difficulty with changes in lighting
- Only able to see the details and not the big picture so everything becomes important

Consequences of PTVS

- Eye movement disorders
  - Fixation
  - Saccades
  - Pursuits
- Vergence disorders
  - Convergence insufficiency
  - Basic exophoria
  - Basic esophoria
  - Vertical Heterophoria
- Accommodative disorders
  - Accommodative insufficiency
  - Accommodative spasm
- Photosensitivity
- Dizziness
- Visual overload

Eye Movement Disorders

- Fixation
  - Inability to hold fixation for even a few seconds
- Saccadic disorders H55.81
  - Losing place when reading
  - Nauseous with eye movement
  - Computer
- Pursuits H55.89
  - Losing place when reading
  - Blur with eye movements

Vergence Disorders

- Convergence insufficiency H55.11
  - Reduced NPC
  - Double with near work
  - Headaches
- Basic exophoria H50.52
  - Double with near, or distance occasionally
  - Headaches
  - Blur
- Basic esophoria H50.51
  - Asthenopia at near
  - Blur
- Vertical Heterophoria H50.53
  - Double
  - Head tilt resolves

Seeing double can be very disruptive in daily life.

Seeing double can be very disruptive in daily life.

Accommodative Disorders

- Accommodative insufficiency ~~H52.4~~ H53.143
  - Blur at distance, worse after reading
  - Asthenopia at near
  - Moves head in and out
  - Excessive blinking/eye rubbing
- Spasm of accommodation H52.533
  - Blur at distance and near
  - Headaches/eye aches

Photosensitivity H53.143

- Worse in fluorescent lighting
- Turns screen brightness down
- Wears sunglasses all the time

- 97% of concussed patients reported photophobia and 100% felt it disrupted their work responsibilities

Dizziness R42

- Falls, sometimes to one side only
- May worsen with near work
- Closing eyes helps
- Distinguish between vertigo/vestibular and ocular issues

H53.149

Visual Overload

- Cannot focus in visually busy places
- Gets overwhelmed easily when in the store
- Sees all the details and not the big picture

In Office Testing Pearls

- Go slow
- Ask simple questions
- Talk slowly and quietly
- Don't wear a "loud" shirt/tie/dress
- May need to divide into multiple days
- Watch them walk down your hallway or observe how they sit in the chair

In Office Testing

- Visual acuity OD/OS/OU
  - Distance and Near
  - May need to isolate
- Extra Ocular Movements
  - Ask easy questions, see if they lose fixation
  - Ask about dizziness or nausea
- Near Point of Convergence
  - Ask about dizziness or nausea

In Office Testing

- Stereopsis
- Cover test at distance and near
- Pupils
- Careful refraction
  - Caution with cylinder correction
  - Keep close to 90 or 180 if possible
  - Processing may be slow, slow choices if possible
  - May need to close eyes between choices

In Office Testing

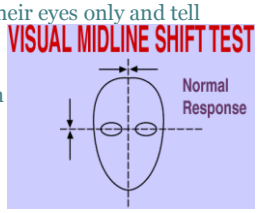
- Vertical heterophoria distance and near
- Horizontal heterophoria distance and near
- Near horizontal vergence ranges (BI and BO)
  - Ask about nausea!
- Near NRA/PRA
- Check for visual midline shift (egocentric shift)
- Ocular health
  - Anterior segment
    - Demodex?
  - Posterior segment
  - Visual fields

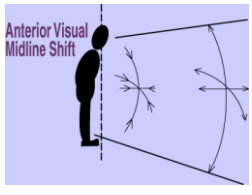
Visual Midline Shift Syndrome(VMSS)

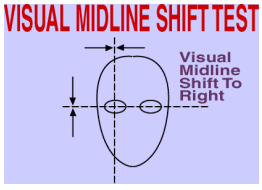
- A mismatch between center and perceived center
- Causes a whole body response
  - Anterior shift: leans forward
  - Posterior shift: leans backward
  - Right shift: leans right
  - Left shift: leans left
- Often away from side of insult
  - Left hemi shows a right shift

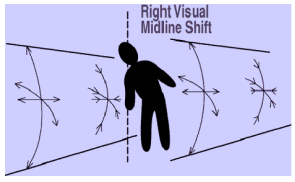
VMSS

- Testing
  - Stand off to the side of the patient
  - Use a Wolff Wand (or other fixation target)
  - Ask patient to follow with their eyes only and tell you stop when it is right in front of their nose
  - Go from L, R, Up and Down









VMSS Treatment

- Yoked prisms!
  - Base will expand space
  - Right VMSS: base left
  - Anterior VMSS: Base up
  - Creates a match between perceived egocenter, and actual egocenter

TRIAL FRAME!

Trial frame

- Even +0.25 can be beneficial!
- Look for improvements in any areas of difficulty
  - Stereopsis
  - EOM's
  - Spatial localization
  - Balance/gait
  - Photophobia

Treatment- Lenses

- Low plus +0.25, +0.50, even +0.12
  - Changes accommodative demand
  - Reduced convergence demand
- Avoid progressive addition lenses
  - Further disrupts dorsal pathway
  - May need two/three pairs of glasses

Treatment-Prisms

- Low amounts to avoid dependency
  - Base in, base down
- May be different for distance and near
- Fresnel prism
  - Transient diplopia
  - Will blur vision more
  - Sectoral?
- Yoked prism
  - Balance and gait
  - Esophoria?

Treatment- Tints

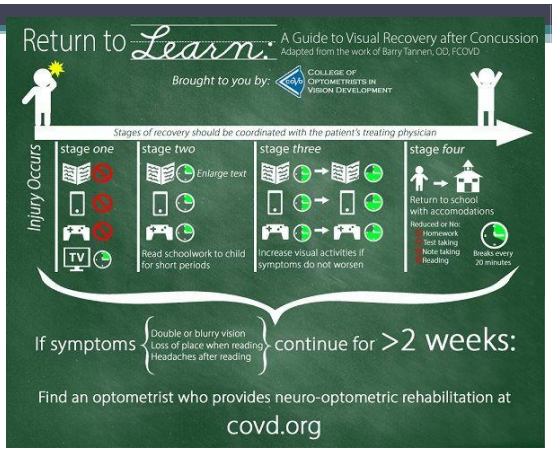
- Avoid constant dark tints
  - Can cause rebound effect once removed
- Purple or blue tints for indoors
- FL41
- Blue-blocking tints
- Clips?

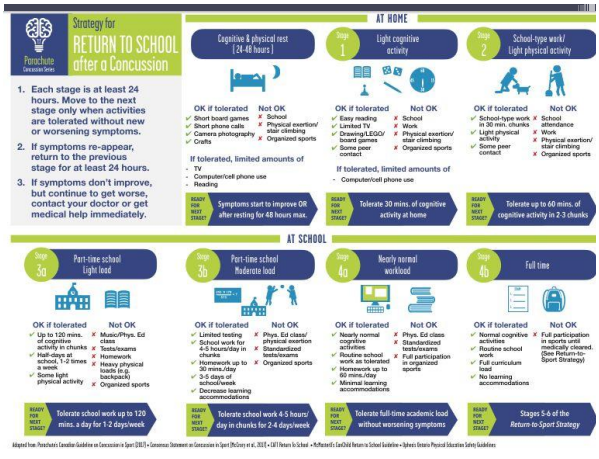
Treatment- Occlusion

- Avoid total occlusion
  - Further disables dorsal pathway
  - If necessary, can it be done on a lens? With frosted Scotch tape?
- Sectoral occlusion
- Binasal occlusion
  - Helpful for photophobia, dizziness, esotropia, exotropia, VMSS, blur not corrected with Rx

Treatment- Neuro-Optometric Vision Therapy

- Repair and restore
- Enhance
- Multifaceted
  - Visual
  - Cognitive
  - Auditory
  - Emotional
- No age restrictions





Helpful Websites

- www.noravisionrehab.org
- www.covd.org
- www.odvn.org
- www.chop.edu/centers-programs/concussion-care-minds-matter
- www.cdc.gov/headsup/providers/index.html