

Myths, Misconceptions, and the Challenge of Concussion in Sports



Scott C. Livingston, PhD, PT, ATC, SCS
Assistant Professor, Physical Therapy & Rehabilitation Sciences
Director, Concussion Assessment Research Lab

7th Annual Northern Kentucky Traumatic Brain Injury Conference



Objectives



1. Define *concussion* and describe the challenges associated with concussion recognition, diagnosis, & management;
1. Dispel some common myths & misconceptions about concussions in sports; differentiate between concussion 'facts' and concussion 'fictions' and highlight the evidence supporting them;
2. Identify relevant sources of accurate information on sport-related concussions that are pertinent to your practice setting (clinical, educational, other).



- Estimated **1.6 to 3.8 million** sports-related traumatic brain injuries (TBIs) annually; about 1/2 involve children or adolescents [Langlois et al., 2006]
- **50,000 to 300,000** brain injuries occur among athletes each sports season [Gerberich, Priest et al. 1983; Sosin, Sniezek et al. 1996; Thurman, Branche et al. 1998]
- Approximately **250,000** brain injuries in high school football alone [Grindel, 2003]



The "Challenge" of Sports-Related Concussions

- **Signs & symptoms** vary widely
 - May/may not be obvious signs
- **Post-concussion symptoms:** subtle, unnoticed by athlete, team medical staff, coaches
- Limited **training** of coaches & team personnel
- Athletes reluctance to report **symptoms**



The "Challenge" of Sports-Related Concussions

- **Methods & tools** to detect concussion & make accurate return-to-play decisions are inadequate



- Traditional **neurological exam & imaging** (CT, MRI) are not consistently useful
- Lack of data on **youngest age groups** affected by concussions



- A **concussion** is a biomechanical injury to brain, characterized by signs & symptoms of neuronal dysfunction

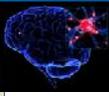
Signs Observed by Outside Observer	Symptoms Reported by Athlete
Appears dazed or stunned	Headache or "pressure" in head
Is confused about assignment or position	Nausea or vomiting
Forgets an instruction	Balance problems or dizziness
Is unsure of game, score, or opponent	Double or blurry vision
Moves clumsily	Sensitivity to light
Answers questions slowly	Sensitivity to noise
Less consciousness (even briefly)	Feeling sluggish, hazy, foggy, or dizzy
Shows mood, behavior, or personality changes	Concentration or memory problems
Can't recall events prior to hit or fall	Confusion
Can't recall events after hit or fall	Just not "feeling right" or "feeling down"




Table 1 – Five major features of a concussion

1. Concussion may be caused by a direct blow to the head, face, neck, or elsewhere on the body with an "impulsive" force transmitted to the head.
2. Concussion typically results in the rapid onset of short-lived impairment of neurological function that resolves spontaneously.
3. Concussion may result in neuropathological changes, but the acute clinical symptoms largely reflect a functional disturbance rather than a structural injury.
4. Concussion results in a graded set of clinical symptoms that may or may not involve loss of consciousness. Resolution of the clinical and cognitive symptoms typically follows a sequential course, however, it is important to note that in a small percentage of cases, postconcussion symptoms may be prolonged.
5. No abnormality on standard structural neuroimaging studies is seen in concussion.

Content From McCrory P. et al. J Am Trau. 2009.4



International Concussion in Sport Group: Consensus Statement on Concussion in Sports. Aubry et al., Clin J Sports Med. 2001; and McCrory et al., J Athl Training 2009

UK
UNIVERSITY OF
KENTUCKY
see blue.

Concussion Symptoms and Signs

Physical & Postural	Cognitive	Emotional	Sleep
Headache Nausea/vomiting Sensitivity to light/sound Visual problems Fatigue Dazed, stunned Dizzy; balance problems	Feeling mentally "foggy" Feeling slowed down Answers questions slowly Difficulty concentrating Forgetful of recent events Repeats questions Drop academic performance	Irritability Sadness/Depression Personality change Anxiety/panic More emotional Less emotion (apathy)	Drowsy Sleeping more Sleeping less Difficulty falling or staying asleep

Most frequent symptoms: headache 1st, dizziness 2nd (Meehan et al., 2010; Williamson et al., 2006)



Concussion Signs & Symptoms




- Many post-concussion signs & symptoms in isolation are non-specific
- A combination of a history of injury in conjunction with some s/s suggests a concussion



Definition



- “A traumatically induced transient disturbance of brain function & involves a complex pathophysiologic process. Concussion is a subset of mild traumatic brain injury (TBI) which is generally self-limited & at the less-severe end of the brain injury spectrum.” [Hartonian & Giza, 2012]



Myths & Misconceptions about Concussions

FICTION:
“A concussion is a minor head injury with no long-term effects.”

FACT:

- A concussion is a minor or mild brain injury.
- Symptoms of a concussion can last hours, days, weeks, months or indefinitely.
- Long-term problems can include: memory loss, poor concentration, anxiety, depression, & personality changes.




*

FICTION:
“If you weren’t ‘knocked out’ then you don’t have a concussion” and “A player who has been knocked unconscious will suffer a worse concussion than a player with no LOC.”

FACT:

- Less than 10% of concussions involve LOC (Guskiewicz et al., 2000)
- LOC is not needed to diagnose a concussion & is of limited value in assessing injury severity (Guskiewicz et al., 2004; McCrory et al., 2005).
- Current definitions of concussion no longer require LOC as criterion.



- **Temporary confusion or amnesia** in absence of loss of consciousness is **more common** [Fisher, 1966]
- LOC is not always predictive of recovery after mild TBI [Guskiewicz et al., 2003; Lovell et al., 1999]




UK
UNIVERSITY OF
KENTUCKY
see blue.

FICTION:
“Having multiple concussions is common in sports and no cause for concern.”

FACT:

- An athlete experiencing 1 concussion is more likely to sustain another than an athlete who hasn’t been concussed.
 - **2 to 5.8 times higher risk**
- Concussions can cause disability affecting school, work, and social life.
- Cumulative effects of repeated injury are well-documented: cognitive, emotional/behavioral, somatic, sleep disturbances.



UK
UNIVERSITY OF
KENTUCKY
see blue.

FICTION:
“Symptoms of a sports concussion will always clear up, usually within a few days.”

FACT:

- Most athletes recover within a short timeframe of 7 to 10 days
- Approximately 20% will experience symptoms lasting for weeks, months, or longer
- **Post-concussion syndrome** (post-concussive signs & symptoms > 3 weeks duration) may develop, further delaying recovery



UK
UNIVERSITY OF
KENTUCKY
see blue.

FICTION:
 “If there is no visible injury, everything is okay!”

FACT:

- Concussions often do not result in any obvious signs & symptoms.
- Signs may be subtle & may not appear for hours or days following injury.




Early versus Delayed Signs

<p>Early (immediate)</p> <ul style="list-style-type: none"> • Alteration in consciousness or memory loss (retrograde or post-traumatic amnesia) • Disorientation • Poor coordination or balance 	<p>Delayed (late presentation)</p> <ul style="list-style-type: none"> • Eating or sleeping disorders • Behavioral changes • Poor academic performance • Psychological sequelae (anxiety, depression)
---	---




FICTION:
 “Athletes should ‘play through the pain’ – get back in the game!”

FACT:

- Returning to contact or collision sports before complete recovery can lead to more serious injury or death (second impact syndrome) & can increase chances of long-term problems.
- Never ‘play through’ symptoms of concussion; having a second concussion & serious injury is increased.



FICTION:

“A symptomatic athlete may return to play as long as the concussion symptoms are *mild*.”

FACT:

- Any athlete with a suspected concussion should be removed from play & evaluated by appropriate medical personnel.
- No athlete should be returned to practice / games while experiencing post-concussion symptoms at rest or w/exertion.



FICTION :

“A concussed individual should be awakened every hour.”



FACT:

- There is no need to wake up someone with a concussion; this interrupts sleep patterns & may increase symptoms. Allow adequate rest!
- Monitor for signs & symptoms of deteriorating neurological status (e.g. subdural or epidural hematoma).



FICTION:

“Concussions are the same for adults & children” and “Younger kids are always more resilient after concussions”



FACT:

- Child & adolescent brains are still developing
- Resolution of symptoms may require longer time frame than adults
- A more conservative return-to-play approach should be used.
- Never return-to-play same day of injury - regardless of level of athletic performance [McCrea et al., 2009; Guskiewicz et al., 2004]




FICTION :

“All concussion grading scales are the same” and “A grade 1 concussion is less serious than a grade 3.”

FACT:

- There are over 17 different concussion severity grading scales, most commonly ranging from mild (grade I) to severe (grade III).
- Concussion severity should be graded on basis of presence and overall duration of symptoms (i.e. after all symptoms have cleared) [Guskiewicz et al., 2004]
- Focus attention on athlete’s recovery w/o too much emphasis on grading system.





Severity	Grade 1: Mild	Grade 2: Moderate	Grade 3: Severe
R. Gantzu Guidelines (2001)	-Post-traumatic amnesia < 30 min - No loss of consciousness	- Loss of consciousness < 5 min, or - Amnesia lasting 30 min – 24 hours	-Loss of consciousness > 5 min, or - Amnesia > 24 hours
Colorado Medical Society	- Confusion - No loss of consciousness	- Confusion - Post-traumatic amnesia - No loss of consciousness	- Any loss of consciousness
American Academy of Neurology	- Confusion - Symptoms last < 15 min - No loss of consciousness	- Symptoms last >15 min - No loss of consciousness	- Loss of consciousness



FICTION:
 “A normal CT (computed tomography) scan can rule out a concussion.”

FACT:

- CT scan only identifies *structural* damage
- A concussion is an alteration of the brain’s normal *functioning*
- Advanced neuroimaging techniques (e.g. fMRI, DTI)



KENTUCKY
see blue.

FICTION:
 “The harder someone is hit, the worse the concussion.”

FACT:

- Any contact to head or body causing rapid head movement can cause a concussion
- Several low impact hits over time might be more serious than a single high force collision.



KENTUCKY
see blue.

FICTION:
 “Helmets prevent concussions.”



FACT:

- Helmets are designed to prevent skull fracture & other serious head injuries; they are not designed to prevent concussions.
- A properly fitted helmet *may* reduce risk or severity of a concussion.

KENTUCKY
see blue.

FICTION:
 “An athlete should be completely restricted from activity after a concussion.”

FACT:

- Current clinical recommendations: complete rest from physical & cognitive activities.
- No evidence that cognitive activity following injury increases risk for further concussions or that complete restriction of all activity accelerates recovery.
- Brain can benefit from appropriately-timed voluntary exercise [Griesbach et al., 2004; Majerske et al., 2008]



FICTION:
 “Girls get concussions more than boys.”



FACT:

- About 75% of all concussions occur in boys
- In sports with comparable rules (soccer & basketball), girls have a higher rate of concussions [Lincoln AE et al., 2011]



THE FACTS ABOUT CONCUSSION

- A concussion is a **brain injury**
- All concussions are **serious**
- Concussions can occur **without** loss of consciousness
- Concussions can occur **in any sport**
- Recognition & management of concussions when they **first occur** can help prevent further injury or death, & possible long-term complications



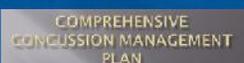

CONCUSSION CARE

- Concussions should be treated & managed on an individual basis
- If you suspect a student-athlete of having a concussion, assume it is!
 - If an athlete is experiencing any symptoms following a blow to head/body, suspect that a concussion has occurred
 - Make sure the athlete is evaluated by a healthcare professional
 - Never allow the athlete to return to sports until medically cleared to do so.



4 R'S: RECOGNIZE, REMOVE, RECOVER, RETURN

- **Recognize** that a concussion occurred; recognize the importance of symptoms & willingness of athlete to report them
- **Remove** from additional contact-risk activities
 - Greatest vulnerability for subsequent injury in first 7-10 days [Guskiewicz et al., 2003; McCrea et al., 2009]
 - Increased risk to subsequent sport-related concussion:
 - Ongoing cerebral pathophysiology
 - Slowed cognitive processing
 - Delayed reaction time
 - Cumulative effects (more severe & longer lasting symptoms) [Guskiewicz et al., 2003]




4 R'S: RECOGNIZE, REMOVE, RECOVER, RETURN

- **Recovery**
 - Typical symptom duration is 7-10 days
 - Management should focus on individualized plan for recovery
 - Provide education about common symptoms, expected impairments, need to prevent further injury
 - Provide counseling & reassurance
 - Younger athletes (high school & younger) may take longer to recovery
 - Cognitive impairments may linger despite resolution of clinical symptoms [Covassin et al., 2012]
 - Identify risk factors for protracted recovery




Risk Factors for Protracted Recovery

1. **Concussion history**
- Cumulative effect esp. w/minimal time between injuries & less biomechanical force results in subsequent concussion
2. **Headache history**
- personal and/or familial history of HA
- migraine HA may result in protracted recovery
3. **Developmental history**
- LD, ADHD: longer recovery
4. **Psychiatric history**
- h/o depression, mood disorder, anxiety, or sleep disorder




4 R'S: RECOGNIZE, REMOVE, RECOVER, RETURN

➤ **Return**

- Return-to-play guidelines require resolution of acute symptoms at rest & with exertion
- Follow stepwise progression for return-to-play*



*Johnson KM et al., 2000. Clin J Sports Med. 10:209-211.



Return to Play

Zurich : Concussion Return to Play Protocol

Rehabilitation Stage	Functional exercise	Objective of each stage
1. No Activity	Complete physical and cognitive rest	Recovery
2. Light Aerobic Exercise	Walking, swimming or stationary cycling keeping intensity < 70% MHR, No resistance training.	Increase HR
3. Sport-specific Exercise	Skating drills in ice hockey, running drills in soccer. No head impact activities	Add movement
4. Non-contact Training Drills	Progress on to more complex training drills (e.g. passing drills in football and ice hockey). May start progressive resistance training.	Exercise, coordination, cognitive load
5. Full Contact Practice	Following medical clearance, participate in normal training activities	Restore confidence, assessment of functional skills by coaching staff
6. Return To Play	Normal game play	

24 hours between each stage!



Discussed at International Conference on Concussion in Sport Held in Zurich, November 2008



Conclusions

- ❖ There are many preconceptions about concussions that have been clarified or refuted by recent research.
- ❖ Clinicians, coaches, school personnel, & parents should keep up-to-date with concussion information & distinguish concussion FACT from FICTION.
- ❖ General approach to concussion management: the 4 R's (recognize, remove, recover, return)



4th Annual Sports Concussion Summit



Saturday, May 18th, 2013
 8:00 AM-3:00 PM
 Marriott Griffin Gate Resort,
 Lexington, KY

Register online @
<http://www.cecentral.com/live/4623>

Questions



Thank you!

Scott Livingston, PhD, PT, ATC, SCS
Scott.Livingston@uky.edu
 (859) 218-0478
Concussion Assessment Research Lab
 Department of Rehabilitation Sciences
 College of Health Sciences
 University of Kentucky