

# Sex Differences in Concussion Symptoms of High School Athletes

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*Journal of Athletic Training*

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# Purpose of the Study

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- To investigate sports-related concussion symptoms in males and females using a large national sample of US high school athletes
  - Symptoms – number and type
  - Symptom resolution time (SRT)
  - Time to return to play (RTP)
- A-priori hypotheses: females would report a greater number of symptoms, longer SRT, and longer RTP



# Data Source: High School RIO

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- Prospective injury surveillance study
- Representative sample of 100 US high schools
  - Geography (4 US census regions)
  - Size ( $\leq 1,000$  vs  $> 1,000$  students)
- Weekly data capture 05/06-09/10 academic years
- Athletic trainers report data via internet
  - Injury incidence and athletic exposure
  - Injured athlete, injury, injury event
- 9 sports
  - Boys' (football, soccer, basketball, wrestling, baseball)
  - Girls' (volleyball, soccer, basketball, softball)



# High School RIO: 2005/06-2009/10

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- Captured 21,863 injuries
  - 11,429 competition
  - 10,434 practice
- 9,503,641 athlete exposures (AE)
  - 2,581,681 athlete competitions
  - 6,921,960 athlete practices
- Overall 2.30 injuries per 1,000 athlete exposures
  - 4.43 injuries per 1,000 athlete competitions
  - 1.51 injuries per 1,000 athlete practices
- Concussions = 11% (2,416) of these injuries



# Concussion Trends Over Time

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	2005/06	2006/07	2007/08	2008/09	2009/10
Rate per 10,000 AE					
Overall	2.3	2.3	2.4	2.6	3.2
Competition	5.4	5.7	6.0	6.5	7.7
% of all injuries					
Overall	9.1%	8.4%	9.2%	11.8%	14.0%



# Study Methodology

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- Analyzed concussion data from 2005/06 and 2006/07
- Injury definition
  - occurred as a result of an organized high school athletic practice or competition
  - required medical attention by AT or physician
  - resulted in restriction of the athlete's participation for  $\geq 1$  days beyond the day of injury
- Outcomes = symptoms (# and type), SRT, RTP
- Confounders = region, age, height, mass, assessor, type of exposure, new or recurrent concussion



# Study Results

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- Overall
  - 812 concussions (391 in 2005/06, 421 in 2006/07)
  - Headache most common symptom, LOC rarely reported
  - SRT within 3 days for 71%
  - RTP within 9 days for 64%
- Differences between Males and Females
  - 812 concussions (610 males, 202 females)
  - No difference in mean # of symptoms reported (2006/07)
  - No difference in SRT
  - No difference in RTP
  - Significant difference in types of symptoms reported



# Important Findings

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- Types of reported symptoms differed
- Males more likely to report cognitive symptoms
  - Amnesia
  - Confusion/disorientation
- Females more likely to report neurobehavioral and somatic symptoms
  - Drowsiness
  - Sensitivity to noise



# Importance of the Findings

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- Male and female high school athletes who sustain concussions may have different types of symptoms and, thus, may present differently to health care professionals
- Neurobehavioral or somatic symptoms may be overlooked/missed on initial assessment or may be attributed to other conditions



# Take Home Message

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- Be observant for all signs/symptoms of concussion
- Recognize that young male and female athletes may present with different symptoms
- Understand that each symptom of a possible concussion must be evaluated, monitored, and fully resolved before an athlete returns to play
- **When in doubt, sit them out!**

# Changing Patterns of Physical Activity



# Contact Information

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Funding for HS RIO thanks to:

CDC NCIPC New Investigator Grant

NFHS Collaborative and Financial Support

DJO

NATA Research Foundation Grant

CDC NCIPC ICRC Grant

NOCSAE Research Grant