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Repeated acceleration and deceleration ability (RADA) in male semi-professional soccer players

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Purpose

Contemporary developments in soccer match play demands players to execute more frequent bouts of short explosive sprints, and consequently be able to control for sudden and rapid reductions in velocity (Barnes *et al.*, 2014). In fact recent research has highlighted the prevalence and importance of executing repeated rapid accelerations (ACC) and decelerations (DEC) (Akenhead *et al.*, 2014; Russell *et al.*, 2015). A reduced proficiency to maintain repeated rapid ACC's and DEC's could have significant performance and injury implications. Therefore, the aims of this study was to develop a new repeated ACC and DEC test that could be used to evaluate the repeated ACC and DEC ability (RADA) in soccer players, but could also be applied to other team sports that demand repeated bouts of ACC and DEC.

Methods

10 male semi-professional soccer players (age 23.06 ± 6.08 years, mass 76.86 ± 8.13 kg, stature 1.78 ± 0.04 m) completed the RADA test. RADA test consisted of a 20m maximal ACC (with 10m-split time) followed by a 5m rapid DEC that proceeded a 3m backpedal, prior to a final 8m re-ACC. This sequence was completed 6 times with a 30s active recovery period (figure 1). Split times at 10, 20, 22 and 25m were used for final analysis and recorded using dual-beam timing gates (Smart Speed, Fusion Sport, Australia). Average velocity and ACC (positive and negative) for each section of the RADA test was calculated and test performance evaluated with best, mean and percentage decrement (Fitzimmons *et al.*, 1993). Pearson's coefficients were also used to investigate the association between distinct aspects of the RADA test.

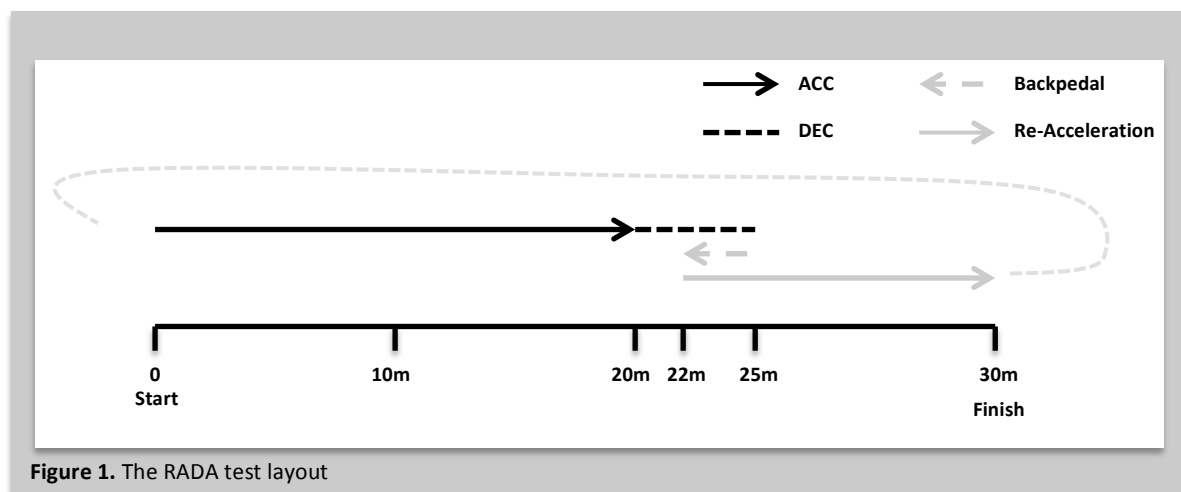


Figure 1. The RADA test layout

Results

Table 1. Descriptive data (mean \pm standard deviation (SD); 90% confidence interval [CI]) for each section of the RADA

RADA test variables	Mean \pm SD	90% CI
ACC performance variables		
10mACC _{best} (s)	1.87 \pm 0.08	1.74-2.00
10mACC _{best} (m.s ⁻²)	2.87 \pm 0.27	2.43-3.31
10mACC _{mean} (s)	1.96 \pm 0.05	1.88-2.04
10mACC _{mean} (m.s ⁻²)	2.61 \pm 0.15	2.36-2.86
10mACC _{%dec} (%)	8.54 \pm 5.82	0-18.11
20mACC _{best} (s)	3.28 \pm 0.09	3.13-3.43
20mACC _{best} (m.s ⁻²)	2.20 \pm 0.09	2.05-2.35
20mACC _{mean} (s)	3.37 \pm 0.09	3.13-3.43
20mACC _{mean} (m.s ⁻²)	2.11 \pm 0.11	1.93-2.29
20mACC _{%dec} (%)	3.88 \pm 1.78	0.95-6.81
DEC performance variables		
5mDEC _{best} (s)	1.16 \pm 0.08	1.03-1.29
5mDEC _{best} (m.s ⁻²)	-5.13 \pm 0.55	4.23-6.03
5mDEC _{mean} (s)	1.26 \pm 0.08	1.13-1.39
5mDEC _{mean} (m.s ⁻²)	-4.60 \pm 0.40	3.94-5.26
5mDEC _{%dec} (%)	10.02 \pm 5.13	1.58-18.46
3mDEC _{best} (s)	0.82 \pm 0.07	0.70-0.94
3mDEC _{best} (m.s ⁻²)	-4.61 \pm 0.83	3.24-5.98
3mDEC _{mean} (s)	0.91 \pm 0.08	0.78-1.04
3mDEC _{mean} (m.s ⁻²)	-3.79 \pm 0.65	2.72-4.86
3mDEC _{%dec} (%)	17.71 \pm 6.31	7.33-28.09
RADA performance variables		
RADA _{best} (s)	4.52 \pm 0.10	4.36-4.68
RADA _{mean} (s)	4.63 \pm 0.10	4.47-4.79
RADA _{%dec} (%)	2.28 \pm 0.98	0.67-3.89

Table 2. Best predictors of RADA. r = correlation coefficient (** = $P < 0.001$, * = $P < 0.05$), r^2 = coefficient of determination, descriptor = magnitude of correlation interpreted using Hopkins (2000) scale (<0.1 trivial, 0.1-0.3 small, 0.3-0.5 moderate, 0.5-0.7 large, 0.7-0.9 very large, 0.9-1.0 perfect).

Best Predictors of RADA	r	r^2	Descriptor
RADA_{%dec}			
DEC _{3%dec}	0.780**	61%	Very Large
RADA_{best}			
DEC _{3best}	0.644*	41%	Large
ACC_{10%dec}			
ACC _{10best}	0.789**	62%	Very Large

Conclusions

RADA_{decrement} was significantly correlated to the DEC_{3mean} ability. A reduction in DEC ability is likely to have huge impact on ability to execute repeated high intensity bouts of ACC's and DEC's, indicating DEC's seem to be highly sensitive to fatigue. Interestingly DEC_{3best} was also significantly correlated to RADA_{best}, reiterating that DEC is critical to overall performance. ACC_{10best} significantly correlated to ACC_{10decrement}, suggesting players that can produce high ACC have less ability to maintain this quality when repeated ACC's are required. Small correlations between all ACC and DEC abilities seem to suggest ACC and DEC are distinct movement skills therefore requiring unique training interventions. Further investigation should focus on identifying physical and technical qualities required for proficient RADA in particular the DEC component, and to determine the validity, reliability and sensitivity of this test.

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