Effects of Time in Competition, Phase of Play, and Field Location on Injury Severity in High School Football

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Over 1 million US high school athletes play football

High school football competition injury rates as high as 26.4 per 1,000 player-competitions have been reported

The potential effect of competition intensity on injury severity has not been studied
Objective

- To evaluate the effects of competition intensity on injury severity in high school football

Specific aims
- Calculate injury rates by severity
- Describe injury epidemiology by severity
- Investigate the potential effect of time in competition, phase of play, and field location on injury severity
Data Collection & Analysis

Data collection:
- High School RIO™ (Reporting Information Online) conducted prospective football injury surveillance during the 2005-06 school year
- Nationally representative sample of 100 US high schools
- ATCs logged in weekly to report athlete exposure (AE) and injury data

Data analysis
- Injury rates
- Weighted injury proportion ratios (IPR)
Definitions

**AE:** 1 athlete participating in 1 practice or competition

**Injury:**
- Occurred during participation in an organized high school football practice or competition
- Required medical attention
- Resulted in \( \geq 1 \) days play loss

**Injury severity:**
- Mild (1-6 days of play loss)
- Moderate (7-21 days of play loss)
- Severe (>21 days of play loss)
Competition Intensity Surrogates

- **Time in competition:**
  - Beginning
  - Middle
  - End/overtime

- **Phase of play:**
  - General play
  - Kickoff/punt

- **Field location:**
  - Middle of the field
  - Red/end zone
## Competition Injury Rates

<table>
<thead>
<tr>
<th></th>
<th># Injuries</th>
<th>AE</th>
<th>Injury Rate (per 1,000 AE)</th>
<th>National Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>992</td>
<td>82,059</td>
<td>12.09</td>
<td>280,919</td>
</tr>
<tr>
<td>Mild</td>
<td>440</td>
<td>82,059</td>
<td>5.36</td>
<td>125,900</td>
</tr>
<tr>
<td>Moderate</td>
<td>294</td>
<td>82,059</td>
<td>3.58</td>
<td>84,675</td>
</tr>
<tr>
<td>Severe</td>
<td>177</td>
<td>82,059</td>
<td>2.16</td>
<td>51,869</td>
</tr>
</tbody>
</table>
Most Common Injuries

- **Mild:**
  - Lower leg/foot/ankle sprains/strains (19.5%)
  - Concussions (8.5%)

- **Moderate:**
  - Lower leg/ankle/foot sprains/strains (21.7%)
  - Concussions (21.0%)
  - Knee sprains/strains (11.0%)

- **Severe:**
  - Knee sprains/strains (22.3%)
  - Arm fractures (21.4%)
Time in Competition

- Beginning: 16.3%
- Middle: 53.8%
- End/overtime: 29.9%

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**Time in Competition**

- **Proportion of severe injuries:**
  - Beginning (22.6%) and middle (22.8%)
  - End/overtime (12.4%)
  - IPR = 1.83, 95% CI: 1.25-2.69

- **Proportion of concussions:**
  - Middle (12.3%) and end/overtime (14.2%)
  - Beginning (6.3%)
  - IPR = 2.07, 95% CI: 1.11-3.88
Phase of Play

- General play: 93.0%
- Kickoff/punt: 7.0%
Phase of Play

- Proportion of severe injuries:
  - Kickoff/punt: 32.7%
  - General play: 19.3%
  - IPR = 1.69, 95% CI: 1.07-2.68

- Proportion of concussions:
  - Kickoff/punt: 20.3%
  - General play: 10.9%
  - IPR = 1.86, 95% CI: 1.05-3.30

- Proportion of foul play-related injuries:
  - Kickoff/punt: 5.4%
  - General play: 1.0%
  - IPR = 5.62, 95% CI: 1.46-21.70
Field Location

- Middle of the field: 78.6%
- Red/end zone: 21.4%
Field Location

- Little variation between field location and injury severity, injury diagnosis, presence of foul play, and need for surgery
Injury Prevention

- Coaches should devote an adequate amount of time rehearsing kickoff and punt plays during the controlled practice environment.

- Ensure that all players participating in competition, particularly kickoff and punt, are in optimum physical fitness and are able to execute proper form while blocking, tackling, and taking hits.

- Coaches should stress the importance of fair play during kickoff and punt and referees should be vigilant for illegal activity during these times.
Limitations

- Only high schools with an NATA-affiliated ATC were eligible to participate.

- There is no known methodology for directly measuring competition intensity.

- Because variable-specific exposure was not known (e.g., time spent in red/end zone vs. middle of the field, etc.), variable-specific injury rates could not be calculated.
Conclusion

- High School RIO™ is the largest, most nationally representative study of US high school football injuries to date.

- Competition injuries are more severe during kickoff/punt and during the beginning and middle of competition, indicating a potential relationship between competition intensity and injury severity.

- Future research must quantify the relationship between potential surrogates of competition intensity (e.g., field location, time in competition, phase of play, etc.) and actual physiological and emotional measures.
R. Dawn Comstock, PhD contributed to this study.

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