BOOK OF ABSTRACTS Open Access

Reliability of Altitude-Induced Performance Changes in a Top-2 Tour de France Cyclist

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Introduction

Assessing fitness changes of athletes is challenging in elite sports (Muller et al. 2000): firstly, tests require a high level of validity, reliability, accessibility and specificity (Hopkins 2000). Secondly, frequent maximal testing sessions are not possible since it would alter the training program and induce additional fatigue. Thirdly, individual responses to an exercise training program are highly variable and influenced by a multitude of determinants and interactions between factors affecting training efficacy. Overall, sharpshooting approach (e.g. investigation of elite athlete)(Mujika 2015) is therefore not only appropriate but necessary for assessing the effectiveness of altitude training.

In cycling, different fitness test protocols (e.g. cycle ergometer, velodrome, uphill…) have been proposed (Paton and Hopkins 2001) but recently the constant use of validated powermeters during training and racing makes the power output (PO, W) available and permits to model the hyperbolic relationship between the different record PO and time durations; the so-called “Record Power Profile” (RPP) (Pinot and Grappe 2011).

Altitude training is now widely used in endurance sports (Millet et al. 2010) including in cycling. It is well-known that altitude training induces high variability in physiological and performance responses between individuals following either live high, train high (in hypobaric hypoxia). Some individuals (e.g. ‘responders’) may respond better than others (e.g. ‘non-responders’) (McLean et al. 2013). Field evaluation is always difficult, especially during the overloaded competitive period. By using RPP, one may detect fitness changes induced by an altitude training camp. For embedded scientists (Fast-thinking) working directly with the team and providing data helpful for coaches and medics as well as for researcher (Slow-thinking) providing evidences for the intervention and controlling its signal/noise ratio (Coutts 2016), the reliability of the measures and methods is absolutely paramount. To our knowledge, there is a scarcity of data on the beneficial or deleterious effects of altitude training in professional cyclists (Garvican et al. 2007; Hahn and Gore 2001). Therefore, the purpose of this study was to assess the reliability and the validity of the response to altitude training in an elite cyclist by the mean of the RPP.

Hypothesis

Investigating multi-exposures in hypobaric hypoxia through the use of the RPP allows assessing and modeling performance changes and his reproducibility in an elite cyclist.

Methods

Fitness changes are assessed by the mean of the RPP for 5 training camps (duration: 18 ± 2.2 days, altitude: 2 268 ± 117.2 m) performed over 3 years (2014 to 2016) by an elite cyclist (age: 26, weight: 63 kg, height: 1.85 m). 3 periods were defined: before (Pre), during (In) and after (Post) training camp. PPR was built with all power files (training and racing), i.e. 3 weeks before, camp duration and 4 weeks after.

Results

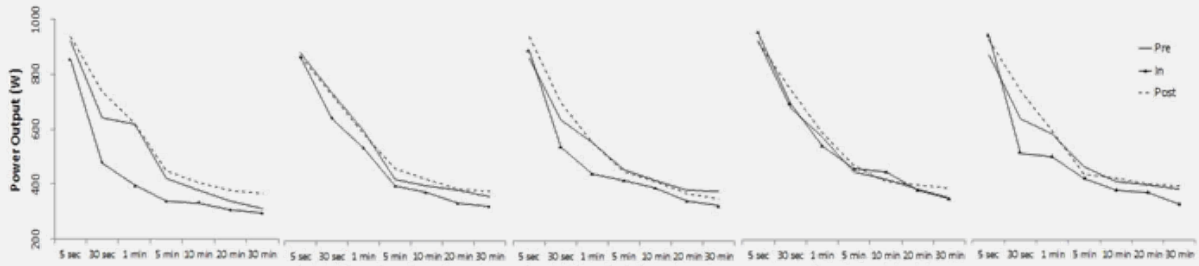

Fig 1. Evolution of the RPP during the 5 training Camps

	Camp 1	Camp 2	Camp 3	Camp 4	Camp 5	Mean	CV
	2014 May	2015 April	2015 May	2016 April	2016 May		
	19 days	17 days	18 days	15 days	21 days		
5 sec	1.4	-1.2	8.7	-0.4	6.2	2.9	1.5
30 sec	14.6	-1.2	9.8	9.7	16.0	9.8	0.7
1 min	1.0	-2.0	-0.5	2.7	2.6	0.7	2.7
5 min	6.7	8.9	-2.2	5.4	-6.4	2.5	2.6
10 min	7.4	6.0	-0.7	-1.4	3.2	2.9	1.4
20 min	12.5	1.0	-2.8	4.5	1.0	3.2	1.8
30 min	17.6	5.8	-3.1	9.7	2.6	6.5	1.2

Tab 1. Performance changes from Pre to Post altitude training camp (%)

Conclusions

•0.7 - 2.7% CV display a good reliability, in line with performance change previously published (Hopkins et al., 2001)
•If measured over 2 pre- and post-periods of 3-4 weeks, ideally including competitions, RPP is a valuable tool for assessing the altitude-induced benefits.

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Key words:

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