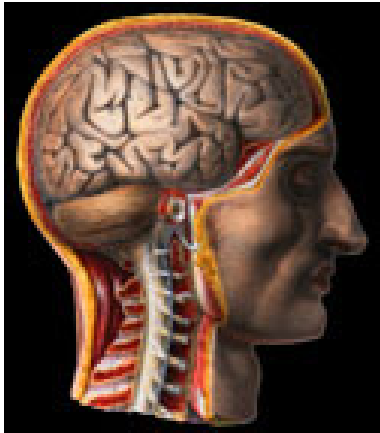

Concussion Update: 2017



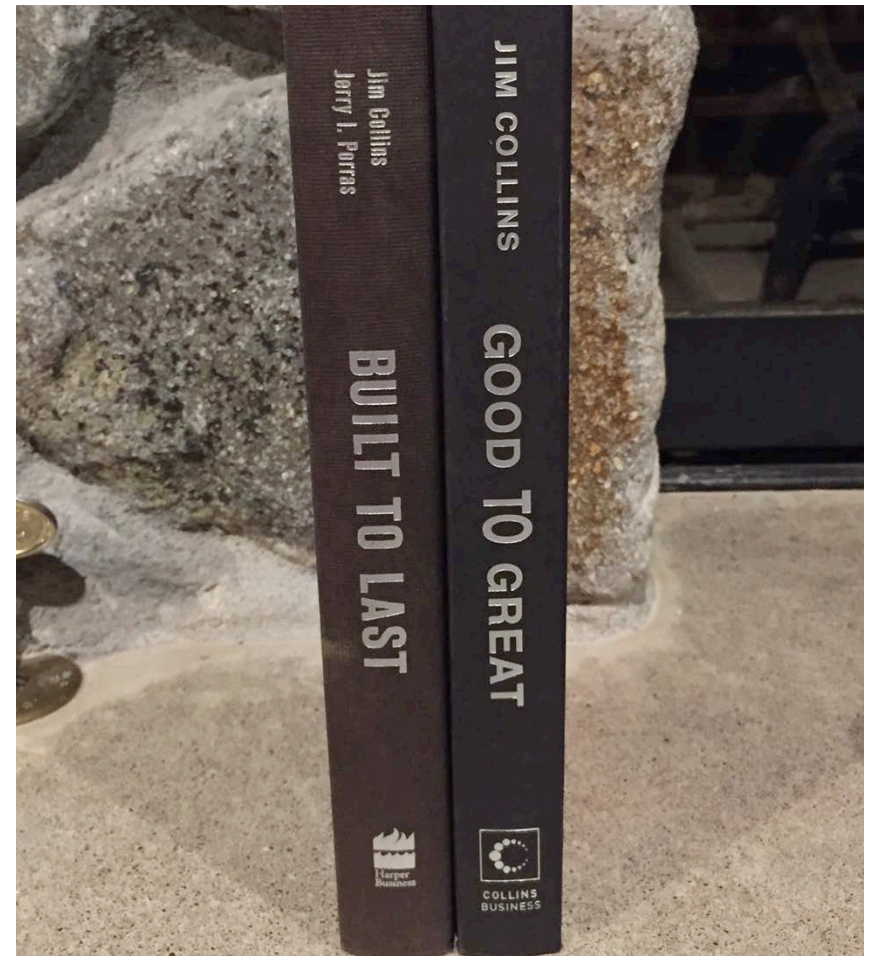
Michael C. Koester, MD

September 22nd, 2017

Slocum Center for Orthopedics and Sports Medicine
Director, Sports Concussion Program
Eugene, Oregon

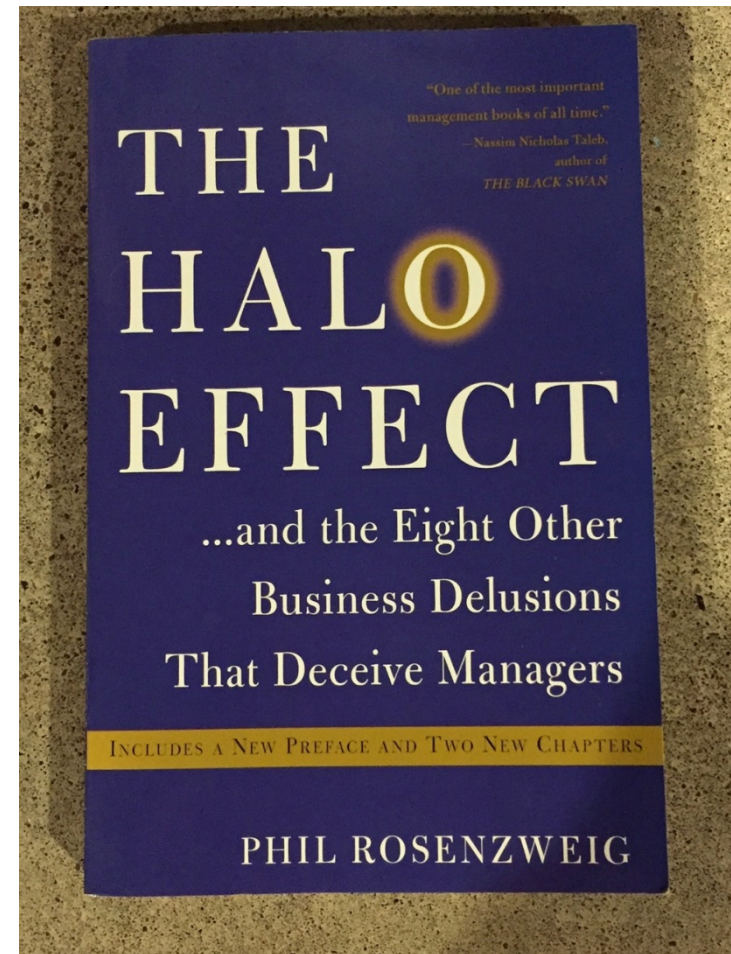
Medicine and Business

- Read these books:
- Built to Last
 - “Clock building, not time telling”
 - BHAGs
 - “Preserve the Core”
- Good to Great
 - “Level 5 Leaders”
 - “First Who...Then What”
 - “The Hedgehog Concept”



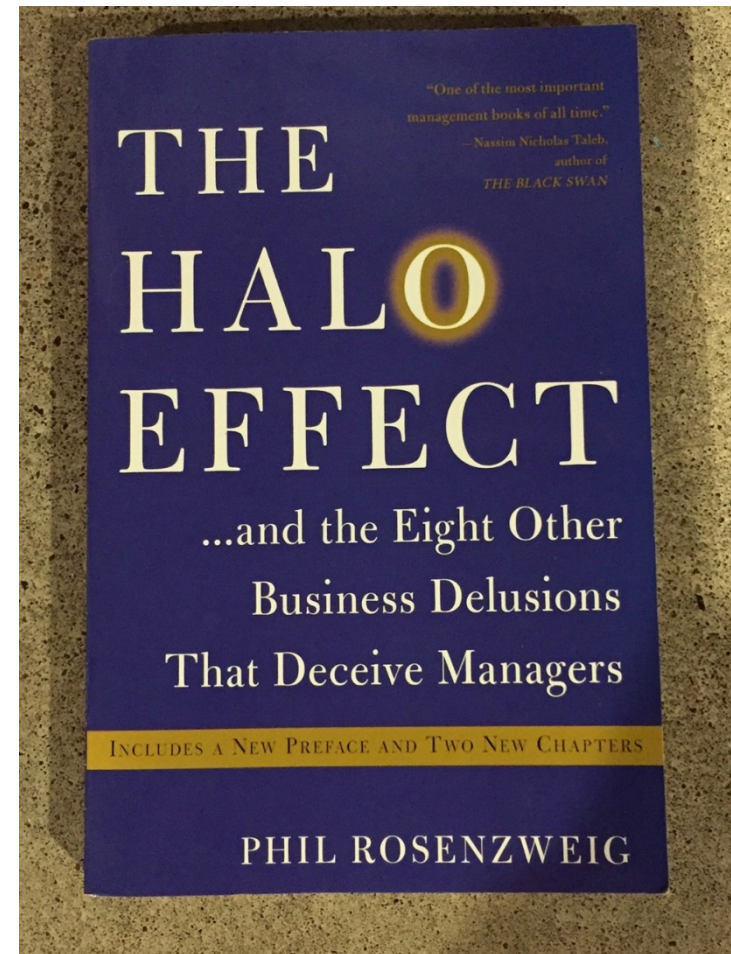
Medicine and Business

- Read this book.....
- Uh-oh!!
- Halo Effect
 - ❑ We assume that because people are good at doing A they will be good at doing B, C and D .
 - ❑ Coined by psychologist Edward Thorndike.
 - ❑ Study with stock picks.....



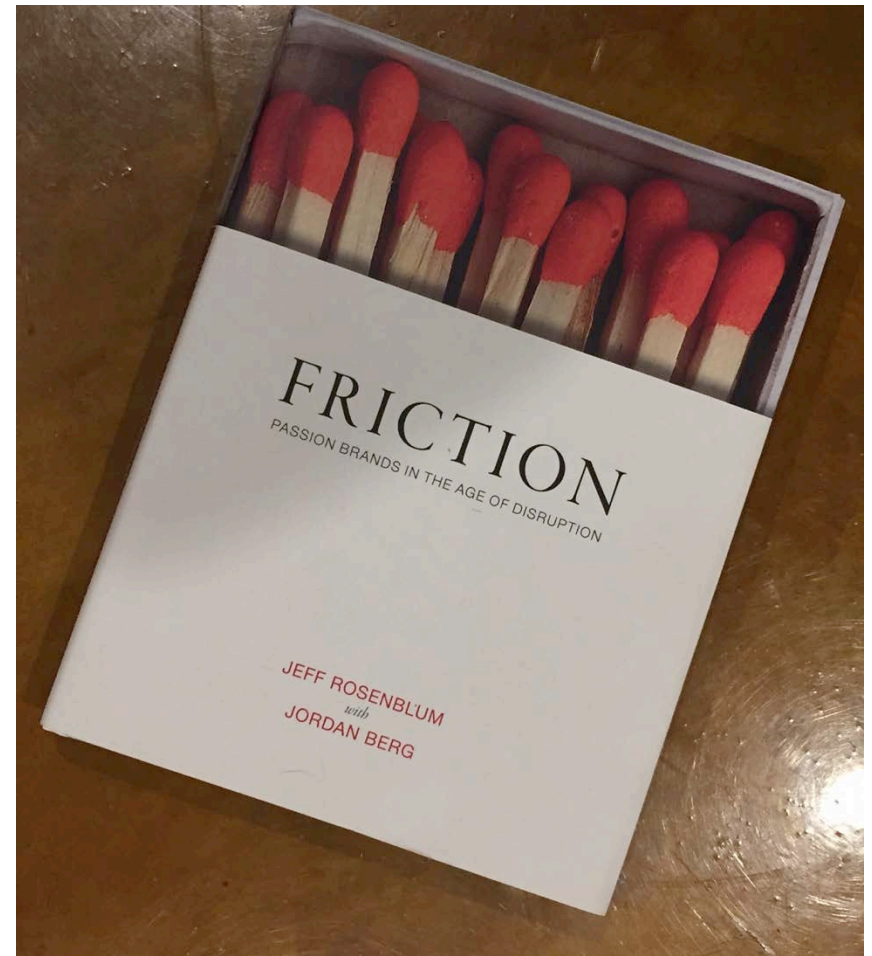
Medicine and Business

- A few examples:
 - ❑ Delusion of Correlation and Causality
 - ❑ Delusion of the Single Explanation
 - ❑ Delusion of absolute Performance
 - Kmart



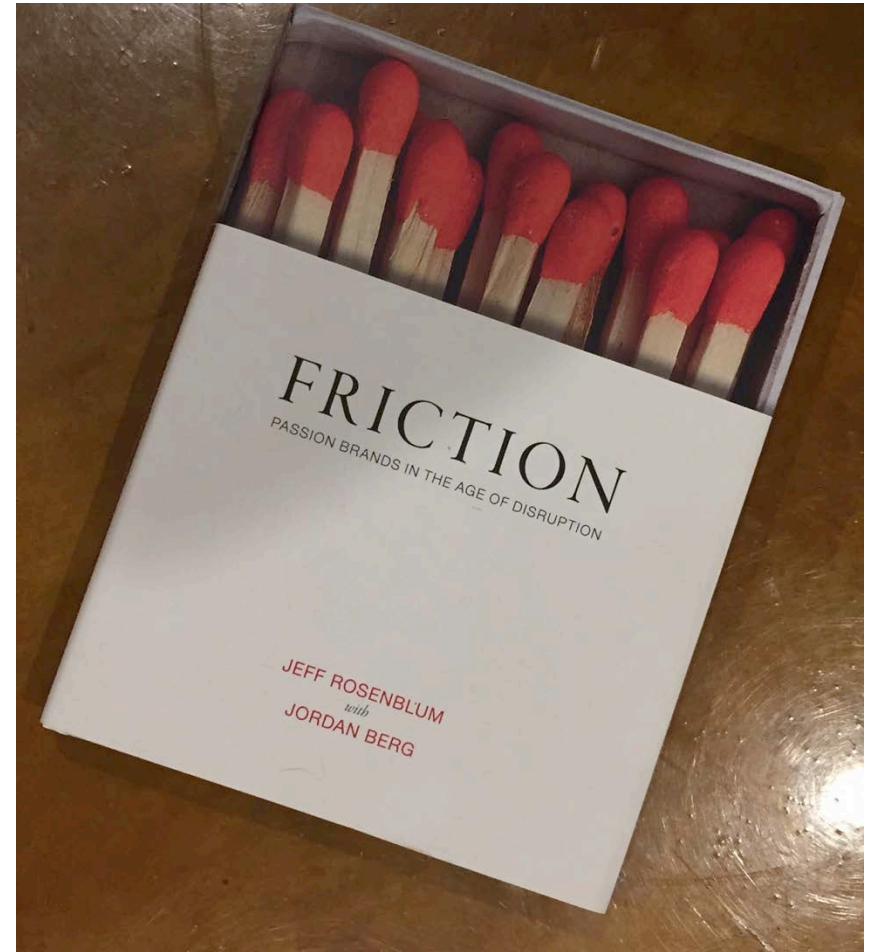
Medicine and Business

- Then read this Book....
- “The difference between the way things are and the way they should be”
 - Uber
- Loved it until...Halo effect!...NOOOO!!!!



Medicine and Business

- Did I waste my time?
- Also learned:
 - PowerPoint presentations are terrible!
 - NASA forbids them
 - You can't listen and read
 - Once you pick up your phone.....



Learning information???

- How do I get you to pay attention??
 - Emoji???
 - Interpretive Dance???
 - Through a story.....
-

What Have I Learned in 30 years

- 1987- Student AT at UNLV
 - Minimal issue
 - 1997- Pediatric Resident at UW
 - Emerging recognition of “Second Impact Syndrome”
 - No good data that the syndrome exists
 - 2007- Eugene- 1st year
 - Handful of athletes with prolonged symptoms after injury- primarily HA, school difficulties
-

Keys to competent clinical practice in a changing field:

- Knowledge changes
 - Do what you know
 - Accept what you don't know
-

Concussion Management: 2017

- Recognize injury and manage properly from beginning
- Pre-existing anxiety or other mental health issues coupled with poor psychosocial supports will usually lead to a bad outcome
- Rare to see prolonged symptoms (> 3 months) in kids without pre-existing mental health pathology

The National High School Sports Injury Surveillance Study: High School RIO™

R. Dawn Comstock, PhD

Professor

Colorado School of Public Health, Epidemiology

University of Colorado School of Medicine, Pediatrics (Emergency Medicine)

Program for Injury Prevention, Education, and Research (PIPER)

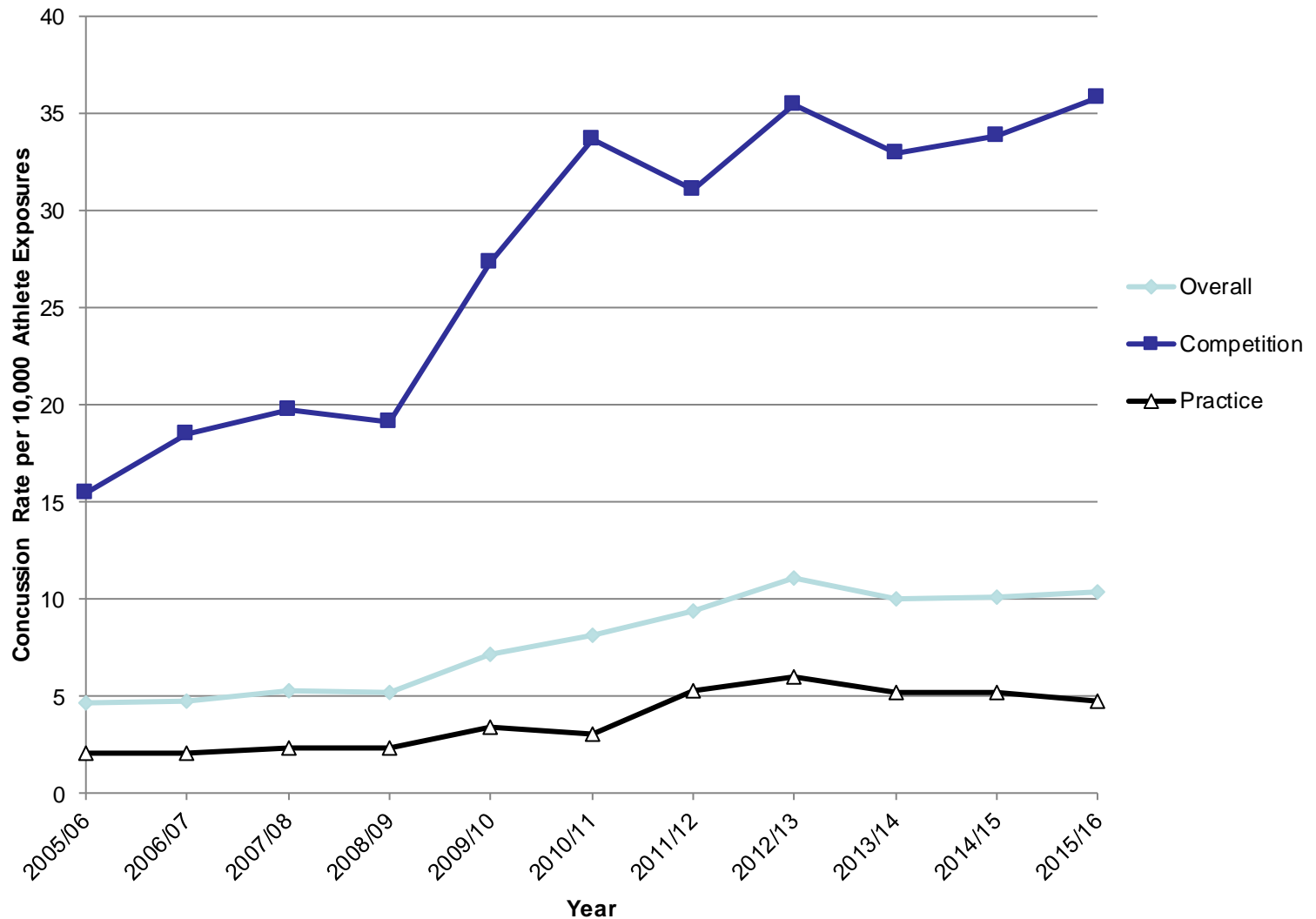
dawn.comstock@ucdenver.edu

(303) 724-7881



PIPER
Colorado School of
PUBLIC HEALTH

Football Concussion Rates over Time 2005/06-2015/16



Football Injury Data

Concussions 2005/06-2015/16

After eight consecutive years of increasing concussion rates, Football concussion rates decreased from 2012/13 to 2014/15, but increased again in 2015/16

- ❑ 4.7 per 10,000 AE 2005/06
- ❑ 9.1 per 10,000 AE 2011/12
- ❑ 10.8 per 10,000 AE 2012/13
- ❑ 10.1 per 10,000 AE 2014/15
- ❑ 10.5 per 10,000 AE in 2015/16
- Boys' Ice Hockey – 7.6/10,000 AE 2015/16.
- Boys' Wrestling – 5.5/10,000 AE 2015/16.
- Boys' Lacrosse – 5.0/10,000 AE 2015/16.
- Boys' Soccer – 4.2/10,000 AE 2015/16.
- Girls' Soccer – 9.1/10,000 AE 2015/16.
 - ❑ ACL 1.17/10,000



National Trends in the Prevalence and Treatment of Depression in Adolescents and Young Adults

Ramin Mojtabai, Mark Olfson, Beth Han

- More concussions or more recognized
- Other factors involved??
 - Anxiety and depression
- 12 month prevalence of MDE in females 12-20
 - 2005-----8.7%
 - 2014-----11.3%

Paradigm Shift

- Prolonged activity restriction after concussion:
Are we worsening outcomes?
 - DiFazio et al, Clinical Pediatrics, 2015
- What is rest?
- Are we increasing anxiety and depression?
 - “Nocebo” effect- causation of sickness by the expectation of sickness
 - Physical deconditioning

Paradigm Shift

- Will be difficult moving forward
 - ❑ Reverse of much of what we've been saying for past few years
 - ❑ Rest but not “too much”
 - ❑ Active but not “too active”
 - ❑ School accommodations, but not missing too much time
 - ❑ “normalization” of activities, but limit risk for reinjury
-

Team Approach

- McCarty et al. Pediatrics 2016
 - Collaborative Care Approach
 - CBT embedded in a team treatment model
 - Randomized trial @ 1 month of symptoms
 - 6 months after baseline assessment:
 - Intervention: 13% high level of symptoms
 - Control: 41.7% high level of symptoms
-

Concussion Team

- PT
 - Neuropsych
 - CBT- “cognitive rehab”
 - Neurology
 - Psychiatry
 - Psychology
 - Athletic Trainer
 - School psych/Counselor
-

Who needs to see a concussion specialist?

■ Those at risk for complicated or prolonged course:

- ❑ Symptoms longer than 2 weeks
- ❑ Vestibular symptoms
- ❑ Pre-existing anxiety/depression
- ❑ Prior concussion in previous 6 months
- ❑ Previous “complicated” concussion
- ❑ Multiple concussions
- ❑ Provider or parent request
- ❑ Clinical/ImPACT predictors

Cutoff Values of ImPACT Neurocognitive Scores at 2 Days Post Injury That Predict Protracted Recovery

	75% Sensitivity	80% Sensitivity	85% Sensitivity
Neurocognitive Domain	Cutoff	Cutoff	Cutoff
Verbal Memory	66.5	64.5	60.5
Visual Memory	48	46	44.5
Processing Speed	24.5	23.5	22.5
Reaction Time	0.72	0.78	0.86

Sensitivity is defined as the ability of the cutoff to accurately identify *protracted* recovery (Mean = 1 month) in an athlete.

*Lau B, Collins MW, Lovell MR.
Neurosurgery 2012.*

	REMOVED (N = 39)	NOT REMOVED (N = 40)
DOI TO MEDICAL CLEARANCE*	19.74 ± 13.60 Days Range: 8 – 66	35.10 ± 22.92 Days Range: 10 - 106
INITIAL EVAL TO CLEARANCE*	16.49 ± 13.13 Days Range: 6 – 63	31.13 ± 23.35 Days Range: 6 - 104

* $p = .001$

Athletes that were NOT removed from play were **5.93 times** more likely to have protracted recovery ≥ 21 days ($\chi^2 = 13.78$, $p < .001$)

Which On-Field Markers/Symptoms Predict **3 or More** **Week** Recovery from MTBI In High School Football Players

On-Field Marker	N	Chi ²	P	Odds Ratio	95% Confidence Interval
Posttraumatic Amnesia	92	1.29	0.257	1.721	0.67-4.42
Retrograde Amnesia	97	.120	0.729	1.179	0.46-3.00
Confusion	98	.114	0.736	1.164	0.48-2.82
LOC	95	2.73	0.100	0.284	0.06-1.37

On-Field Symptom	N	Chi ²	P	Odds Ratio	95% Confidence Interval	
Dizziness**	98	6.97	0.008	6.422	1.39-29.7	**p<.01
Headache	98	0.64	0.43	2.422	0.26-22.4	
Sensitivity LT/Noise	98	1.19	0.28	1.580	0.70-3.63	
Visual Problems	97	0.62	0.43	1.400	0.61-3.22	
Fatigue	97	0.04	0.85	1.080	0.48-2.47	
Balance Problems	98	0.28	0.59	0.800	0.35-1.83	
Personality Change	8	0.86	0.35	0.630	.023-1.69	
Vomiting	97	0.68	0.41	0.600	0.18-2.04	

The total sample was 107. Due to the normal difficulties with collecting on-field markers, there were varying degrees of missing data. The number of subjects who had each coded ranged from 92-98. The N column represents the number of subjects for whom data were available for each category. Markers of injury are not mutually exclusive.

*Lau, Kontos,
Collins, AJSM
2011*

On-Field Symptoms & Protracted Recovery

(Lau et al, 2011)



- **Dizziness** was sole factor related to prolonged recovery; when present, athlete > 6x more likely to take > 3 weeks to recover
- Vomiting & LOC were predictive of **Quick** (<7d) Recovery !!

Variables	Wald χ^2	OR	p	95% CI for OR
DIZZINESS	5.44	6.34	0.02	1.34 -29.91
LOC	2.53	0.27	0.11	0.54 – 1.35
Vomiting	1.45	0.42	0.23	0.10 – 1.72

5th International Conference on Concussion in Sport, October 2016

- Use of sensor systems to detect concussion cannot be supported at this time
- Baseline testing not required
- Brief period of “complete rest”
 - Goal of back to school in 2-3 days
- Multi-disciplinary treatment plan which includes “sub-symptom-threshold, submaximal exercise” before symptom resolution
 - No complete rest!!

5th International Conference on Concussion in Sport, October 2016

- Severity of initial symptoms most consistent predictor of slow recovery (>4 weeks)
 - Migraine history
 - Mental health history- anxiety/depression
- “Schools are encouraged to have a SRC policy”
- A cause-and-effect relationship has not yet been demonstrated between CTE and SRCs or exposure to contact sports
- Limited data on prevention strategies
 - Best data is disallowing body checking in youth hockey

Soccer and Injury

- Headers

- Act of attempting heading
- Ball to head
 - Adaptive
 - Symptoms due to above?

- Absolute risk- look at exposure

- ACL risk??

- 1.17/ 10,000 AE
-

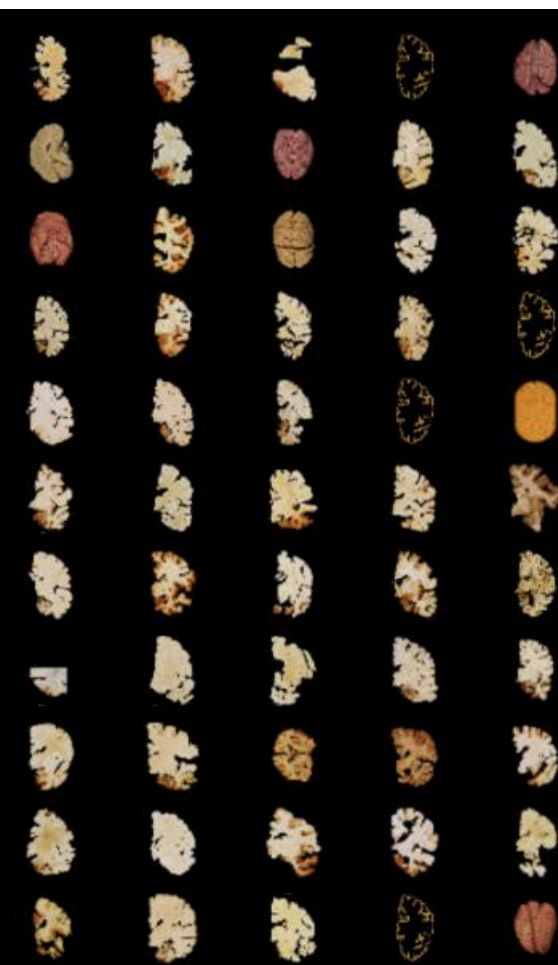
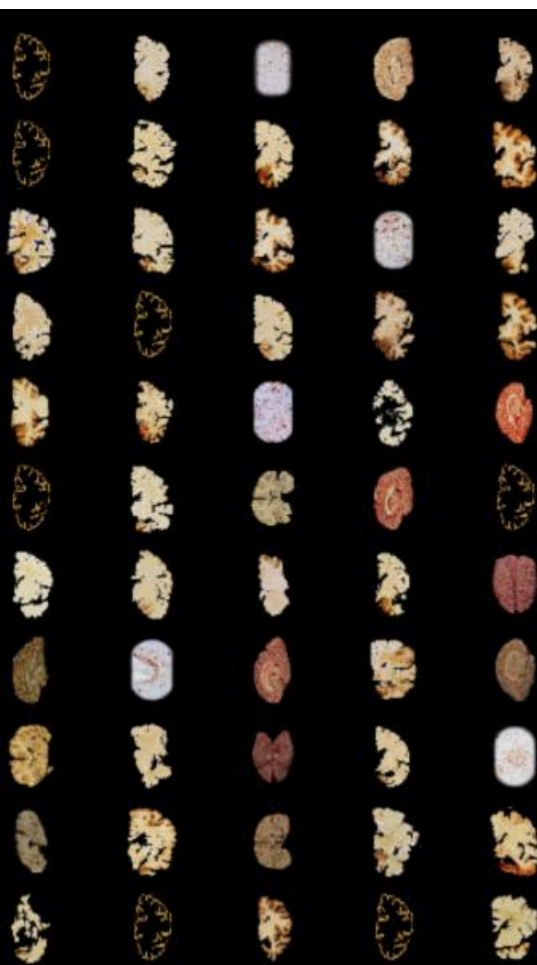


110

N.F.L. Brains

A neuropathologist has examined the brains of 111 N.F.L. players — and 110 were found to have C.T.E., the degenerative disease linked to repeated blows to the head.

By Joe Ward, Josh Williams and Sam Manchester
July 25, 2017



Tauopathies

- Many neurodegenerative diseases involve abnormal accumulation of the microtubule-associated protein tau.
 - Alzheimer's
 - Down's syndrome
 - chronic traumatic encephalopathy
 - frontotemporal dementia
 - Pick's disease
 - corticobasal degeneration
 - progressive supranuclear palsy

Tauopathies

- Tau accumulation is typically an age-dependent process; however, traumatic brain injuries early in life may also induce and/or expedite this phenomenon which was initially observed in boxers, inspiring the term "punch drunk"
 - Tau is a protein that binds to microtubules in the CNS and likely has a role in their stabilization.
-

FOOTBALL

Did High School Football Break Your Brain?

You've heard about the NFL's "concussion crisis"—but what about all those hard hits you took? MF asks an expert about the long-term effects of being knocked silly.

High School Football and Late-Life Risk of Neurodegenerative Syndromes, 1956-1970.

Janssen PH¹, Mandrekar J², Mielke MM³, Ahlskog JE⁴, Boeve BF⁴, Josephs K⁴, Savica R⁵.

Author information

Abstract

OBJECTIVE: To assess whether athletes who played American varsity high school football between 1956 and 1970 have an increased risk of neurodegenerative diseases later in life.

PATIENTS AND METHODS: We identified all male varsity football players between 1956 and 1970 in the public high schools of Rochester, Minnesota, and non-football-playing male varsity swimmers, wrestlers, and basketball players. Using the medical records linkage system of the Rochester Epidemiology Project, we ascertained the incidence of late-life neurodegenerative diseases: dementia, parkinsonism, and amyotrophic lateral sclerosis. We also recorded medical record-documented head trauma during high school years.

RESULTS: We identified 296 varsity football players and 190 athletes engaging in other sports. Football players had an increased risk of medically documented head trauma, especially if they played football for more than 1 year. Compared with nonfootball athletes, football players did not have an increased risk of neurodegenerative disease overall or of the individual conditions of dementia, parkinsonism, and amyotrophic lateral sclerosis.

CONCLUSION: In this community-based study, varsity high school football players from 1956 to 1970 did not have an increased risk of neurodegenerative diseases compared with athletes engaged in other varsity sports. This was from an era when there was a generally nihilistic view of concussion dangers, less protective equipment, and no prohibition of spearing (head-first tackling). However, the size and strength of players from previous eras may not be comparable with that of current high school athletes.

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High School Football and Later Life Cognition and Mental Health: An Observational Study

Sameer K. Deshpande, BS^{*1}; Raiden B. Hasegawa, BA^{*1}; Amanda R. Rabinowitz, PhD²; John Whyte, MD, PhD²; Carol L. Roan, PhD³; Andrew Tabatabaei⁴; Michael Baiocchi, PhD⁵; Jason H. Karlawish, MD¹; Christina L. Master, MD, FAAP, CAQSM^{1,6}; Dylan S. Small, PhD¹

Conclusions and Relevance: Later-life cognitive and depression outcomes were found to be similar for HS football players and their non-playing counterparts from mid-1950s Wisconsin. The risks of playing football today might be different than in the 1950s, but for current athletes, this study provides information on the risk of playing sports today that have a similar head trauma exposure risk as high school football played in the 1950s.

Clinical Trajectories of Concussion

- Cognitive/Fatigue
 - Academic accommodations
 - Vestibular
 - PT
 - Ocular
 - PT/Vision tx
 - Post-traumatic Migraine
 - Medication/exercise
 - Cervical
 - PT
 - Anxiety/Mood
 - Schedule/School!!
 - Exercise
 - Psychology/counseling
-

-
- What is “better” and what is “healed???”
 - Not like orthopedics!!
 - ImPACT
 - School performance
 - Symptoms
 - Physical Exam
 - RTP- no changes
 - Future: dual task gait studies, imaging, biomarkers
-

Prevention

- “Concussion prevention” has become the “holy grail” for sports equipment marketers
 - ❑ Soccer head gear?????
 - ❑ Girls’ Lacrosse head gear/helmets
 - ❑ Pole vaulting helmet
- New football helmets, soccer head pads, mouth guards-
NO PROVEN PROTECTION FROM CONCUSSION!!
- New generation of helmets
 - ❑ Vicis
 - ❑ Xenith
 - ❑ Riddell “Precision Fit”



Future of football

- What is the “State of Football?”

- State summit in April

- Community Program

- “Late” start of contact
 - USA Football
 - Common language
 - Common safety protocols
 - Common goals

- Classification changes

- School size
 - SES (free-reduced lunch)
 - Past success
 - Participation numbers



USA Football

- Protocols
 - ❑ SCA
 - ❑ EAP
 - ❑ Concussion
 - ❑ Heat and Hydration
 - ❑ Contact restrictions
 - ❑ Safe blocking/Tackling
 - ❑ Gear fitting
- Educational materials
- Safety Blogs



Safety Checklist

- Emergency Action Plan
 - Lightning Policy
 - AED
- Concussion Policy
 - Athlete/Parent education
 - Return to play protocol
- Injury Policy
 - Notes for return to play
- Athletic Trainer for game coverage
- Medical Advisor(s)



-
- What if we outlawed football in high schools tomorrow?????

Thank you all very much!!!!



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