



Atlantic Sports Health

ATLANTIC HEALTH SYSTEM

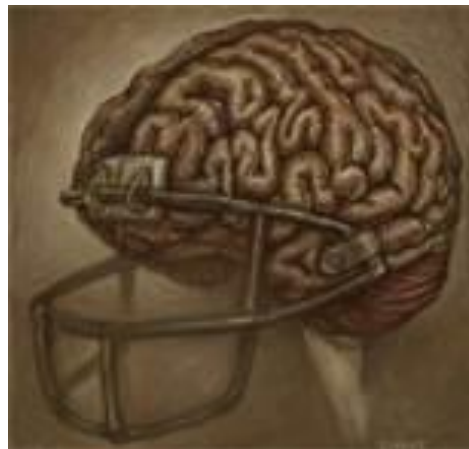
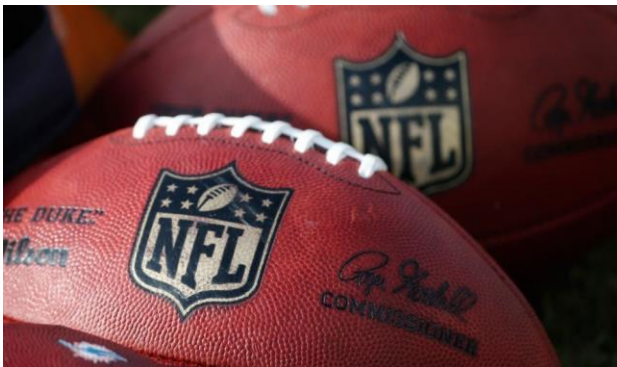
Updates and Current Challenges with the NFL Sideline Concussion Evaluation

Dean Padavan MD

Primary Care Sports Medicine, Atlantic Sports Health, Team Physician New York Jets

Megan Patierno ATC

Atlantic Sports Health



DISCLOSURES

The planners, editors and faculty of this presentation have no relevant financial relationships to disclose.



*Are we **HEADED** in the Right Direction?*





CBS NETWORK

CBS

3RD & 10



MIA 0



BAL 13

2ND 3:21

12



NETWORK

CBS

NETWORK

07 **G** 3RD & GOAL

CBS **3RD & GOAL** **C** CHI 7 **G** GB 21 3RD 4:43 06 **NETWORK**

ESPN WILD CARD





 TEN 3  KC 14 2ND 1:31 37

@CJZERO

Objectives

- Why are we talking about concussions again?
- Updates from the neurology conference
- Epidemiology of concussions in the NFL
- Review common signs and symptoms
- NFL game day concussion protocol
- Why are concussions so hard to diagnose
- Post-Test with videos



Not another concussion talk...

- Media scrutiny
- NFL rule updates (fines and draft picks)
- How can we improve?



News Headlines

\$1.50 - NYDailyNews.com

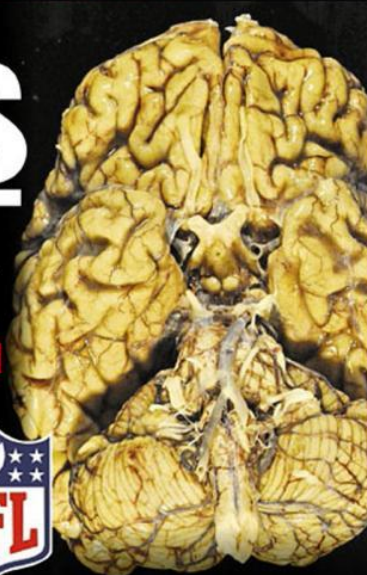
SPORTS FINAL

Partly cloudy, 37/34. Saturday, January 30, 2016

DAILY NEWS


NEW YORK'S HOMETOWN NEWSPAPER

This is your brain on football



Despite immense pressure from the medical community and attempts to lower concussion rates, the NFL reported a whopping increase in head injuries for 2015.

SEE SPORTS



- **NFL concussions up a stunning 58%**
- **Frightening figures just 'tip of iceberg'**

WHITE HOUSE: HIL HAD TOP-SECRET EMAILS PAGES 6-7

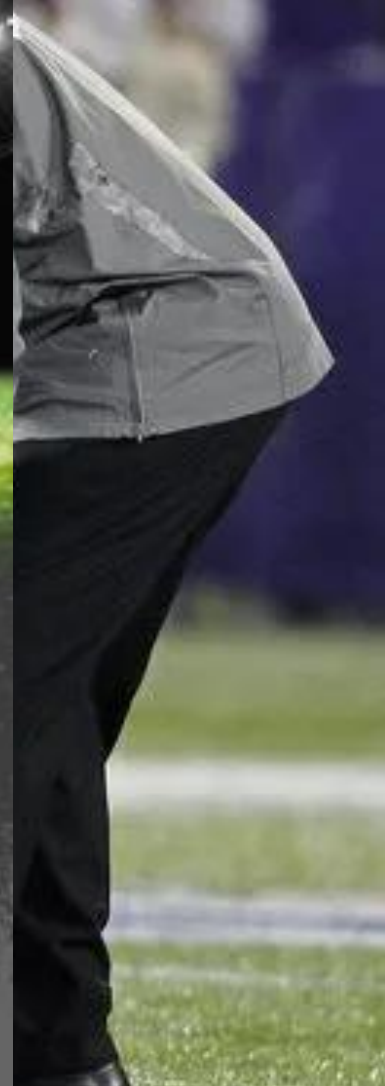
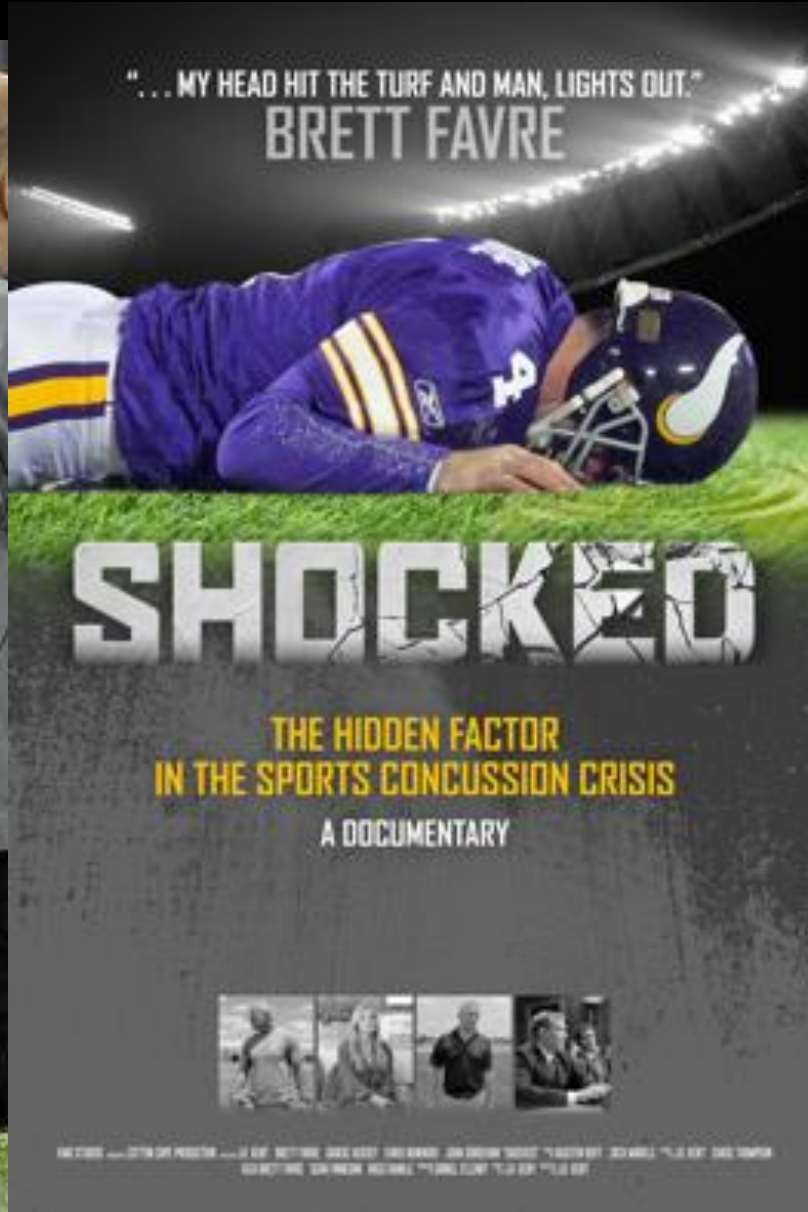
ANN C. MCKEE/VA BOSTON/BOSTON

Former Players

NFL
Football
Concussion

By Jade Scott

or



Discipline For Violations

- First violation- remedial education and/or max fine of **\$150,000** against the club
- Further violations- minimum **\$100,000** against the team
- If the commissioner determines medical team failed to follow protocol because of ***competitive considerations***, the club may be required to forfeit draft pick(s).



We Are Still Not Perfect

- We need to understand the in-game factors that are associated with concussions in the NFL.
- Leads to efforts directed at athlete safety, improvements in equipment, rules, coaching and playing technique



Objectives



Consensus statement on concussion in sport—the 5th international conference on concussion in sport held in Berlin, October 2016

Paul McCrory,¹ Willem Meeuwisse,² Jiří Dvorak,^{3,4} Mark Aubry,⁵ Julian Bailes,⁶ Steven Broglio,⁷ Robert C Cantu,⁸ David Cassidy,⁹ Ruben J Echemendia,^{10,11} Rudy J Castellani,¹² Gavin A Davis,^{13,14} Richard Ellenbogen,¹⁵ Carolyn Emery,¹⁶ Lars Engebretsen,¹⁷ Nina Feddermann-Demont,^{18,19} Christopher C Giza,^{20,21} Kevin M Guskiewicz,²² Stanley Herring,²³ Grant L Iverson,²⁴ Karen M Johnston,²⁵ James Kissick,²⁶ Jeffrey Kutcher,²⁷ John J Leddy,²⁸ David Maddocks,²⁹ Michael Makdissi,^{30,31} Geoff T Manley,³² Michael McCrea,³³ William P Meehan,^{34,35} Sinji Nagahiro,³⁶ Jon Patricios,^{37,38} Margot Putukian,³⁹ Kathryn J Schneider,⁴⁰ Allen Sills,^{41,42} Charles H Tator,^{43,44} Michael Turner,⁴⁵ Pieter E Vos⁴⁶

Terminology:

- **CISG** – Concussion in sport group
- **SRC** – Sport related concussion
- **TBI** – Traumatic brain injury

Is concussion part of a TBI spectrum with less structural change than severe TBI?

UNRESOLVED



Consensus statement on concussion in sport—the 5th international conference on concussion in sport held in Berlin, October 2016

Paul McCrory.¹ Willem Meeuwisse.² Jiří Dvorak.^{3,4} Mark Aubry.⁵ Julian Bailes.⁶

Definitions:

- SRC is a ***brain injury***.
- Direct blow that ***transmits*** a force to the head
- Rapid onset of short lived impairment of ***neurological function***
- May result in neuropathological change but the acute signs and symptoms reflect a ***functional disturbance***



Consensus statement on concussion in sport—the 5th international conference on concussion in sport held in Berlin, October 2016

Paul McCrory.¹ Willem Meeuwisse.² Jiří Dvorak.^{3,4} Mark Aubry.⁵ Julian Bailes.⁶

Definitions:

- Standard structural neuroimaging is ***normal***
- SRC results in a range of clinical signs and symptoms that ***may or may not*** involve loss of consciousness
- Symptoms cannot be explained by **drug, alcohol, medications or other injuries** (i.e. cervical injuries, peripheral vestibular dysfunction, psychiatric)



Consensus statement on concussion in sport—the 5th international conference on concussion in sport held in Berlin, October 2016

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- Standard orientation questions (time, place and person) are ***unreliable***
- Helmet based sensor systems to diagnose or assess SRC is ***not supported***



Descriptive Characteristics of Concussions in National Football League Games, 2010-2011 to 2013-2014

Michael D. Clark,^{*†} BS, Breton M. Asken,[‡] MS, ATC, Stephen W. Marshall,^{*§||} PhD, and Kevin M. Guskiewicz,^{*†§¶} PhD, ATC
Investigation performed at the University of North Carolina at Chapel Hill, Chapel Hill, North Carolina, USA

Epidemiology:

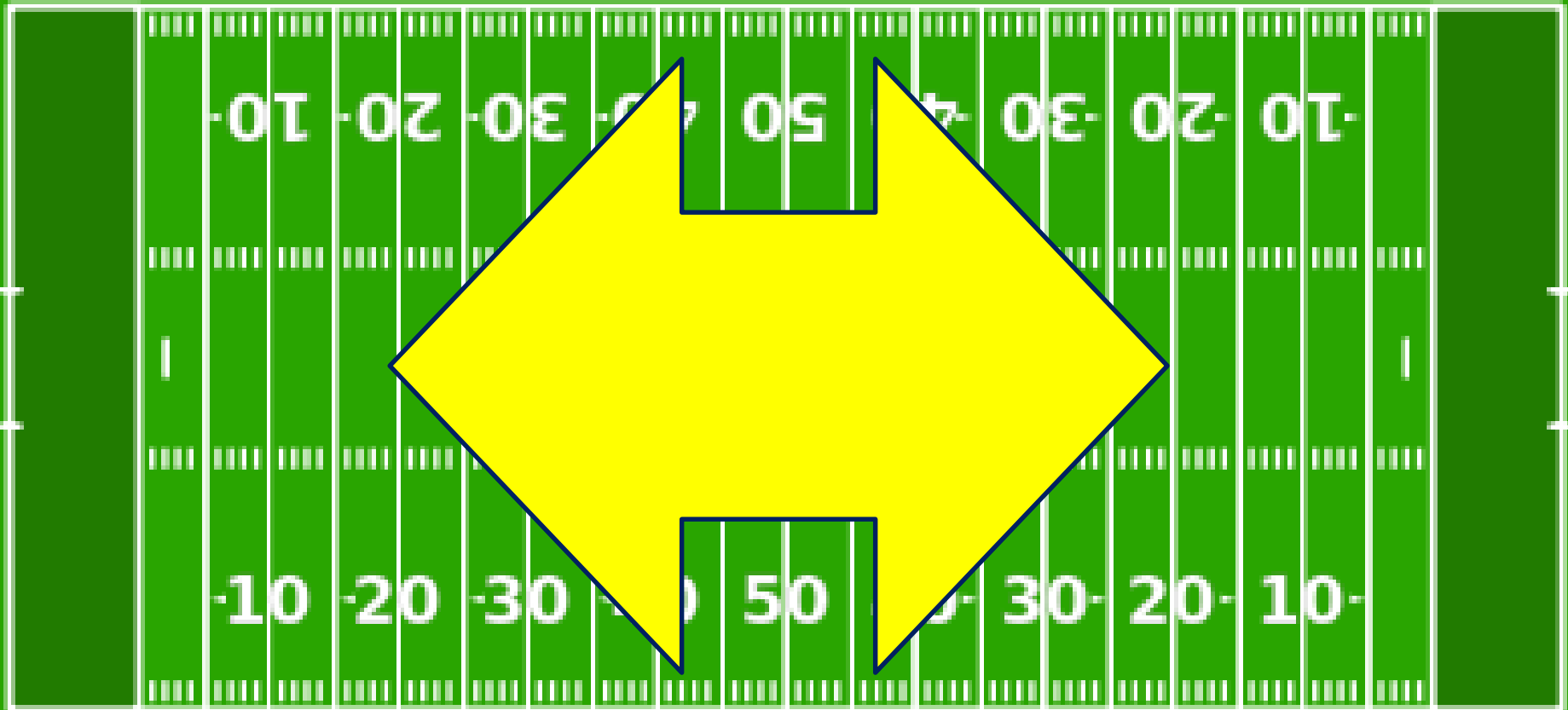
- 871 SRC reported 2010-2014
- 1324 games, incidence rate of **0.658**



More concussion occurred in the *last quarter*
(29.6%)



Most occur *between the offensive and defensive 20 yard lines*, 32.2% in the red zone



Majority occurred with *less than 10 yards* (59%)



Game Schedules and Rate of Concussions in the National Football League

Masaru Teramoto,^{*†} PhD, MPH, Daniel M. Cushman,[†] MD, Chad L. Cross,[‡] PhD, PStat(R), Heather M. Curtiss,[†] MD, and Stuart E. Willick,[†] MD

Investigation performed at the University of Utah, Salt Lake City, Utah, USA

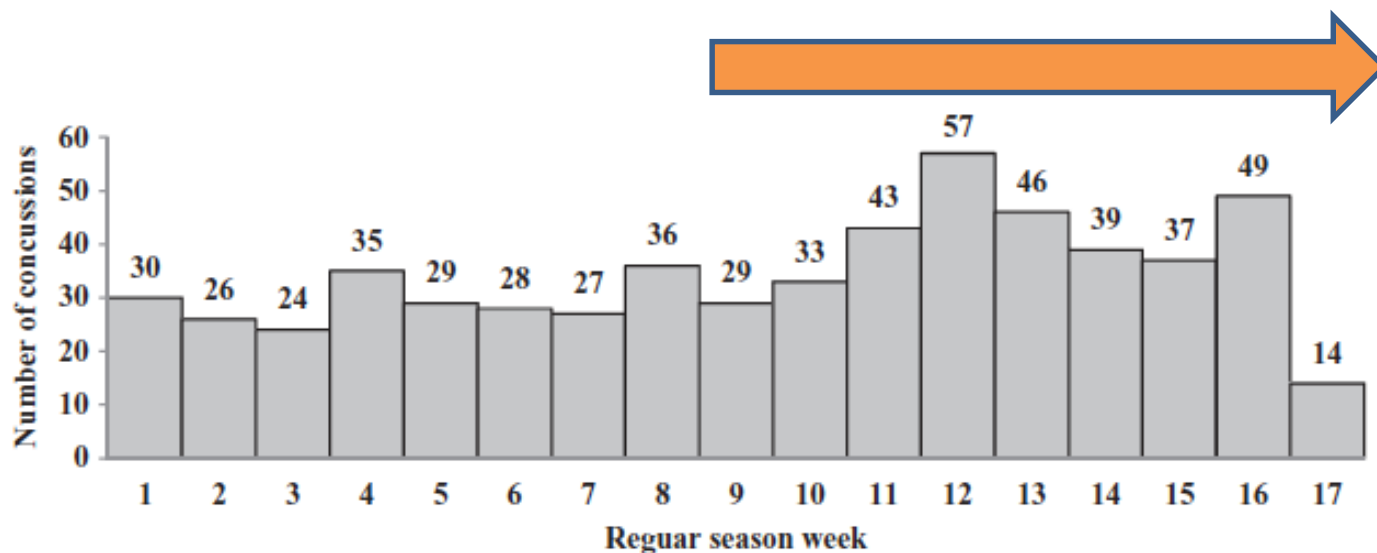
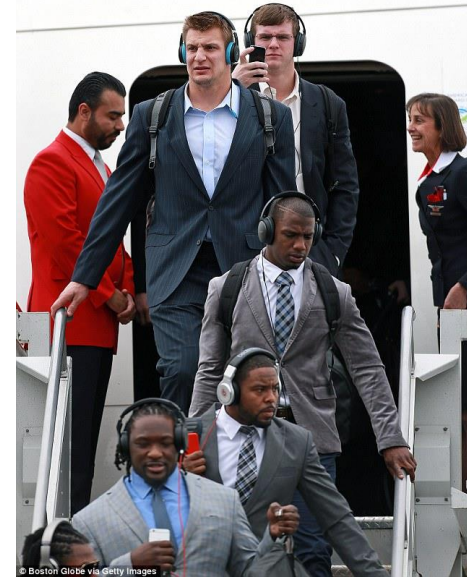


Figure 1. Concussions by regular-season week during the 2012-2015 National Football League seasons (N = 582).



Time of the Week

- ***More away game concussions***
- No association between concussion and timing of bye week
- No association of playing overseas
- ***Less rest days (Thursday night game) did not increase concussions***
- ***Increased risk after longer rest (9-14 days)***



Data is Driving Change





Teramoto, M et al. Game schedules and rate of concussions in the NFL. The orthopedic journal of sports medicine. 2017.



NO HELMET SYSTEM CAN COMPLETELY PROTECT AGAINST SERIOUS BRAIN AND/OR NECK INJURIES A PLAYER MIGHT SUSTAIN WHILE PARTICIPATING IN FOOTBALL.

Objectives

- Why are we talking about concussions again?
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Observable Signs

- Loss of consciousness
- Slow to get up
- Motor coordination/ balance problems
- Blank or vacant look
- Disorientation
- Amnesia
- Clutching of head after contact
- Facial injury in combination with above



Loss of consciousness



Slow to get up



Motor coordination problems







Vacant look/ Disorientation



Amnesia



Clutching of head after contact



Facial injury, plus



Impact Seizures



Sport-related concussive convulsions: a systematic review

Nicholas O. Kuhl^a, Aaron M. Yengo-Kahn^{a,b}, Hannah Burnette^c, Gary S. Solomon^{a,b} and Scott L. Zuckerman^{a,b}

^aVanderbilt Sports Concussion Center, Vanderbilt University School of Medicine, Nashville, TN, USA; ^bDepartment of Neurological Surgery, Vanderbilt University Medical Center, Nashville, TN, USA; ^cSurgical Outcomes Center for Kids (SOCKs), Vanderbilt University Medical Center, Nashville, TN, USA

Concussive convulsions:

- Initial period of tonic stiffening followed by myoclonic jerks of all limbs
- Occur within seconds of impact
- Last for seconds

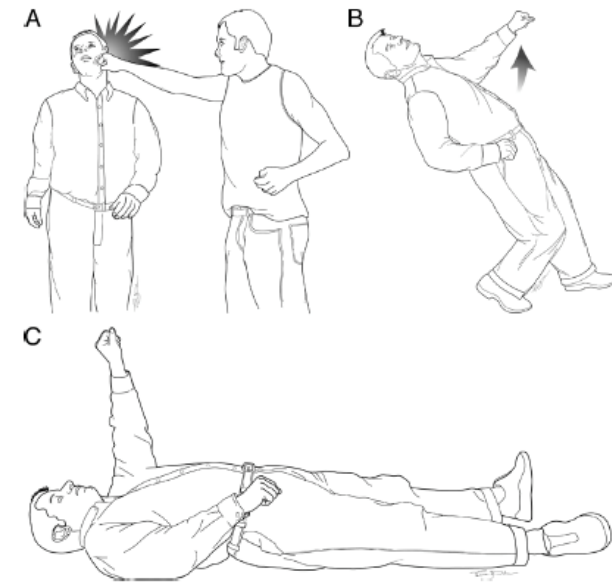


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Asymmetric posturing:



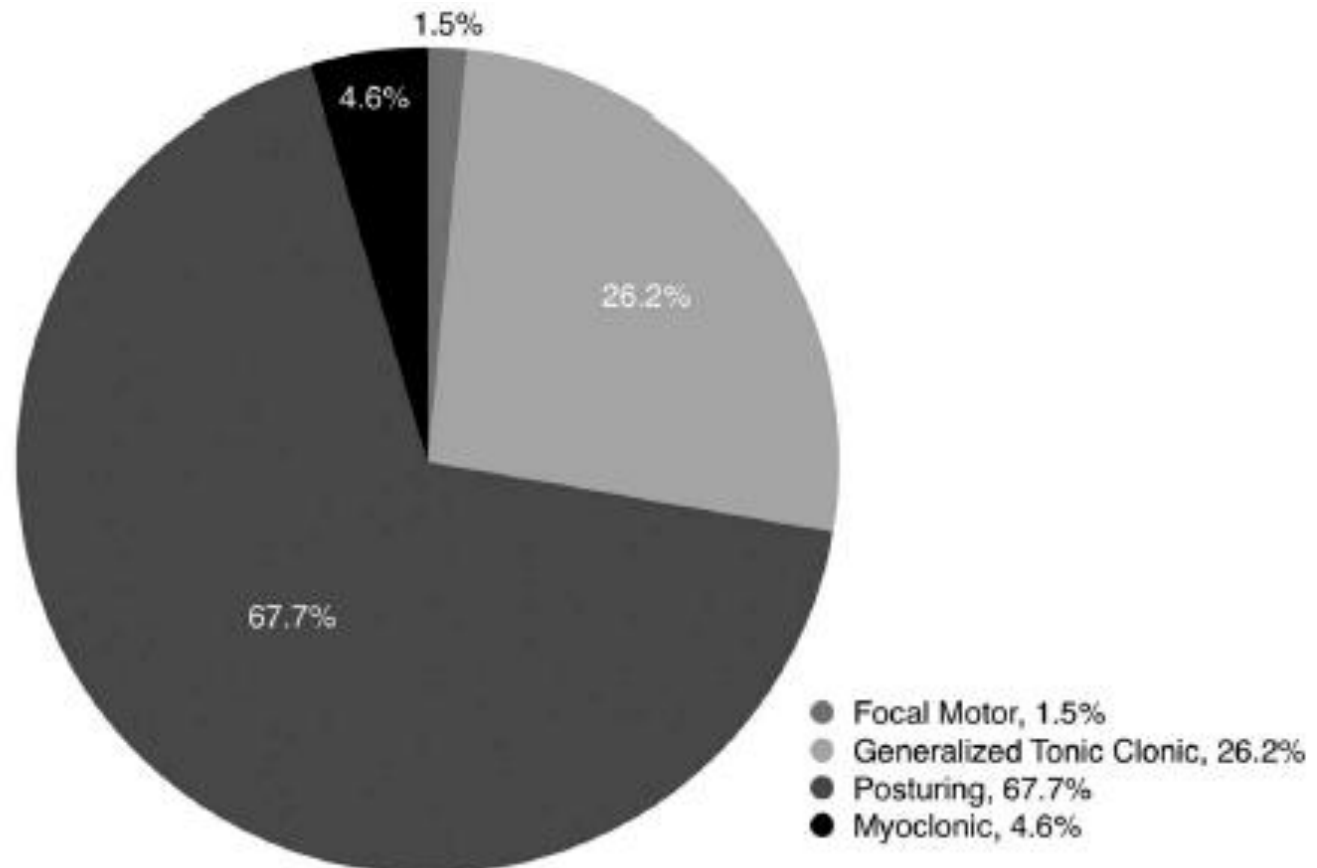
- Tonic posturing without clonic movements



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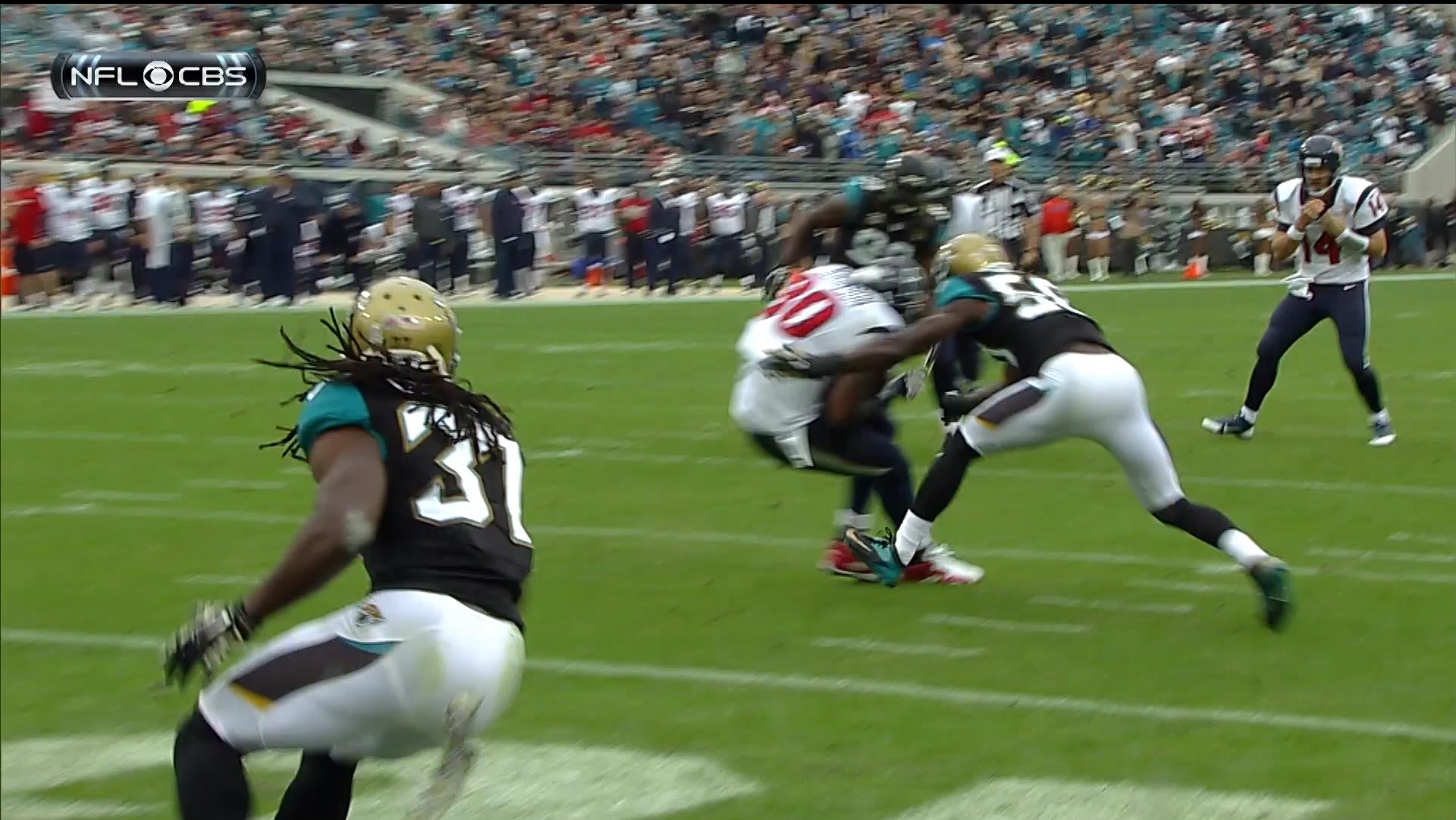
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Bear Hug Posture



NFL CBS



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Fencing Response



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Righting Movements



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- ***No clear consensus*** currently exists on the prevalence of seizures or their associated morbidity in sports-related activity.



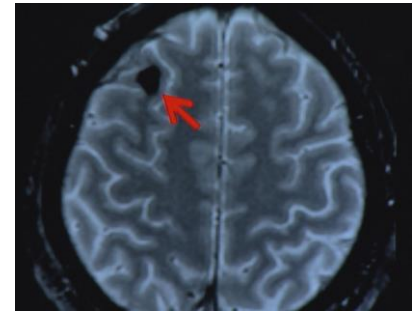
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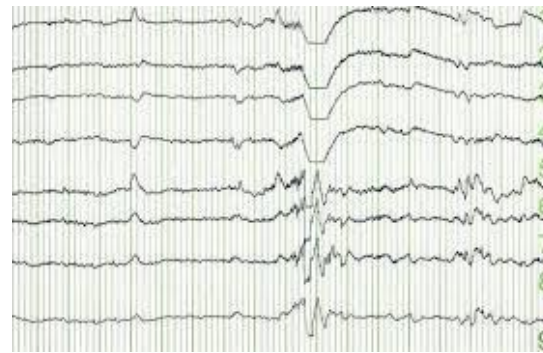
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Clinical management

1. Imaging?



2. EEG?



3. Anti seizure medication?



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- ***Education*** can improve sideline recognition and acute stabilization of the athlete
- 68% of SRC-C is characterized by ***posturing***
- Recognizing the ***“bear hug posture”*** or ***“fencing response”*** immediately after head impact is paramount



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Ominous Signs

- Delayed seizure onset
- Extended periods of unconsciousness
- Lucid interval prior to losing consciousness
- Seizure greater than 5 minutes
- Focal neurological deficit

**Emergency Action Plan and Prompt Emergency
Medical Attention**



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- CISG guidelines - concussive convulsions ***should not be a modifying factor*** in the management of SRC
- This can be concluded given the low incidences of imaging studies with positive findings, EEGs with abnormal features, long-term sequelae, and AEDs required for pharmacologic control.



Potential Concussion Symptoms

- Headache
- Dizziness
- Balance or coordination difficulties
- Nausea
- Amnesia
- Cognitive Slowness
- Light/sound sensitivity
- Disorientation
- Visual disturbance
- Tinnitus



When to send to the ER

- Worsening headache
- Very drowsy or not easily awakened
- Unable to recognize people
- Significant nausea or vomiting
- Develops weakness or numbness in arms or legs
- Develops seizures
- Slurred speech



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Game Day Home Coverage

THE TEAM BEHIND THE TEAM 30 GAME DAY MEDICAL STAFF

ON AVERAGE EACH TEAM HAS:



4 ATHLETIC TRAINERS
Assess and treat player injuries in conjunction with team doctors



2 PRIMARY CARE PHYSICIANS
Evaluate players for general medical conditions and concussions



2 ORTHOPEDISTS
Evaluate and treat players for injuries to the bones and joints



1 UNAFFILIATED NEUROTRAUMA CONSULTANT
Evaluates players for possible head injuries and concussions



1 CHIROPRACTOR
Provides back/spinal adjustments for players and treats muscular injuries

STADIUM MEDICAL TEAM:



2 INDEPENDENT ATHLETIC TRAINERS
Notify on-field medical staff of possible injuries from press box. The independent AT spotters can call a medical timeout to stop the game to have a player receive medical attention



1 RADIOLOGY TECHNICIAN
Takes x-rays of injured players at the stadium



1 OPHTHALMOLOGIST
Treats eye injuries



2 EMTS/PARAMEDIC CREW
Transport players to hospital in the event of serious injuries



1 UNAFFILIATED NEUROTRAUMA CONSULTANT
Monitors broadcast video/audio and notifies on-field UNCs of possible head, neck or spine injuries



1 DENTIST
Treats dental issues



1 VISITING TEAM MEDICAL LIAISON
Local emergency physician certified to practice medicine in the state where the game is being played. The VTML works with the team to provide access to care, medication and first-rate medical facilities



1 AIRWAY MANAGEMENT PHYSICIAN
Provides emergency intubation to severely injured, non-breathing players



NFL CONCUSSION PROTOCOL

THE PROTOCOL MAY BE TRIGGERED BY:

TEAMMATE



GAME OFFICIAL



ATC SPOTTERS
OR BOOTH UNC



TEAM OR UNAFFILIATED
MEDICAL PERSONNEL



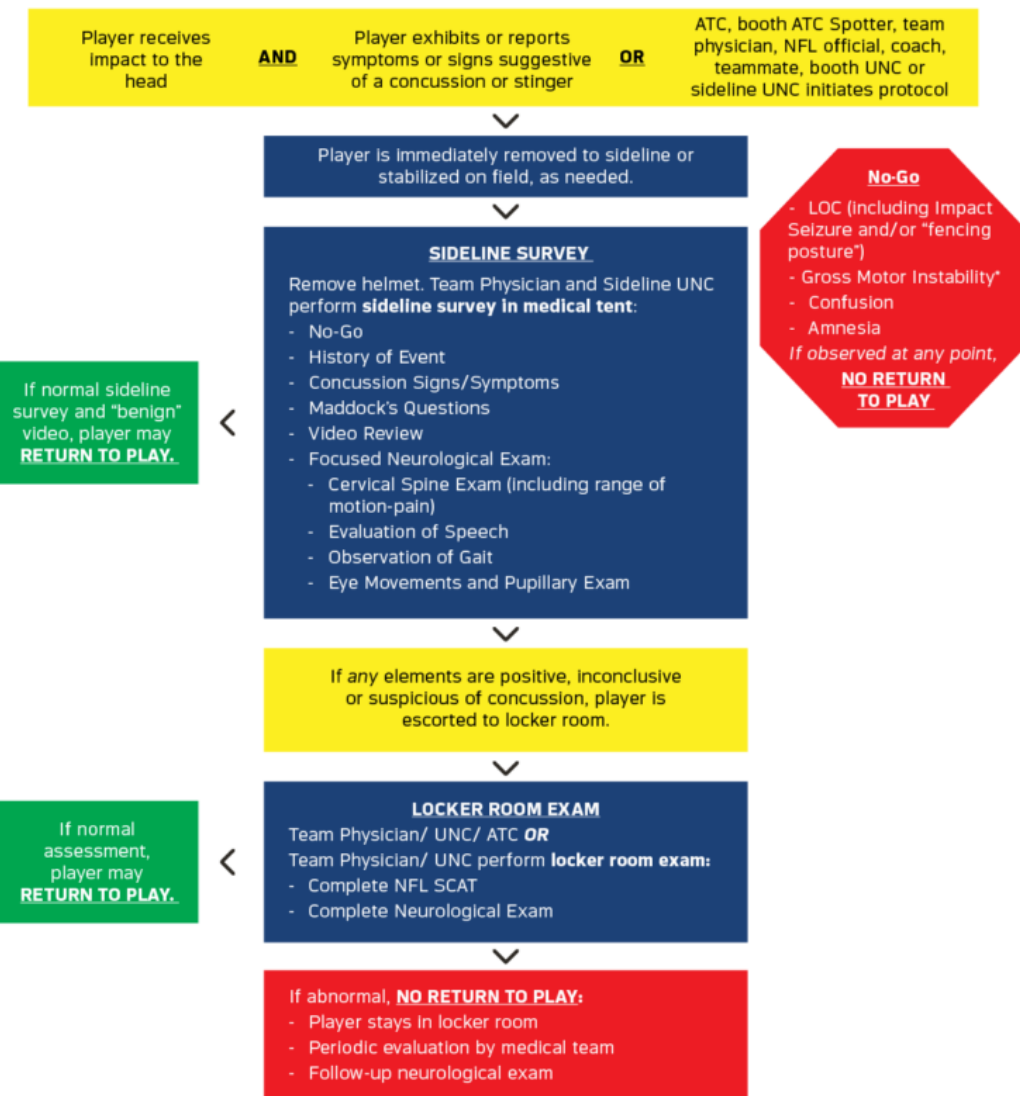
COACH



So what happens when someone is suspected of having a concussion?



CONCUSSION GAME DAY CHECKLIST



During above checklist, if player demonstrates progressive/ worsening concussion symptoms -> **No Return to Play**

* Determined by team physician, in consultation with the UNC, to be neurologically caused

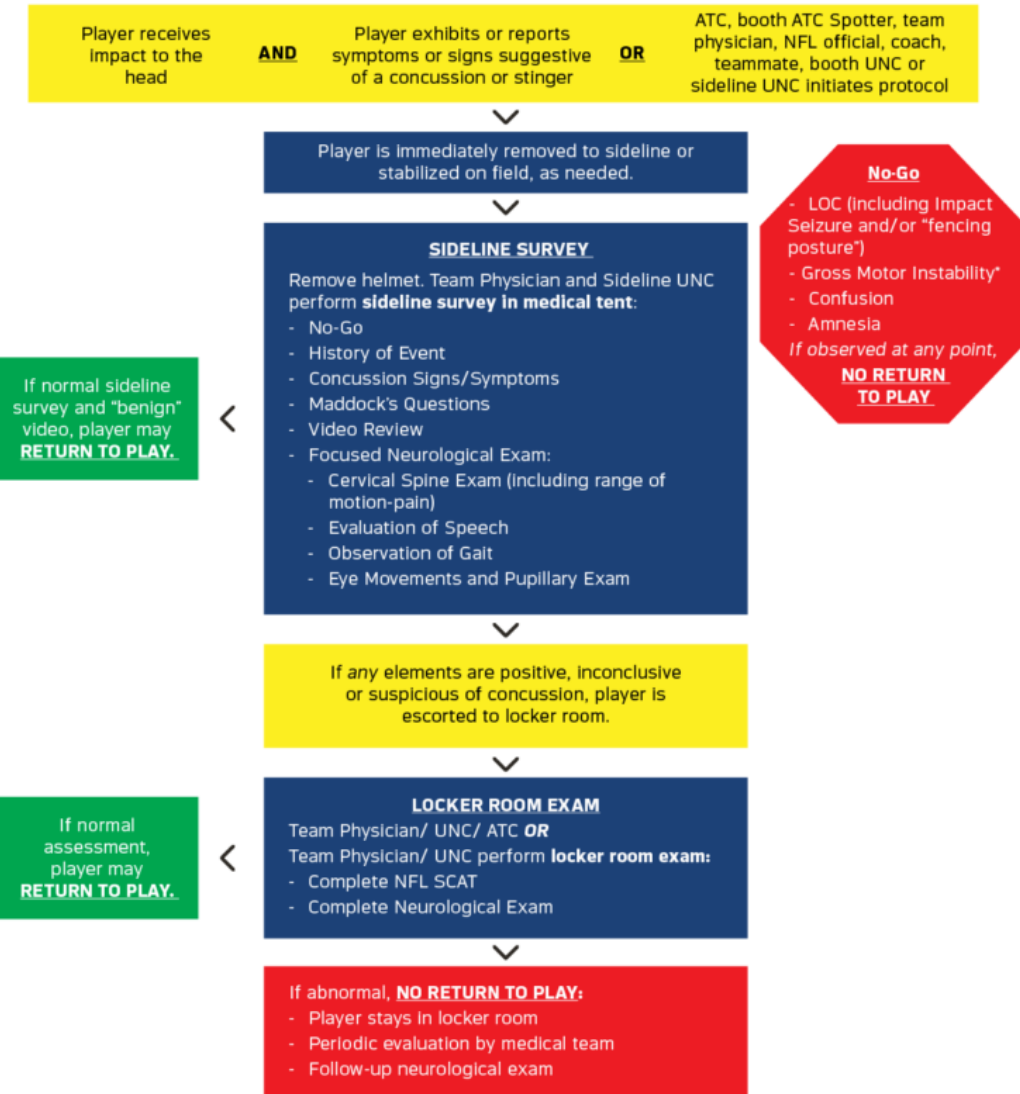
Revised June 2018



Tent Evaluation



CONCUSSION GAME DAY CHECKLIST



During above checklist, if player demonstrates progressive/ worsening concussion symptoms -> **No Return to Play**

* Determined by team physician, in consultation with the UNC, to be neurologically caused

Revised June 2018



Unaffiliated Neurotrauma Consultant



Video Review



Locker Room Evaluation



The Sport Concussion Assessment Tool 5th Edition (SCAT5): Background and rationale

The Sport Concussion Assessment Tool 5th Edition (SCAT5): Background and rationale

Ruben J Echemendia,^{1,2} Willem Meeuwisse,³ Paul McCrory,⁴ Gavin A Davis,^{5,6}
Margot Putukian,^{7,8} John Leddy,^{9,10} Michael Makdissi,^{6,11} S John Sullivan,¹²
Steven P Broglio,¹³ Martin Raftery,¹⁴ Kathryn Schneider,^{15,16,17,18} James Kissick,¹⁹
Michael McCrea,²⁰ Jiří Dvořák,²¹ Allen K Sills,²² Mark Aubry,²³ Lars Engebretsen,^{24,25}
Mike Loosemore,²⁶ Gordon Fuller,²⁷ Jeffrey Kutcher,²⁸ Richard Ellenbogen,²⁹
Kevin Guskiewicz,³⁰ Jon Patricios,^{31,32} Stanley Herring^{29,33}

SCAT5[©]

SPORT CONCUSSION ASSESSMENT TOOL – 5TH EDITION

DEVELOPED BY THE CONCUSSION IN SPORT GROUP

FOR USE BY MEDICAL PROFESSIONALS ONLY

supported by



FIFA[®]



FEI





- Team Overview**
- #01 Alonzo, Albert RTP 2
 - #02 Brown, Robert Go
 - #03 Carsow, Charles RTP 1
 - #04 Dahlstrom, David Go
 - #05 Evans, Eamon RTP 2
 - #06 Foxgrove, Frederick No Go
 - #07 Grove, Gary RTP 4
 - #08 Heffner, Heath RTP 3
 - #09 Ingraham, Isaac RTP 1
 - #10 Jones, Jacob** Go
 - #222 Zconversion, Erika RTP 1
 - #333 Zconversion, Nor... RTP 3
 - #111 Zconversion, Wayne Go



#10
Jones, Jacob
Active

concussions

5 | 1 | 2

lifetime 3 months 1 year

assessments

0 | 0 | 0

baseline injury RTP



date	exam	examiner	decision	edit
14 Jun	Post Injury	Scott, Wayne	Go	✎ >
07 Jun	Return To Play	Scott, Wayne	Go	✎ >
07 Jun	Return To Play	Scott, Wayne	RTP 1	✎ >
07 Jun	Return To Play	Scott, Wayne	Go	✎ >



Cancel

Post Injury Assessment

Save



#10 Jones, Jacob

Baselined on: 8/12/13, 10:55 AM PDT



Hx

Evaluation

Symptoms

Maddock's

SAC

Coordination

Delayed Recall

Summary

SAC / Orientation

Have the athlete answer the following questions the best they can. Indicate with a check mark for the correct answer.



SAY this

"I am going to ask you a few questions.
Listen carefully and please answer as best you can."

What month is it?	August	<input checked="" type="checkbox"/>	<input type="checkbox"/>
What is the date today?	Aug 16	<input checked="" type="checkbox"/>	<input type="checkbox"/>
What is the day of the week?	Friday	<input checked="" type="checkbox"/>	<input type="checkbox"/>
What year is it?	2013	<input checked="" type="checkbox"/>	<input type="checkbox"/>
What time is it right now? (within an hour)	2:31 PM	<input checked="" type="checkbox"/>	<input type="checkbox"/>

baseline



SAC
Orientation

0

(of possible 5)

baseline = 3

< Previous



X2ICE

Next >



List	Alternate 10 word lists					Score (of 10)		
						Trial 1	Trial 2	Trial 3
G	Finger	Penny	Blanket	Lemon	Insect			
	Candle	Paper	Sugar	Sandwich	Wagon			
H	Baby	Monkey	Perfume	Sunset	Iron			
	Elbow	Apple	Carpet	Saddle	Bubble			
I	Jacket	Arrow	Pepper	Cotton	Movie			
	Dollar	Honey	Mirror	Saddle	Anchor			
Immediate Memory Score						of 30		
Time that last trial was completed								



10 Jones, Jacob
Baselined on: 8/22/12, 7:45 AM PDT

Hx

- Evaluation
- Symptoms
- Maddock's
- SAC
- Coordination**
- Delayed Recall
- Summary

Modified BESS - Double Leg

SAY this



"Stand with your feet together with your hands on your hips and with your eyes closed. Maintain stability for 20 seconds as best you can. I will start timing when you are set and your eyes are closed."

DO this



Record # of ERRORS

- Hands off iliac crest
- Opening eyes
- Step, stumble, fall
- Moving hip into > 30 degree abduction
- Lifting forefoot or heel
- Out of position for > 5 secs

Option: Examiner may pause timer during errors



NON-DOMINANT: R

Number of Errors

3

(of possible 10)

baseline = 0



20.0s

Start

Reset Page



STEP 2: SYMPTOM EVALUATION

The athlete should be *given the symptom form* and asked to *read this instruction paragraph out loud* then complete the symptom scale. For the baseline assessment, the athlete should rate his/her symptoms based on how he/she typically feels and for the post injury assessment the athlete should rate their symptoms at this point in time.

Please Check: Baseline Post-Injury

Please hand the form to the athlete

	none	mild		moderate		severe	
Headache	0	1	2	3	4	5	6
"Pressure in head"	0	1	2	3	4	5	6
Neck Pain	0	1	2	3	4	5	6
Nausea or vomiting	0	1	2	3	4	5	6
Dizziness	0	1	2	3	4	5	6
Blurred vision	0	1	2	3	4	5	6
Balance problems	0	1	2	3	4	5	6
Sensitivity to light	0	1	2	3	4	5	6
Sensitivity to noise	0	1	2	3	4	5	6
Feeling slowed down	0	1	2	3	4	5	6
Feeling like "in a fog"	0	1	2	3	4	5	6
"Don't feel right"	0	1	2	3	4	5	6
Difficulty concentrating	0	1	2	3	4	5	6
Difficulty remembering	0	1	2	3	4	5	6
Fatigue or low energy	0	1	2	3	4	5	6
Confusion	0	1	2	3	4	5	6
Drowsiness	0	1	2	3	4	5	6
More emotional	0	1	2	3	4	5	6
Irritability	0	1	2	3	4	5	6
Sadness	0	1	2	3	4	5	6





Mental Status	Cranial Nerve Examination	Motor Examination	Coordination and Gait	Reflex Examination	Sensory Examination
▪ Observation	I – Olfactory	▪ Observation	▪ Cerebellar testing	▪ Deep Tendon Reflexes	▪ Tactile
▪ Attention	II – Optic ▪ Visual Fields ▪ Visual Acuity ▪ Fundoscopy	▪ Test for drift	▪ Gait, Station and Romberg testing	▪ Superficial Reflexes	▪ Painful
▪ Frontal Lobe Function	III, IV, VI – Ocular Motility	▪ Testing tone		▪ Pathological Reflexes	▪ Thermal
▪ Memory	V – Trigeminal	▪ Strength			▪ Postural
▪ Left Hemisphere Function	VII – Facial	▪ Finger Tapping			▪ Vibratory
▪ Right Hemisphere Function	VIII – Acoustic				
	IX, X – Palate movement				
	XI – Spinal Accessory				
	XII – Hypoglossal (tongue)				



Vestibular/Ocular Motor Screening (VOMS)



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Objectives

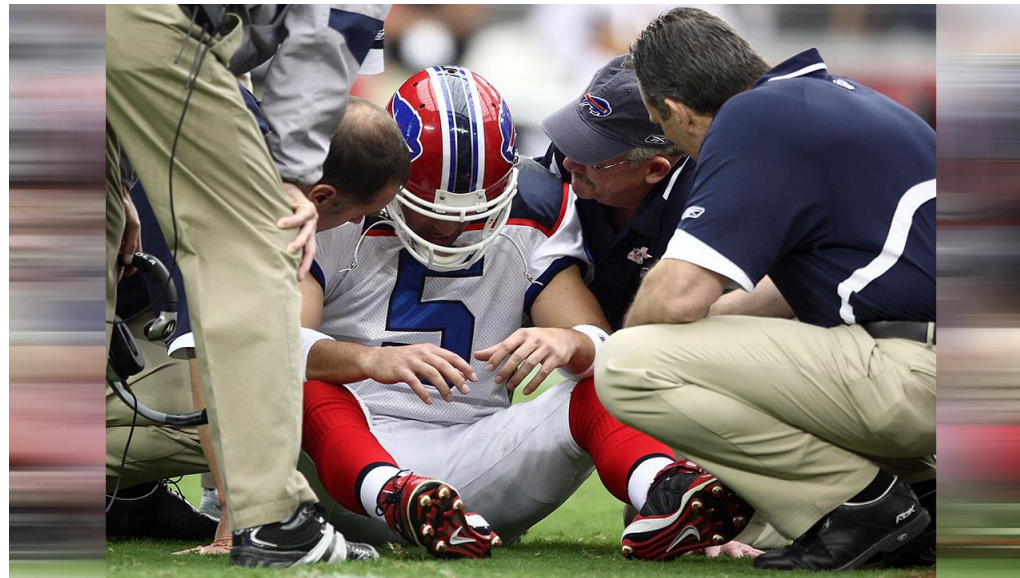
- Why are we talking about concussions again?
- Updates from the neurology conference
- Epidemiology of concussions in the NFL
- Review common signs and symptoms
- NFL game day concussion protocol
- Why are concussions so hard to diagnose
- Post-Test with videos



Consensus statement on concussion in sport—the 5th international conference on concussion in sport held in Berlin, October 2016

Paul McCrory.¹ Willem Meeuwisse.² Jiří Dvorak.^{3,4} Mark Aubrv.⁵ Julian Bailes.⁶

- SRC is considered to be amongst the ***most complex injuries*** in sports medicine to diagnose, assess and manage.



McCrory P et al. Consensus statement on concussion in sport – the 5th international conference on concussion in sport held in Berlin, Oct 2016. Br J sports med 2017;0:1-10



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- ***Evolving injury*** in the acute phase
- Majority occur ***without*** LOC or frank neurological signs

No perfect diagnostic test or marker!



Clinical Evaluation of the Concussed Athlete: A View From the Sideline

Margot Putukian, MD, FACSM

University Health Services, Princeton University, NJ, and Rutgers-Robert Wood Johnson Medical School, New Brunswick, NJ

- In some cases an athlete appears dazed or out of it, answers questions a bit more slowly than expected or appears to process information more slowly or displays an unusual affect and ***yet completes the sideline assessment without errors.***
- The ATC and team physician should ***keep the athlete out of play*** because of the clinical assessment of a suspected concussion.



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- The clinical assessment and intuition of the sideline clinician remain the criterion standard and should ***take precedence*** over how an athlete performs on sideline testing.



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- Fast paced environment
- Symptoms are so diverse
- Some teams have high turnover and you may not be familiar with their ***baseline personality***



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Field View



Concussion Nondisclosure

- Retrospective survey design
- Data from retired NFL Players General Health Survey (GHS)
- 2010 Sample N = 829
- Average age 61
- Largest group played 6-10 years
- 23.2% offensive lineman, 15.2% linebacker
- 56.8% played before 1976 (pre spearing)



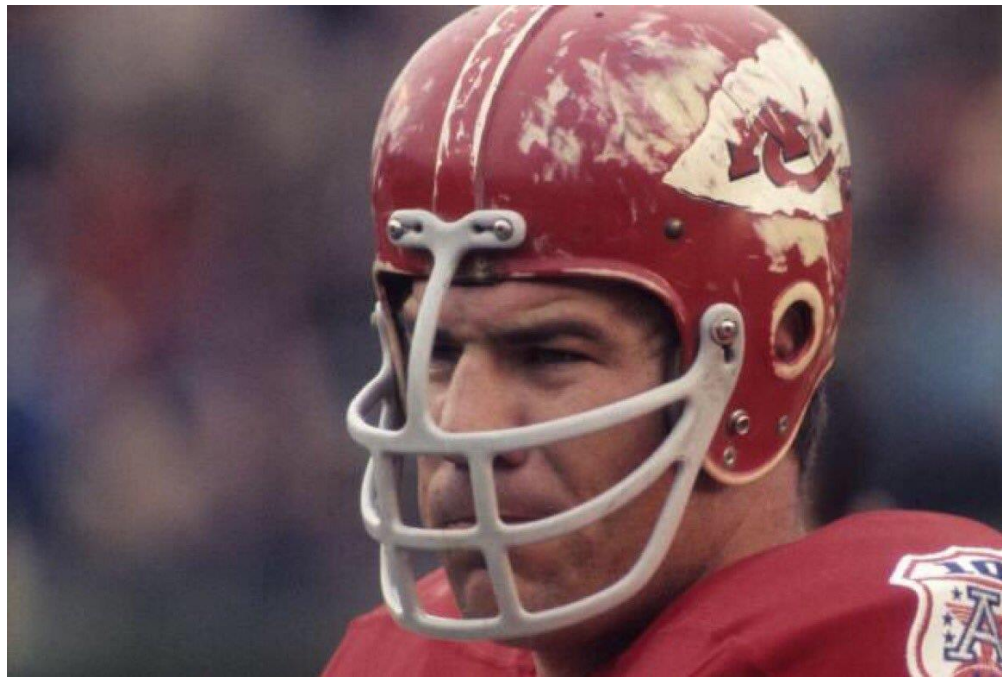
Concussion Nondisclosure

- **50.3%** admitted to ***not informing*** medical staff after sustaining a concussion
- Prevalence was ***higher among non whites*** (56.2%), after the spearing rule change and linebackers (57.1%)
- Lowest nondisclosure was ***running back*** (35.2%) and ***quarterbacks*** (42.2%)



Concussion Nondisclosure

- Limitation: self report
- Did not examine reasons for nondisclosure



Kerr, Z et al. Concussion nondisclosure during professional career among a cohort of former NFL athletes. The American journal of sports medicine. Vol 46 2018



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**If there is any suspicion
of a head injury remove
the athlete from play.**

McCrory P et al. Consensus statement on concussion in sport – the 5th international conference on concussion in sport held in Berlin, Oct 2016. Br J sports med 2017;0:1-10



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  **PIT** ₍₅₋₂₎ **9**  **IND** ₍₃₋₆₎ **17** 3RD 1:41 40 3RD & 10

NFL  **MIN** 35  **WSH** • 20 3RD 3:29  **S. PERINE: 8 RUSH, 34 YDS**

FOX NFL

49ERS 2-10 0 TEXANS 4-8 3 2nd 9:13



NFL
AFC CHAMP





1st & 10

		PHI 9		NE 3	2nd 13:11	:16	1st & 10
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Conclusions

- Concussions continue to be one of the most ***difficult diagnoses*** to make in sport.
- Tremendous ***variability*** in presentation
- The NFL game day protocol continues to ***evolve*** to protect our players.
- ***Recognizing*** concussion signs are of the utmost importance and require a ***team approach***.

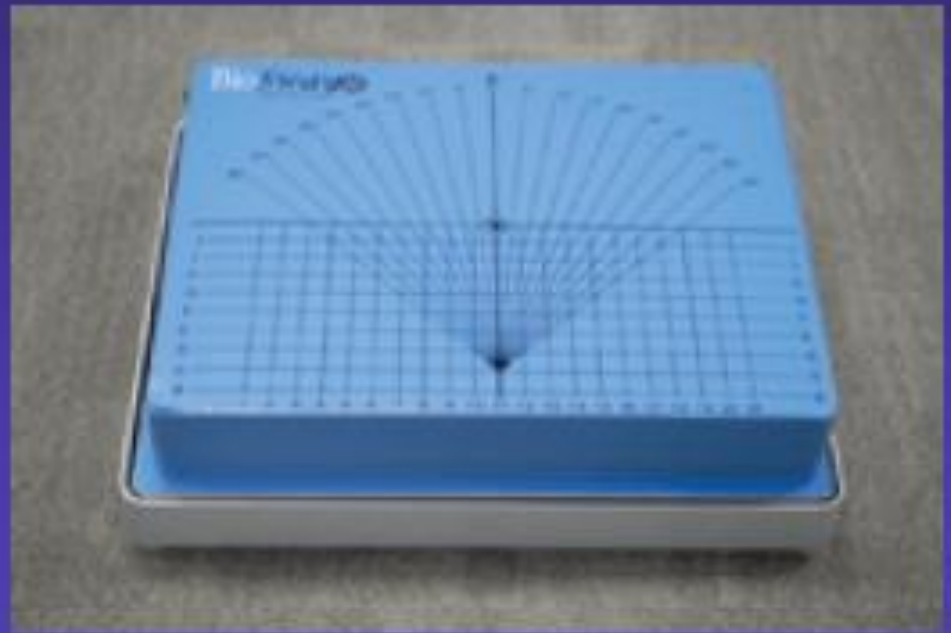


Questions???

CONCUSSIONS



Balance Assessment: Biodex Sway



Helpful Resources

1. NCAA Concussion Fact Sheets and Video for Coaches and Student-Athletes

Available at www.NCAA.org/health-safety.

2. Heads Up: Concussion Tool Kit

CDC. Available at www.cdc.gov/ncipc/tbi/coaches_tool_kit.htm.

3. Heads Up Video

NATA. Streaming online at www.nata.org/consumer/headsup.htm.

