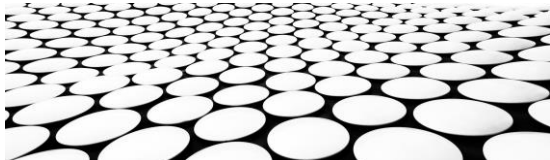


THE ROLE OF THE VISUAL SYSTEM IN CONCUSSION

ASHLEY S. REDDELL, OD, FCOVD



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ABOUT ME

- Born & Raised in Kansas
- Graduated from KU -- Rock Chalk!
- Graduated from Southern College of Optometry
- Completed Residency in Pediatrics & Vision Rehab
- Own private practice with my husband in LVN and KC metro

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WHY IS AN EYE DOCTOR TALKING ABOUT CONCUSSIONS?

- Increase public awareness of the members of the post-concussive health care team.
- 50-90% of TBI patients suffer from visual dysfunctions.
- 70% of all sensory processing in the entire body is directly affected by information coming from the two eyes.
- Visual processing accounts for 44% of the brain's energy consumption.
- Many post-concussive symptoms are visual in nature.

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VISUAL DYSFUNCTIONS FOLLOWING MTBI

	mTBI	Control
Convergence Insufficiency	55%	5%
Saccadic Impairment	30%	<1%
Pursuit Impairment	60%	<1%
Ocular Misalignment (vertical phoria)	55%	5%
Ocular Misalignment (horizontal phoria)	45%	5%
Accommodative Dysfunction	65%	15%

Capo-Aponte et al. Military Medicine 2012

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WHY ARE WE ALL TALKING ABOUT CONCUSSION?

- Overall PCS rates up from 7.3% to 13.2% (81% increase) from 2010 to 2015, with most of the increase coming from females.
- 15% remain symptomatic at 1 year...why?
- Suicide is 3x higher among post-concussion patients than the general population. In the study, 1% of the patients who committed suicide visited a physician during the last week of life.
- Patient who has a concussion is 4-6x more likely to have another concussion.

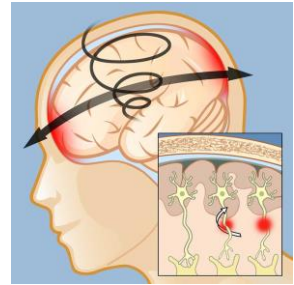
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***GREAT HANDOUT FOR CONCUSSION PATIENTS.**

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DEFINITION OF CONCUSSION

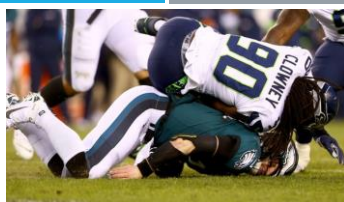
1. Concussion may be caused either by a direct blow to the head, face, neck or elsewhere on the body with an 'impulsive' force transmitted to the head.



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DEFINITION OF CONCUSSION

2. Concussion typically results in the rapid onset of short-lived impairment of neurological function that resolves spontaneously. However, in some cases, symptoms and signs may evolve over a number of minutes to hours.



NO RETURN TO PLAY/WORK/LEARN THE SAME DAY IF CONCUSSION SUSPECTED.

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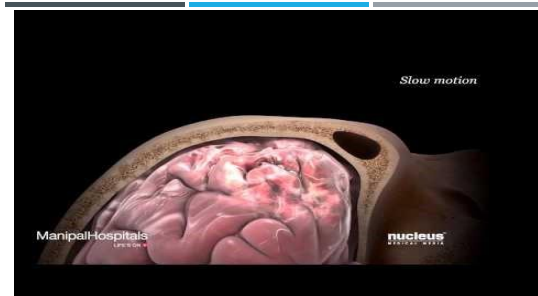
DEFINITION OF CONCUSSION

3. Concussion may result in neuropathological changes, but the acute clinical symptoms largely reflect a functional disturbance rather than a structural injury and, as such, no abnormality is seen on standard structural neuroimaging studies.



PART OF WHY CONCUSSION DETECTION & MANAGEMENT CAN BE CHALLENGING.

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DEFINITION OF CONCUSSION

4. Concussion results in a graded set of clinical symptoms that may or may not involve loss of consciousness (LOC). Resolution of the clinical and cognitive symptoms typically follows a sequential course. However, it is important to note that in some cases symptoms may be prolonged.

Post-Concussion Syndrome

80-90% OF CONCUSSIONS RESOLVE IN 7-10 DAYS.

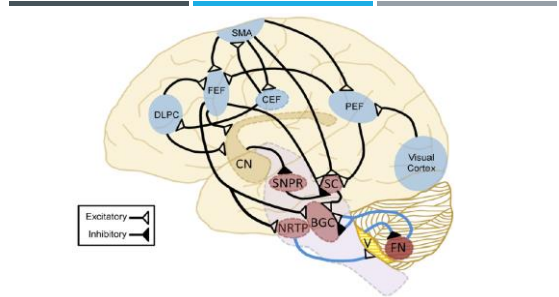
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POSTCONCUSSION SYNDROME

Who is most likely to get it?

- Female
- Advanced Years
- History of Previous Concussion
- Hx of Mood Disorder, Learning Disability, ADHD
- History of Migraines
- Double Impact
- Severe Visual Symptoms Soon After Injury

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KING-DEVICK TEST

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VESTIBULAR/ OCULOMOTOR SCREENING (VOMS)

Vestibular/Ocular Motor Test:	Not Tested	Headache 0-10	Dizziness 0-10	Nausea 0-10	Fogginess 0-10	Comments
BASELINE SYMPTOMS:	N/A					
Smooth Pursuits						
Saccades - Horizontal						
Saccades - Vertical						
Convergence (Near Point)						(Near Point in cm): Measure 1: _____ Measure 2: _____ Measure 3: _____
VOR - Horizontal						
VOR - Vertical						
Visual Motion Sensitivity Test						

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DEFINITION OF VISION

From Dr. Padula

A **dynamic, interactive** process of **motor** and sensory function mediated by the eyes for the purpose of simultaneous organization of **posture, movement, spatial orientation, manipulation of the environment** and to its highest degree of perception and thought.

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Vision is the DOMINANT sense!

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VISION SIGNS & SYMPTOMS WITH ABI

- Blurred Vision (constant)** No longer able to compensate for small prescription
- Focusing Dysfunctions (intermittent)** Unable to change focus from distance to near and back
- Light Sensitivity**
- Double Vision**

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VISION SIGNS & SYMPTOMS WITH ABI

- Headaches**
- Balance Issues/Dizziness/Nausea**
- Struggling with Reading**
- Stationary objects appear to move**
- Seeing words & print run together**
- Attempting to walk on a "slanted" floor**
- Having significant difficulties in crowded moving environments**

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BINOCLAR DYSFUNCTION

The consumption of soft drinks by American youth is increasing. National dietary surveys show that carbonated soft drink consumption more than doubled in youths aged 6 to 17 from about 5 ounces per day in 1977-78 to 12 ounces in 1994-98, the most recent years for which national data is available. Adolescent boys' soft drink consumption more than tripled during those years.

There are at least two negative results to this soft drink explosion. First, the use of soft drinks is likely related to the rise in childhood obesity. A variety of studies suggest that we don't eat fewer calories from other sources when we increase calories from beverages. If a child drinks 9 to 10 ounces of a soft drink, that's equivalent to almost 120 calories.

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ACCOMMODATIVE DYSFUNCTION

Failing to clean off your desk before lunch not only raises the risk of salad dressing spilling onto your work, but it could also increase your chances of getting sick. A new report shows that close to half of Americans don't clean their desks before eating at them, and a third don't wash their hands, which may foster the spread of infectious diseases like colds and flu.

Due to a shortage of the flu vaccine this year, health officials have urged the public to take measures to reduce their risk, and researchers say improving at-work hygiene and hand washing habits could have a major impact in reducing sick days. "Desks, phones, door knobs, conference tables, fax machines and other common workplace areas can be breeding grounds for bacteria-spreading germs," says Brian Sansoni, spokesman for the Soap and Detergent Association, in a news release.

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OCULOMOTOR DYSFUNCTION

Henry looked to the right. He looked to the left. He looked up, and he looked down. "Where had Frog gone?" Henry did not like being alone in the forest. "Frog, where are you?" Henry called. "Please come back!"

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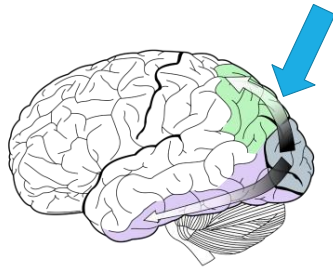
FOCAL PATHWAY

- Object Identification →
- WHAT?
- Reactive
- Slower
- Cortical/Higher Level Processing
- Guidance of fine motor
- Secondary to ambient process in survival
- TEMPORAL LOBE

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AMBIENT PATHWAY

- Spatial Identification → Where??
- Proactive/Lighting fast
- Sensitive to Movement
- Spatial Localization
- Figure-Ground Segregation
- Larger impact on balance/posture/function
- Anticipates change in preconscious
- PARIETAL LOBE



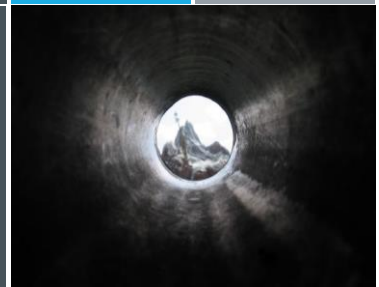
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UNSTABLE AMBIENT VISION

Decoupling of the focal and ambient processes

- Deficits in posture, balance, movement, planning
- Less in speed of ambient visual processing

M-cells have larger diameter axons and are more susceptible to damage.



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FOCAL BINDING

- Causes inability to release detail
- Environment becomes over-stimulating
- Movement in the environment (busy, crowded) becomes chaos to the visual system
- Print on page becomes mass of detail



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FOCAL BINDING & MOTOR SKILLS

- Movement becomes conscious and isolates function - lack of automaticity
- No fluency b/c system is unable to anticipate
- May have intact peripheral field but lack peripheral awareness
- Makes them more susceptible for re-injury



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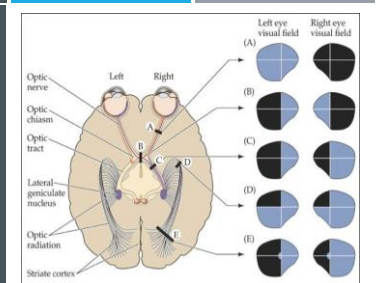
DIFFICULT ENVIRONMENTS



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VISION DYSFUNCTIONS (ADD'L)

- Visual field defects
- Visual Midline Shift
- Unilateral Spatial Inattention
- Visual-vestibular dysfunctions
- Dizziness
- Vertigo



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OPTOMETRY & REHAB



Step 1 Glasses Prescription

- Even small RXs
- Get out of Progressive lens design
- No Monovision Prism



Step 2 Lens Treatments

- Non-glare coating
- Blue Blocker
- Transitions
- Binasal Occlusion



Step 3 Continue Therapies with New Rx

- Vestibular
- Cervical
- Speech/Cognitive



Step 4 In-Office Vision Rehab

- Visual Skills
- Ambient Processing

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- Depending on age may need more than one pair of glasses.
- Often includes prism...
 - Vertical Prism
 - "First time I felt like myself since the accident."
 - Horizontal Prism
 - Base IN prism to improve magnocellular processing.
 - Yoked Prism
- Gives us a surface to apply binasal occlusion.



STEP 1: PRESCRIPTION GLASSES

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- Patients often have an immediate reaction to certain tint colors trialed during the exam.
- If positive response, then consider tint in Rx.
- Often have patients who initially wear sunglasses inside.
 - Particularly students in fluorescent lighting
 - Transitions
 - Oasys Transitions CLs
- Non-glare
- Blue Blocker



STEP 2: LENS TREATMENTS

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VISUAL HYGIENE

20/20/20 Rule

- Every 20 minutes take 20 seconds to look 20 feet away

Lighting

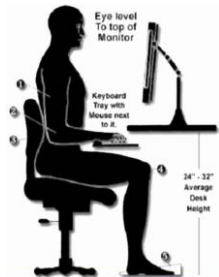
- Try to eliminate exterior lighting
- Position computer so windows/lighting from the side...not in front or behind
- If possible, turn off the overhead fluorescent lights and use floor lamps that provide indirect incandescent or halogen lighting instead.

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VISUAL HYGIENE

Seating Position

- Feet should be flat on the floor
- Seating options – exercise ball
- Outdoor time



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STEP 4: VISION REHAB



Visual Skills Training



Ambient Processing

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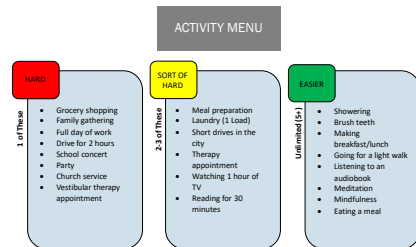


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OTHER COUNSELING RECOMMENDATIONS

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MENU OF OPTIONS



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SLEEP HYGIENE

- Go to bed at the same time & wake up at the same time...have a bedtime ritual.
- Make your bedroom a haven for sleep...dark, cool, quiet & comfortable.
- Use bed for sleeping only, not work or TV.
- Limit/restrict caffeine after 1:00 pm
- Access morning sunlight within 15 minutes of waking.
- Exercise (but not 1-2 hours before bed)
- Limit daytime napping to 30-45 minutes or not at all.
- APPs: Sleep Pillow, Calm Sleep Stories, My Sleep Button, Sounds for Sleep YouTube

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MINDFULNESS

- Use preventatively and for symptom reduction
- Start with 10-minute guided meditation
- Need to practice in order to develop skills
- Mindful Activities:
 - Coloring
 - Puzzles
 - Pet therapy
 - Palming
 - Head Space/Calm App
- Yoga! (if physically cleared to do so)

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QUESTIONS??



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