

Dangers at Work and Play: Sports Injuries

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Why Sports?

- Could/should workplace safety knowledge be applied in the sporting arena?
- Physical activity = physical activity?
- Environmental factors = environmental factors?

- Worker safety = athlete safety?

Similarities

- Topics covered yesterday
 - Heat-related illness
 - Rhabdomyolysis
 - Developing credible messages using culture
 - Research to practice
 - Training needs for professionals
 - Funding
- Topics covered today
 - Zika
 - Traumatic brain injury surveillance
 - Insights from fatality databases
 - Using surveillance to identify high risk groups

Differences

- Regulation
 - Pro/college sports exempted from most regulations
 - Regulations self-imposed, in-house regulators
- Culture
 - Injuries just part of the game, the price to play
 - Each sport has its own culture
- Population
 - Age groups
 - \$\$\$\$\$
- Healthcare resources and expectations
- Data resources

One Area where Sports is Playing an Important Role: Concussions

- “There is a very definite brain injury due to single or repeated blows on the head or jaw which cause multiple concussion hemorrhages. ... The condition can no longer be ignored by the medical profession or the public.”
 - Martland HS. Punch Drunk.
JAMA, 1928; 91:1103-1107

Yet we still struggling with sports-related concussion diagnosis, management, and prevention issues in 2016?

Examples: High School RIO Dataset

- Injury data captured 05/06 through 15/16
 - 78,937 injuries
 - 40,195,806 AE
 - 1.96 injuries per 1,000 AE
- Injury by type of exposure
 - About half of all injuries occur in practice
 - Rates of injury are significantly higher in competition compared to practice

Sports Included in High School RIO

Boys' Sports	Years Studied	Girls' Sports	Years Studied
Baseball	11	Basketball	11
Basketball	11	Cross Country	4
Cross Country	4	Field Hockey	8
Football	11	Gymnastics ⁺	4
Ice Hockey	8	Lacrosse	8
Lacrosse	8	Softball	11
Soccer	11	Soccer	11
Swimming	8	Swimming	8
Tennis	2	Tennis	2
Track	8	Track	8
Volleyball ⁺	3	Volleyball	11
Wrestling	11	Cheerleading [*]	7

⁺Sports no longer under surveillance * Co-Ed sport although predominantly female participants

Concussions: High School RIO

- Concussion data captured 05/06 through 15/16
 - 14,064 concussions
 - 40,195,806 AE
 - 3.50 concussions per 10,000 AE
- Injury by type of exposure
 - 63.5% competition related
 - Competition rate 8.44 per 10,000 AE
 - Practice rate 1.66 per 10,000 AE
 - $RR=5.08$

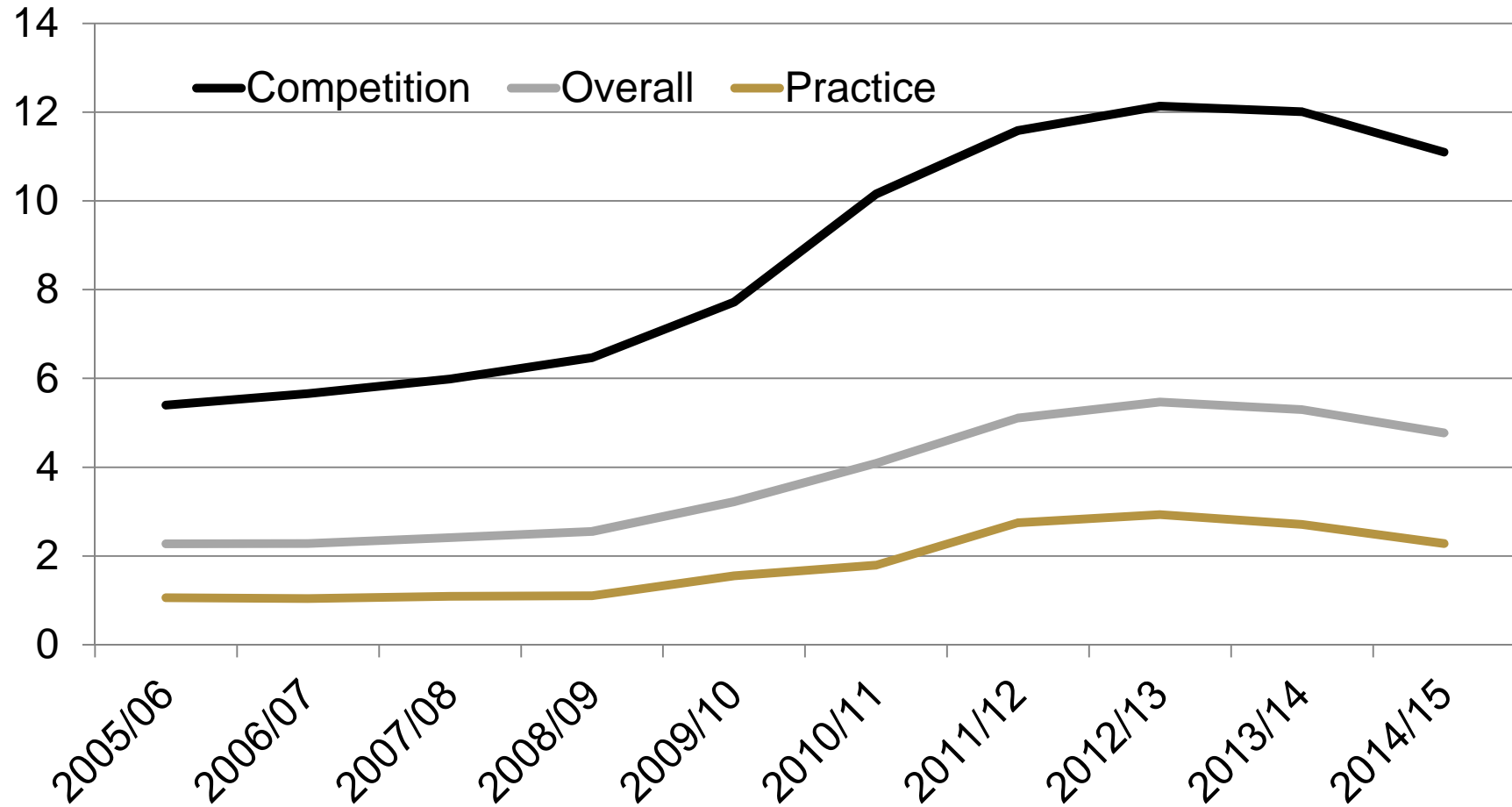
Epidemiology of Sports Concussion: Who is at highest risk?

- Concussion rates and patterns vary by level/intensity of play
- Concussion rates and patterns vary by sport
- Concussion rates and patterns vary by sex
- Concussion rates have increased over time

Concussion Rates per 10,000 AEs: 2014/15

Sport	Competition	Rank	Practice	Rank
Football	30.5	1	5.0	1
Girls' Soccer	20.7	2	2.1	3
Boys' Ice Hockey	15.9	3	1.2	9
Boys' Lacrosse	11.3	4	1.0	11
Girls' Basketball	9.9	5	1.7	6
Boys' Wrestling	9.1	6	2.1	4
Boys' Soccer	8.9	7	0.9	12
Girls' Lacrosse	7.7	8	1.3	8
Field Hockey	7.1	9	0.9	13
Girls' Volleyball	4.9	10	1.9	5
Boys' Basketball	3.4	11	1.1	10
Softball	3.0	12	1.5	7
Baseball	2.4	13	0.5	14
Cheerleading*	1.8	14	2.6	2

Concussion Rates per 10,000 AE



Epidemiology of Sports Concussion: Outcomes of Sports Concussion?

- Athlete reporting has changed over time
- Clinical management has changed over time
- What influences outcomes
 - Sex
 - Age

Trends in Symptoms Reported by Athletes

% of HS Student Athletes Presenting with Symptom by Year

	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15
Amnesia	23.9	24.9	21.4	22.1	16.9	15.6	14.1	11.2
Concentration Difficulty	59.4	56.4	53.3	59.6	58.6	60.2	57.9	58.1
Confusion/Disorientation	50.2	46.7	43.4	45.3	43.4	44.1	39.3	37.9
Dizziness/unsteadiness	83.7	76.3	75.2	77.6	75.0	74.7	74.1	75.4
Drowsiness	32.1	27.6	30.2	32.5	33.9	33.5	31.4	34.7
Headache	94.6	94.2	94.2	94.6	95.3	94.5	94.8	95.4
Irritability	8.8	9.6	10.0	10.5	11.0	10.6	12.6	14.1
Light Sensitivity/ Visual Disturbance	35.1	38.3	34.1	38.9	42.4	46.1	49.7	52.3
LOC	6.6	4.5	4.1	3.8	3.3	3.5	2.3	2.4
Noise Sensitivity	12.0	19.5	16.9	24.4	25.4	30.8	32.5	33.7
Nausea	35.5	32.3	29.0	32.2	31.0	30.5	29.7	30.6

Symptom Resolution

% of HS Student Athletes With All Symptoms Resolved by Year

	07/08	08/09	09/10	10/11	11/12	12/13	13/14
< 1 Day	30.5	24.8	24.5	18.4	12.9	13.0	9.3
Within 1 Week	52.7	54.7	53.4	54.9	46.3	44.0	48.9
>21 Days	1.4	1.7	2.7	2.8	7.8	5.4	6.9

Trends in Return to Play Time

% of HS Student Athletes in Each Category of RTP by Year

	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15
<1 day	7.9	2.6	1.5	0.8	1.8	0.6	0.9	1.7
1-2 days	6.7	6.4	4.0	2.4	1.9	0.8	1.0	0.9
3-6 days	21.4	19.5	17.9	12.9	9.0	8.3	7.6	7.0
Season DQ	2.8	3.6	4.6	4.1	4.4	3.0	2.6	2.4
Career DQ	0.2	0.1	0.3	0.3	0.2	0.4	0.4	0.4
Season ended	0.8	0.1	8.7	12.2	14.2	14.5	14.0	15.8
Athlete quit sports despite no DQ	0.4	1.4	1.2	1.4	1.9	1.9	2.7	1.9

Differences by Sex

- Frommer et al, Sex Differences in Concussion Symptoms of High School Athletes, *JAT*, 46(1):76-84 (2011).
 - No difference in # of signs/symptoms reported
 - Difference in type of signs/symptoms
 - *Males – amnesia, confusion/disorientation*
 - *Females – drowsiness, sensitivity to noise*
 - No difference in symptom resolution time
 - No difference in RTP time

Differences by Age

- NCAA ISP and High School RIO data
 - 2005/06-2008/09
 - Soccer, basketball, and baseball/softball
- Concussions
 - NCAA ISP: 6.6% of all injuries, rate 3.6 per 10,000AE
 - HS RIO: 9.1% of all injuries, rate 2.2 per 10,000AE
- Concussion outcomes
 - NCAA ISP: 54.8% RTP in 1-6 days, 1.5% MDQ
 - HS RIO: 34.6% RTP in 1-6 days, 3.1% MDQ

Types of Prevention

- Primary prevention
 - Prevent concussions from occurring in the first place
- Secondary prevention
 - Identify, diagnose, and report concussion injuries early and manage them appropriately to return the athlete to pre-injury health as quickly as possible
- Tertiary prevention
 - Prevent or minimize long-term negative effects of concussion and reduce risk of re-injury

Current Status of Prevention?

- To date, almost all resources have been focused on secondary and tertiary prevention
 - Very little primary prevention
 - Almost no evaluation of the few primary prevention programs that have been implemented
 - *Controversy regarding USA Football's Heads Up Program outlined in recent NY Times article*

Examples of Difficulty in Implementing Prevention Efforts in Sport Setting

- Reducing rough play in soccer
- Helmets in girls' lacrosse
- Football recommendations regarding contact limits in practice

Do We Need to Ban Soccer Heading?

- Comstock et al, An Evidence-Based Discussion of Heading the Ball and Concussions in High School Soccer, *JAMA Peds*, 69(9):830-837 (2015).
 - Heading is the most common activity
 - 30.6% boys, 25.3% girls
 - Player contact is the most common mechanism
 - 78.1% boys, 61.9% girls
 - Reducing rough play by enforcing current rules would be more effective than banning heading

Should Girls' LAX Players Wear Helmets and, If So, What Type?

- Injury Patterns
 - Boys, 24.9% were head/face; 21.9% were concussions
 - Girls, 26.0% were head/face; 22.7% were concussions
- Mechanism of concussion
 - Boys, 74.4% player-player vs. 12.7% player-apparatus
 - Girls, 24.8% player-player vs. 63.8% player-apparatus
- Arguments against helmets in girls' LAX vs. **reality**
 - Not needed, **not supported by the epidemiologic data**
 - No helmet standard, **helmet doesn't care about gender**
 - Increase in aggressive play, **will only occur if allowed**

Football Contact Practice Recommendations

- 90.7% of football concussions are player-player mechanism
- In 13/14 there were 4 states with contact practice limits
 - Practice concussion rates lower in those states
 - $RR=0.56$, 95% CI 0.40-0.77
 - No significant difference in competition concussion rates
 - $RR=0.96$, 95% CI 0.74-1.26
 - No significant difference in other injuries we looked at
- NFHS and USA Football both released recommendations (for implementation fall 2015)
 - Limits on the number of full contact practice days
 - Limits on the the length of time spent in full contact practice

In 2015/16 the rate of practice related concussions decreased below 5.0 per 10,000 for the first time since 2010/11

The goal is to keep athletes as safe as possible while they participate in sports and recreational activities so they can play more and spend less time sidelined with injury!

