

# Sports-Related Concussion



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# Sports-Related Concussion

## Objectives

- Overview of Sports-Related Concussion
- Concussion and Soccer
- Rhode Island Legislation
- Concussion Management Overview
- Resources for Concussion Management



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# Sports-Related Concussion

## Definition of Concussion\*

- “a complex pathophysiological process affecting the brain, induced by traumatic biomechanical forces”



- 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
- results in the rapid onset of short lived impairment of neurological function that resolves spontaneously
- The acute clinical symptoms largely reflect a functional disturbance rather than a structural injury
- typically associated with grossly normal structural neuroimaging studies

\*Consensus Statement on Concussion in Sport, 3rd International Conference on Concussion in Sport, Zurich, November 2008

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## Trauma-induced brain dysfunction

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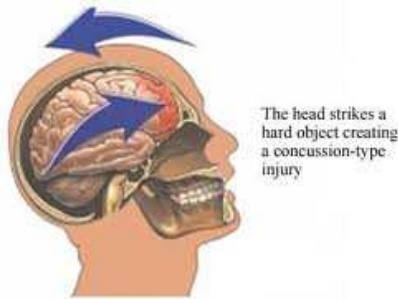


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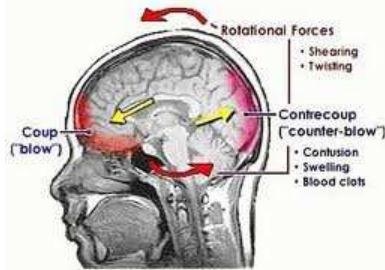
# Sports-Related Concussion

## Biomechanics

- deceleration injury



- rotational injury

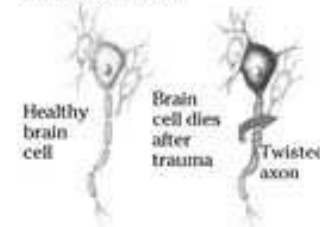


## IMPACT OF CONCUSSION ON ATHLETE'S BRAIN

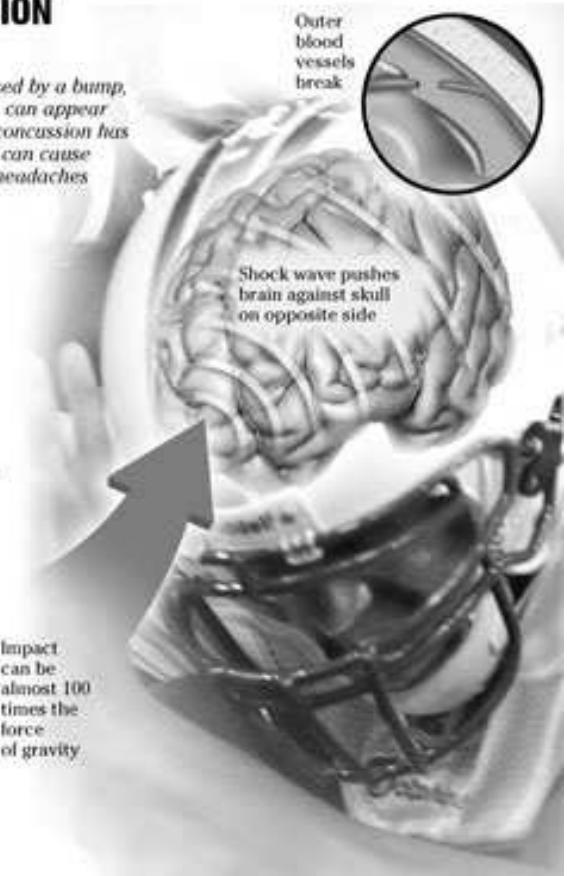
A concussion is a brain injury caused by a bump, blow, or jolt to the head. Symptoms can appear right away or days later. A severe concussion has a dangerous cumulative effect and can cause debilitating memory loss, chronic headaches and clinical depression.

### What happens

In a severe concussion, forces can twist and break the long, slender axons of brain cells



Fluid surrounding the brain can fail to protect blood vessels and nerves from damage



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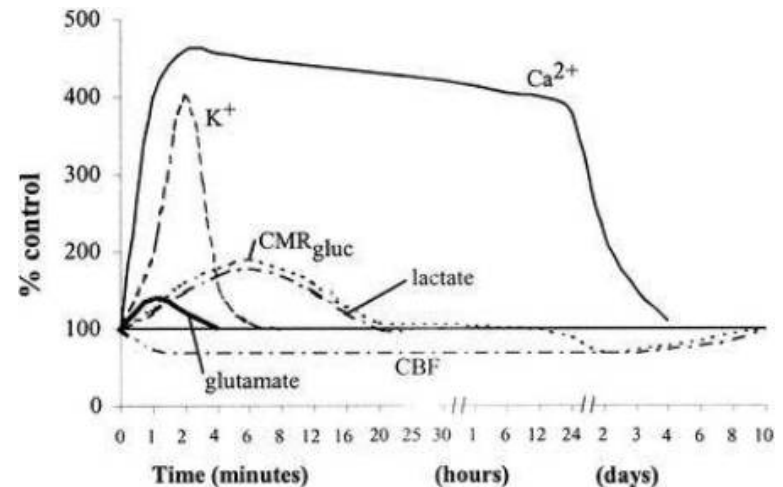


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# Sports-Related Concussion

## Molecular Level

- “*Concussion may result in neuropathological changes, but the acute clinical symptoms largely reflect a functional disturbance rather than a structural injury.*”
- Potassium ( $K^+$ ) moves out of cells
  - Increases demand for glucose
- Calcium ( $Ca^{++}$ ) moves into cells
- Vasoconstriction results
- Blood flow (CBF) to brain decreases
- Energy (glucose) can't be supplied to cells
- **PROCESS LASTS UP TO 10 DAYS**



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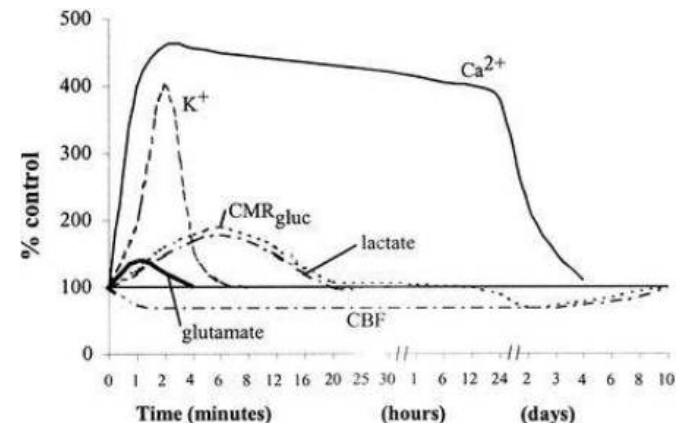


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# Sports-Related Concussion

## Molecular Level

- “Concussion may result in neuropathological changes, but the acute clinical symptoms largely reflect a functional disturbance rather than a structural injury.”
- **2 THINGS NOT TO DO DURING THIS TIMELINE:**
  - 1) **RE-CONCUSS**
  - 2) **INCREASE ENERGY DEMANDS (cognitive demands in school)**
- **PROCESS LASTS UP TO 10 DAYS**



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# Sports-Related Concussion

## Statistics/Salient Points

- Only one in 5 concussed players recognizes his/her symptoms are due to a concussion
- Concussion symptoms may take several days to recognize/develop
- Athletes who have sustained one concussion are at increased risk of more concussions
- The effects of concussion are cumulative
- Risk of recurrent/repeat concussive injury may be greatest within **7 to 10 days** of an acute concussive injury

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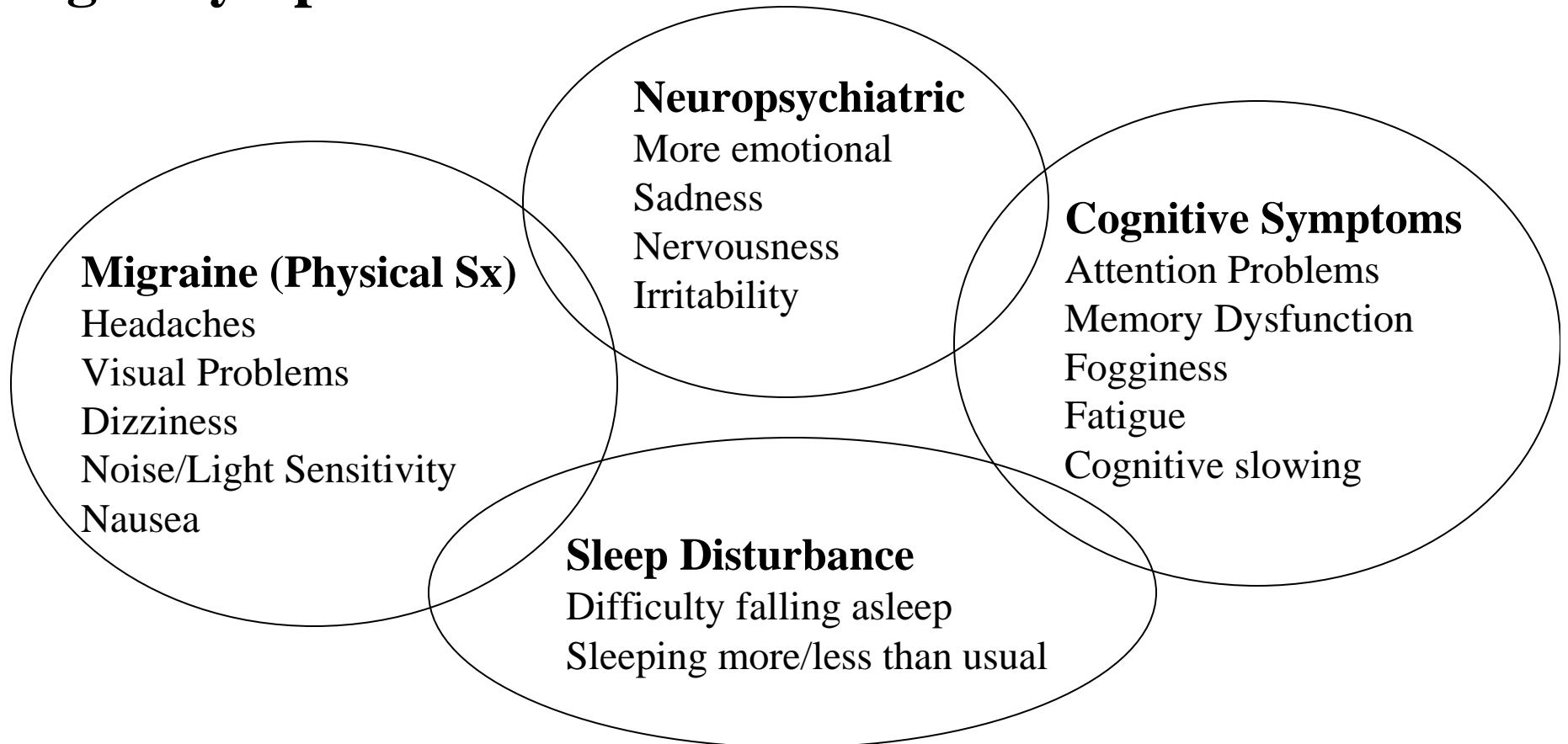


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# Sports-Related Concussion

## Signs/Symptoms of Concussion



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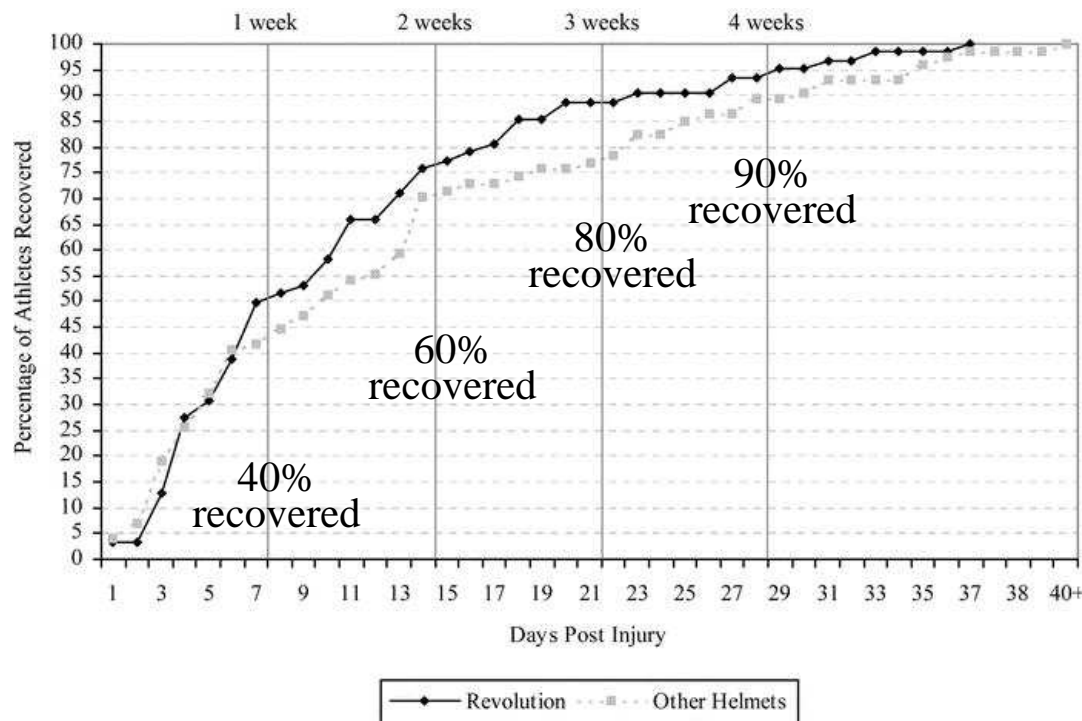
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# Sports-Related Concussion

## Recovery from Concussion: How Long Does it Take?



Collins MW et al. Examining Concussion Rates and Return to Play in High School Football Players Wearing Newer Helmet Technology: A Three-Year Prospective Cohort Study. *Neurosurgery* 2006; 58:275-286

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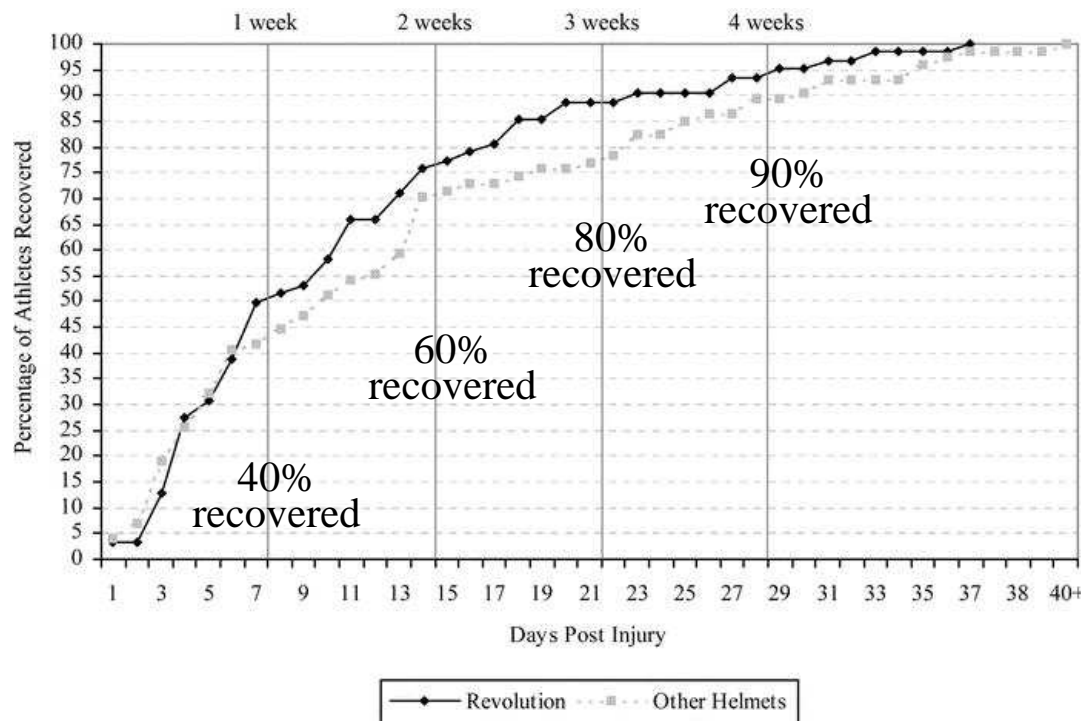
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# Sports-Related Concussion

## Recovery from Concussion: How Long Does it Take?



## Recovery Rates Vary by Age

Author	Pop	Test	CogS x	All Sx
Lovell 2005	NFL	Paper/ Pencil	1 day	1 day
Bleiberg 2005	Coll	Comp (ANAM)	3-7 days	N/A
Iverson 2006	HS	Comp (ImPACT)	10 days	7 days
McClincy 2006	HS	Comp (ImPACT)	14 days	7 days

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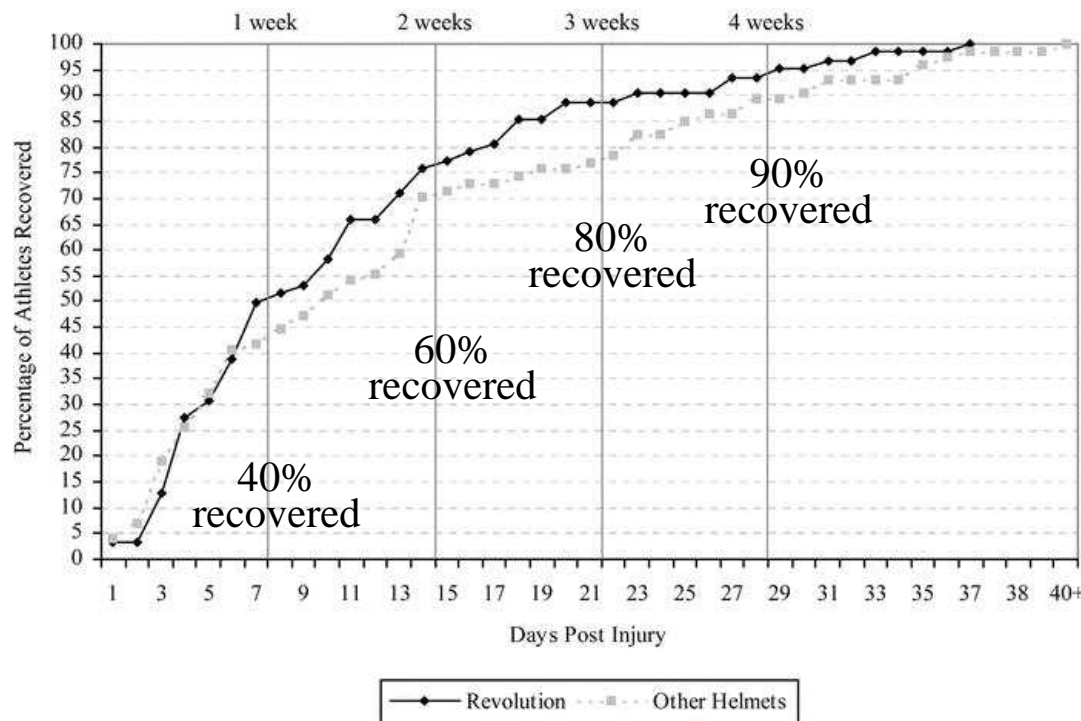
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# Sports-Related Concussion

## Recovery from Concussion: How Long Does it Take?



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- \*Younger players require longer recovery times
- American Academy of Pediatrics recommends conservative management of concussion

# Sports-Related Concussion

## Concussion and Soccer

- 2005-2006 academic year\*:
  1. Football (40.5%)
  2. Girls' Soccer (21.5%)
  3. Boys' Soccer (15.4%)
  4. Girls' Basketball (9.5%)



\*Comstock RD et al. Concussions among United States high school and Collegiate Athletes. *J Athl Train* 2007; 42: 495-503.

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# Sports-Related Concussion

## Concussion and Soccer

- Account for 2-4% of all acute soccer injuries
- NCAA women's soccer:
  - 8.6% of all game-time injuries
- Purposeful heading is NOT a common cause\*
  - collision with another player
  - goal post, ground, other solid objects
  - struck in head unexpectedly by ball forcefully from close range

\* 6-yr prospective study of 20 FIFA tournaments



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# Sports-Related Concussion

## Concussion and Soccer

- **Heading**
  - most experts agree: *no conclusive evidence* that purposeful heading of the ball causes neurologic deficits
  - athletes who head frequently **ARE** at increased risk of concussion
  - Headgear: no well-designed studies. Potential benefit?
  - no definitive recommendation can be made  
players are allowed to head the ball



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# Sports-Related Concussion

## Rhode Island Legislation

Rhode Island's concussion law was signed by Gov. Carcieri and became effective July 7, 2010. The main provisions apply to school districts and athletes age 19 and younger:



- removal of any athlete suspected of having a concussion from practice/game
- athletes cannot return to practice/game until evaluated by a licensed physician and given written medical authorization
- parents and athletes are required to sign a concussion information sheet
- school districts are encouraged to have an athletic trainer at each event and to provide "baseline" neuropsychological testing

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# Sports-Related Concussion

## Concussion Management Overview

- Physical rest
  - Cognitive rest
  - If prolonged, headache management (Off label)
  - Cognitive medications (Off-label)
- The return to play will be gradual, monitored, and conducted in a step-wise fashion.



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# Management



Baseline  
ImPACT  
Testing

Season  
Starts

Referred  
to Clinic

Post-  
Injury  
Testing

Cognitive &  
Physical Rest

Graded  
Return  
to Play



Injury



# Sports-Related Concussion

## Graded Return to Play (Zurich Guidelines, 2008)



TABLE 1. Graduated Return to Play Protocol

Rehabilitation Stage	Functional Exercise at Each Stage of Rehabilitation	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% MPPHR; 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	Progression to more complex training drills, eg, passing drills in football and ice hockey; may start progressive resistance training	Exercise, coordination, and cognitive load
5. Full contact practice	Following medical clearance, participate in normal training activities	Restore confidence and assess functional skills by coaching staff
6. Return to play	Normal game play	

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# Resources for Concussion Management

- 3 physicians fellowship-trained in concussion management
- free baseline ImPACT testing
- comprehensive concussion and sports injury management

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[www.thecenterforsportsmed.org](http://www.thecenterforsportsmed.org)



# Resources for Concussion Management

## THE TEAM

### About Us

The Center for Sports Medicine, a collaboration between the departments of Emergency Medicine, Orthopedics, and Pediatrics, provides comprehensive evaluation, treatment, and subspecialty resources to Rhode Island and Southern New England athletes of all ages. Our team is comprised of primary care sports medicine physicians, orthopedic surgeons, and physical therapists.

### Primary Care Sports Physicians

Neha Raukar, MD, MS

*Director*

Peter Kriz, MD

### Sports Concussion Specialists

Elizabeth Jacobs, MD

Ailis Clyne, MD

### University Orthopedics Surgeons

#### Division of Sports Medicine

Paul Fadale, MD

*Chief*

#### Division of Pediatric Orthopedics

Craig Eberson, MD

*Chief*

### Conditions Treated

- acute and overuse sports injuries
- back and spine injuries
- concussions
- dance injuries
- fractures
- growth-related conditions
- hip and pelvic injuries
- osteoarthritis
- stress injuries
- throwing injuries

### Subspecialty Services

- bone health
- compartment testing
- female athlete triad
- injections (corticosteroids, hyaluronic acid, PRP)
- on-site physical therapy, radiology, and laboratory services
- pre-participation physical exams
- sports safety and injury prevention

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# Sports-Related Concussion



## Questions?

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# Sports-Related Concussion



## Thank You!

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