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# 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  $25.5 \pm 2.4$  years;

Body mass  $101.5 \pm 12.2$  kg,

Stature  $1.86 \pm 0.07$ m

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



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# 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)

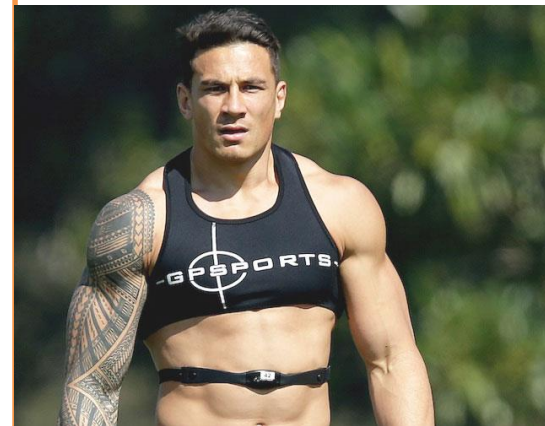
## Accelerometer

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

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### SPI Pro GPS unit

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



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# Results

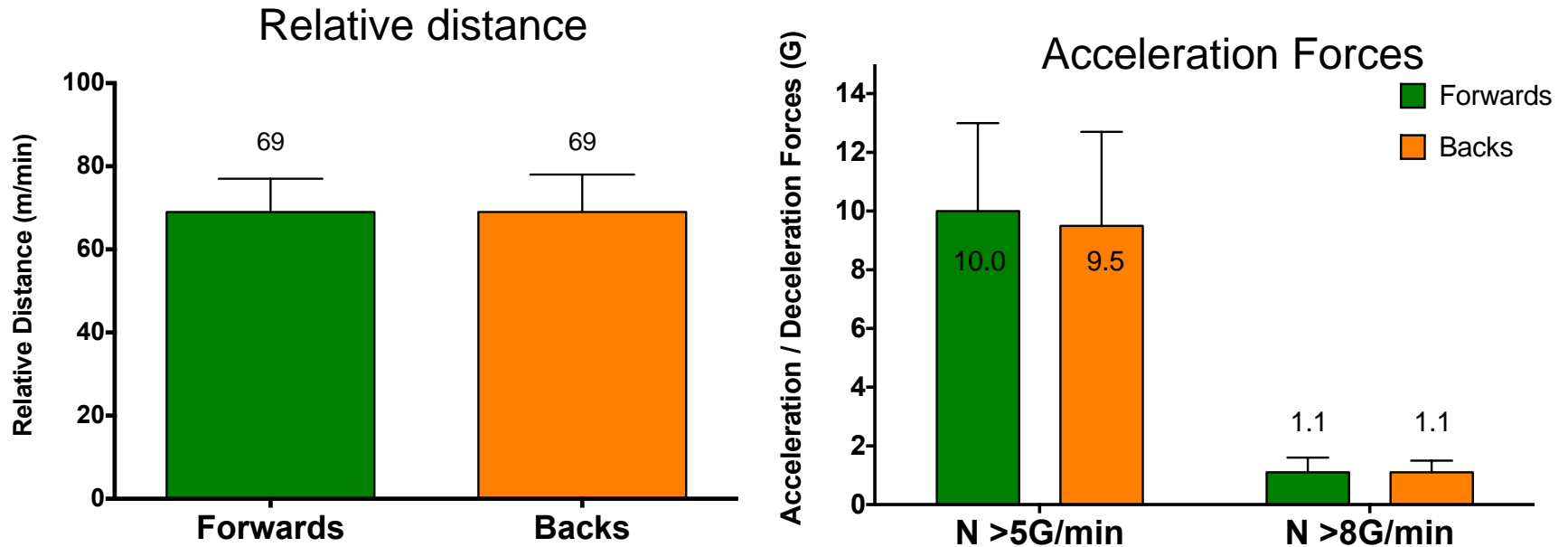
Typical physical performance characteristics of a professional rugby union player

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



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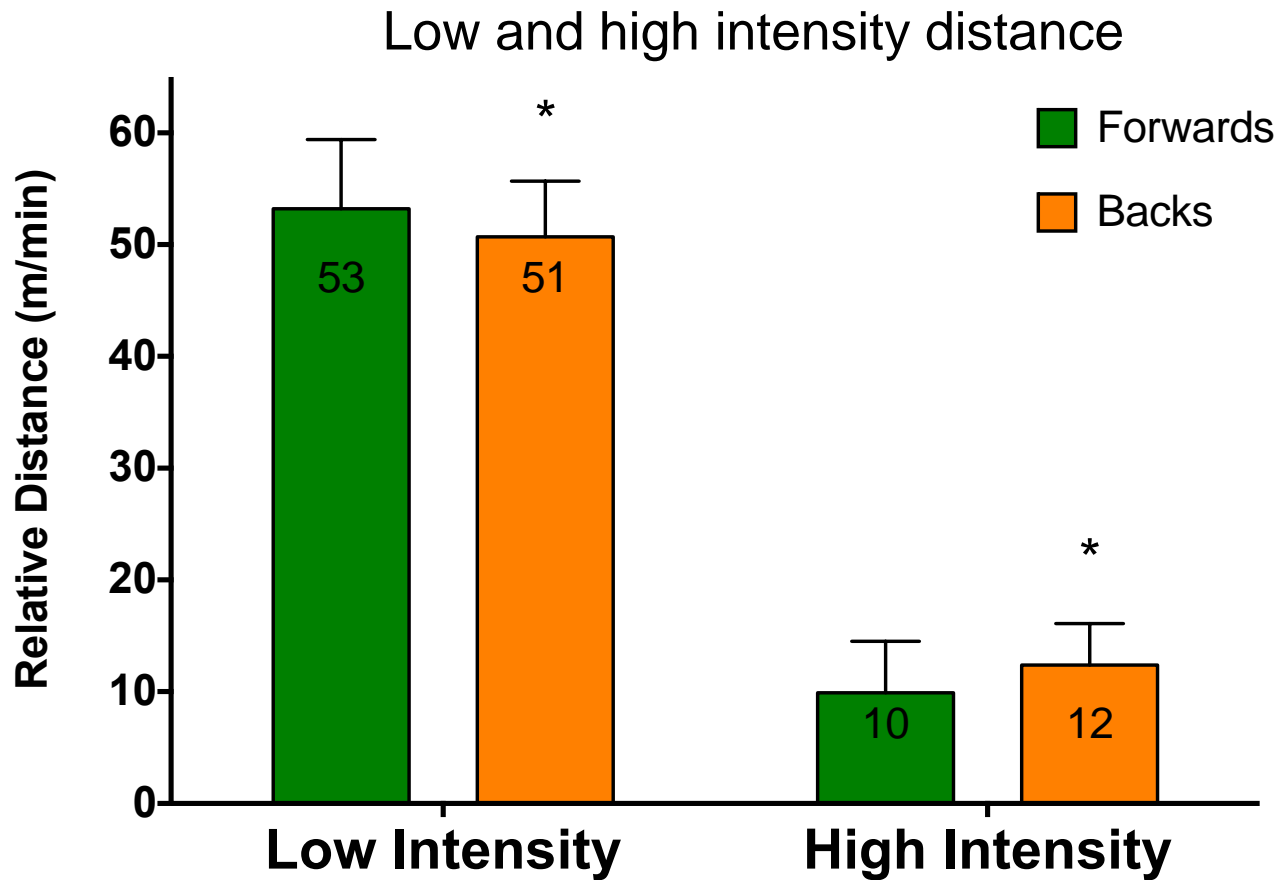
# Comparison – Forwards and Backs



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

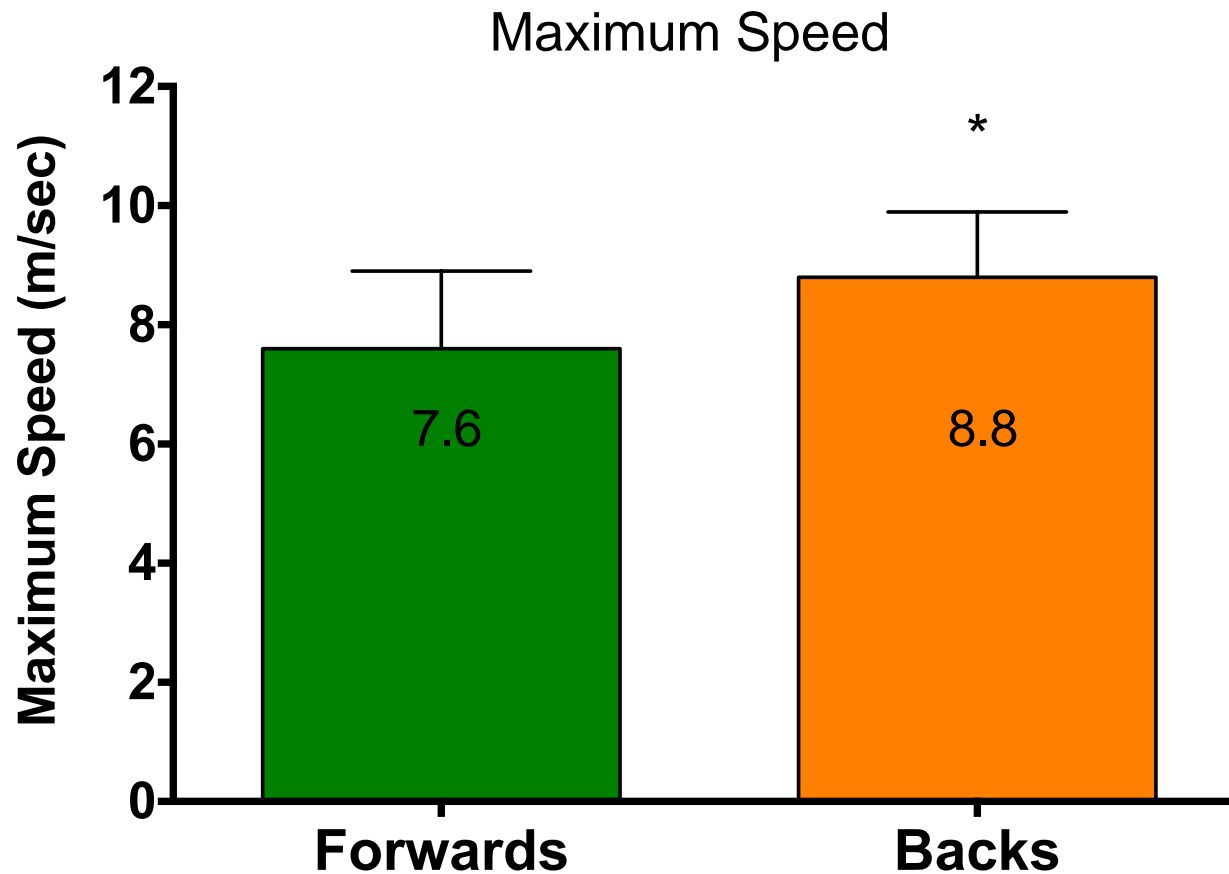


# Comparison – Forwards and Backs



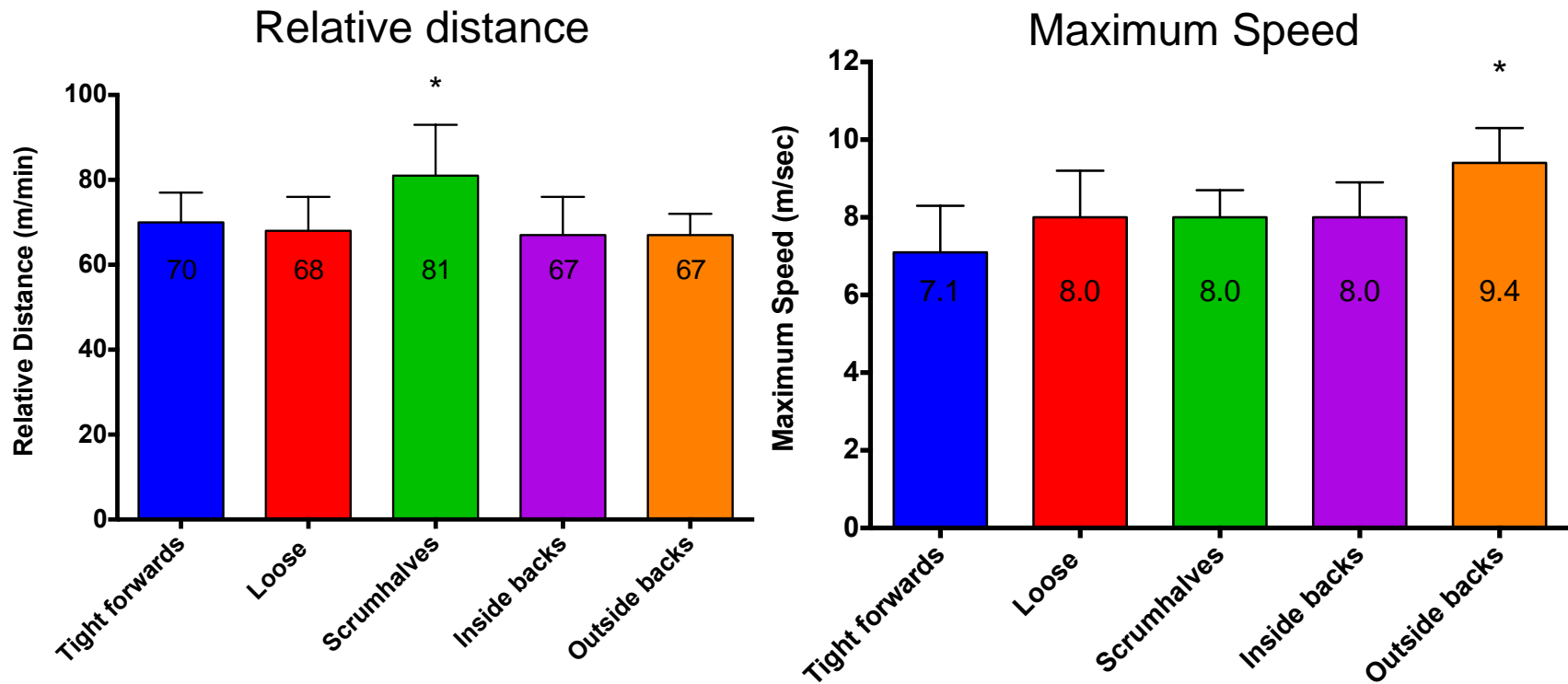
However, there are significant differences in the distances covered in low- and high-intensity speed zones.

# Comparison – Forwards and Backs



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

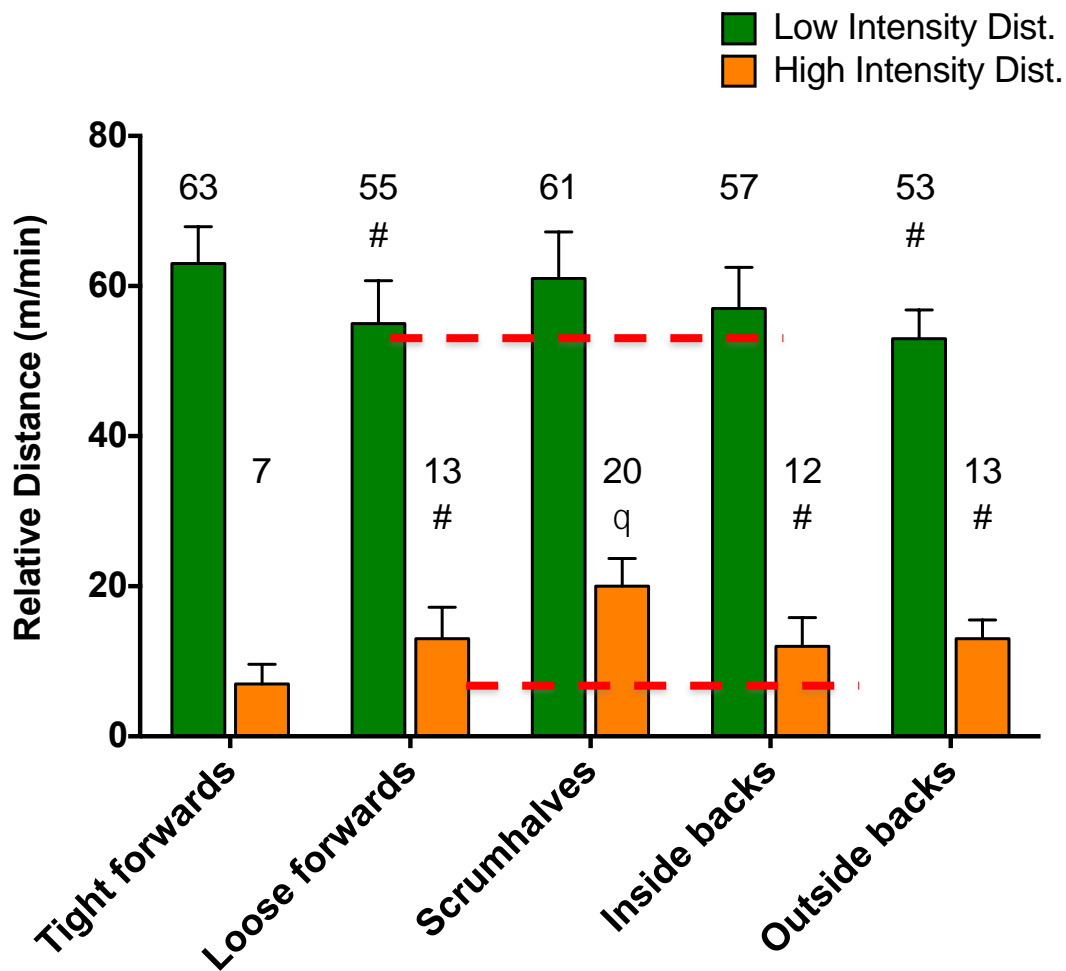
# Comparison – Positional groups



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

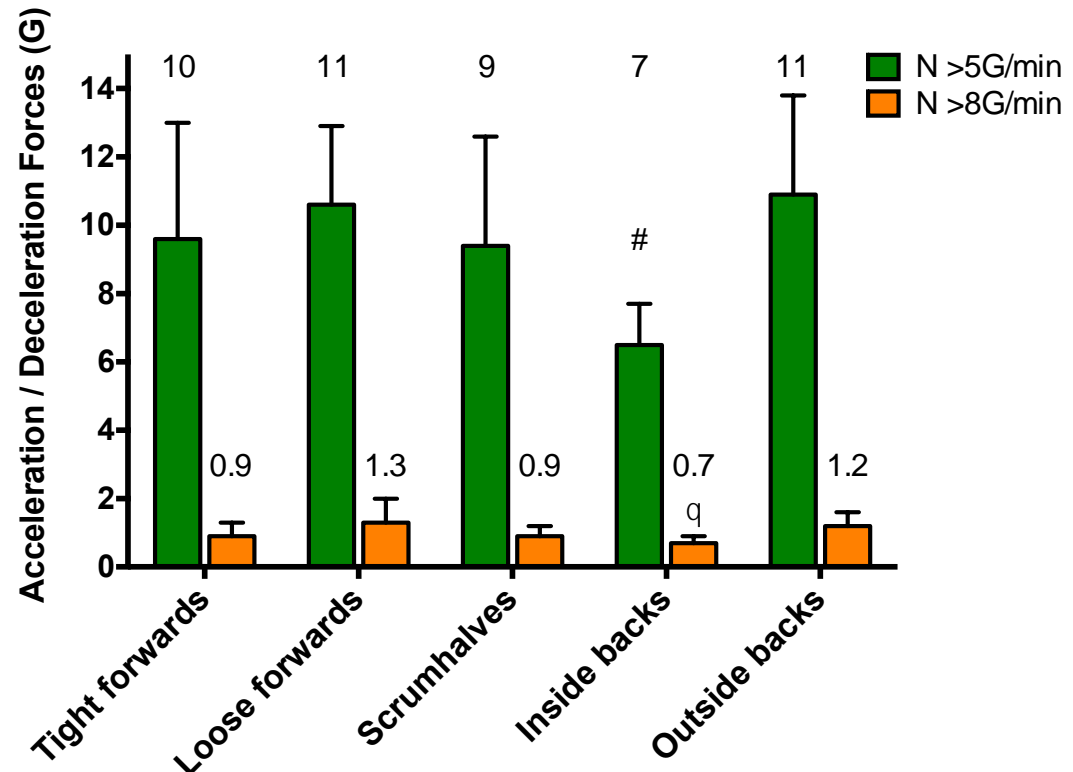
experience **less total and high-intensity acceleration forces** per minute than other positions.

**BUT**

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

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

## Acceleration / Deceleration Forces

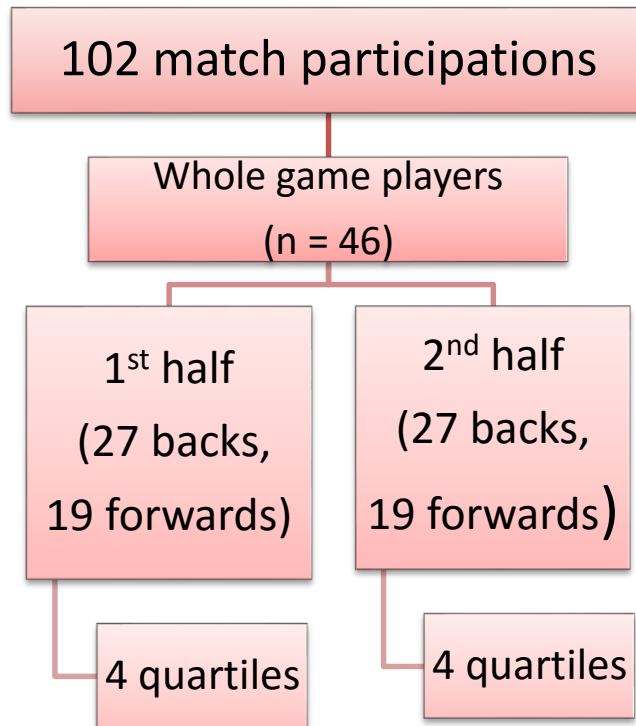


# indicates different from tight forwards, loose forwards and outside backs;  
q indicates different for outside backs only



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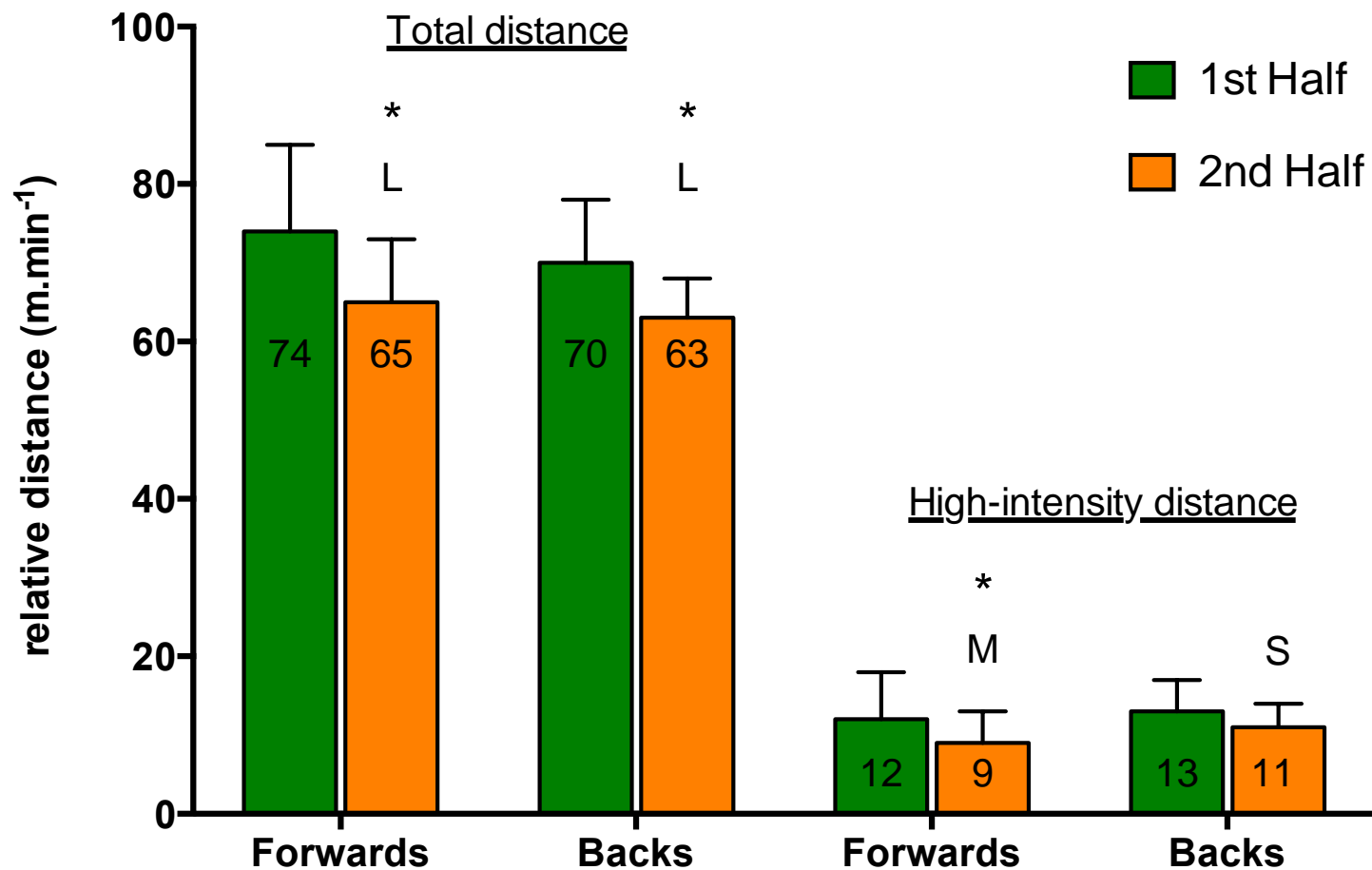
# Methods – Pacing strategies for different positions



## Statistics

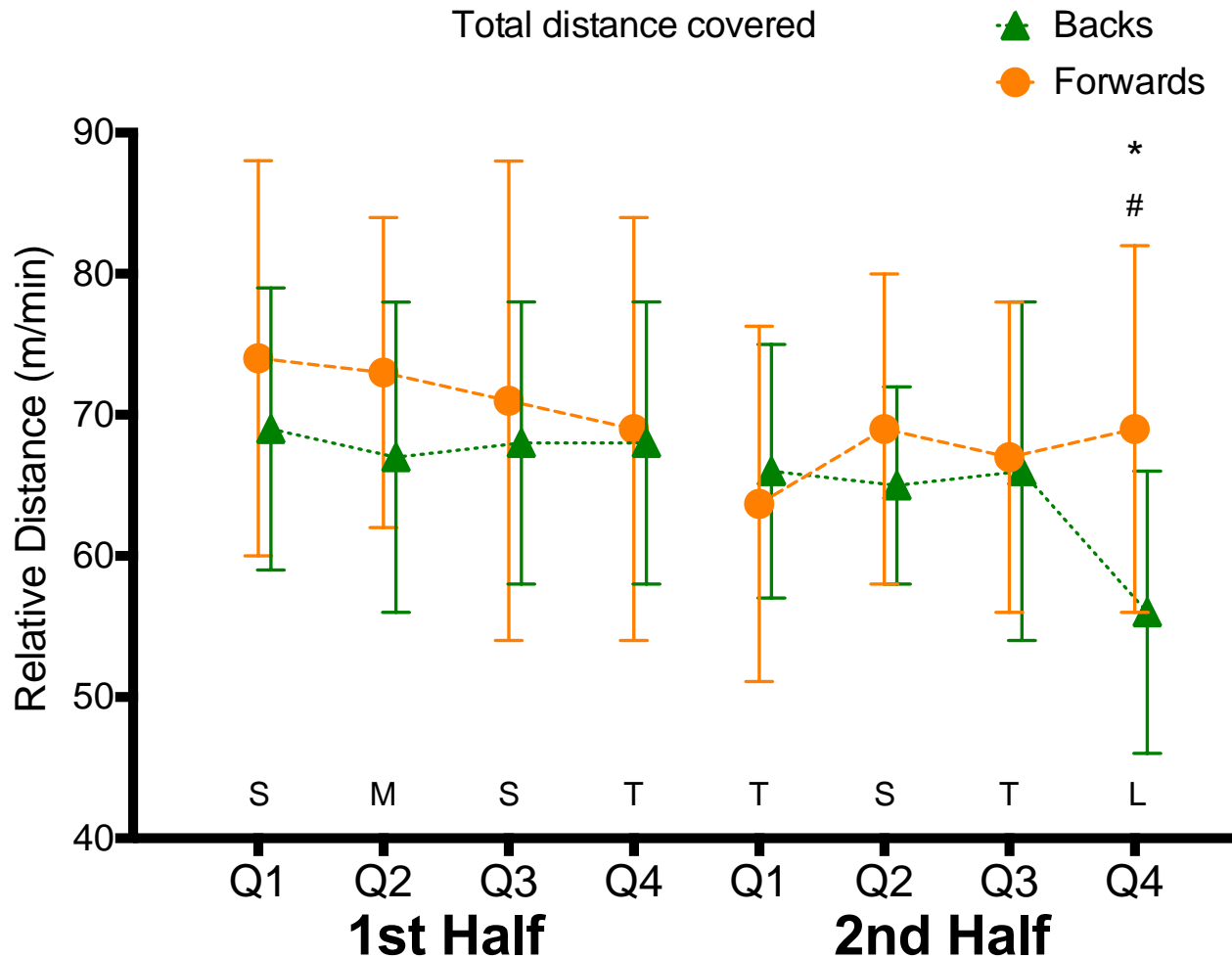
- Factorial ANOVA
- Paired and independent sample t-tests
- Cohen's effect size

## 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.

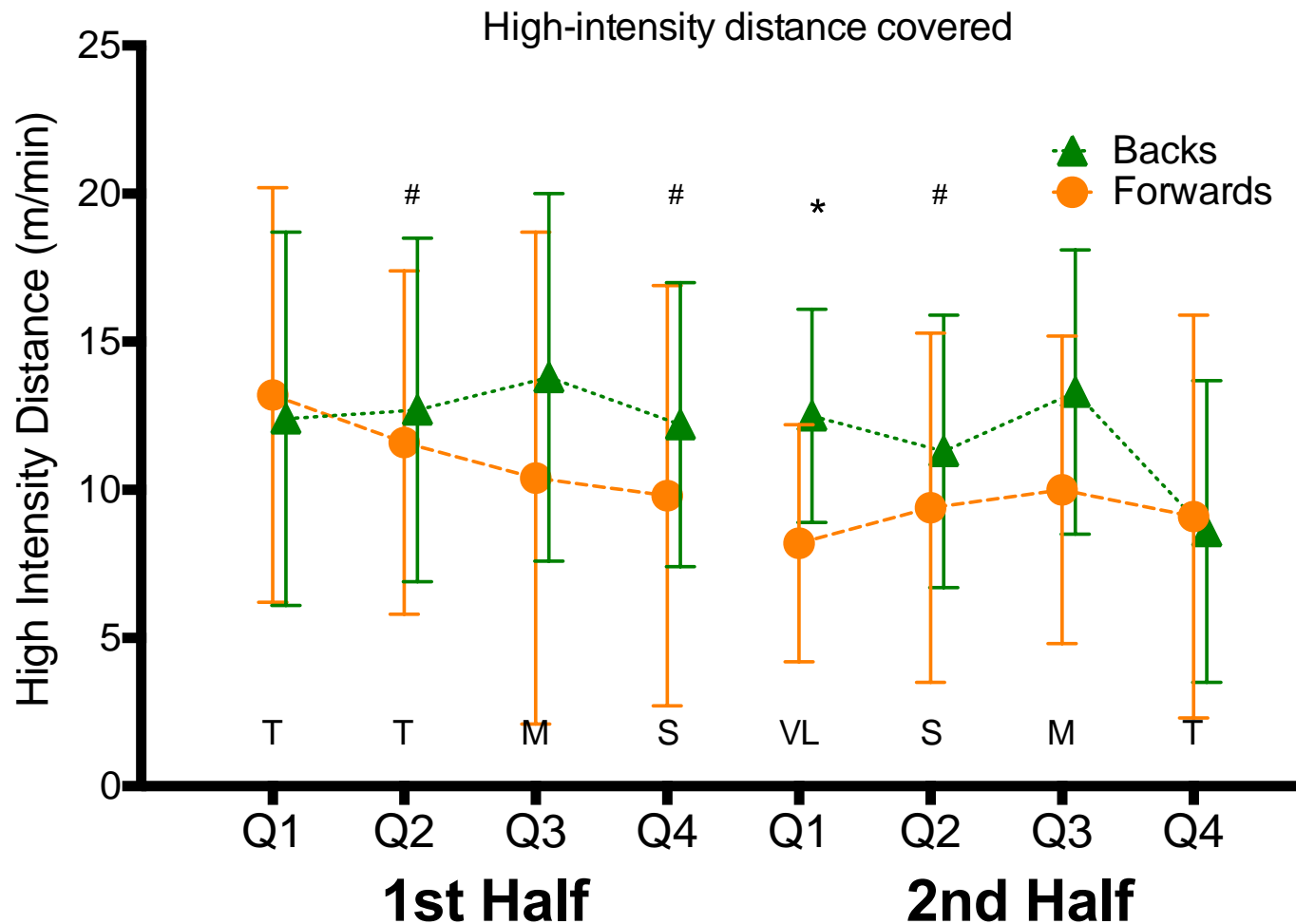
# Results – Total distance per match period



\* 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.

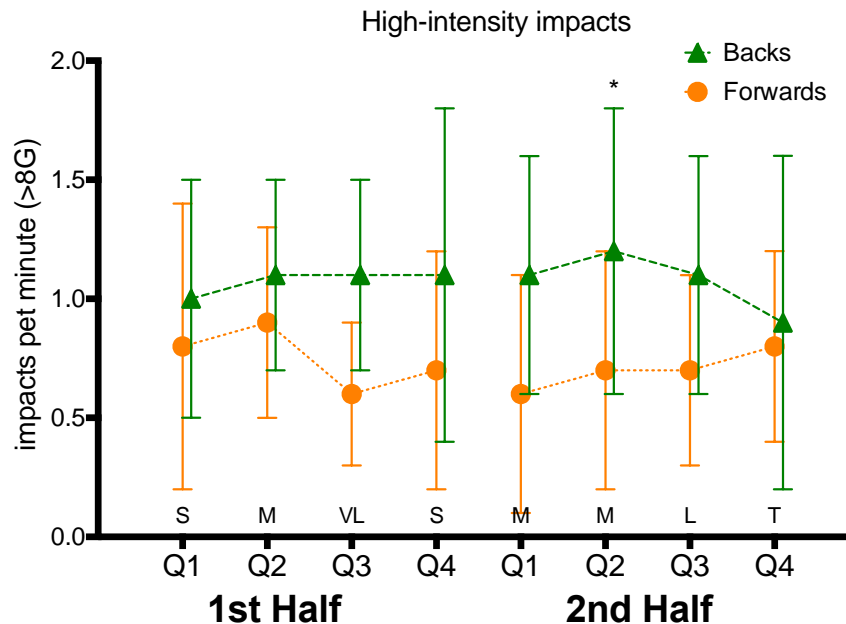
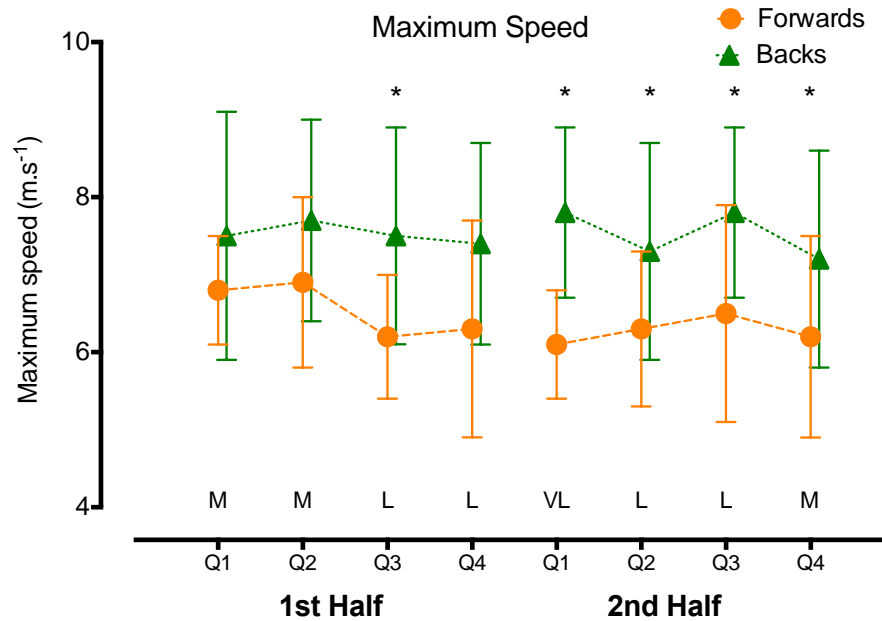


# Results – High-intensity distance per match period



\* 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.

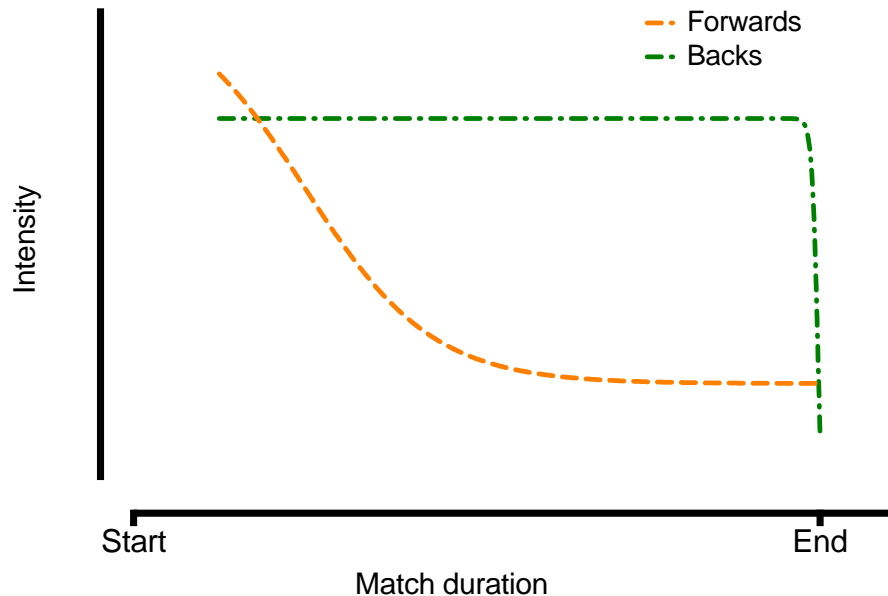
## Results – Maximum speed and High-intensity impacts



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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