

Epidemiology of Sport-Related Concussion in a NCAA Division 1 Football Bowl Subdivision Sample

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Purpose

To examine sport-related concussion rates in a NCAA Division I Football Bowl Subdivision (FBS) sample based on the activity setting where injuries occurred, play type, and when they occurred relative to the 2010 NCAA Concussion Management Policy.

Methods

Medical records from January 2006 to January 2015 for a NCAA Division I FBS program were analyzed. Concussion rates [per 1000 athlete-exposures (AEs)] were compared among the following settings:

- 1) Spring practice
- 2) Preseason training camp
- 3) Regular season high-contact practice [HCP]
- 4) Regular season low-contact practice [LCP]
- 5) Bowl game practice
- 6) Game competition

Play type analyses examined incidence rates [per 1000 play-exposures (PEs)] during offensive, defensive, and special teams plays. Changes in concussion rate coinciding with the 2010 NCAA Concussion Management Policy were also studied.

Analyses

Concussion rates were calculated as the number of concussions per 1000 AEs. Rate ratios (RR) and chi square analyses were conducted to compare concussion rates among different activity type and play type.

Activity Type	Total AEs (% of total AEs)	No. of Concussions (% of total concussions)	Concussion Rate (per 1000 AEs)	95% CI
Overall	130,710 (100.0)	155 (100.0)	1.19	1.00 – 1.37
<i>Game</i>	<i>9,855 (7.5)</i>	<i>44 (28.4)</i>	<i>4.46</i>	<i>3.15 – 5.78</i>
<i>Practice</i>	<i>120,855 (92.5)</i>	<i>111 (71.6)</i>	<i>0.92</i>	<i>0.75 – 1.09</i>
Spring Practice	14,040 (10.7)	28 (18.1)	1.99	1.26 – 2.73
Preseason Training Camp	14,175 (10.8)	54 (34.8)	3.81	2.80 – 4.82
Regular Season HCP	16,200 (12.4)	14 (9.0)	0.86	0.41 – 1.32
Total Contact Practice	44,415 (34.0)	96 (61.9)	2.16	1.73 – 2.59
Regular Season LCP	62,040 (47.5)	5 (3.2)	0.08	0.01 – 0.15
Bowl Practice	14,400 (11.0)	10 (6.5)	0.69	0.26 – 1.12

Play Type	Total No. Athletes of Plays	Athletes Per Play	Total PEs (% of total)	No. of Game Concussions (% of total)	Concussion Rate (per 100 PEs)	95% CI
Overall	16,592	11	182,512 (100.0)	44 (100.0)	0.24	0.17 – 0.31
Offense	7,642	11	84,062 (46.1)	17 (38.6)	0.20	0.11 – 0.30
Defense	7,624	11	83,864 (45.9)	14 (31.8)	0.17	0.08 – 0.25
Special Teams	1,326	11	14,586 (8.0)	13 (29.5)	0.89	0.41 – 1.38

Seasons	Total AEs (% of total AEs)	No. of Concussions (% of total concussions)	Concussion Rate (per 1000 AEs)	95% Confidence Interval
Overall	130,710 (100.0)	155 (100.0)	1.19	1.00 - 1.37
2006- Spring 2010 Seasons	61,780 (47.3)	61 (39.3)	0.99	0.74 - 1.24
Fall 2010-2014 Seasons	68,930 (52.7)	94 (60.6)	1.36	1.09 – 1.64

Results

Of the 452 unique players on the roster during the 9-year study period, 118 (26.1%) were diagnosed with a concussion. Concussion rate during games was significantly higher than all practices combined ($p < .001$). However, when comparing game rate (4.46/1000 AE) with preseason training camp alone (3.81/1000 AE) there was no significant difference ($p = .433$). Concussion rate during special teams plays was significantly higher than offensive ($p < .001$) and defensive plays ($p < .001$). Concussion recognition in the four seasons (2010-2014) following the 2010 NCAA Concussion Management Policy was significantly higher than the four seasons (2006-2009) preceding the policy ($p = .036$).

Conclusion

- 1) Based on activity type, games and preseason training camp present the greatest risk of sustaining a concussion.
- 2) Based on play type, special teams plays pose the greatest risk of sustaining a concussion.
- 3) The 2010 NCAA Concussion Management Policy was significantly associated with increased rates of diagnosed concussion.

Significance

Preseason training camp and games – especially special team plays – have the highest concussion rates and should be targeted when attempting to decrease collegiate football concussion incidence. This information should be collected at an institutional and national level in order to inform university-specific and national prevention efforts.

