The Reliability of a Team Sport-Specific Running Protocol on a Non-Motorised Treadmill

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Introduction

▪ At present there are few testing methods that reliably evaluate performance of the work demands of team sports (3,7).

▪The purpose of this study was to report on the reliability of a new test and method for measuring team sport running performance on a non-motorised treadmill (NMT) in a laboratory.

Methods

Subjects

▪ 11 moderately-trained (VO_2max = 52.6±4.5 ml·kg^{-1}·min^{-1}; age = 23.6±4.5 yrs; body mass = 77.5±8.2 kg) male team sport athletes participated in this study.

▪ Following a familiarisation session, each subject completed three *30 min team sport-specific running protocols* on a NMT, separated by 6 days.

30 min Team Sport-Specific Running Protocol

▪ The activity profile of the 30 min team sport-specific running protocol was based on previous time and motion studies of various team sports including soccer, rugby league and Australian rules football (2,6).

▪ Two 15 min activity profiles were performed succinctly (separated by a 2 min rest) on a NMT (Force Tread Dynameter, Woodway, USA) to form a total duration of 30 min.

▪Included in these activity profiles were six running speeds: standing (0% of maximal sprint speed (MSS)), walking (20% MSS), jogging (35% MSS), running (45% MSS), fast running (65% MSS) and sprinting (100% MSS) (see figure 1).

▪ The six movement categories were designated a particular duration based on time and motion data from team sports (2,6). Standing, walking and jogging were all assigned 8 s time durations. Running, fast running and sprinting were assigned 6 s, 4 s, and 3 s time durations, respectively.

▪A specialised software package (Force Software, Innervations Joondalup, Australia) then randomised the movement duration data into a 15 min set protocol such that the total amount of running at any given speed would approximate that which occurred during a competitive match (1).

▪ The result was a 30 min team sport-specific running protocol, which comprised of 181 changes in speed (first 15 min period = 91changes, second 15 min period = 90 changes).

Statistics

▪A one-way ANOVA was used to determine any significant differences in physiological and performance variables between the three trials (SPSS Inc., Version 12.0.1 for Windows, Chicago, USA).

▪Typical error (TE), typical error expressed as a coefficient of variation (CV), and Intraclass correlation coefficient (ICC) were used to determine the reliability of each physiological and performance variable between the three trials (see table 1 and 2). TE and CV were calculated according to the methods of Hopkins (4).

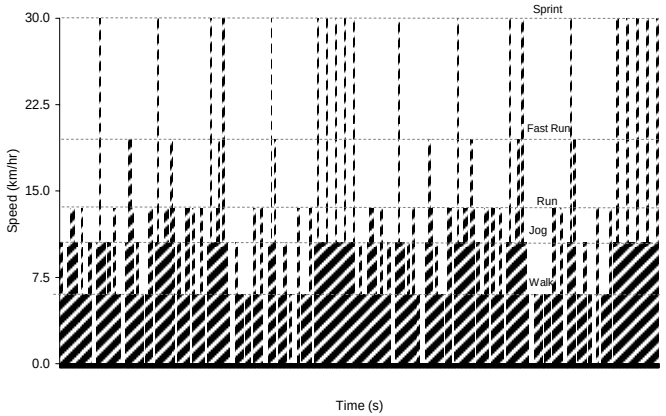

Figure 1: 30 min activity profile for a participant with a maximal speed of 30km·h^{-1}. Two 15 min periods were completed with 2 min rest separating each 15 min activity profile.

Results

▪ No significant differences were shown in any of the physiological or performance variables between trial 1-2, trial 2-3 and trial 1-3 (P<0.05).

▪The mean (±SD) total distance covered, 3 s and 6 s sprint distance was 3430.7 ± 122.2 m, 17.3 ± 1.5 m, and 36.6 ± 2.3 m, respectively. The mean (±SD) peak running speed was 25.5 ± 1.4 km·h^{-1}. The mean (±SD) total 5 x 6 s repeated sprint ability (RSA) test distance (sprinting and jogging) was 661.5 ± 37.7 m.

▪The mean (±SD) heart rate (HR) and blood lactate concentration ([BLa$^-$]) for the entire 30 min team sport-specific running protocol was 158.3 ± 9.9 bpm and 9.9 ± 3.3 mmol·L^{-1}, respectively.

Table 1: Typical error, typical error expressed as a coefficient of variation and Intraclass correlation coefficients for each important performance variable.

	Total Distance (m)	Peak Running Speed (km·h^{-1})	5 x 6 s RSA Distance (m)	6 s Sprint Distance (m)	3 s Sprint Distance (m)
			Trial 1-2		
TE	74.66	0.43	8.17	1.08	0.88
CV (%)	2.21	1.73	2.40	3.26	5.95
ICC	0.62	0.89	0.88	0.78	0.59
			Trial 2-3		
TE	65.04	0.53	12.75	0.32	1.08
CV (%)	1.91	2.01	3.51	0.87	1.29
ICC	0.74	0.85	0.62	0.97	0.92
			Trial 1-3		
TE	71.31	0.43	15.11	1.13	0.84
CV (%)	2.14	1.68	4.29	3.34	5.79
ICC	0.68	0.91	0.57	0.78	0.22

TE, typical error; CV, typical error expressed as a coefficient of variation; ICC, Intraclass correlation coefficient; RSA, repeated sprint ability.

Table 2: Typical error, typical error expressed as a coefficient of variation and Intraclass correlation coefficients for each important physiological variable.

	Total Oxygen Conumsumption (L)	Mean HR First Half (bpm)	Mean HR Second Half (bpm)	Mean [BLa$^-$] First Half (mmol·L^{-1})	Mean [BLa$^-$] Second Half (mmol·L^{-1})
			Trial 1-2		
TE	2.96	2.32	2.21	1.42	1.44
CV (%)	3.41	1.53	1.37	16.08	20.80
ICC	0.74	0.94	0.96	0.79	0.87
			Trial 2-3		
TE	4.05	3.18	2.46	1.40	1.75
CV (%)	4.88	2.16	1.55	18.22	16.17
ICC	0.55	0.90	0.95	0.79	0.75
			Trial 1-3		
TE	5.98	2.90	2.98	1.75	2.33
CV (%)	7.13	1.94	1.91	19.19	23.19
ICC	0.15	0.92	0.92	0.63	0.62

TE, typical error; CV, typical error expressed as a coefficient of variation; ICC, Intraclass correlation coefficient; HR, heart rate; [BLa$^-$], blood lactate concentration.

Discussion & Conclusions

▪The activity profile used to simulate team sport match running demands in this study elicited physiological responses that were similar to those reported from match play in a variety of team sports (2,6).

▪ The 30 min team sport-specific running protocol has a high reproducibility and can be considered more reliable than common field tests used to assess the physical capacity and performance of team sport athletes (5).

▪A 6 s sprint is more reliable then a 3 s sprint on a NMT. Furthermore a 5 x 6 s RSA test can be used reliably on a NMT under pre-fatigued conditions.

▪These results demonstrate that the NMT system and 30 min team sport-specific running protocol used provide a reliable tool for assessing both key performance variables and physiological measures in team sport athletes. Furthermore, these results indicate that two familiarisation sessions should be completed prior to testing on a NMT.

▪The present results can be used to interpret meaningful changes in performance and also to determine the appropriate sample size needed for future studies using this protocol.

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