



Pacing characteristics of whole and part-game players in professional rugby union

Dr. Jason Tee

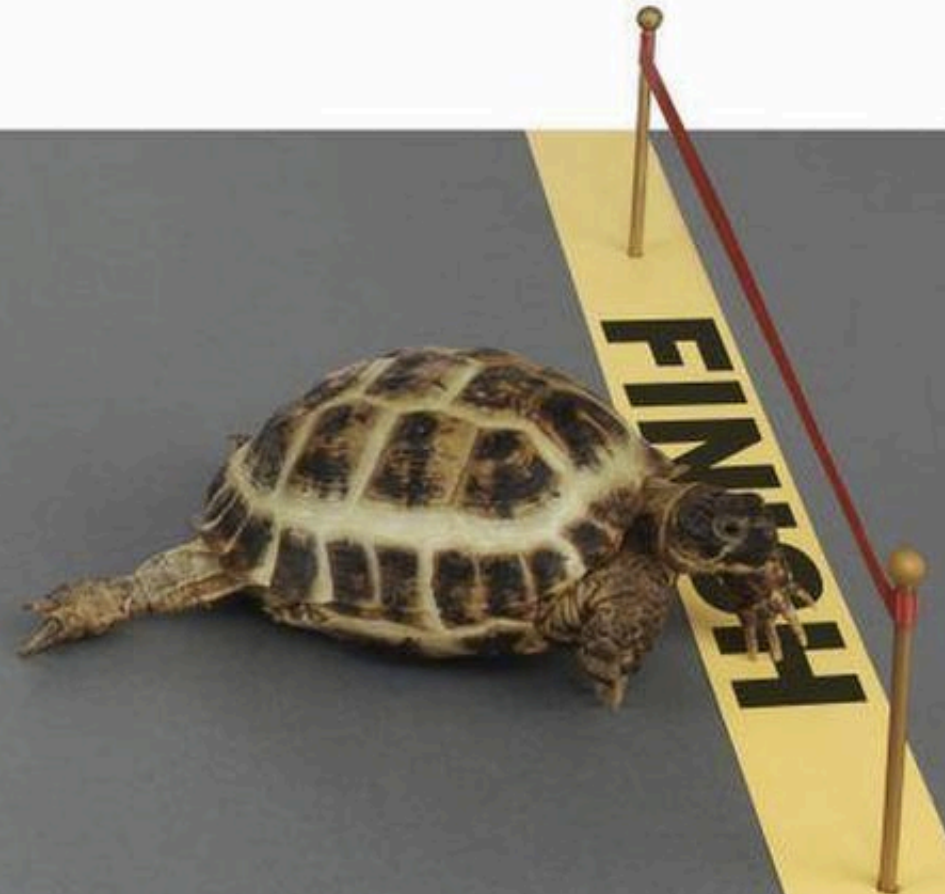


@JasonCTee



JasonT@dut.ac.za

What is pacing?

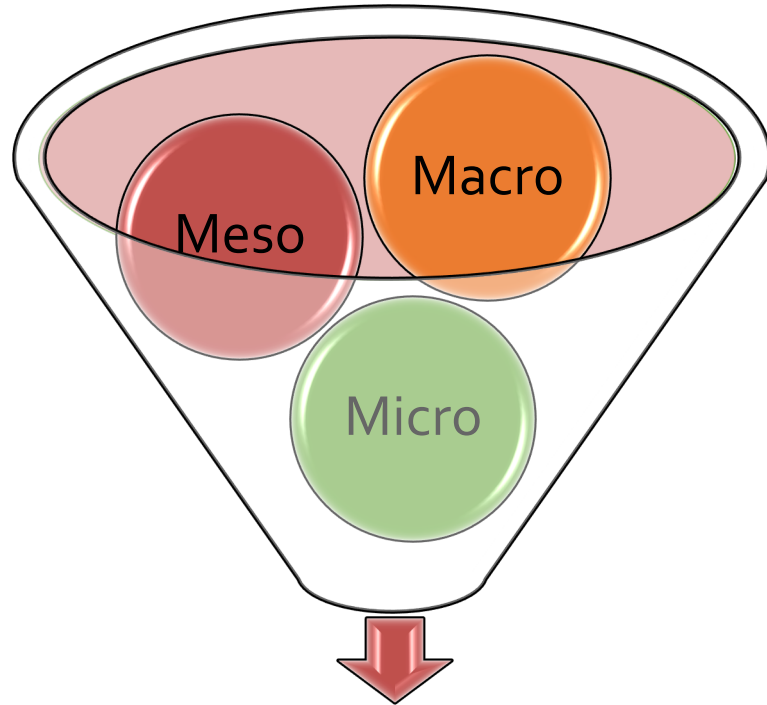


What does pacing look like in team sports?



Fatigue \neq  in total and high-intensity running distance

(Waldron and Highton, 2014, Sports Med 44:12)



Pacing schema

Distribution of energy resources

Macro-pacing (pre-match)

- hydration, fuel availability, motivation, temperature, opposition, whole-game/substitute

Meso-pacing (half time)

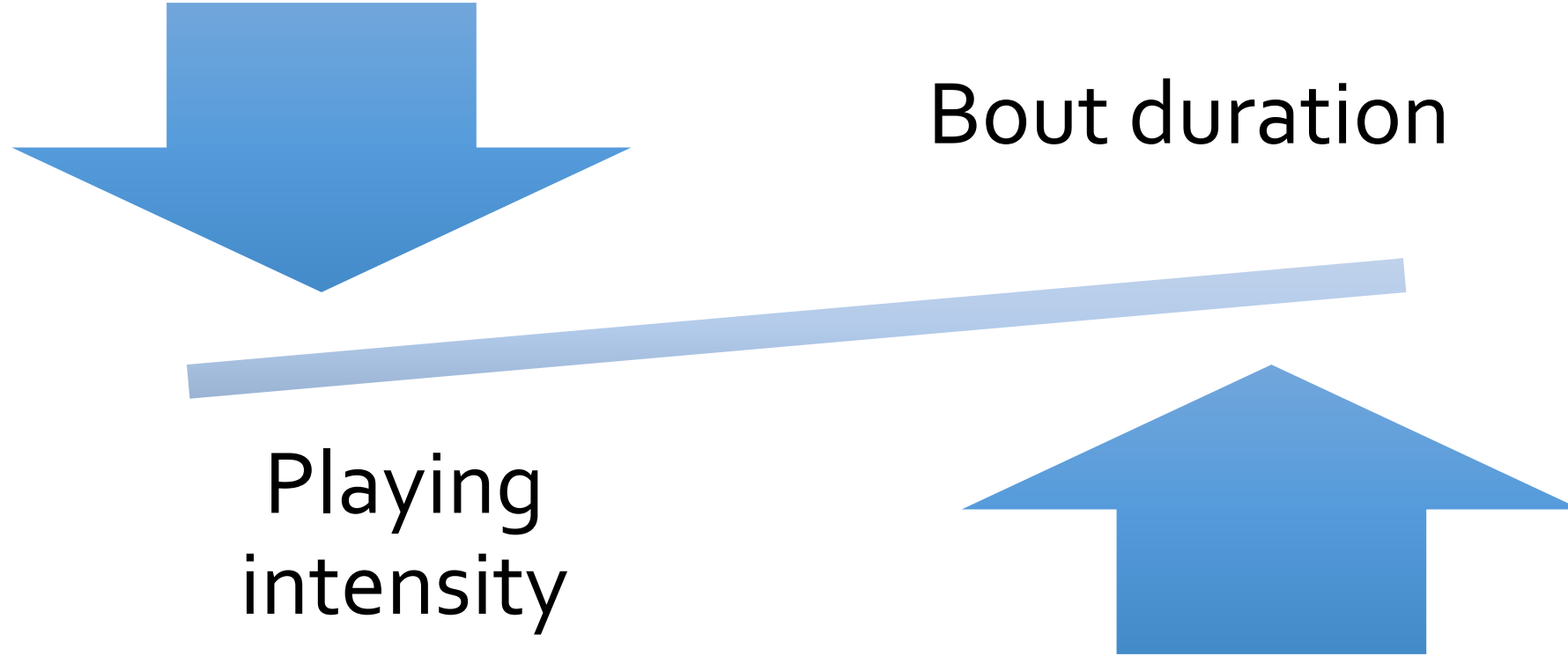
- homeostatic disturbance, opposition, scoreline

Micro-pacing (continuous)

- homeostatic disturbance, opposition, scoreline

Edwards and Noakes, 2009, Sports Med 39:1

Effect of bout duration



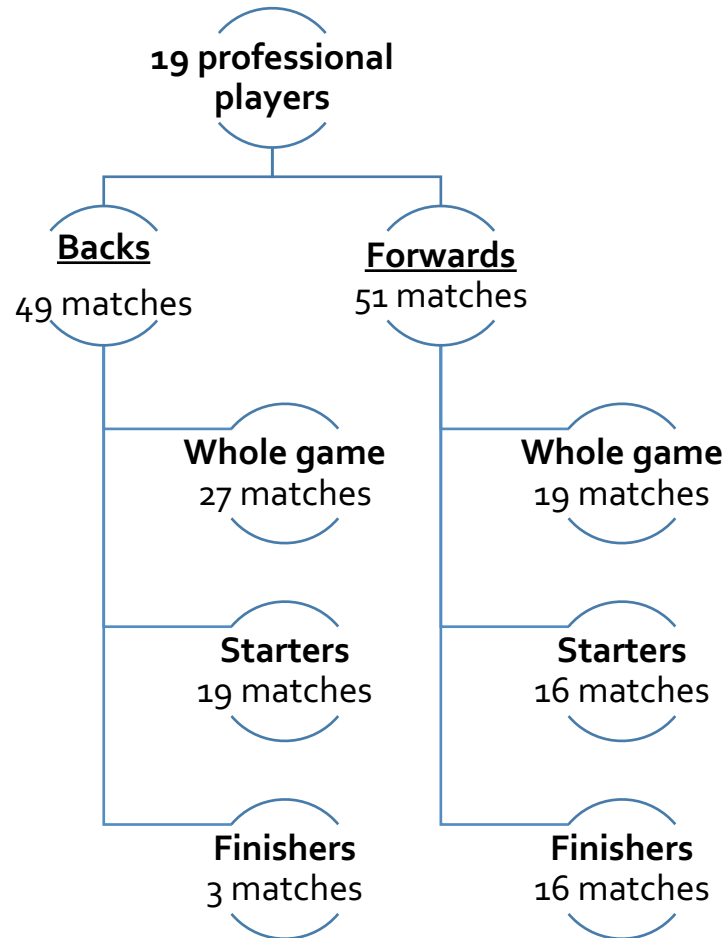
Gabbett, Walker, & Walker (2015) IJSP; Highton, Mullen, & Twist (2017) IJSP;
Sampson, Fullagar, & Gabbett (2015) JSS



What does this look like in collision sport?



Methods



Measurement

SPI Pro GPS unit (GPSports, Canberra)



Match demand metrics

- Total distance
- High speed distance ($>4 \text{ m}\cdot\text{s}^{-1}$)
- Acceleration count ($>2.75 \text{ m}\cdot\text{s}^{-2}$)
- Impact count ($> 5\text{G}$)

All normalized to playing time and divided into quartiles

Statistics

Linear mixed models &
Magnitude based decisions



Results – Bout duration effects

Table I. Comparison of locomotive match performance variables according to participation bout type (whole game, starters and finishers) for forward and back position groups

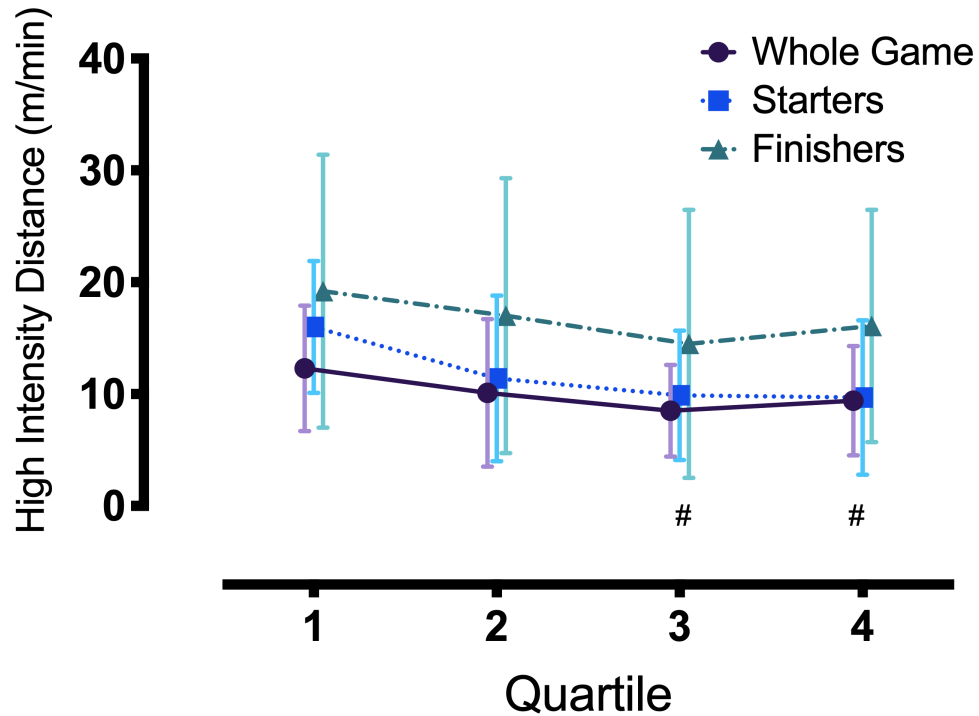
Forwards (N = 51)	Whole game (N = 19)	Starter (N = 16)	Finisher (N = 16)	Whole game vs. Starter	Whole game vs. Finisher	Starter vs. Finisher
Time playing (mins)	96 ± 12 [#]	61 ± 11 [*]	30 ± 13 ^{*#}	<i>Most likely</i> very large (-3.03 ± 1.03)	<i>Most likely</i> very large (-5.3 ± 1.5)	<i>Most likely</i> very large (-2.59 ± 0.95)
Relative distance (m·min ⁻¹)	68 ± 6	66 ± 6	71 ± 9	<i>Unclear</i> (0.32 ± 0.56)	<i>Unclear</i> (0.41 ± 0.74)	<i>Unclear</i> (0.69 ± 0.73)
High-speed distance (m·min ⁻¹)	10 ± 4	12 ± 5	17 ± 9 ^{*#}	<i>Unclear</i> (0.45 ± 0.66)	<i>Very likely</i> large (1.47 ± 0.95)	<i>Very likely</i> medium (0.95 ± 0.85)
Acceleration frequency (min per accel.)	11 ± 20	10 ± 21	6 ± 10 ^{*#}	<i>Unclear</i> (0.12 ± 0.54)	<i>Very likely</i> large (1.39 ± 0.88)	<i>Very likely</i> large (1.32 ± 0.92)
Impact frequency (>5G·min ⁻¹)	8.3 ± 2.7	11.3 ± 2.5	12.8 ± 2.6	<i>Unclear</i> (0.99 ± 0.63)	<i>Likely</i> large (1.50 ± 0.75)	<i>Likely</i> small (0.55 ± 0.82)
Backs (N = 49)	Whole game (N = 27)	Starter (N = 19)	Finisher (N = 3)	Whole game vs. Starter	Whole game vs. Finisher	Starter vs. Finisher
Time playing (mins)	96 ± 8 [#]	61 ± 14 [*]	24 ± 9 ^{*#}	<i>Most likely</i> very large (-3.22 ± 0.93)	<i>Most likely</i> very large (-8.55 ± 1.96)	<i>Most likely</i> very large (-2.55 ± 0.99)
Relative distance (m·min ⁻¹)	65 ± 4	71 ± 8	65 ± 15	<i>Likely</i> medium (1.01 ± 0.60)	<i>Unclear</i> (0.02 ± 0.59)	<i>Unclear</i> (-0.53 ± 0.61)
High-speed distance (m·min ⁻¹)	12 ± 3	16 ± 5	16 ± 2	<i>Likely</i> medium (1.01 ± 0.60)	<i>Unclear</i> (1.44 ± 1.35)	<i>Unclear</i> (0.05 ± 0.59)
Acceleration frequency (min per accel.)	5 ± 10	5 ± 9	4 ± 6	<i>Unclear</i> (0.24 ± 0.52)	<i>Unclear</i> (0.78 ± 3.05)	<i>Unclear</i> (0.48 ± 2.77)
Impact frequency (>5 G·min ⁻¹)	9.5 ± 3.1	9.6 ± 3.1	9.1 ± 6.4	<i>Unclear</i> (0.03 ± 0.59)	<i>Unclear</i> (-0.14 ± 3.38)	<i>Unclear</i> (-0.16 ± 3.33)

Notes: Data presented as mean ± SD. Role indicates whether a player completed the whole game (whole), started the game and was substituted (starter) or did not start the game and came on as a substitute (finisher). Acceleration frequency indicates how regularly players exceeded the acceleration threshold of 2.75 m·s⁻¹. Impact frequency indicates the number of time that player collision-forces exceeded 5G. *, # indicate significant difference from whole game and starters respectively (P < .05). Paired comparisons are a statement of the likelihood and magnitude of effects (Effect size ± 95%CI). Likelihood for substantial effects are described as possibly (25–75%), likely (75–95%), very likely (95–99.5%) and most likely (>99.5%).

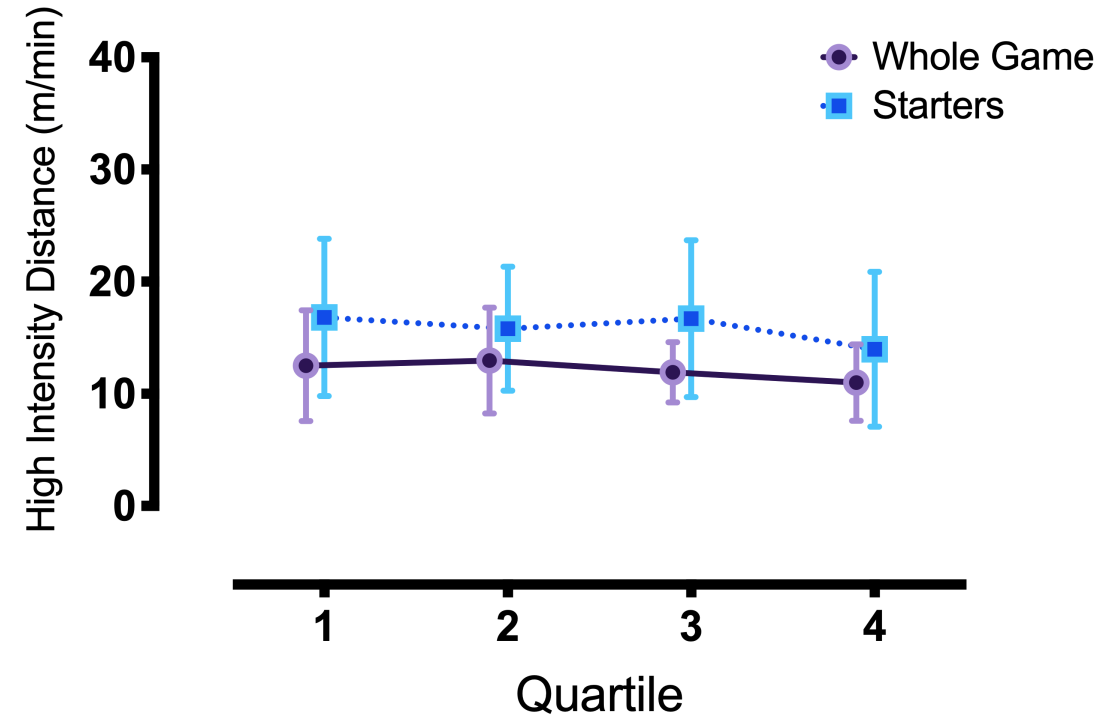
Results – Temporal effects



Forwards

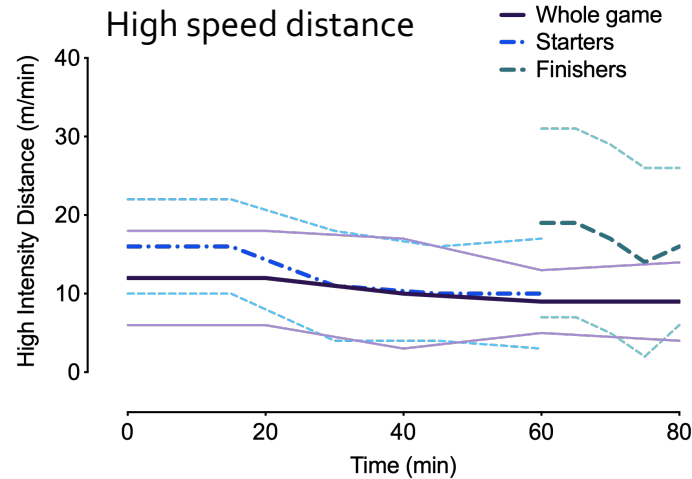
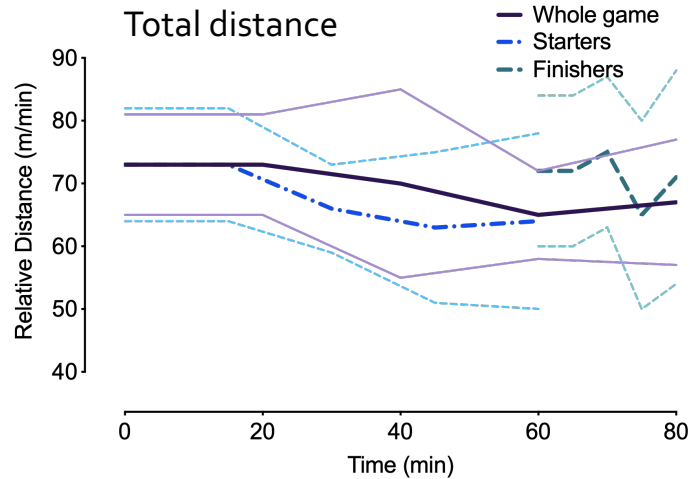


Backs

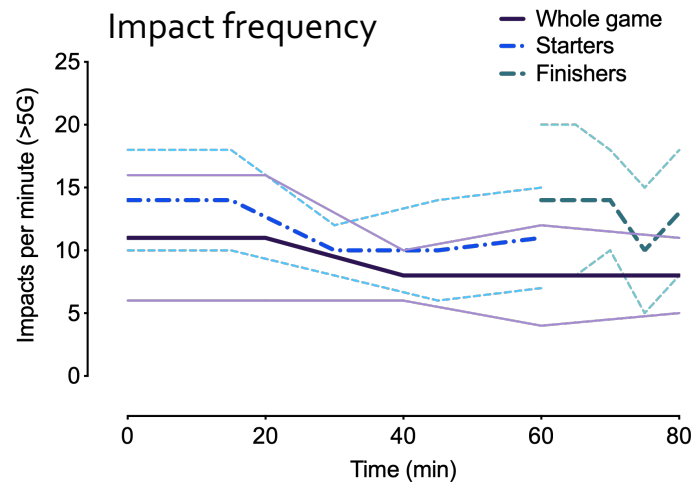
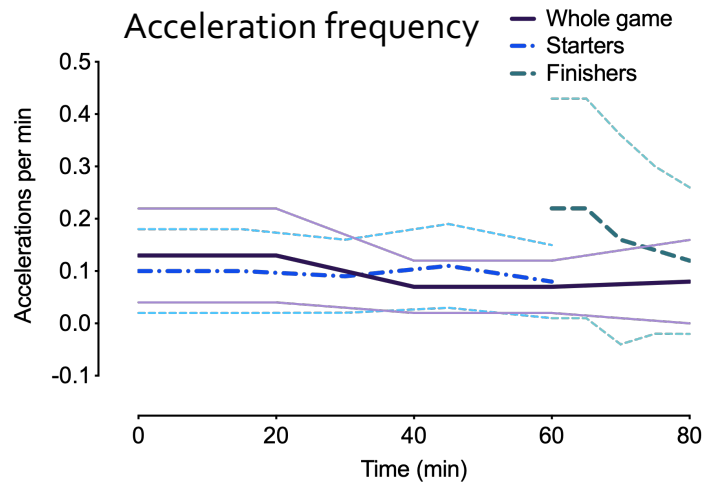


Forwards showed significant and practically meaningful reductions in running distance, high speed running distance and acceleration frequency over time
Backs no change in playing intensity over time

Results – Finishers vs Whole game players



For forwards there were significant and practically meaningful differences in all physical performance parameters vs. whole game players.



These differences diminished over time, but were still practically meaningful at the end of the game.

Practical implications



Forwards reduce playing intensity of time, backs don't
Load the bench with forwards!

Plan the timing of substitutions carefully to maximise the bout effect
Players work harder if they know how long they will play for!

Difference in playing intensity between whole game players and finishers is of concern
Investigate whether this is linked to injury risk!



Thanks for listening

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ORIGINAL ARTICLE

Pacing characteristics of whole and part-game players in professional rugby union

JASON C. TEE ^{1,2}, YOGA COOPOO³, & MIKE LAMBERT ⁴

^a*Department of Sport Studies, Faculty of Applied Sciences, Durban University of Technology, Durban, South Africa;* ^b*Carnegie Applied Rugby Research (CARR) Centre, Institute for Sport, Physical Activity and Leisure, Carnegie School of Sport, Leeds Beckett University, Leeds, UK;* ^c*Department of Sport and Movement Studies, Faculty of Health Sciences, University of Johannesburg, Johannesburg, South Africa* & ^d*Division of Exercise Science and Sports Medicine, Faculty of Health Sciences, University of Cape Town, Cape Town, South Africa*



@JasonCTee



JasonT@dut.ac.za