Citation:

Link to Leeds Beckett Repository record:
http://eprints.leedsbeckett.ac.uk/4478/

Document Version:
Conference or Workshop Item

Creative Commons: Attribution 4.0
Movement, Impact and Pacing Characteristics of South African Professional Rugby Players

Jason Tee
Twitter: @JasonCTee
Email: jasonctee@gmail.com
Professional Rugby Union

Rugby Union is characterised by **short-duration, high-intensity efforts**, interspersed by longer **low-intensity periods of standing, walking and jogging**.
Diversity of Physical Requirements

The game demands differ for players in different positions. (Deutsch et al., 2007, J Sport Sci 25:4)

Groupings
- Forwards vs. Backs
- Tight forward, loose forward, scrumhalf, inside backs, outside backs

Research Aim

Understand how the physical challenges of the game differ for players in different positions

- What is the difference in movement and impact characteristics of players in different positions?
- What is the influence of match period and position on movement patterns?
Methods

19 players from a professional South African Rugby team volunteered to take part. Mean age 25.5 ± 2.4 years; Body mass 101.5 ± 12.2 kg, Stature 1.86 ± 0.07m

Players wore GPS devices in 24 competitive matches through the 2013 rugby season – 105 match participations were recorded.

@JasonCTee #SASMA2015
Methods – Global Positioning System (GPS)

Variables measured

- Playing time
- Relative distance (m.min\(^{-1}\)) in speed zones

### Speed bands

- Low intensity running 0-4m.s\(^{-1}\)
  (Standing, walking and jogging)
- High intensity running >4m.s\(^{-1}\)
  (Striding and sprinting)

Accelerometer

- Total impacts >5G
- High intensity impacts >8G

SPI Pro GPS unit
(GPSports, Canberra)
mass = 76g;
size = 87 x 48 x 20 mm
5Hz GPS Tracking
100Hz Tri-axial Accelerometer

@JasonCTee #SASMA2015
## Results

Typical physical performance characteristics of a professional rugby union player

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>% time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Distance (m.min⁻¹)</td>
<td>69 ± 9</td>
<td>100%</td>
</tr>
<tr>
<td>Maximum Speed (m.sec⁻¹)</td>
<td>8.3 ± 1.2</td>
<td>-</td>
</tr>
<tr>
<td>Low intensity running (m.min⁻¹)</td>
<td>57 ± 7</td>
<td>96 ± 13%</td>
</tr>
<tr>
<td>High intensity running (m.min⁻¹)</td>
<td>12 ± 5</td>
<td>4 ± 2%</td>
</tr>
<tr>
<td>Impacts &gt;5G (N.min⁻¹)</td>
<td>10 ± 3</td>
<td></td>
</tr>
<tr>
<td>Impacts &gt;8G (N.min⁻¹)</td>
<td>1 ± 0.5</td>
<td></td>
</tr>
</tbody>
</table>
Comparison – Forwards and Backs

There is no difference in the relative distance covered or exposure to acceleration forces between forwards and backs.

@JasonCTee #SASMA2015
Comparison – Forwards and Backs

However, there are significant differences in the distances covered in low- and high-intensity speed zones.
Due to their lower maximum speed, forwards are required to work relatively harder than backs throughout match play.
Scrumhaves cover the most relative distance, and outside backs are the fastest position group.
Comparison – Positional groups

Low and high intensity distance

Tight forwards cover the most low-intensity distance, and the least high-intensity distance.

Scrumhalves cover the most high-intensity distance

No difference in movement requirements of loose forwards and inside backs

# indicates different from tight forwards, θ indicates scrumhalves different from all other groups

@JasonCTee SASMA2015
Comparison – Positional groups

Inside backs experience less total and high-intensity acceleration forces per minute than other positions.

BUT

Accelerometer recording do not reflect the actual number of contact (tackle/ruck) events. McLellan et al., (2011) JSCR 29(15)

# indicates different from tight forwards, loose forwards and outside backs; θ indicates different for outside backs only

@JasonCTee #SASMA2015
Methods – Pacing strategies for different positions

Statistics
• Factorial ANOVA
• Paired and independent sample t-tests
• Cohen’s effect size

102 match participations
Whole game players (n = 46)

1st half
(27 backs, 19 forwards)

2nd half
(27 backs, 19 forwards)

4 quartiles

4 quartiles

@JasonCTee #SASMA2015
Results – Effect of half on total and high-intensity distance

Total distance

- Forwards
  - 1st Half: 74 m.min⁻¹
  - 2nd Half: 65 m.min⁻¹
- Backs
  - 1st Half: 70 m.min⁻¹
  - 2nd Half: 63 m.min⁻¹

High-intensity distance

- Forwards
  - 1st Half: 12 m.min⁻¹
  - 2nd Half: 9 m.min⁻¹
- Backs
  - 1st Half: 13 m.min⁻¹
  - 2nd Half: 11 m.min⁻¹

* indicates significant difference from 1st half. T, S, M, L and VL indicate effect sizes trivial (<0.2), small (0.2-0.5), medium (0.5-0.8), large (0.8-1.2) and very large (>1.2) respectively.
Results – Total distance per match period

Total distance covered

- Backs
- Forwards

* indicates significant difference between backs and forwards, # indicated significant different from all other match periods. T, S, M, L and VL indicate effect sizes trivial (<0.2), small (0.2-0.5), medium (0.5-0.8), large (0.8-1.2) and very large (>1.2) respectively.
Results – High-intensity distance per match period

High-intensity distance covered

* indicates significant difference between backs and forwards, # indicates significant different from match period 2nd half Q4. T, S, M, L and VL indicate effect sizes trivial (<0.2), small (0.2-0.5), medium (0.5-0.8), large (0.8-1.2) and very large (>1.2) respectively.

@JasonCTee #SASMA2015
Results – Maximum speed and High-intensity impacts

The magnitude of difference in the physical outputs of forwards and backs increases during the middle periods of the match.
Backs and forwards demonstrate differing fatigue profiles.

### Pacing profile

<table>
<thead>
<tr>
<th></th>
<th>Forwards</th>
<th>Backs</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Slow positive”</td>
<td>“Flat”</td>
<td></td>
</tr>
</tbody>
</table>

Forwards progressively total and high-intensity distance, maximum speed, high-intensity acceleration frequency

Backs maintain total and high-intensity distance, maximum speed, and high-intensity acceleration frequency for majority of match

@JasonCTee #SASMA2015
For the coach - Take home message

• The composition of **workloads and rates of fatigue for players in different positions varies**, and physical conditioning programs should reflect this.

• Players with greater proximity to the ball (forwards and scrumhalf) jog more, while players in wider positions sprint more often.

• Scrumhalves have unique positional requirements, and carry the greatest workload.

• Loose forwards and inside backs exhibit similar running requirements and can be grouped together for training.
Thank you for listening!

Acknowledgements
Thank you to the players and staff of the GLRU for their support of the project

This research was partially funded by the National Research Foundation.

Jason Tee
Twitter: @JasonCTee
Email: jasonctee@gmail.com