



**RESURRECTING LIVES
FOUNDATION**

CONCUSSIONS: Brain Bashers

Introduction and overview of this
under diagnosed epidemic



RESURRECTING LIVES FOUNDATION

Christopher Brown MD, MPH
Board member Resurrecting Lives
Foundation, Inc

CONFLICTS OF INTEREST

- None



RESURRECTING LIVES FOUNDATION

Chrisanne Gordon, M.D.
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Executive Director, Founder
Resurrecting Lives Foundation, Inc.

CONFLICTS OF INTEREST



OBJECTIVES

- By the end of this lecture the attendee will be able to
 - Define Traumatic Brain Injury
 - Know the key manifestations of mTBI (mild TBI)
 - List the most serious consequences of unmanaged mTBI
 - Identify the major differences in mTBI acquired on the battlefield versus on the playing field

DEFINITIONS

- Traumatic Brain Injury – TBI- intracranial injury when an external force injures the brain – mild TBI (mTBI)

“Nothing MILD About It”

- Concussion – a form of mTBI – head injury with temporary loss of brain function

DEFINITION

- TBI is defined as an alteration in brain function, or other evidence of brain pathology, caused by an external force.

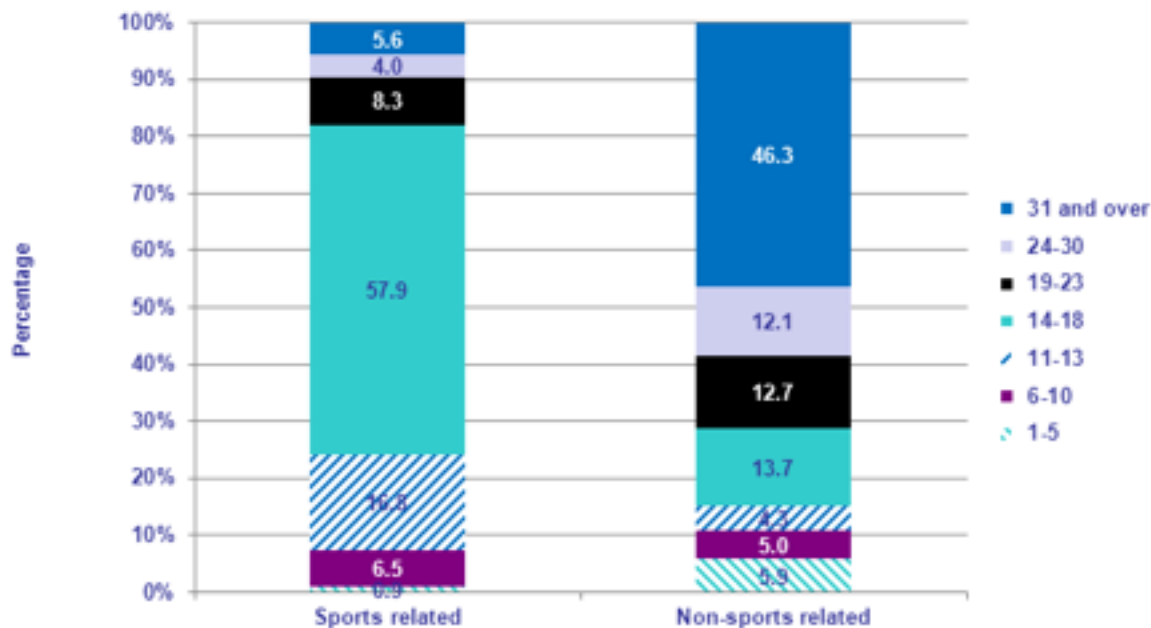
EPIDEMIOLOGY

- CDC estimates reveal that 1.6 million to 3.8 million concussions occur each year
- 5-10% of athletes will experience a concussion in any given sport season
- Fewer than 10% of sport related concussions involve a Loss of Consciousness (e.g., blacking out, seeing stars, etc.)

AGES AND CAUSES



Figure 1. Age distribution for sports related compared to non-sports related concussions, 2008



Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Emergency Department Sample, 2008

ACTIVITY INVOLVED IN CONCUSSION

- Very Young-falls/shaken baby
- Young – MVA
- Young Adult - sports/ war
- Elderly - falls

EPIDEMIOLOGY

- Football is the most common sport with concussion risk for males (75% chance for concussion)
- Soccer is the most common sport with concussion risk for females (50% chance for concussion)
- 78% of concussions occur during games (as opposed to practices)

SPEEDS OF CONCUSSIVE BLOWS

- Impact speed of a professional boxers punch: 20mph
- Impact speed of a football player tackling a stationary player: 25mph
- Impact speed of a soccer ball being headed by a player: 70mph

THE WARRIOR VS. THE ATHLETE

- The Warrior TBI most often caused by IED- Improvised Explosive Device
- Wavefront of high pressure that spreads out at 1,600 feet per second from the point of explosion, traveling rapidly over hundreds of yards.
- IED BLAST – 1100mph
- 15,000 Warriors in Ohio/450,000 in nation.



DoD Numbers for Traumatic Brain Injury Worldwide Number of Service Members Diagnosed

No. of cases

35,000

30,000

25,000

20,000

15,000

10,000

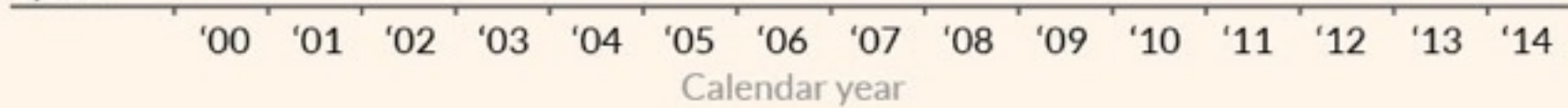
5,000

'00 '01 '02 '03 '04 '05 '06 '07 '08 '09 '10 '11 '12 '13 '14
Calendar year

Source: Defense Medical Surveillance System (DMSS), Theater Medical Data Store (TMDS)

Prepared by the Defense and Veterans Brain Injury Center (DVBIC)

2000 -2014, as of Aug 18, 2015





DoD Numbers for Traumatic Brain Injury Worldwide

Number of Service Members Diagnosed by Branch of Service

No. of cases

25,000

20,000

15,000

10,000

5,000

0

'00 '01 '02 '03 '04 '05 '06 '07 '08 '09 '10 '11 '12 '13 '14

Calendar year

◆ Army

■ Navy

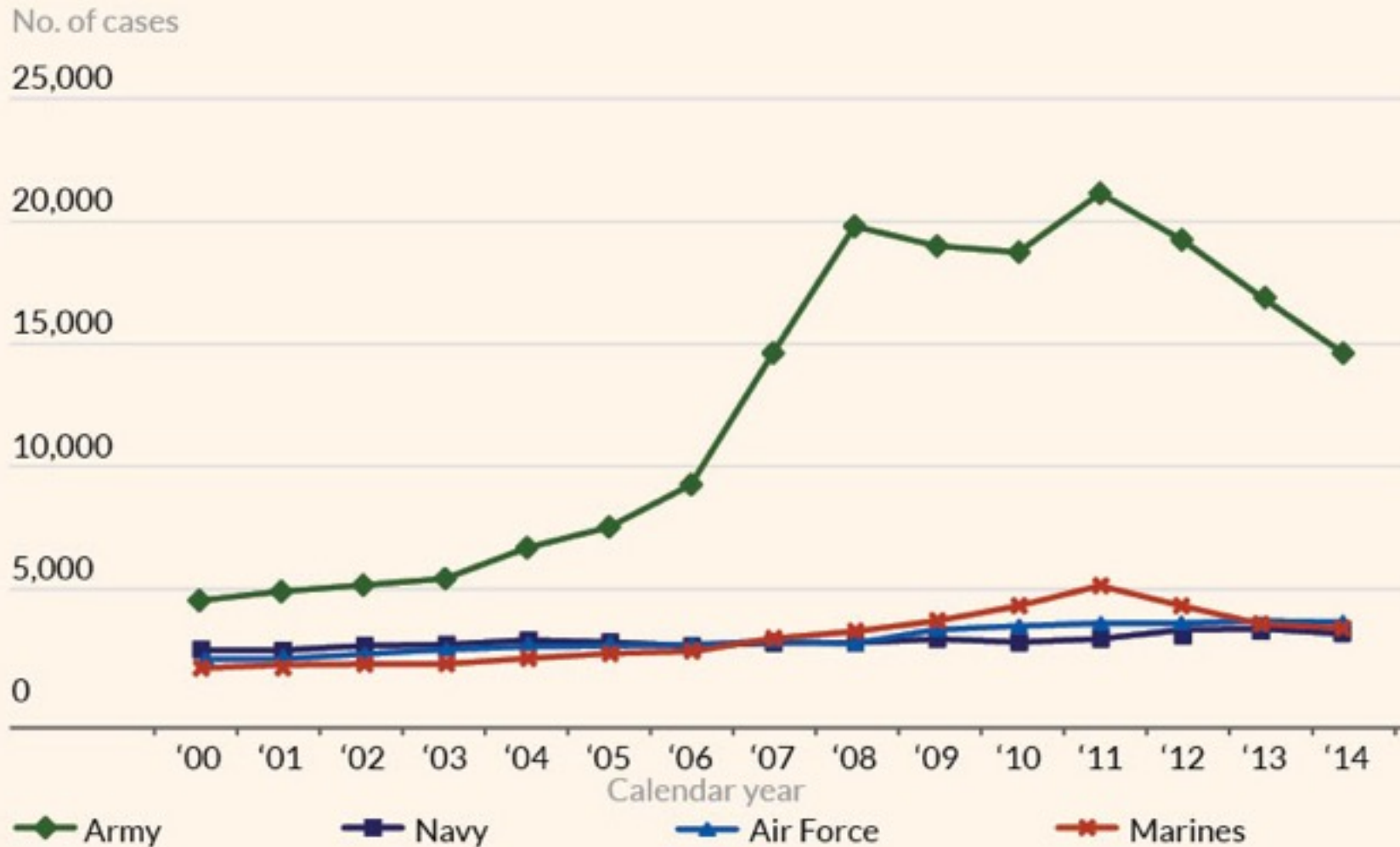
■ Air Force

✕ Marines

Source: Defense Medical Surveillance System (DMSS), Theater Medical Data Store (TMDS)

Prepared by the Defense and Veterans Brain Injury Center (DVBIC)

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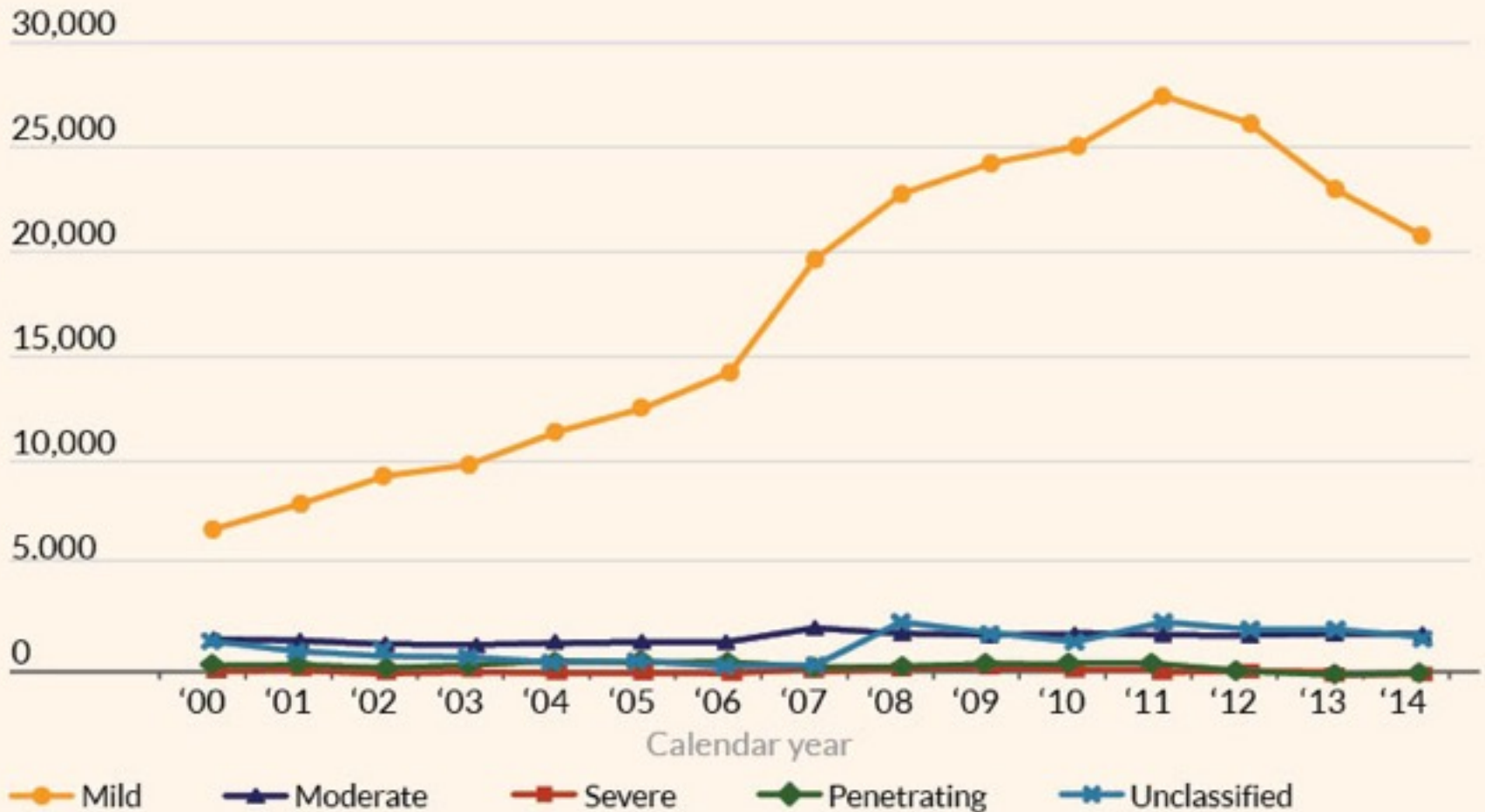




DoD Numbers for Traumatic Brain Injury Worldwide

Number of Service Members Diagnosed by Severity

No. of cases



Source: Defense Medical Surveillance System (DMSS), Theater Medical Data Store (TMDS) provided by the Armed Forces Health Surveillance Center (AFHSC)

20%- 25% OF OIF/OEF VETERANS DEPLOYED HAVE EVIDENCE OF TBI

1. BLAST INJURY – IED; RPG; Mortar
2. VEHICULAR ACCIDENTS -MRAP
3. FALLS- Terrain
4. OTHER- Hit on head during night drills
5. Sports events in training or theatre

Rand Report – “Invisible Wounds of War”

Terri Tanielien, 2008

1/3 OF NFL PLAYERS AFFECTED BY TBI

- Researchers in Canadian and National Football League agree on this figure
- Results published New York Times – Sept. 12, 2014
- Brain Trauma is Cumulative – possibly from early school play – on.

PLAYING FIELD AND BATTLEFIELD

- When was the last time you saw football players butt heads on a tackle, and the players arms/legs blew off?

Terry Thomas, Esq.

THESE INJURIES are NOT comparable
Sports Trauma – localized - cumulative
War Trauma- global- cumulative

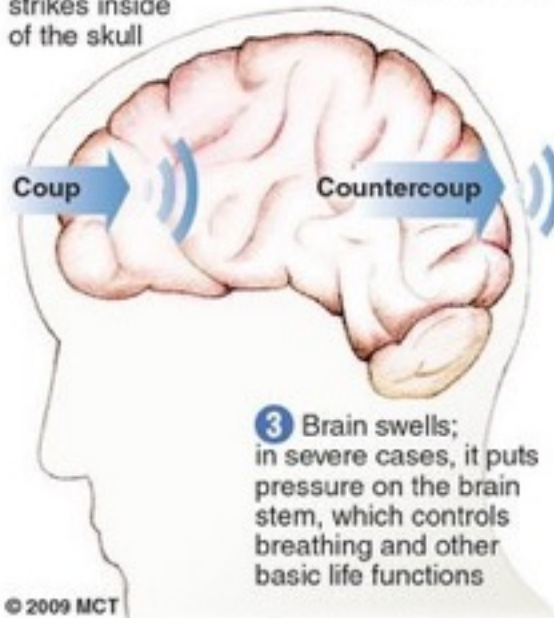
CONCUSSION

Concussions

Most often caused by blows to the head, these traumatic brain injuries usually result in temporary disorientation or short-term memory loss, but more serious concussions can do permanent damage.

1 Initial impact, or coup, causes a countercoup when brain strikes inside of the skull

2 Shaking disrupts the brain's normal chemical balance



3 Brain swells; in severe cases, it puts pressure on the brain stem, which controls breathing and other basic life functions

Levels of severity

Grade 1 Confusion lasting less than 15 minutes

Grade 2 Confusion and amnesia lasting more than 15 minutes

Grade 3 Brief unconsciousness, more serious amnesia

Guidelines for athletes

Grade 1 May return to sport after 15 minutes if symptoms are gone

Grade 2 May return to sport after one symptom-free week

Grade 3 May return to sport after two symptom-free weeks

© 2009 MCT

Source: U.S. Centers for Disease Control and Prevention. University of Pittsburgh Medical Center
Graphic: Andrea Machietto, San Jose Mercury News

BLAST INJURY

- GLOBAL INJURY – DAI – Diffuse Axonal Injury –
- Ripping and Tearing of nerve fibers in sporadic, unpredictable, and individualized manner
- Basal Ganglia/Cerebellum most often affected

BLAST INJURY IS ITS OWN DISEASE

- Honeycomb destructive pattern largely across the brain making executive decisions, memory, and reasoning
- Type of injury not previously described
- Johns Hopkins study released Journal of Head Trauma and Rehabilitation –
Jan. 2015

FOOTBALL INJURY - CTE

- CTE- Chronic Traumatic Encephalopathy
- Described by Omalu and Mckee
- Brain Degeneration with accumulation of TAU PROTEIN
- Dementia, Memory Loss, Aggression, Depression

1 PREDICTOR OF TBI

- PREVIOUS TBI –

Research suggests that for every concussion, the person is 1-2 times more likely for a second; 2-4 times more likely for a third; and 3-9 times more likely for a fourth.

RETURN TO PLAY

- Requires history of previous injuries
- Requires comparison of Baseline Testing to current
- Multi-factorial analysis –referees, coaches, trainers, family included
- Cannot return to play same day as injury-law in nearly 50 states for HS athletes
- LONG term consequences to decision

RETURN TO WAR THEATRE

- Early on in Iraq and Afghanistan conflicts – no rest/down time for IED blast and TBI
- Still depends on situation – ie, raging battle, etc.
- Now have TBI Rest Tents in Forward Operating Bases
- Difficult to diagnose – often no LOC – just dazed feeling

CO-MORBIDITIES OF TBI

- Substance Abuse
- Unemployment/Under-educated
- Homelessness
- Incarceration
- Suicide
- Development of CTE – Chronic Traumatic Encephalopathy

SIMILARITIES IN SUBJECTS

Hyper-adrenalin State at time of injury

What is firing is what is injured –

athlete/military vs. drunk and disorderly

ADDITIVE NATURE of the Insults

Adolescent Brain in Athlete and Warrior-

HORMONES MATTER

Post Concussive Syndrome – CRPS of the
Central Nervous System

BRAIN DEVELOPMENT/ INJURY

- Frontal Lobe develops until age 25-
- WAR keeps brain in adolescent state
- Best predictor of ongoing Brain Pathology – BALANCE Abnormalities—
- Second best predictor – Visual changes
- THESE ARE RARELY TESTED! And hard to identify in this “Fit” Population.

DIFFERENCES IN SUBJECTS

- Athletes – taken out of Play- Warriors remain in the war theatre
- Athletes – with baselines – Warriors/without
- Athletes- protective gear – Warriors/without adequate gear often
- Athletes-Win or Lose– Warriors/Live or DIE - PTSD generators

DISCUSSION OF BRAIN SYNDROME-

- **TBI vs. Concussion**

- TBI – insult to the brain from external mechanical force.
- Concussion – injury due to shaking, spinning, or blow.
- BLAST –DAI, Hemorrhage, Emboli
- Playing field injury is NOT a battlefield injury.

HALLMARKS OF TBI – MIDBRAIN/FRONTAL INJURIES

1. Sensory processing alterations
 - a. Photophobia
 - b. Hyperacusis –
 - c. Sensory overload – Big Box Syndrome
2. Loss of Mapping skills and Memory.
3. Pituitary Dysfunction.
4. Chronic Headaches.

DIAGNOSIS OF TBI

**Listen to the Patient: He is telling
you the diagnosis.**

Sir William Osler

TBI Diagnosed by HISTORY.

CULTURAL SIMILARITIES

- Both Warrior Culture and Athlete Culture is one of minimizing the symptoms to continue the mission.
- Health care workers must be hyper-vigilant to detect who is in trouble.
- More control over younger athlete (coach) than warrior (commanding officer) or Pro Player

NEURORADIOLOGY

- Radiologic Studies: Timing/Technique
 1. CT/MRI – Notoriously Negative – VA standard
 2. Diffusion Tensor Imaging – Gold Standard
Lipton et al. Radiology Aug. 2009 (DAI)
 3. PET- SPECT - Hovda UCLA -2007
 4. fMRI –brain mapping

Most veterans tested 1-4 yrs. after last TBI

Most professional athletes tested @ the Game

PITUITARY FUNCTION

Blood work – pituitary profile- GH;
TSH;

LH; ACTH

ESR, Tox screen.

Do NOT miss Dx. of hypopituitarism
which mimics depression.

NEUROPSYCHOLOGICAL TESTING

- May not find unequivocal results
- Most with mild TBI won't show memory deficits
- Lack of baseline
- Helpful in more significant injuries
- ImPACT, COGSTAT, ANAM, Headminder may be useful- used in HS/ not in Military

INCREASED AROUSAL (SYMPATHETIC NERVOUS ACTIVATION)

- Difficulty falling or staying asleep
- Irritability or outbursts of anger
- Difficulty concentrating
- Hypervigilance
- Exaggerated startle response

SUICIDE

- 2nd leading cause of death in military
- Young, White, Unmarried Male Junior Enlisted Active Duty
- Drugs/alcohol
- Firearm
- No psychiatric history (Washington Post, 2008, per CDP)
- 1.2% Army Post-Deployment survey had suicidal ideation (Miliken et al., 2007 per CDP)
- Of completed suicides, most saw a healthcare provider within one month before suicide (USUHS, 2009)
- 19% of patients with PTS will attempt suicide (CDP, 2009)

SUICIDE IN NFL

- Increasing headlines about suicides from high profile athletes – Dave Duerson, Junior Seau, Mike Webster
- 79 NFL players brains studied – 76 with evidence of CTE as of Sept., 2014
- Currently, AUTOPSY diagnosis
- History of declining health precedes suicide

RETURN TO WAR/GAME – DECISION PROCESS COMPLEX

1. Delicate balance of Exercise/Rest – no standards yet based on age/activity-
HOVDA UCLA
2. Who will be involved in decision to return to play, war. – HUGE responsibility
3. Chronicle of recovery – HUGE insight
4. Research opportunities are HUGE, too.

TREATMENT OPTIONS FOR TBI:

- Symmetrel, Methylphenidate, Dextroamphetamine, Modafinil- for processing
- Propranolol, Amitriptyline – for post concussive
- Electronic aides – Bushnell GPS, PDA, iPHONE
- Setting modifications or organization
- Routine/schedule
- Memory strategies (chunking, acronyms, music)
- Pain management as needed

ADJUNCTIVE TREATMENT

- Service
- Education (GI-Bill)
- Psychoeducation and support groups for self and family
- Exercise (use caution with TBI) and pleasurable activity scheduling
- De-toxification from caffeine, stimulants, and alcohol
- Solutions (action-oriented, specific goals)
- Family or marital treatments
- Advocate regarding employment or military problems
- Stress management
- Adequate, restful sleep
- Nutrition
- Relaxation/Rest

TBI TEAM

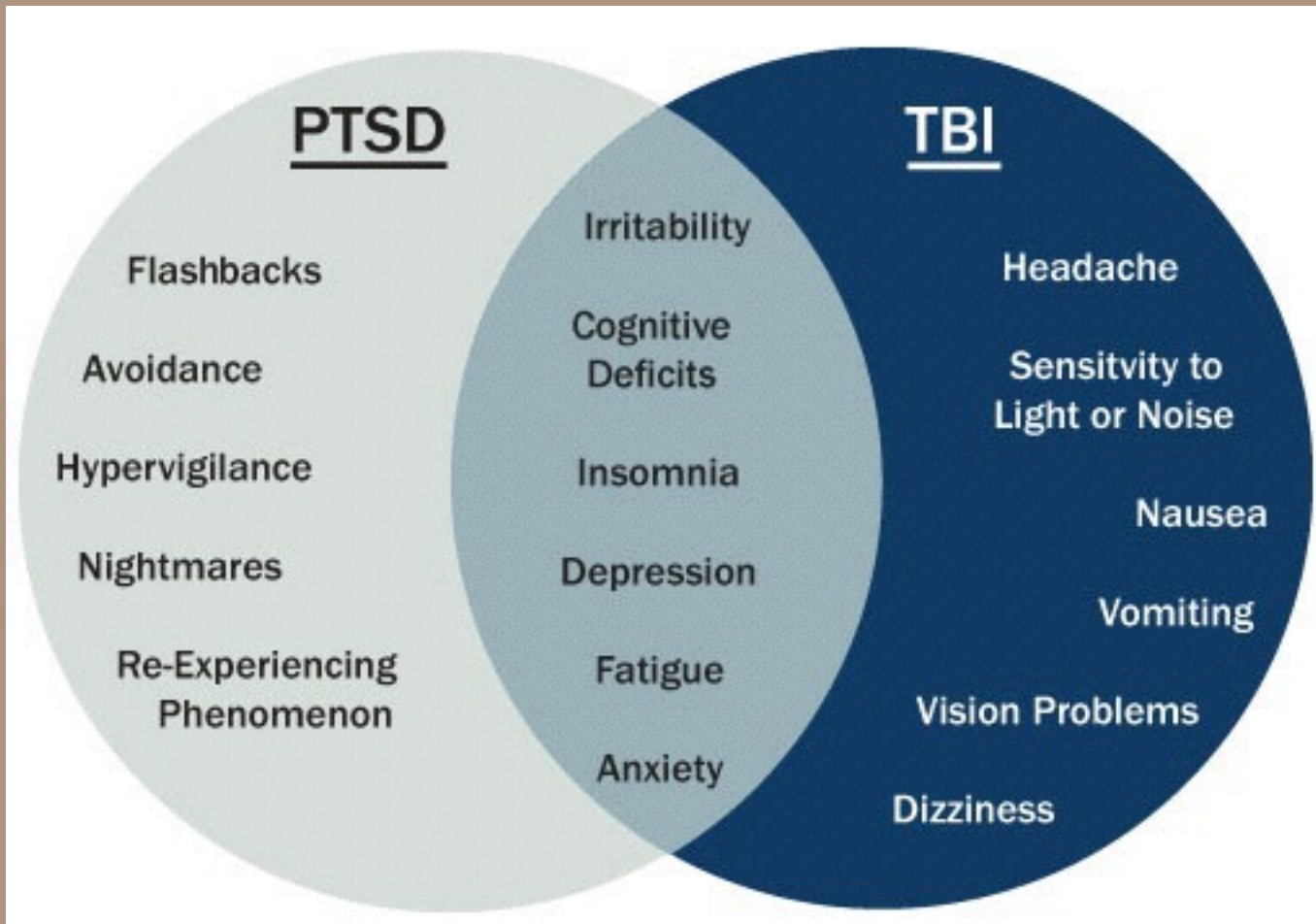
- Primary care physician/specialist
- Nurse/nurse practitioner
- Psychiatrist
- Psychologist/Neuropsychologist
- Counselor
- Social Worker
- Psychiatrist
- Speech-Language Pathologist
- Occupational Therapist
- Physical Therapist

RETURN TO PLAY/WAR/ADL

- Difficult assessment - each TBI is different, each circumstance is different
- Tough decisions which will be challenged
- **WOULD** you return your relative?
- At minimum, patient baselines on **IMPACT** to return to normal, physical exam to normal **BALANCE - KEY**

EXERCISE PARAMETERS

- Treadmill is the 1st key to exercise, usually.
- Gradually increase activity – first length of activity, then difficulty of activity
- Best exercise is the activity itself – CHALLENGE your athlete –ie, exercise PLUS mental challenge – eg. Balance ball
- Document in notes/video – legal document for future reference



Reference: Stein MB, McCallister TW (2009). Exploring the convergence of post-traumatic stress disorder and mild traumatic brain injury. *Am J Psychiatry*; 166:766-776.

SENATOR ROB PORTMAN,(R) - OHIO

- MEPS Act – introduced to mandate baseline mental and brain health parameters, and retest after every deployment or major incident.
- MEPS –Medical Evaluation Parity for Servicemembers
- LANDMARK legislation

SENATOR SHERROD BROWN (D) OHIO

- Significant Event Tracker- mandates documentation for events capable of causing PTSD/TBI
- Event will be documented and accepted by Commanding Officer
- Even if not collaborated, the event remains on the record as some documentation for future evaluations.

RESEARCH POTENTIAL

- Definitely wide open field for exercise and TBI HOW much? How soon? What type?
- Neuroradiology studies are key – eg., DTI for sports injuries – and follow up – U of Vermont Med School studies
- Long term follow up will be key to determine stages of Chronic Traumatic Encephalopathy - CTE

HOLISTIC APPROACH TO TBI

- BODY – needs to keep moving
- MIND- needs time to rest and keep up
- SPIRIT – needs to constantly be nurtured through this process – IT is the most important factor to recovery.

SAGE ADVICE

- Healing is a matter of time, but it is sometimes also a matter of opportunity.
Hippocrates
- WE are responsible for providing the Opportunity for Healing.

PLEASE JOIN THE MISSION

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WHAT WE KNOW NOW - WHAT WE DIDN'T KNOW THEN

- 1. PTSD is chemical form of TBI - Bazarian, MD, MPH University of Rochester
- 2. TBI has cumulative effects
- 3. Brain is Computer - Lose what is on your desktop
- 4. Brain - have to Rewire before you Fire
- 5. Hyper-adrenalin responses MATTER -

PHYSICAL THERAPY – THE NEW NEUROLOGY CLINIC

- Concussions/TBI – often diagnosed and followed most closely by Family Medicine and Physical Therapists – The NEW Neurologists
- Look for vision problems –
PHOTOPHOBIA
- Look for Gait - Balance & Movement
- Watch for Attention, Memory, Emotion

WHAT CAN YOU DO NOW?

- 1. Add strategies in your office practice to screen for TBI- can be a tedious process
- 2. Attend courses on TBI - the new epidemic - only 8% of physicians Dx and TX
- 3. Get involved in Law Making on State and Local level
- 4. Support RLF- a collaborative force for TBI awareness in employment, education, research

THE NEW LOGO FOR RESURRECTING LIVES, INC.



Turn the lights on for TBI

CONCUSSION- BY WILL SMITH



- <https://www.youtube.com/watch?v=Io6hPdC41RM>

POST QUIZ





RESURRECTING LIVES FOUNDATION

A 501(c)(3) Nonprofit Organization

Dr. Chrisanne Gordon, MD,

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Physical Medicine & Rehabilitation Physician



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