Injuries in rugby union

Presented by Keith Stokes
Professor of Applied Physiology, University of Bath
Medical Research Lead, Rugby Football Union
What I will cover

Background to injury surveillance methods

Injuries in elite rugby union

Size, strength, speed and scrum forces differences between elite men and elite women

Any evidence that size and strength is an injury risk factor?
Injuries in rugby union

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Any evidence that size and strength is an injury risk factor?
What is an injury?

“To many people, discussion about the definition of an injury is an over-complex, theoretical debate about what is essentially a simple issue”

Colin Fuller

Injury is tissue damage or other derangement of normal physical function due to participation in sports, resulting from rapid or repetitive transfer of kinetic energy.
Consensus statements for various sports

SHORT REPORT

Consensus statement on injury definitions and data collection procedures for studies of injuries in rugby union

Colin W Fuller, Michael G Molloy, Christian Bagate, Roald Bahr, John H M Brooks, Hilton Donson, Simon P T Kemp, Paul McCrory, Andrew S McIntosh, Willem H Meeuwisse, Kenneth L Quarrie, Martin Raftery, Preston Wiley


Injuries in rugby union

Consensus statement on epidemiological studies of medical conditions in tennis, April 2009

B M Pluim,1, C W Fuller,1 M E Bott,1 L Chase,1 B Hainline,1 S Miller,1 B Montalvar,1 P Ranstöm,1 K A Strickler,1 K Weber,1 T D Wood10

Consensus statement on epidemiological studies of injuries in rugby union

Epidemiological studies of injuries in rugby league: Suggestions for definitions, data collection

European consensus on epidemiological studies of injuries in the thoroughbred horse racing industry

World Rugby Transgender Meeting
25 February 2020

Prof Keith Stokes | k.stokes@bath.ac.uk

@drkeithstokes
Rugby Injury Surveillance

AIM | to describe the incidence and severity of injuries in rugby

METHOD | capture information about all injuries during rugby and information about all exposure to playing rugby

TIME LOSS INJURY | any injury resulting in an absence from full participation in match play or training

INCIDENCE | number of injuries per 1000 player hours of exposure

SEVERITY | number of missed due to injury

BURDEN | number of days lost per 1000 player hours of exposure
Injury incidence in Rugby World Cups

Injury incidence per 1000 hours:
- 2005: Women 35.4, Men 83.9
- 2010: Women 42.0, Men 89.1
- 2015: Women 53.3, Men 90.1

Rugby Injury Surveillance in England

Professional Men’s Rugby
2002-present

>100,000 h match exposure
>8,000 injuries

Elite / Professional Women’s Rugby
2011-2014
2017-present

~7,500 h match exposure
~300 injuries
Consistent methods allow us to compare levels (2017-18)
Match injury incidence in the men’s game is stable
Most common match injuries

<table>
<thead>
<tr>
<th>Year</th>
<th>Concussion</th>
<th>Hamstring muscle</th>
<th>Thigh haematoma</th>
<th>Ankle syndesmosis</th>
<th>MCL</th>
<th>Thigh haematoma</th>
<th>Ankle lat. lig.</th>
<th>AC joint</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012-13</td>
<td>6.7</td>
<td>4.9</td>
<td>4.2</td>
<td>3.8</td>
<td>3.6</td>
<td>3.3</td>
<td>2.9</td>
<td>2.9</td>
</tr>
<tr>
<td>2013-14</td>
<td>10.5</td>
<td>MCL 3.7</td>
<td>Thigh haematoma 3.4</td>
<td>Ankle lat. lig. 2.9</td>
<td>MCL 3.3</td>
<td>2.5</td>
<td>AC joint 2.9</td>
<td>Thigh haematoma 3.0</td>
</tr>
<tr>
<td>2014-15</td>
<td>13.4</td>
<td>Hamstring muscle 4.4</td>
<td>Thigh haematoma</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2015-16</td>
<td>15.8</td>
<td>AC joint 3.1</td>
<td>Hamstring muscle 3.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2016-17</td>
<td>20.9</td>
<td>Hamstring muscle 6.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2017-18</td>
<td>17.9</td>
<td>Hamstring Muscle 6.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Women 2017-18
- Concussion
- Ankle ligament
- Knee ligament
- Shoulder
- Knee (other)
Match injury severity in the men’s game has increased.
Match concussion incidence in the men’s game has increased.
Injuries in rugby union

Concussion at different levels in England (2017-19)

% values are the proportion of all injuries that are concussion
The tackle is associated with a high proportion of injuries.

**All injuries**

<table>
<thead>
<tr>
<th>Category</th>
<th>% of all injuries</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUCS Super League</td>
<td>28%</td>
</tr>
<tr>
<td>Community Men</td>
<td>24%</td>
</tr>
<tr>
<td>Premiership Men</td>
<td>25%</td>
</tr>
<tr>
<td>Championship Men</td>
<td>22%</td>
</tr>
<tr>
<td>Schoolboys</td>
<td>19%</td>
</tr>
<tr>
<td>TPIIS Women*</td>
<td>15%</td>
</tr>
</tbody>
</table>

**Concussions**

<table>
<thead>
<tr>
<th>Category</th>
<th>% of all concussions</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUCS Super League</td>
<td>51%</td>
</tr>
<tr>
<td>Community Men</td>
<td>32%</td>
</tr>
<tr>
<td>Premiership Men</td>
<td>44%</td>
</tr>
<tr>
<td>Championship Men</td>
<td>44%</td>
</tr>
<tr>
<td>Schoolboys</td>
<td>47%</td>
</tr>
</tbody>
</table>

- Tackled
- Tackling
What I will cover

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Size, strength, speed and scrum forces differences between elite men and elite women

Any evidence that size and strength is an injury risk factor?
Height in men and women

**HEIGHT**

### Men (n = 1883)

- **2nd perc.**
  - Extremely low: < 172
  - Unusually low: 172 – 178
  - Below average: 178 – 181

- **10th perc.**
  - Broadly normal: 181 – 190

- **25th perc.**
  - Above average: 190 – 196

- **75th perc.**
  - Unusually high: 196 – 202

- **90th perc.**
  - Extremely high: > 202

### Women (n = 473)

- **2nd perc.**
  - Extremely low: < 155
  - Unusually low: 155 – 161
  - Below average: 161 – 165

- **10th perc.**
  - Broadly normal: 165 – 174

- **25th perc.**
  - Above average: 174 – 178

- **75th perc.**
  - Unusually high: 178 – 183

- **90th perc.**
  - Extremely high: > 183

Note: Height shows upper end of a 2cm band (eg: 184 indicates 182-184 cm)
Injuries in rugby union

Mass in men and women

**MASS**

<table>
<thead>
<tr>
<th>Men</th>
<th>2nd perc.</th>
<th>10th perc.</th>
<th>25th perc.</th>
<th>75th perc.</th>
<th>90th perc.</th>
<th>98th perc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extremely low</td>
<td>&lt; 78</td>
<td>78 – 85</td>
<td>85 – 93</td>
<td>93 – 112</td>
<td>112 – 119</td>
<td>119 – 126</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Women</th>
<th>2nd perc.</th>
<th>10th perc.</th>
<th>25th perc.</th>
<th>75th perc.</th>
<th>90th perc.</th>
<th>98th perc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extremely low</td>
<td>&lt; 55</td>
<td>55 – 61</td>
<td>61 – 66</td>
<td>66 – 81</td>
<td>81 – 89</td>
<td>89 – 99.6</td>
</tr>
</tbody>
</table>

Note: Mass shows upper end of a 5kg band (eg: 100kg indicates 95-100kg)
Bench 1-RM Comparison (kg)

- Adult 15s Male
- Adult 15s Female
- U16 Male
- U18 Male

135kg
75kg
59kg
74kg

Adult elite men (n = 174)  |  Adult elite women (29)  |  U16 boys (61)  |  U18 boys (61)
Adult male vs female bench press comparison

Male vs female gap

135kg

80%

75kg

5\textsuperscript{th} percentile M = 108.3kg

95\textsuperscript{th} percentile W = 96kg

No overlap between weakest 5\% men and strongest 5\% women
10m Sprint time

Averages

- 1.68s
- 1.87s
- 1.78s
- 1.98s
- 1.97s
- 1.92s

<table>
<thead>
<tr>
<th>Category</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult elite men</td>
<td>169</td>
</tr>
<tr>
<td>Adult F (73)</td>
<td></td>
</tr>
<tr>
<td>Academy (37)</td>
<td></td>
</tr>
<tr>
<td>Academy F (73)</td>
<td></td>
</tr>
<tr>
<td>U16 boys (63)</td>
<td></td>
</tr>
<tr>
<td>U18 boys (67)</td>
<td></td>
</tr>
</tbody>
</table>

Adult elite men (n = 169)

### 10m Sprint Time (sec)

- Adult 15s Male
- Adult 15s Female
- Academy Male
- Academy Female
- U16 Male
- U18 Male
Male vs female 10m sprint comparison

5th percentile M = 1.82s
95th percentile W = 1.76s

Small overlap between slowest 5% men and fastest 5% women

Male vs female mean gap 10.5% 1.87s 1.68s

Adult elite men (n = 169)
Academy Male (37)
Academy Female (73)
U 16 boys (63)
U 18 boys (67)

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Adult 15s Male Adult 15s Female Academy Male Academy Female U16 Male U18 Male
Scrum forces

△ International Men

△ Elite Men

△ Community Men

△ Academy Men

△ Elite Women

△ Schoolboy

Male vs female gap

8593 N 94% 4437 N
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Any evidence that size and strength is an injury risk factor?
No difference in height between injured and uninjured men

Average height in PRISP data
Injured: 185.9 cm
Not injured: 185.6 cm
Injuries in rugby union

No difference in mass between injured and uninjured men

Average mass in PRISP data

Injured: 102.1 kg
Not injured: 101.5 kg
Mass as a risk factors for injury? RWC 2007 data

In RWC 2007, injury incidence in games involving 10 heaviest and 10 lightest teams – no difference in incidence when “mismatches” occurred (Fuller, 2010)
Evidence from age-grade rugby

In youth rugby, it is not necessarily the same players who are biggest, strongest and most powerful (Krause, 2015)

Consistent finding that youth players of greater size (mass or height) are at GREATER risk of injury:
Australian youth (Krause, 2015)
Irish schoolboy (Archbold, 2015)
English schoolboy (unpublished)
Front row of the scrum as an area of risk?

- International Men
- Elite Men
- Community Men
- Academy Men
- Elite Women
- Schoolboy

Peak force (Newtons)

29
New Zealand introduce national club competition for under-85kg players

Weight-restricted rugby is being rolled out on a grander scale this season

By Charlie Morgan, RUGBY REPORTER
20 February 2020 - 11:42am

Early maturing players perceived greater physical and technical challenge, and in turn new opportunities.

Late maturing players perceived … greater opportunity to demonstrate technical and tactical abilities
Specific question about neck strength and concussion?

Isometric neck strength been shown to be 50% lower in females
What have I covered?

Injury incidence is higher in the men’s than women’s game and a large proportion of injuries happen in the tackle.

There are stark differences in size, strength, speed and scrum forces between elite men and elite women.

There is very limited evidence in sport relating to mismatches as a risk factor for injury (but where challenges arise, they are considered in a range of contexts).