

VA/DVBIC TBI Clinical Grand Rounds

Visual Dysfunction Associated with Traumatic Brain Injury

August 7, 2015, 12:00-1:15 p.m. (ET)

Presenter: Suzanne Wickum, OD, FAAO
University of Houston College of Optometry
Consultant, TIRR Memorial Hermann Hospital
Consultant, Houston Methodist Hospital
SME, Vision Center of Excellence

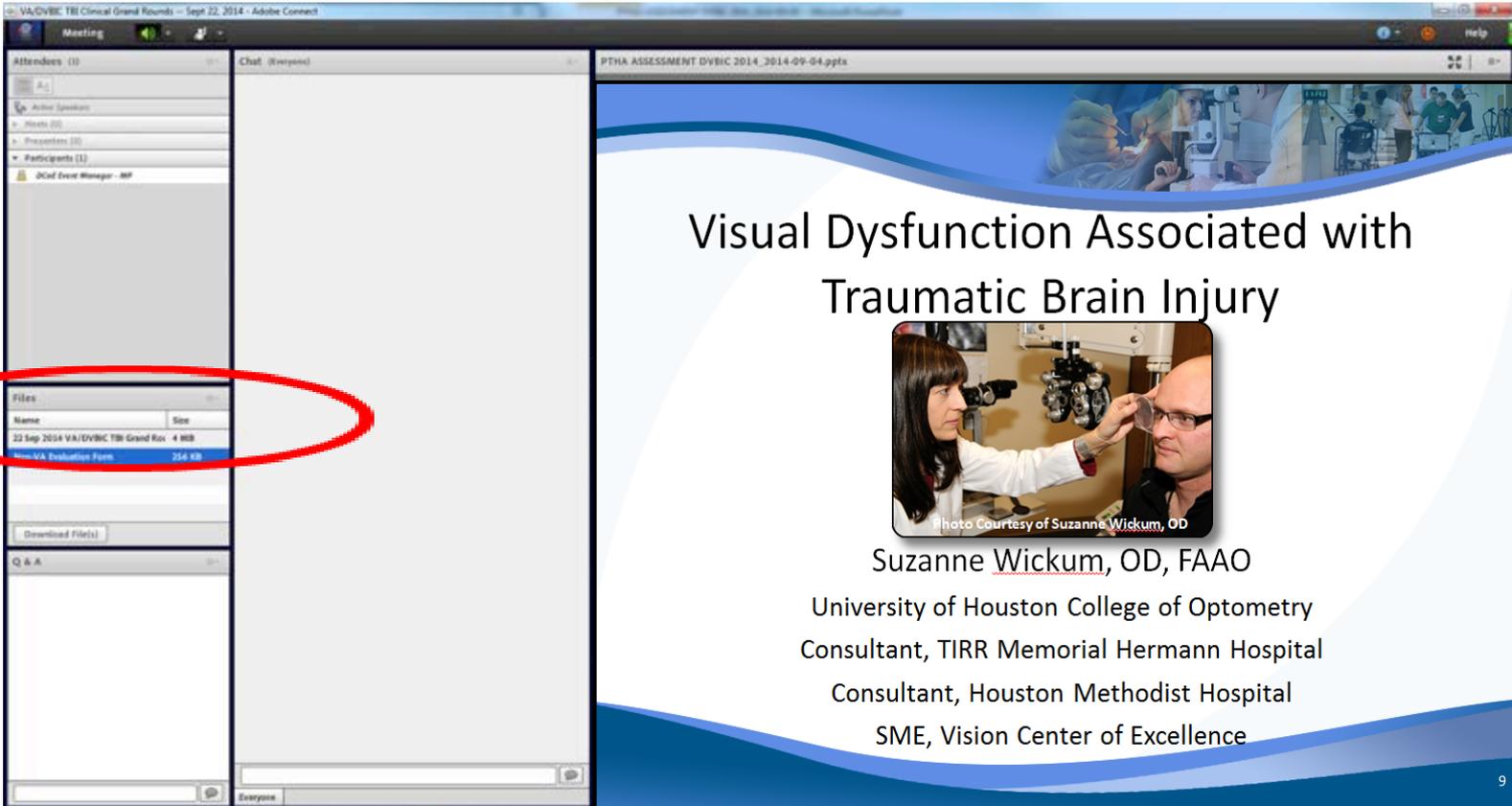
Moderator: Sherray Holland, PA-C
TBI Clinical Educator, Clinical Training and Education
Defense and Veterans Brain Injury Center
Silver Spring, MD

Webinar Details

- Audio for this webinar is **not** provided via Adobe Connect
 - Dial: VANTS **1-800-767-1750**
 - Use participant pass code: **49114#**
- This webinar session is being recorded
- Question-and-answer (Q&A) session
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Resources Available for Download

Today's presentation will be available for download at the end of the program in the "Files" box on the screen.



The image shows a screenshot of an Adobe Connect meeting interface. On the left, there are panels for 'Attendees (1)', 'Chat: Everyone', and 'Files'. The 'Files' panel is circled in red and contains a table with the following information:

Name	Size
22 Sep 2014 VA/DVBC TBI Grand Rm	4 MB
NonVA Evaluation Form	354 KB

Below the 'Files' panel is a 'Q & A' section. The main area of the screen displays a presentation slide titled 'Visual Dysfunction Associated with Traumatic Brain Injury'. The slide features a photograph of a woman in a white lab coat examining a man's eye with a light. Below the photo, the text reads: 'Photo Courtesy of Suzanne Wickum, OD', 'Suzanne Wickum, OD, FAAO', 'University of Houston College of Optometry', 'Consultant, TIRR Memorial Hermann Hospital', 'Consultant, Houston Methodist Hospital', and 'SME, Vision Center of Excellence'. The slide number '9' is visible in the bottom right corner.

Continuing Education Details

- All attendees are eligible for 1.0 credit hour of ACCME, ACCME-NP, ANCC and APA for 100% attendance.
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- For DoD/Non-VA participants, you must pre-register for this course on the VHA TRAIN portal at <http://vha.train.org>.
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Webinar Overview

- This knowledge-based presentation will focus on vision assessment and rehabilitation following a traumatic brain injury (TBI). Many providers currently working with service members and veterans lack sufficient knowledge about the high prevalence of vision problems after TBI and may not be aware of the most common vision problems. As a result, patients may not be referred for care or receive appropriate intervention in a timely fashion. This training is designed to review the most prevalent vision problems after a mild TBI and outline the most important treatment options.

Webinar Overview

- By the conclusion of this educational presentation, learners will be able to:
 - describe at least three visual symptoms frequently reported by patients who sustain a mild TBI;
 - recognize at least three visual deficits commonly found in patients after mild TBI; and
 - differentiate between visual symptoms and dysfunctions that are more common in blast-related mechanism TBI vs. non-blast TBI

Presenter: Suzanne Wickum, OD, FAAO



- Doctor of Optometry degree at the University of California Berkeley.
- Dr. Wickum completed a residency in pediatric optometry at the University of Houston, College of Optometry (UHCO).
- Currently, she is a Clinical Professor at UHCO. Her clinical practice and teaching focus is on pediatrics, binocular vision, and brain injury vision rehabilitation.
- Director of Vision Rehabilitation Services at The Institute for Rehabilitation and Research (TIRR) at Memorial Hermann Hospital.
- Director of Neuro-optometric Rehabilitation Services at the University Eye Institute.
- Director of the Pediatric Optometry Residency at UHCO.
- Subject Matter Expert for the DoD and VA VCE since 2011.
- Fellow of the American Academy of Optometry, a member of the American Optometric Association, served on the AOA Journal Review Board, and is a member of the editorial review board for the Journal of Optometric Education.



Visual Dysfunction Associated with Traumatic Brain Injury



Photo Courtesy of Suzanne Wickum, OD

Suzanne Wickum, OD, FAAO

University of Houston College of Optometry
Consultant, TIRR Memorial Hermann Hospital
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Disclosures

- The views expressed in this presentation are those of the presenter and do not reflect the official policy of the DOD or the US Government.
- Dr. Wickum has no relevant financial relationships to disclose.
- Dr. Wickum does not intend to discuss off-label/investigative use of commercial products or devices.



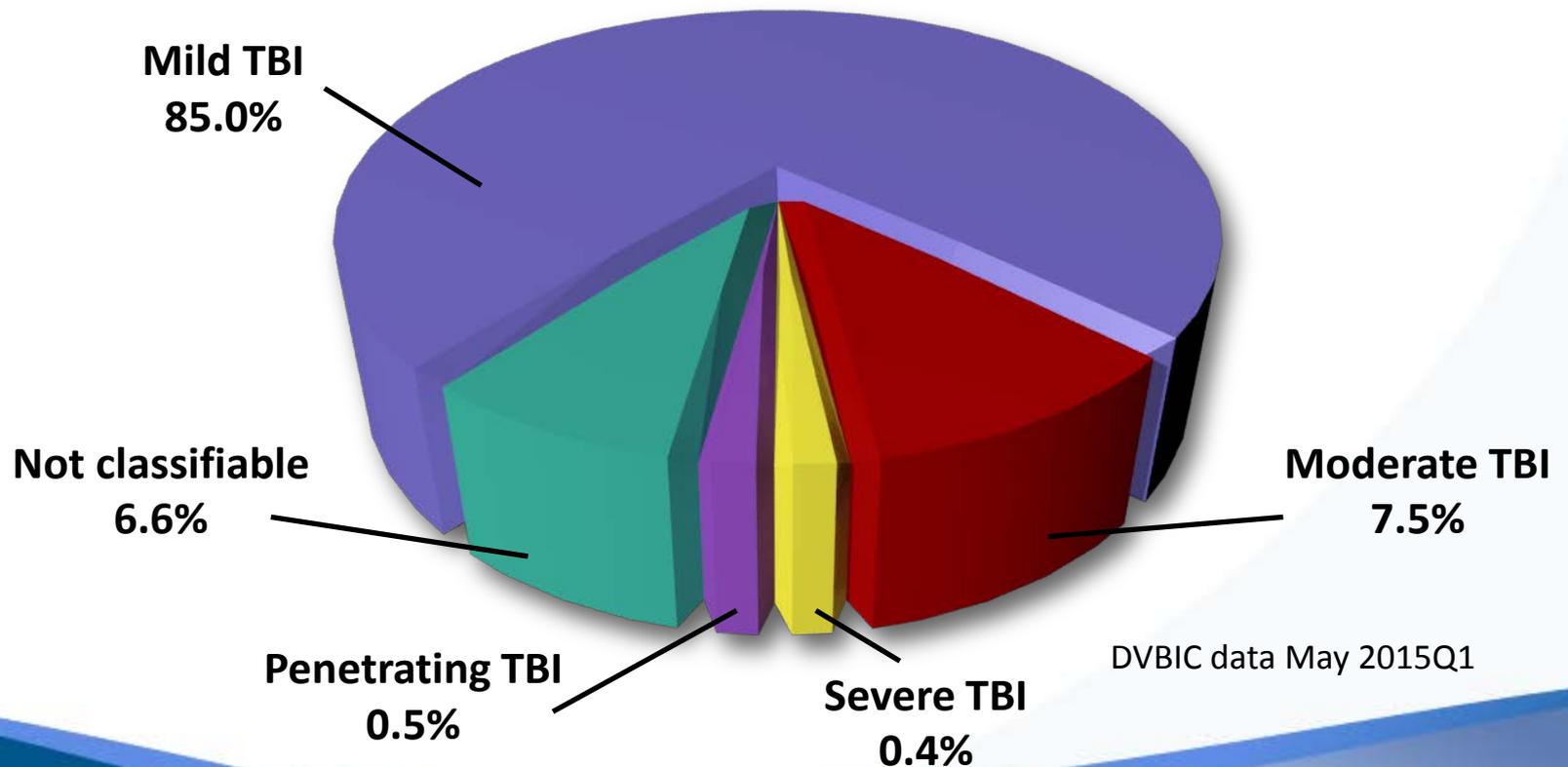
At the conclusion of this educational program, learners will be able to...

- Describe at least three visual symptoms frequently reported by patients suffering mild traumatic brain injury (mTBI).
- Recognize at least three visual deficits commonly found in patients after mTBI.
- Differentiate between visual symptoms and dysfunctions that are more common in blast related mechanism TBI vs. non-blast TBI.



TBI in Military Personnel

DoD TBI data for US forces worldwide 2000-2015¹





TBI in Military Personnel

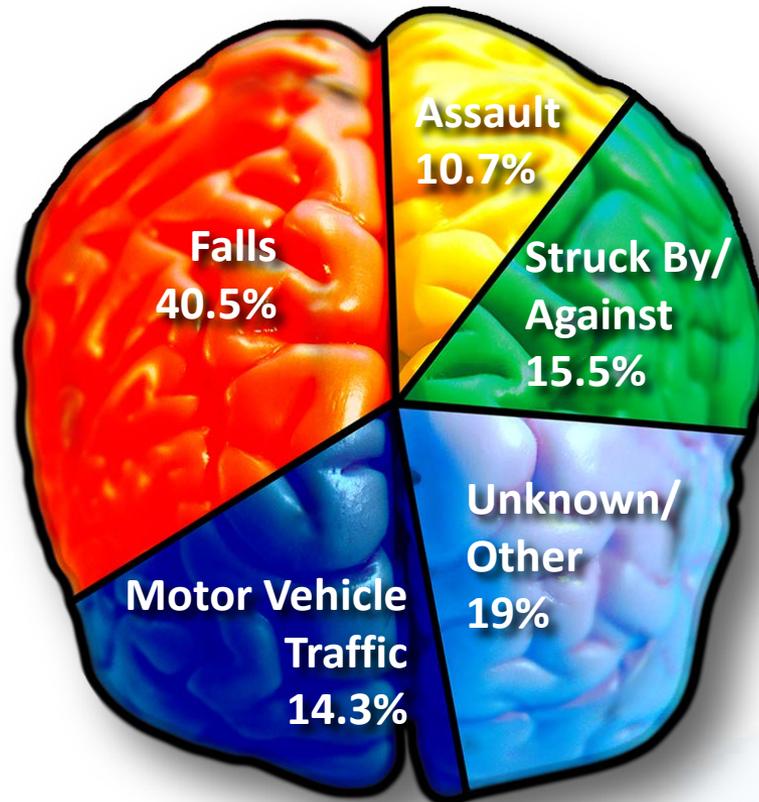
- Most common causes of military TBI:^{2,3}
 - Blast/explosion 50-67%
 - MVA 25-26%
 - Blunt trauma/falls 8%
 - Gunshot wound 4%
 - Anoxia 4%



Source: defense.gov

TBI in Civilians⁴

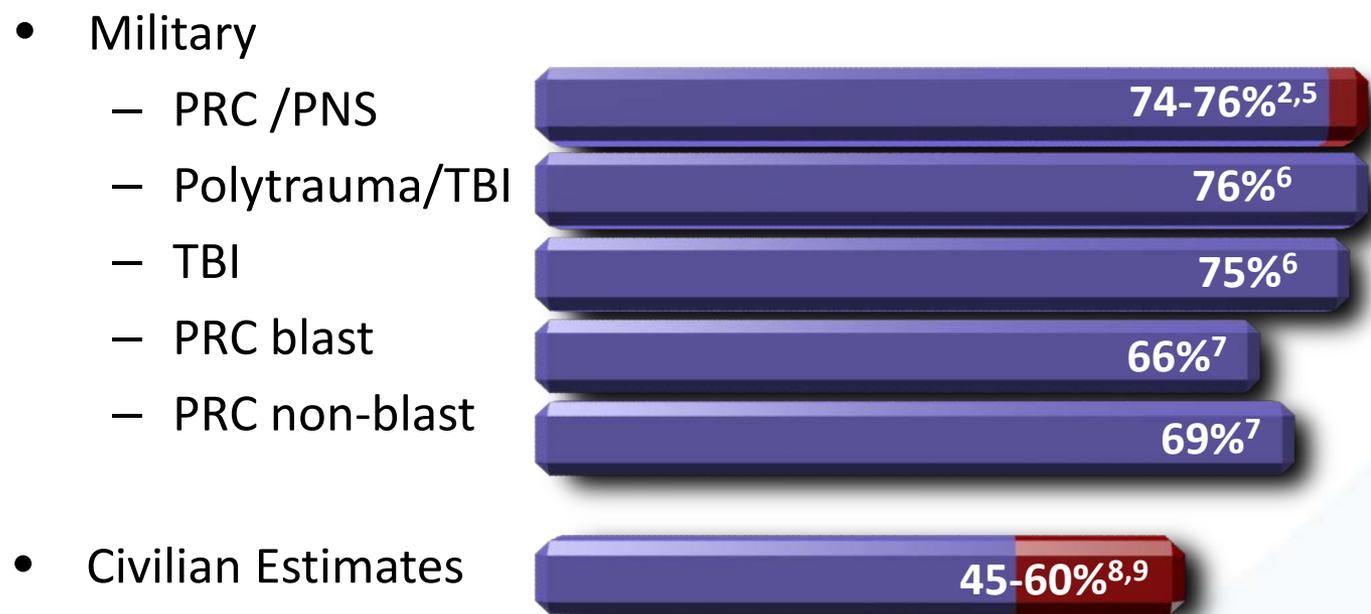
Estimated Average Percentage of Annual TBI by External Cause
in The United States, 2006-2010



http://www.cdc.gov/traumatic-braininjury/get_the_facts.html



Percentage of TBI Patients with Visual Symptoms





Types of Visual Symptoms in TBI

<u>Symptom</u>	<u>In-patient</u>	<u>Out-patient</u>
Photophobia ^{6,8,10}	7%	13-59%
Diplopia ^{2,6}	7%	8-15%
Eyestrain ¹⁰		35%
Blur when reading ¹⁰		35%
Loss of place reading ¹⁰		60%
Reduced reading speed ¹⁰		50%
Words run together ¹⁰		40%
Reduced reading comprehension ¹⁰		40%



Military Blast vs. Non-blast TBI

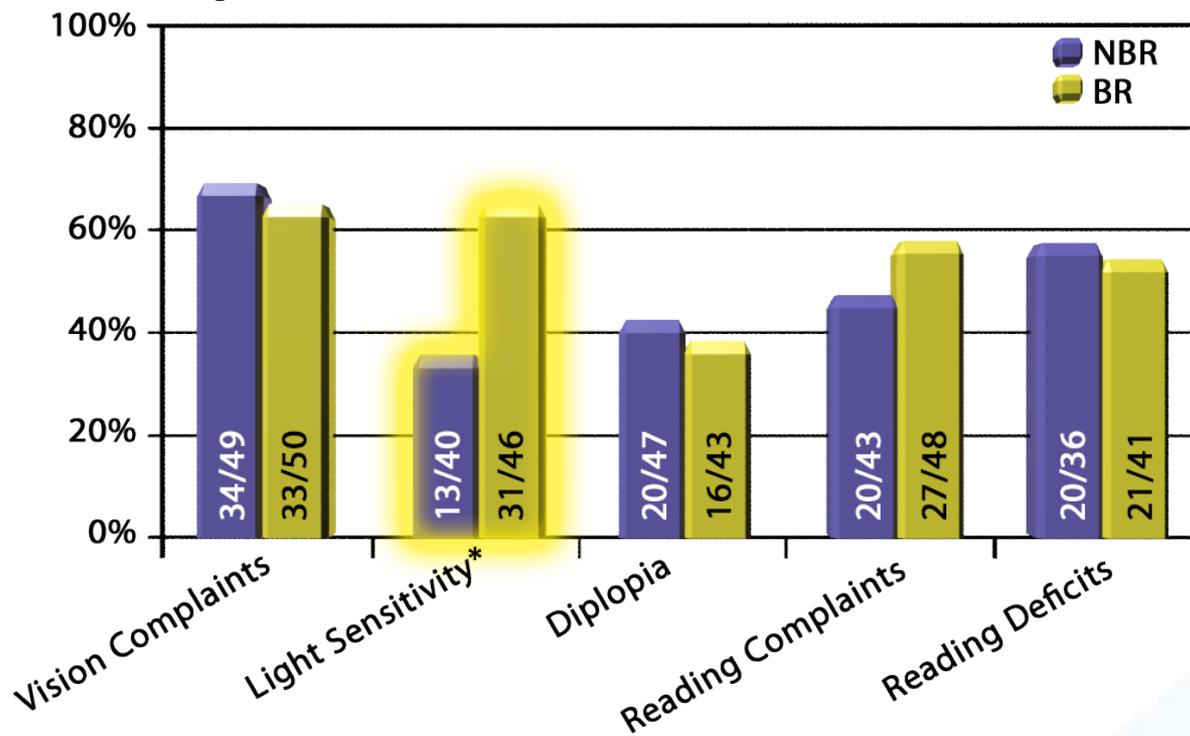


Figure 1.

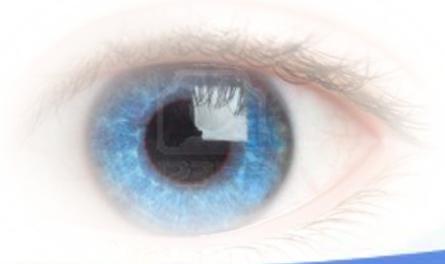
Percentage of patients with subjective vision complaints and reading performance deficits. The number of patients with each anomaly/total number of patients measured is given in each bar. *Light sensitivity was found at a significantly higher frequency in the BR TBI group ($p = 0.002$).

Goodrich, et. al., 2013



Visual Acuity and TBI

Acuity level	Civilian ⁸	PRC ⁵	PNS ⁵
20/60 or better	85%	78%	98%
20/70 – 20/100	3%	6%	0%
Worse than 20/100	5%	13%	2%
NLP (1 or both eyes)	7%	3% (OU)	0%





Visual Field Defects and TBI

<u>Type of VF Defect</u>	<u>Civilian⁸</u>	<u>PRC²</u>
RHH	4%	2%
LHH	4%	16%
Quadrantopsia	6%	4%



RHH: right homonymous hemianopia
 LHH: left homonymous hemianopia

<http://www.lighthouse.org/about-low-vision-blindness/vision-disorders/hemianopia/>



Accommodative Dysfunction and TBI

– Civilian

- Alvarez, et al⁸

24%

- Ciuffreda, et al¹¹

41%

– Military

- Goodrich, et al²

22%

- Lew, et al¹²

21%

- Stelmack, et al⁶

47%

- Goodrich, et al⁷

64% NBR; 69% BR



Convergence Insufficiency and TBI

- Civilian

- Alvarez, et al⁸
- Ciuffreda, et al¹¹
- Cohen, et al¹³

23% in and out-patient

56%

42%

- Military

- Brahm, et al⁵
- Stelmack, et al⁶
- Goodrich, et al²
- Lew, et al¹²

43% PRC; 48% PNS

28%*

30%*

46%*



A Retrospective Study of the Prevalence of Visual Deficits after Mild TBI Secondary to Blast Exposure during Military Deployment¹⁴

BV/Accom Dx	# of Subjects (26)	% of Subjects	% in General Adult Pop.
Vertical	8	31	0.5 (HrT)
Ac Infacility	6	23	xx
CI	4	15	7.7
Ac Insufficiency	4	15	6.2
Strabismus	2	8	3.9
Basic EP	2	8	1.5
Ac Spasm	2	8	10.8
Basic XP	1	4	3.1
FVD	1	4	1.5
CN Palsy	1	4	xx



Military Patient Case:

- 27 year old male
- Active duty army sergeant
- CC:
 - (+) Intermittent vertical diplopia
 - (+) Words look “bunched up on the page” and he often skips lines when reading
 - (+) Motion sickness and dizziness with walking



<http://www.wilsonsdisease.org/diplopia-definition/>



Additional History:

- 2 deployments
 - 2004-05 Iraq
 - 2/07-12/07 Iraq
- 6 IED blasts
- Last blast hit his vehicle and it was lifted from the ground
- He lost consciousness for 6 min
- Being treated for:
 - Headaches
 - PTSD
 - Dyslipidemia
- Being treated with:
 - Topamax (topiramate)
 - Klonopin (clonazepam)
 - Seroquel (quetiapine)
 - Lipitor (atorvastatin)
 - ASA
- POH (+) Glasses

Exam Findings:

- Subjective Refraction:
 - OD: -2.50 -2.00 x 014 20/20
 - OS: -2.50 -1.75 x 180 20/20
- EOMs: +1 OAIO OS
- Maddox Rod @ near:

R		L
	7BI, 3BU	
5BI, 3BU	6BI, 2BU	5BI, 3BU
	6BI, 2BU	
5BI, 3BU	Prism over OD	5BI, 3BU

- Associated Phoria:
 - 2BU OD (Wesson)
- Stereo acuity:
 - Randot: 250"Global, 70" Local
 - With 2BU OD: 20"Local



Photo Courtesy of Suzanne Wickum, OD

Outcome:

- Assessments:

- CMA OU
- Intermittent diplopia secondary to left hyper-deviation
- Ruled out CN IV palsy

- Plan:

- New spec Rx
- 2BU OD Fresnel prism added to specs
- F/U in 2 weeks





2 Week Follow-up Summary:

- Assessment:
 - OS hyper deviation with much improved symptoms since addition of prism
- Plan:
 - Prism will be ground into new spectacle Rx





Saccadic/Pursuit Dysfunction and TBI

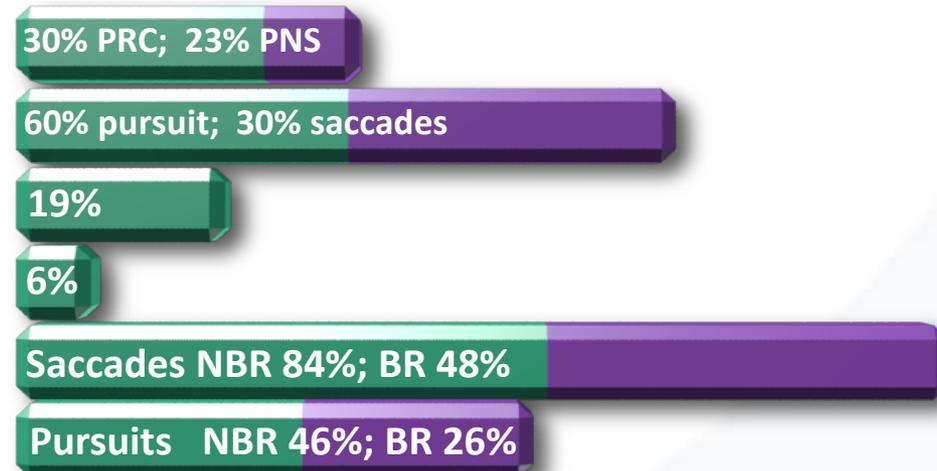
- Civilian

- Alvarez, et al⁸
- Ciuffreda, et al¹¹



- Military

- Brahm, et al⁵
- Capo Aponte, et al¹⁰
- Goodrich, et al²
- Stelmack, et al⁶
- Goodrich, et al⁷
- Goodrich, et al⁷





Oculomotor Deficits in TBI

	Military Estimates	Civilian Estimates	Non-TBI General Population Estimates ^{15, 16}
Accommodative Dysfunction	21-69% ^{2,6,7,12}	24-41% ^{8,11}	6-17%
Convergence Dysfunction	28-48% ^{2,5,6,12}	23-56% ^{8,11,13}	7-8%
Vertical Deviation	31-55% ^{10,14}	Not Available	5-9% (20%)
Saccadic &/or Pursuit Dysfunction	6-84% ^{2,5,6,7,10}	8-51% ^{8,11}	<1.0%



Military Blast vs. Non-blast TBI

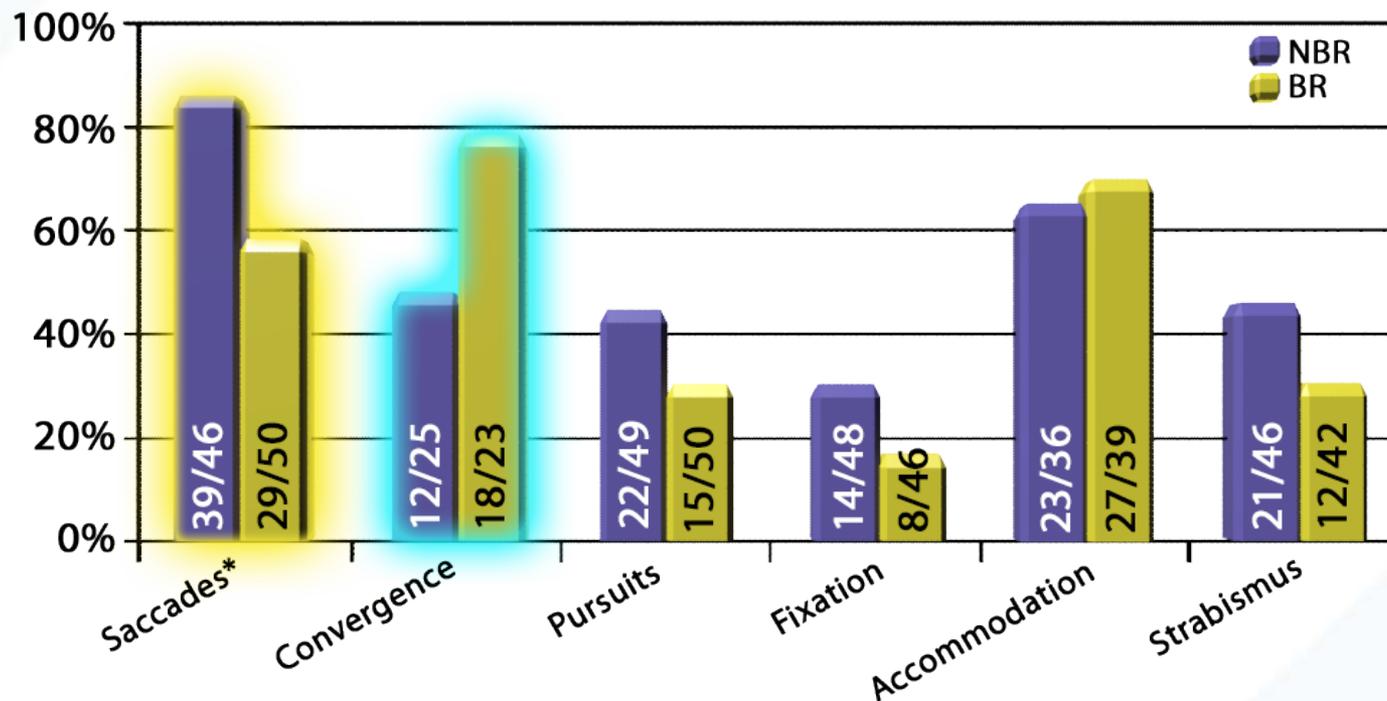


Figure 2.

Percentage of patients with oculomotor deficits. The number of patients with each anomaly/total number of patients measured is given in each bar.

*Saccadic dysfunction was significantly higher in the NBR TBI group ($p = 0.006$).

Goodrich, et. al., 2013



Cranial Nerve III, IV, VI Palsies and TBI

- Civilian

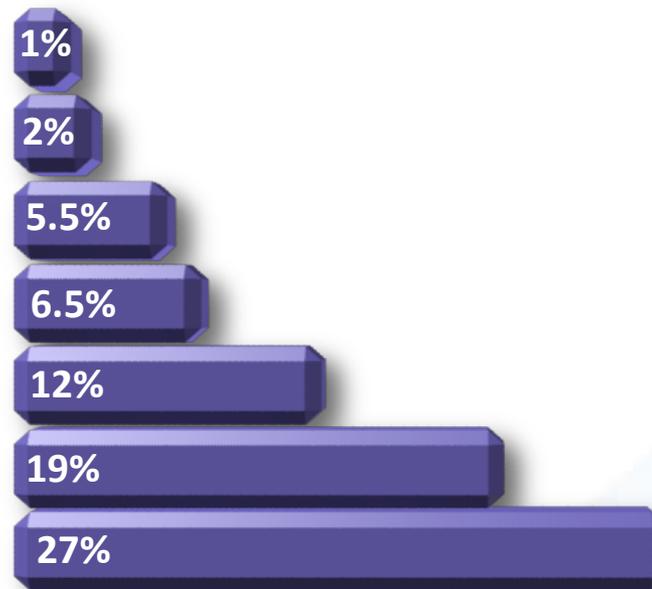
	CN III	CN IV	CN VI
– Alvarez ⁸	6%	10%	4%
– Ciuffreda ¹¹	4%	3%	1%
– VanStavern ¹⁷	12%	13%	6%
- Military
 - Goodrich⁷ (Data combines CN III, IV, VI palsies)
 - 16% of non-visually impaired
 - 42% of visually impaired
 - 20% of non-blast related polytrauma
 - 32% of blast related polytrauma



Ocular Pathology and TBI

- UK civilian study of 200 consecutive cases in an ED
- 84% of TBI patients had ocular findings within hours of admission to the ED¹⁸

- ON trauma
- Corneal/scleral tears
- Papilledema
- Pupil abnormality
- Orbital fracture
- Subconjunctival hemorrhage
- Peri-ocular ecchymosis





Overall, the military and civilian TBI populations have much in common





Patient Case: Soccer Player

- 28 year old male
- Professional soccer player
- CC: Concussion 2 months prior with visual and vestibular symptoms, difficulty tracking the ball, trouble with near asthenopia, and photophobia
- “Feeling off and out of balance” since concussion
- “How long until I can get back to practice and games?”



Photo Source: CreativeCommons



- Additional History:
 - Took header to right temple in practice
 - Felt “dizzy & out of it” afterward, continued with practice
 - C/O: intermittent blur, trouble focusing, trouble tracking, and photophobia x 2 months
 - Will be starting vestibular therapy soon
 - (+) Phonophobia
 - When he does light training, his symptoms increase
 - Prior concussion in 2003, but “fully healed from it”
 - No prior ocular or visual deficits in past
 - No prior systemic conditions
 - No medications



Exam Findings:

- DVAsc: 20/10 OD, OS
- NVAsc: 20/12.5 OD, OS
- Retinoscopy: plano OU
- Filter Eval: 550nm (I/O)
- CVF/AVF: normal OD, OS
- Pupils: normal OU
- OH: normal OD, OS





- EOM: FROM OU
- (+) end gaze nystagmus
- Pursuits adequate
- Saccades inaccurate
- NPC x 3: 7cm with effort
Mild head shaking/tremor
- DCTsc: orthophoria
- NCTsc: 14pd XP
- Stereo: 250"G/25"L
- Prism Bar Vergence @ N:
 - BO: x/20/10
 - Significant effort
 - Scrunching forehead
- AA: 9D OD, OS
- MEMsc: +0.75D OD, OS
- Accom Facility +/- 2.00
 - 9 cycles/min with effort
 - Binoc. (+) more difficult



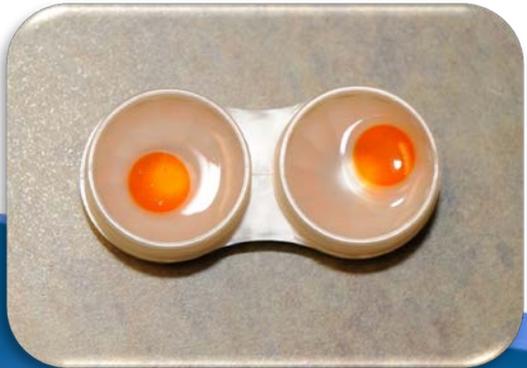
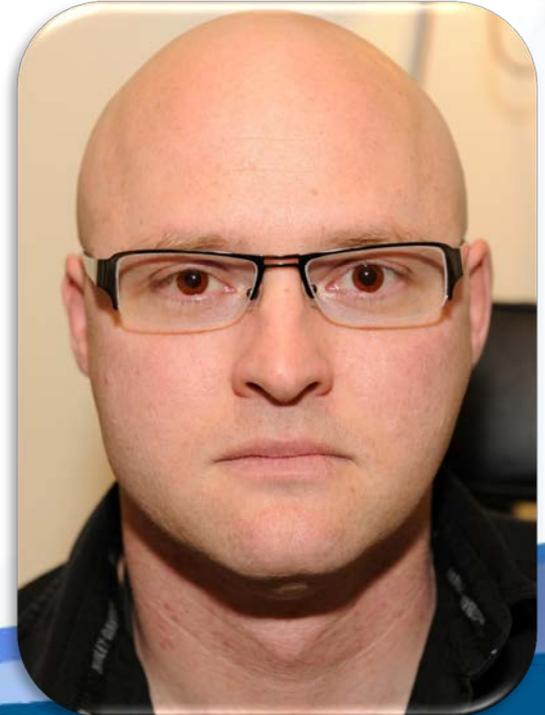
Initial Assessment & Plan

- Photophobia indoors/outdoors related to concussion
- Prescribe selective wavelength filter contact lenses (CL)
 - Counselor about induced color distortions





Military Patient



Photos Courtesy of Suzanne Wickum, OD

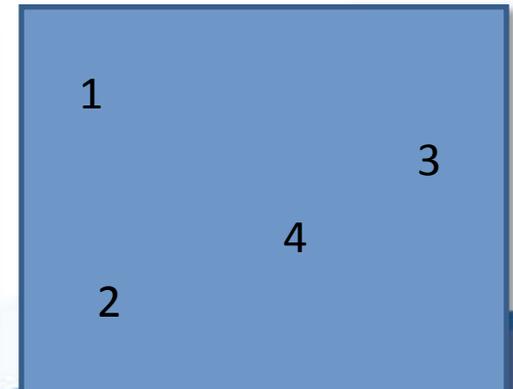
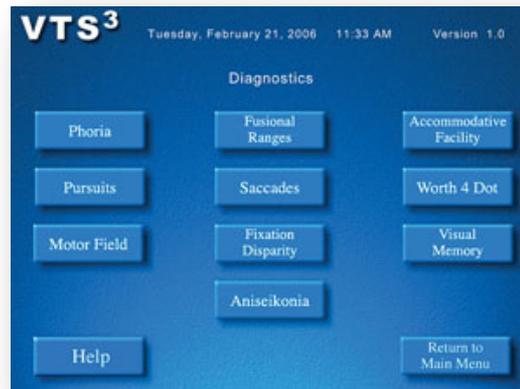


Filter Glasses



Initial Assessment & Plan

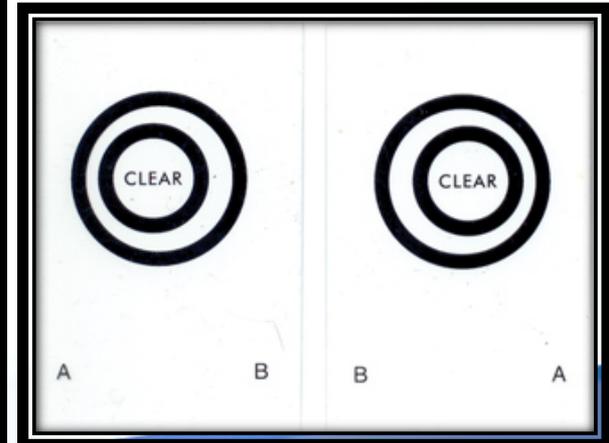
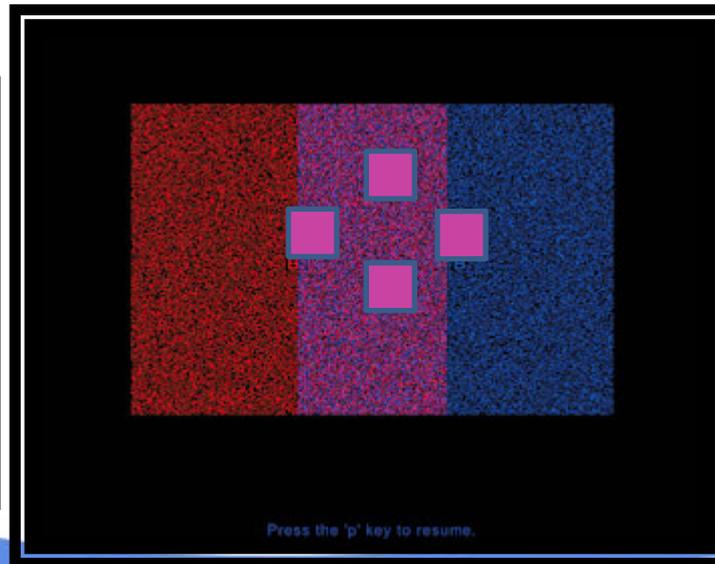
- Difficulty with saccadic accuracy after concussion
- Rx: HTS pursuit & saccadic therapy; 3 min each 2x/day
- At practice and games while on sidelines and in stands track ball in real time





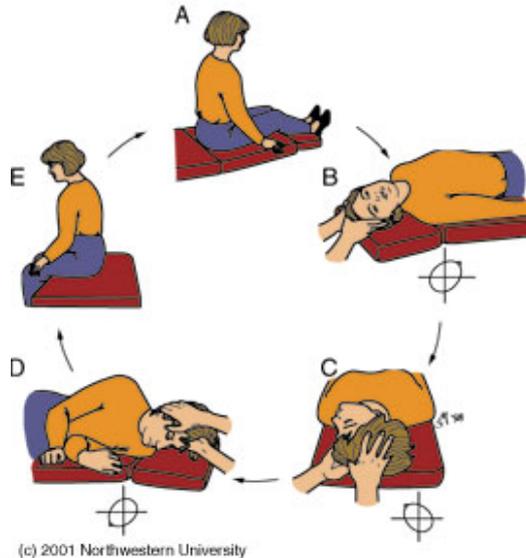
Initial Assessment & Plan

- Asthenopia secondary to convergence insufficiency (CI)
- CI decompensated secondary to concussion
- Rx: Gross convergence therapy & HTS therapy: Vergence BO, Autoslide vergence, Jump ductions; 5 min each, 2x/day



Initial Assessment & Plan

- The eye movement deficits and CI may be contributing to the patient's dizziness; however, likely otolith mislocation causing most of vestibular symptoms.





Initial Assessment & Plan

- All findings and recommendations conveyed to patient and his team trainer in person.
- Summary report sent to team physician.
- Summary sent to vestibular therapist.





Follow-up Summary

Time since initial eye examination	10 days	1 month	2 months
Compliance with Vision Rehab	Doing more than Rx'd	Reduced slightly	Stable
Symptoms	Stable	Improving	Resolved
Kinesthetic Awareness	Improving	Normal	Normal



Follow-up Summary

Time since initial eye examination	10 days	1 month	2 months
Vergence	Improving	Significant Improvement	Better than goals
Saccades & Pursuits	Stable	Pursuits good Sac improving	Normal
Vision Rehab	HTS+EcCircles	HTS+EcCircles	Discontinued



At time of vision rehab discharge:

- Loves his filter CLs!!!
- Vestibular therapy continues
- Started RTP protocol
 - Light running, goal kicking
- Returned to game play 6.5 months after concussive event





2 years later:

- “My light sensitivity hasn’t been a problem for the past year now. I definitely found the tinted contacts helpful as a transitional step for me towards reintegrating into practice and play. I don’t have any real residual side effects from the concussion but find that I monitor potential symptoms more closely and still wear a rugby helmet for comfort and peace of mind...”



Final Thoughts



References

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4. Center for Disease Control. Traumatic Brain Injury in the US. Accessed June 2015. http://www.cdc.gov/traumaticbraininjury/get_the_facts.html
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18. Kulkarni AR, et.al. Ocular Manifestations of Head Injury: A Clinical Study. *Eye* (2005) 19, 1257–1263.

Questions?

- Please submit your questions now via the question box located on the left side of the screen.



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Save the Date

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TBD

November 2015

12:00-1:15 p.m. (ET)

VA/DVBIC TBI Clinical Grand Rounds

POCs

- **DOD:**

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- **VHA and all other federal partners:**

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