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Designing a Cost-Effective Power Profile Test for Talent Identification Programs

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Abstract

Introduction: Cycling is of increasing popularity among the world. World Cycling Centre (UCI-WCC) offers training and development for around 100 talented athletes every year, with three permanent groups in the Olympic disciplines of road, track and BMX, in order to leverage their sporting careers. Human, material and financial resources could become limiting factors when performing talent identification (TID) programs. Consequently, designing a test, which can provide coaches with relevant information about the physical potential of their cyclists and an initial benchmark thanks to a simple but reliable protocol, might become an asset for the cycling industry.

A Power Profile Test (PPT) is a laboratory test that assesses a cyclist's maximum capacity to produce power over durations that are strongly related to physiological capacities required to perform in specific cycling events (Quod et al. 2010). Designing a PPT to evaluate power producing capacity on physiological key efforts using a cycle ergometer such as Wattbike, with a mean error of <2% compared to the SRM, would be acceptable for talent identification purposes (Hopker et al. 2010), and accessible to every UCI-WCC Satellite-Centre or Federation due to cost-effectiveness ratio and easy to use.

Purpose: The aim of this study was to design a new World Cycling Centre - Power Profile Test (WCC-PPT) to generate benchmarks in order to help coaches identifying potential talented endurance cyclists around the world.

Methods: A total of 126 (91 males and 35 females) international level endurance cyclists from 41 countries completed the WCC-PPT. The data used for analysis were collected over a 2-year period, at the WCC and its Satellite-Centers. All cyclists completed the WCC-PPT as part of a TID program in similar conditions. WCC-PPT was performed on an air-braked cycle ergometer (WattBike Ltd, Nottingham, UK).

The WCC-PPT involved a total of 4 efforts, 2 x 6s (234s recovery in between and after last 6s effort), 1 x 30s (330s recovery) and 1 x 4min. A controlled 17-min warm-up was performed before the test.

Continuous variables are summarized by mean, 25^{th}, 50^{th} and 75^{th} percentiles.

Results: Anthropometrical characteristics and WCC-PPT results for male and female are presented in Table 1.

Table 1. Male-Female anthropometrical characteristics and WCC-PPT results.

Variable	Mean*		25th Pctl		50th Pctl		75th Pctl	
	M	F	M	F	M	F	M	F
Anthropometrical characterisstics								
Age (yr)	19±3	22±6	18	18	19	19	21	24
Mass (kg)	66.0±7.3	59.0±6.4	61.0	53.7	66.3	58.2	72.2	65.2
Height (m)	1.77±0.06	1.64±0.07	1.71	1.58	1.77	1.64	1.80	1.68
BMI (kg/m2)	21.2±1.7	21.9±1.7	20.4	20.8	21.1	21.4	22.1	22.5
First effort (6s)								
Peak Power (w)	1122±216	810±129	1022	719	1129	806	1264	893
Peak Power/Weight (w/kg)	17.1±3.0	13.8±1.9	15.8	12.1	17.3	13.4	18.7	15.1
Average Power (w)	940±223	670±108	837	598	968	664	1079	718
Average Power/Weight (w/kg)	14.3±3.1	11.4±1.5	13.7	10.2	14.6	11.4	15.4	12.3
Peak Cadence (rpm)	164±14	158±13	158	154	167	158	167	167
Second effort (6s)								
Peak Power (w)	1185±196	851±140	1020	779	1184	852	1320	903
Peak Power/Weight (w/kg)	18.0±2.5	14.5±2.1	16.7	13.1	17.8	14.3	19.5	15.7
Average Power (w)	1001±184	713±136	864	635	992	703	1139	776
Average Power/Weight (w/kg)	15.2±2.4	12.1±2.0	14.2	10.8	15.0	12.1	16.6	13.6
Peak Cadence (rpm)	162±16	156±13	154	154	162	158	171	162
Third effort (30s)								
Peak Power (w)	1042±186	746±143	907	652	1053	734	1179	827
Peak Power/Weight (w/kg)	15.8±2.4	12.7±2.2	14.5	11.1	15.9	12.5	17.3	14.1
Average Power (w)	693±99	481±79	615	435	694	486	769	541
Average Power/Weight (w/kg)	10.5±1.1	8.2±1.1	9.8	7.5	10.7	8.1	11.3	9.0
Fourth effort (4min)								
Average Power (w)	369±76	239±43	313	202	364	249	428	271
Average Power/Weight (w/kg)	5.6±1.0	3.9±0.9	5.0	3.6	5.7	4.0	6.3	4.5

*mean±standard deviation.

Conclusion: The proposed test methodology and its descriptive results indicate that designing an easy and cost-effective laboratory test such as the WCC-PPT may allow the cycling community to generate a powerful database in order to create power outputs benchmarks to identify talented endurance cyclists over the world.

Further research is needed to evaluate the reliability and validity of this test for TID purposes. In addition, it is important to increase the number of cyclists tested in order to create relevant references per continent, gender, age and Olympic cycling disciplines.

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