

Movement, Impact and Pacing Characteristics of South African Professional Rugby Players

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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 ± 0.07 m

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



Methods – Global Positioning System (GPS)

Variables measured

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

Speed bands

Low intensity running $0\text{-}4\text{m}\cdot\text{s}^{-1}$
(Standing, walking and jogging)

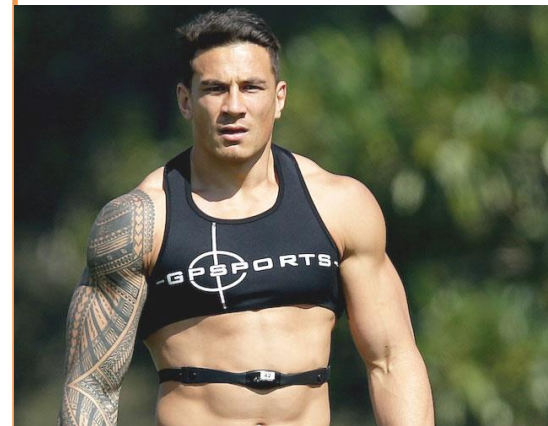
High intensity running $>4\text{m}\cdot\text{s}^{-1}$
(Striding and sprinting)

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



**SPORTS
BRA
FOR MEN**

Results

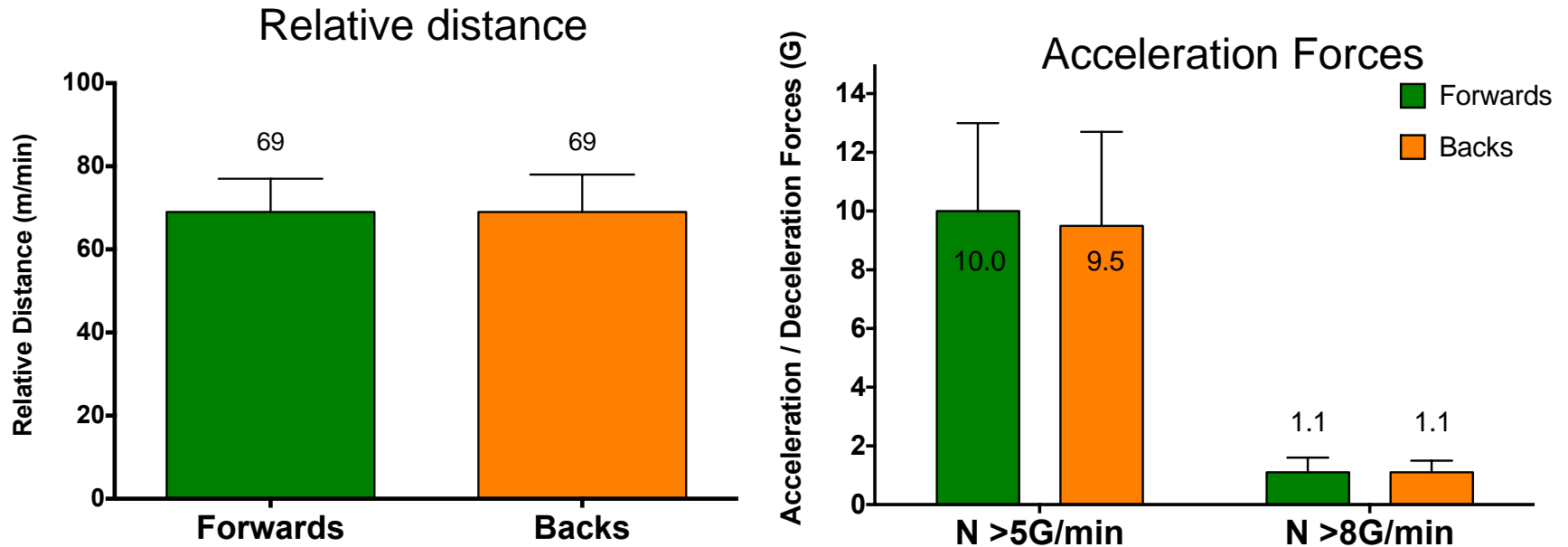
Typical physical performance characteristics of a professional rugby union player

	Mean	% time
Total Distance (m.min ⁻¹)	69 ± 9	100%
Maximum Speed (m.sec ⁻¹)	8.3 ± 1.2	-
Low intensity running (m.min ⁻¹)	57 ± 7	96 ± 13%
High intensity running (m.min ⁻¹)	12 ± 5	4 ± 2%
Impacts >5G (N.min ⁻¹)	10 ± 3	
Impacts >8G (N.min ⁻¹)	1 ± 0.5	



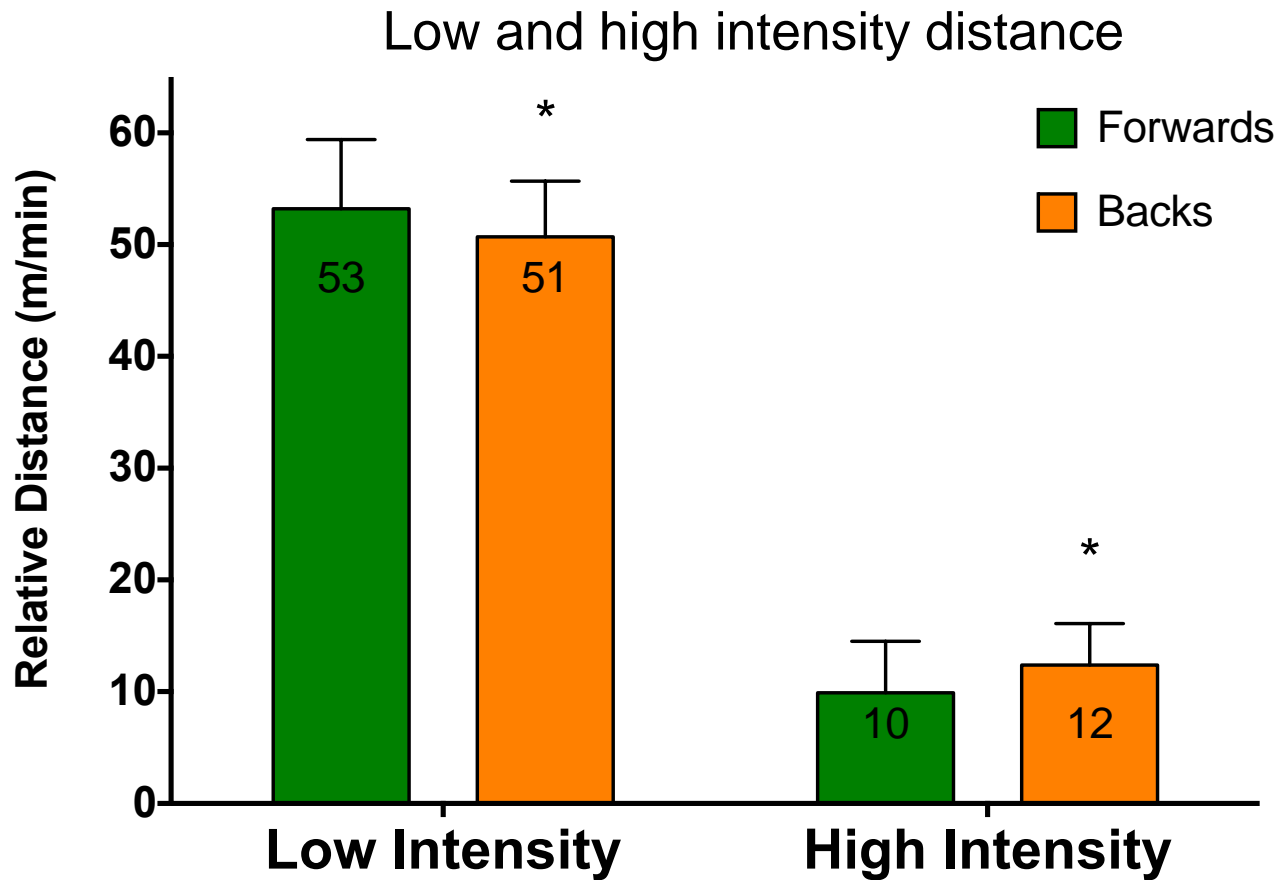
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Comparison – Forwards and Backs



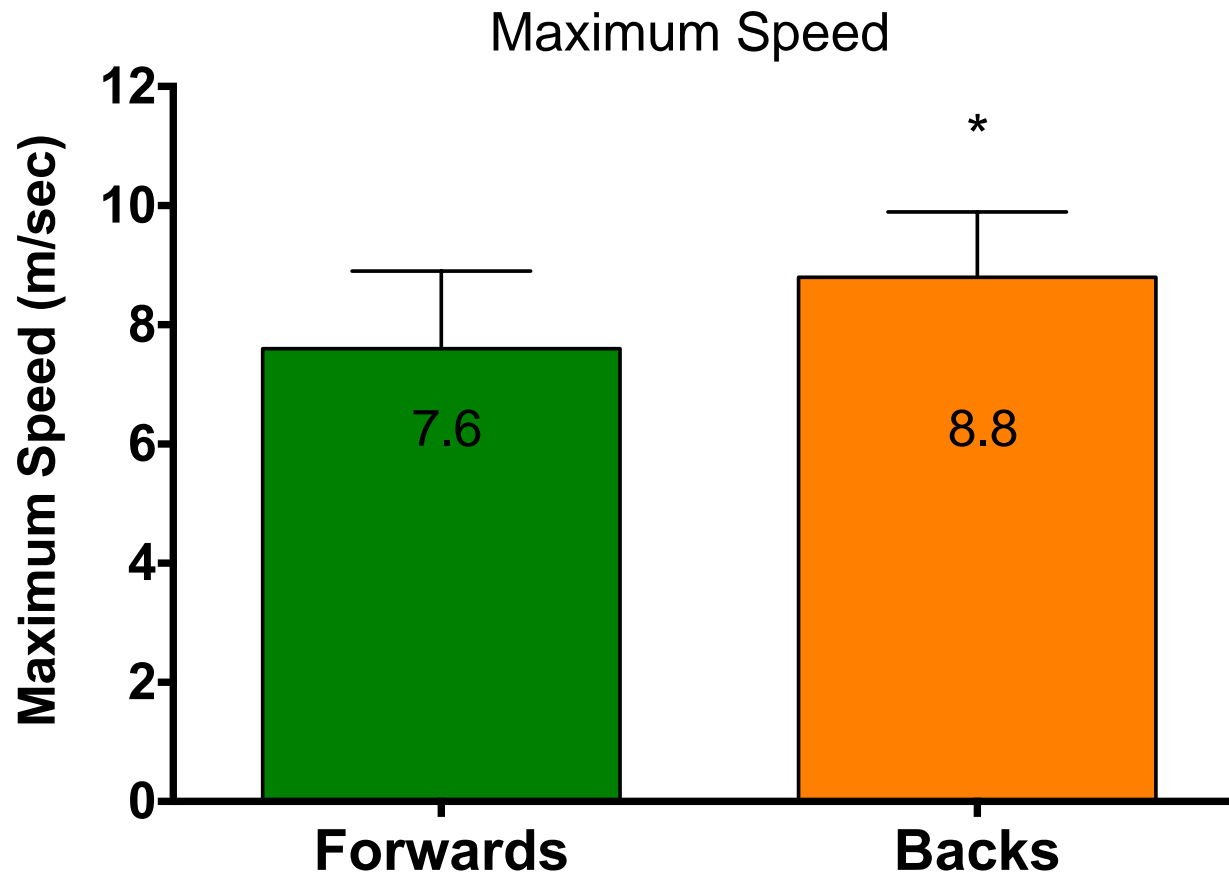
There is **no difference** in the **relative distance** covered or exposure to **acceleration forces** between forwards and backs

Comparison – Forwards and Backs



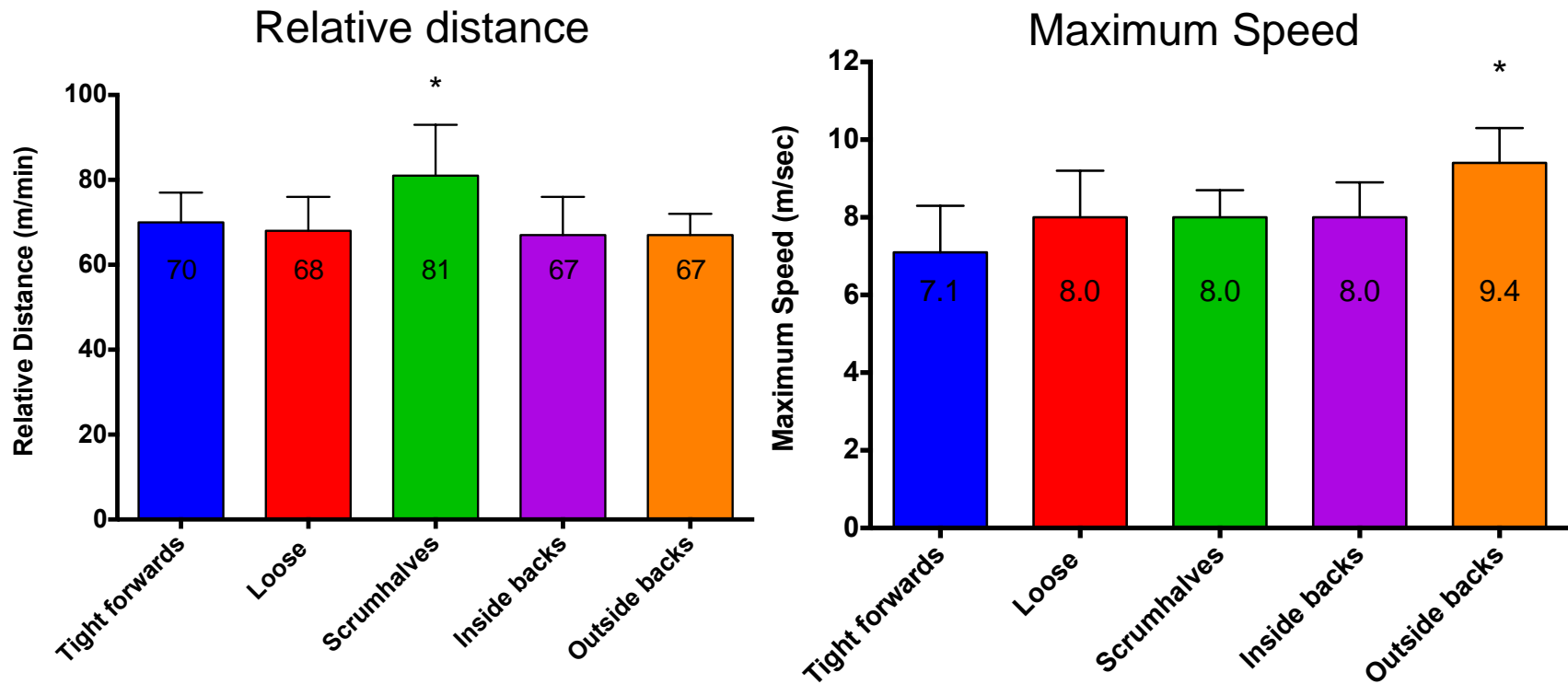
However, there are significant differences in the distances covered in low- and high-intensity speed zones.

Comparison – Forwards and Backs



Due to their lower maximum speed, forwards are required to work relatively harder than backs throughout match play.

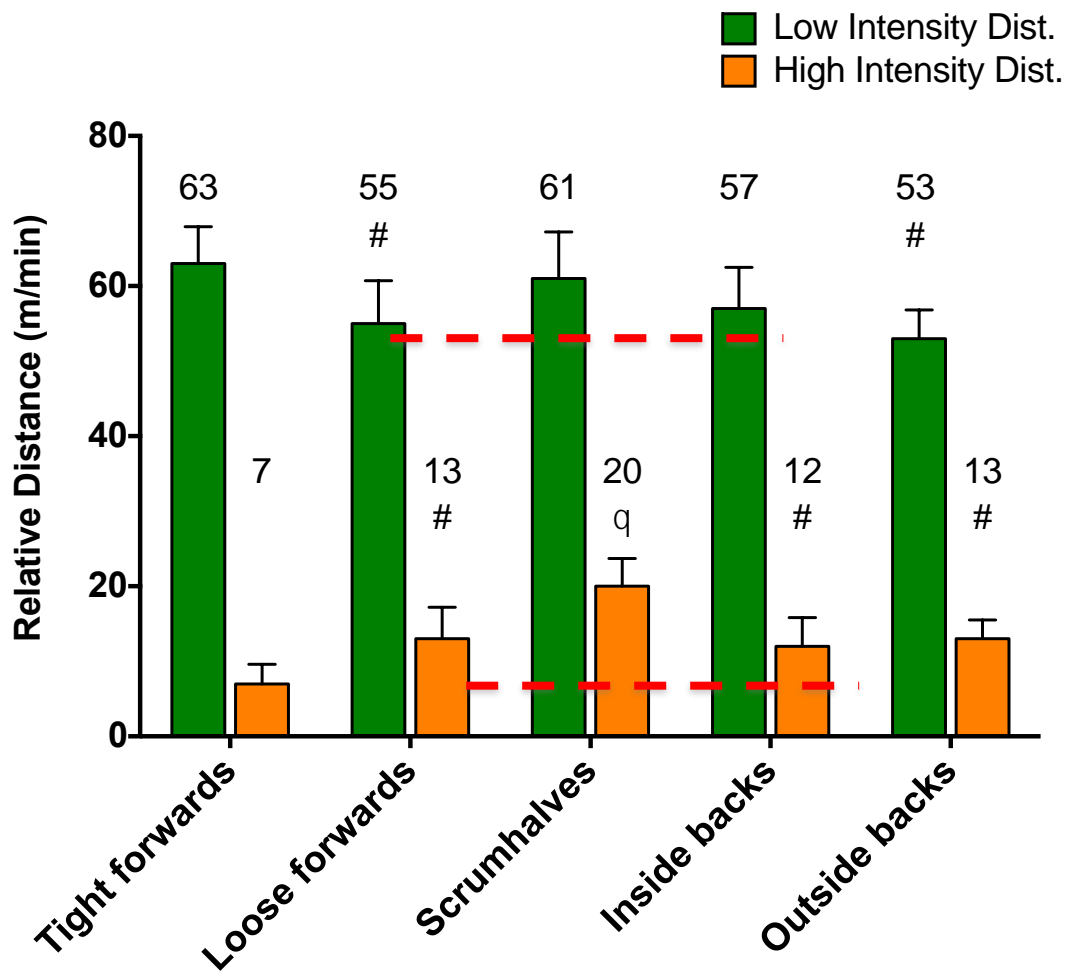
Comparison – Positional groups



Scrumhalves 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

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Comparison – Positional groups

Inside backs

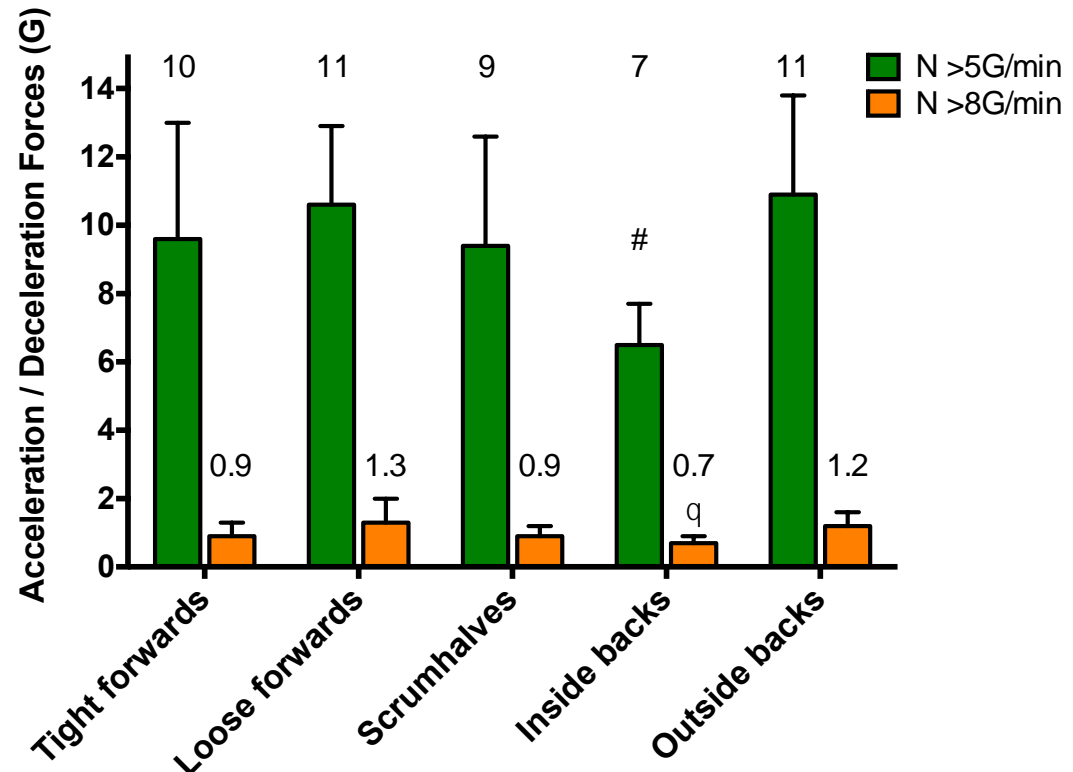
experience **less total and high-intensity acceleration forces** per minute than other positions.

BUT

Accelerometer recording do not reflect the actual number of contact (tackle/ruck) events

McLellan et al., (2011) JSCR 29(15)

Acceleration / Deceleration Forces

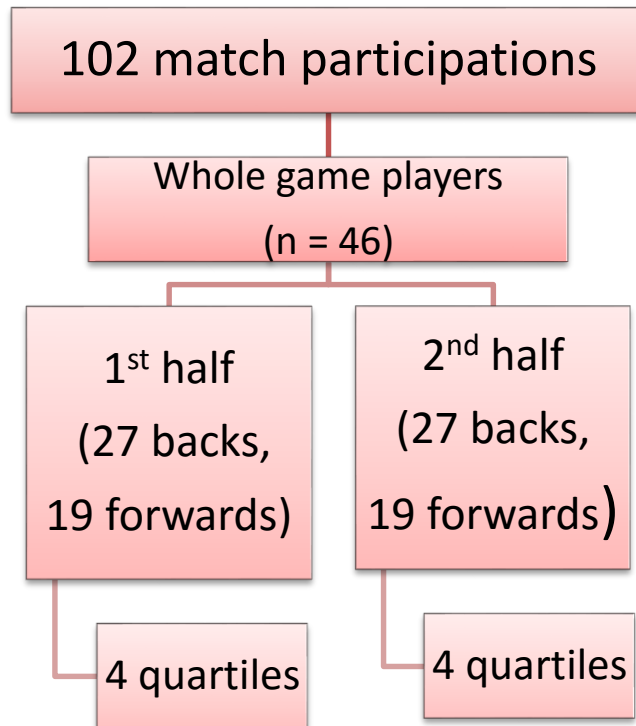


indicates different from tight forwards, loose forwards and outside backs;
q indicates different for outside backs only



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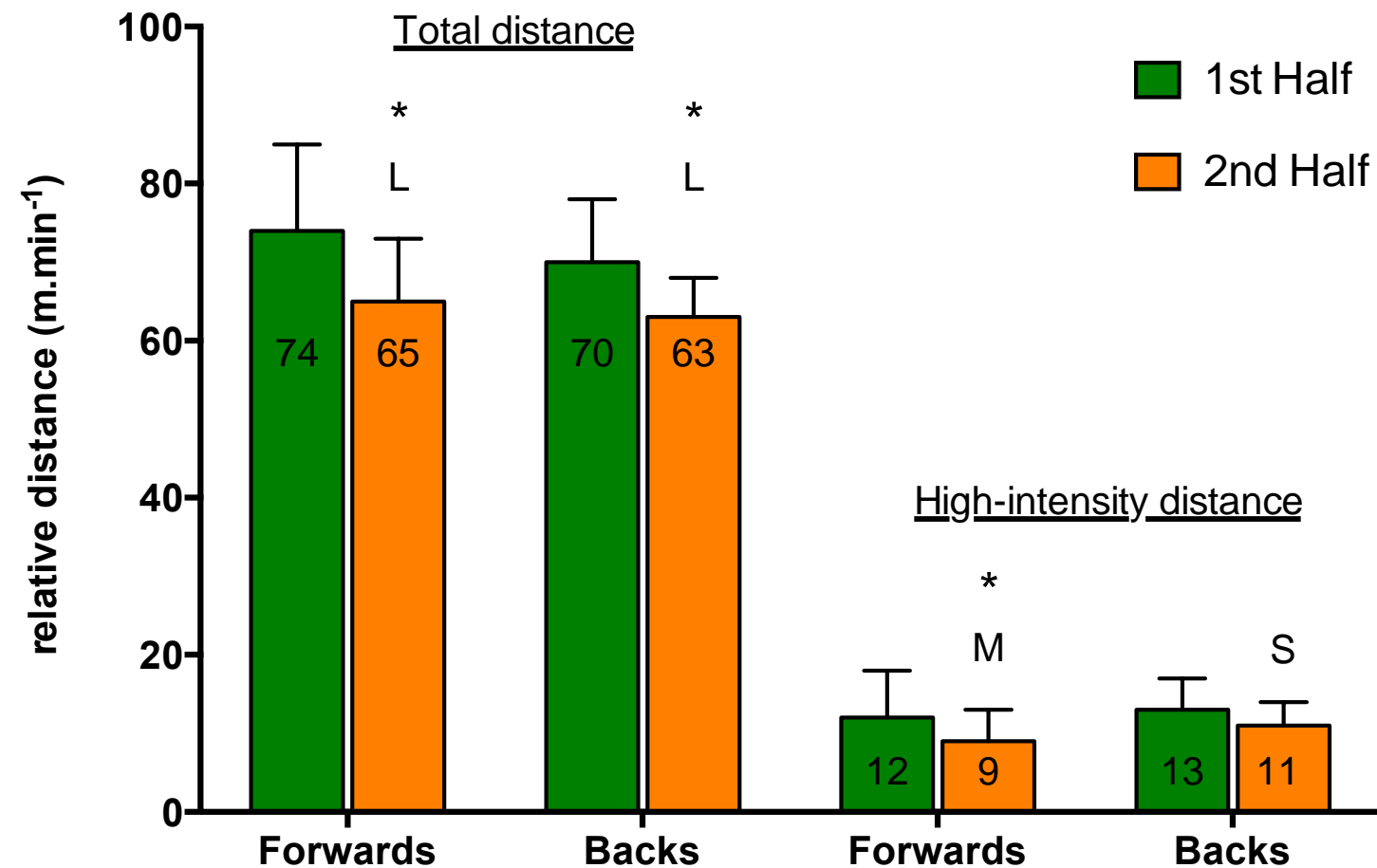
Methods – Pacing strategies for different positions



Statistics

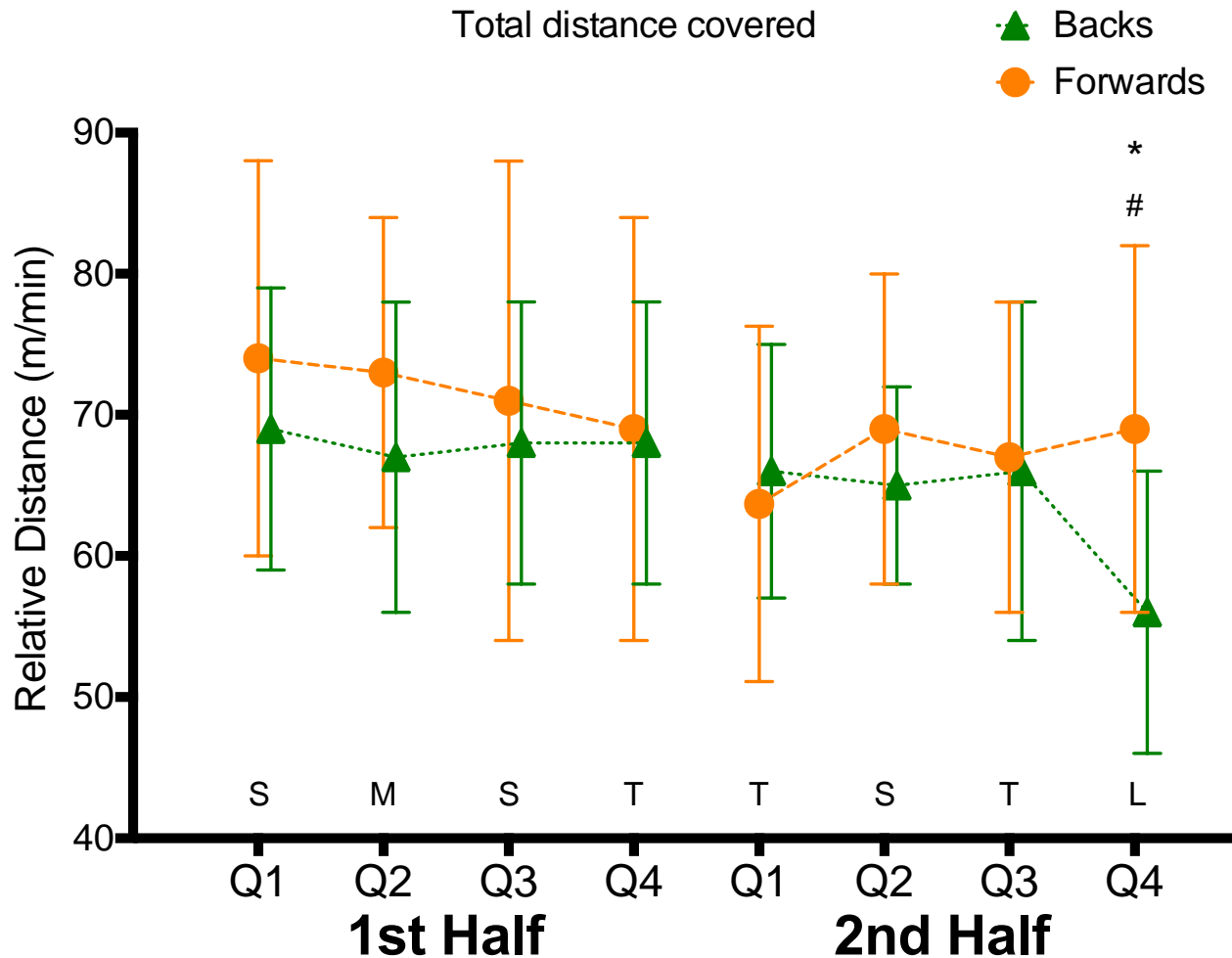
- Factorial ANOVA
- Paired and independent sample t-tests
- Cohen's effect size

Results – Effect of half on total and high-intensity distance



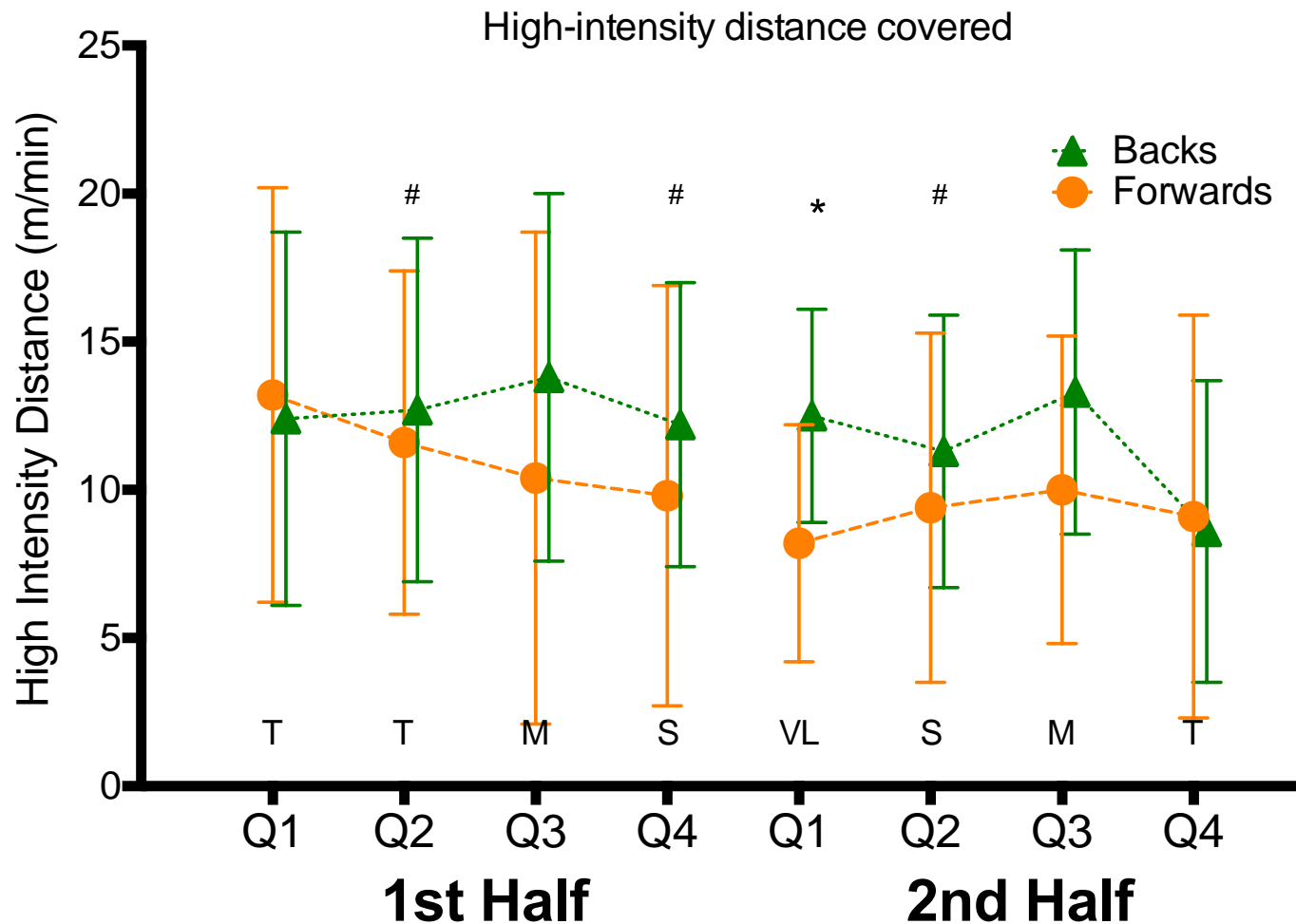
* indicates significant difference from 1st half. T, S, M, L and VL indicate effect sizes trivial (<0.2), small (0.2-0.5), medium (0.5-0.8), large (0.8-1.2) and very large (>1.2) respectively.

Results – Total distance per match period



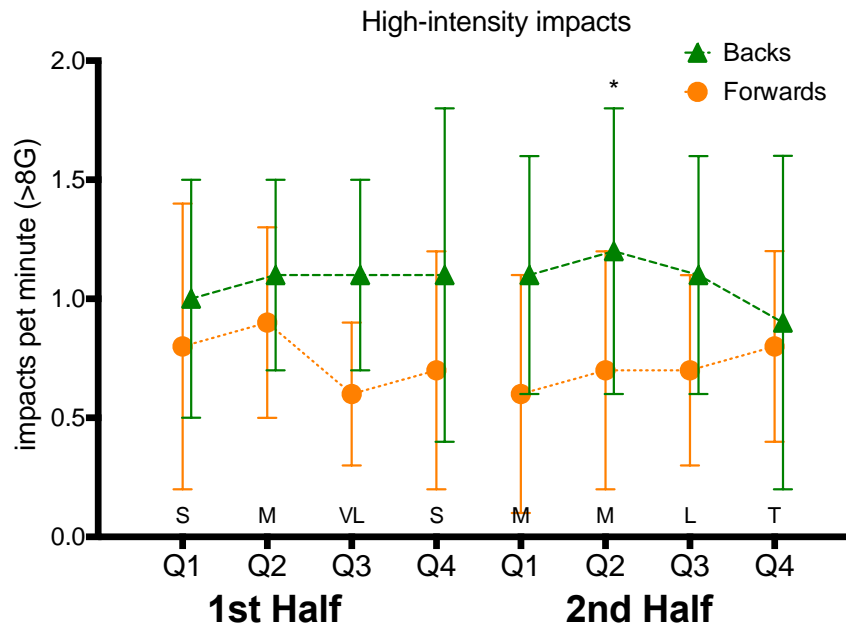
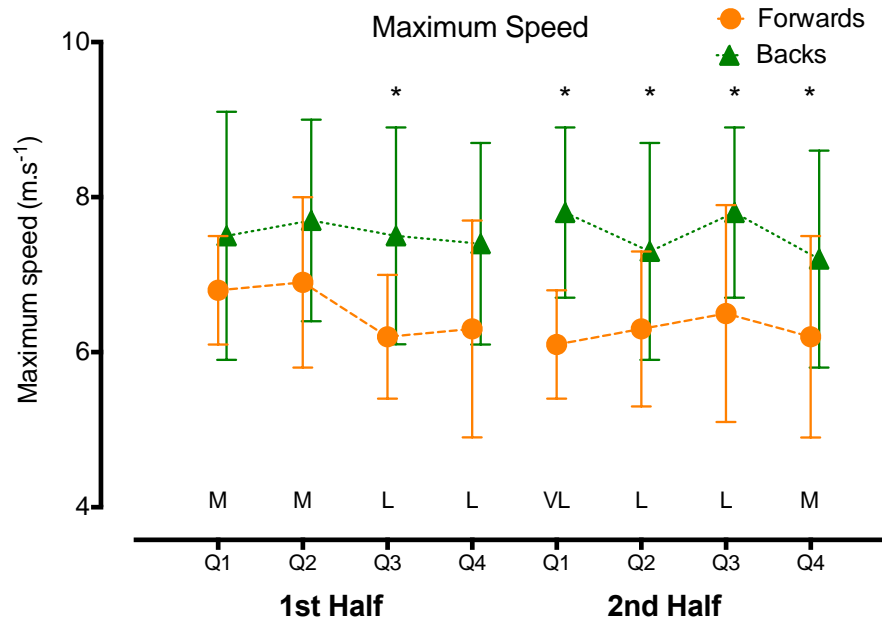
* indicates significant difference between backs and forwards, # indicated significant different from all othe match periods. T, S, M, L and VL indicate effect sizes trivial (<0.2), small (0.2-0.5), medium (0.5-0.8), large (0.8-1.2) and very large (>1.2) repectively.

Results – High-intensity distance per match period



* 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.

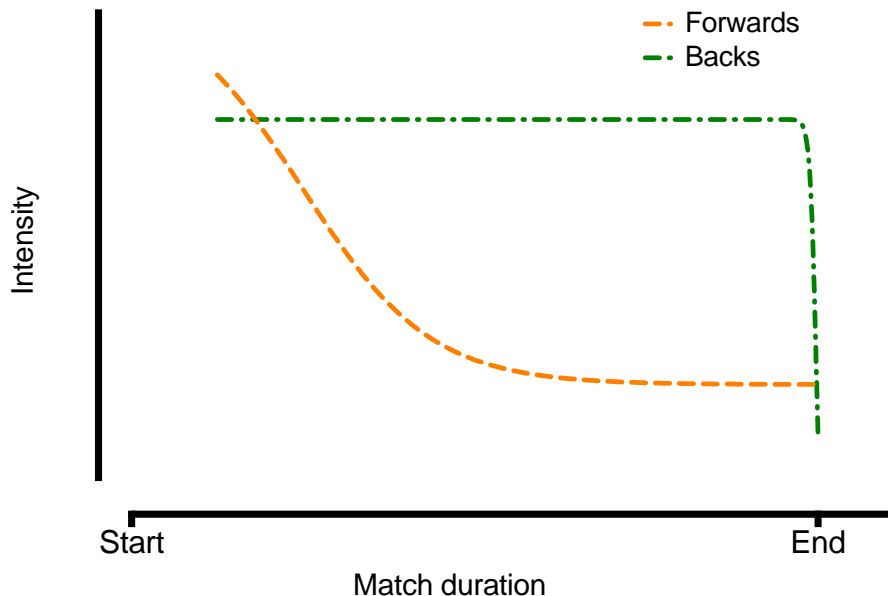
Results – Maximum speed and High-intensity impacts



The magnitude of difference in the physical outputs of forwards and backs increases during the middle periods of the match.


Conclusions – fatigue profile

Pacing strategies of rugby union forwards and backs



Backs and forwards demonstrate differing fatigue profiles.

Pacing profile	
Forwards	Backs
“Slow positive”	“Flat”

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

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

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