BOOK OF ABSTRACTS **Open Access**

Power profiling in elite U23 riders during a competitive season.

Leo, P.[1], Mujika, I.[2], Menz, V.[3], Lawley, J.[3]

[1] Cycling Team Tirol, Innsbruck Austria

[2] University of the Basque Country

[3] University of Innsbruck, Sports Science Department

Contact email: peter-leo@live.at

Purpose:

Changes in the power profile of elite U23 cyclists throughout a competitive season could provide valuable information about racing demands and the training process. A rider's power-duration relationship shows a dynamic behaviour affected by training and racing, and repeated computation is required to gain accurate insights into a rider's performance capabilities. Assessing the power-duration relationship by means of different performance tests in the field is one common way to proceed. However, such tests require regular attempts as well as a motivated and rested athlete, which could be difficult during a competitive season. Therefore, the aim of this study was to investigate changes in the power-duration relationship based on peak power output values obtained during racing.

Methods:

Fourteen highly trained elite U23 cyclists (N=14; mean ± SD age 20.6 ± 1.1 years; body mass 67.7 ± 6.0 kg; height 180.7 ± 5.6 cm; maximum oxygen uptake 73.9 ± 2.0 mL·kg-1 min-1·; maximal aerobic power 443 ± 27 W) completed 3 maximal efforts on their road bike in the pre-competitive period. The efforts lasted 12, 5 and 2 min on a climb of 5-6% gradient, interspersed by a 30-min recovery period after each trial. In a further step 12, 5 and 2 min power outputs were used to calculate critical power and anaerobic work capacity. During the competitive season peak power outputs during efforts lasting 12, 5 and 2 min were used to track changes in the power-duration relationship over three consecutive periods, for the early (February – April), mid (May – July) and late (August – October) season. A repeated-measure ANOVA was used to compare the peak power outputs across the three periods.

Results:

Mean power output during the 12, 5 and 2 min maximal effort trials were 379 ± 23, 420 ± 7 and 505 ± 33 W, respectively, resulting in a critical power of 352 ± 24 W (see Graph 1).

The 2 min peak power outputs over the three consecutive periods were 484 ± 54, 515 ± 35 and 518 ± 40 W, with significant differences between the first and third periods ($p = 0.009$). The 5 min peak power outputs were 415 ± 26 W, 441 ± 25 W and 445 ± 24 W, with significant changes between the first and second ($p = 0.012$) as well as first and third ($p = 0.002$) periods. Peak power outputs for 12 min were 373 ± 32 W, 397 ± 26 W and 405 ± 24 W, with significant differences between the first and second ($p = 0.001$) as well as the first and third periods ($p = 0.001$). Critical power values (see Graph 2) during the three consecutive periods were 342 ± 9 W, 360 ± 6 W and 366 ± 6 W, with significant changes between the first and third periods ($p = 0.017$).

Conclusion:

These findings reveal that variations in peak power outputs during a competitive season have a significant influence on the power-duration relationship. Relatively small changes in peak power outputs could nonetheless be of practical relevance. Indeed, mean improvements of 8.6%, 7.2% and 7.0% in 12, 5 and 2 min peak power outputs from the first to the third period could be quite beneficial for a rider's and a team's competition outcomes. In addition, using racing

power output data to determine the power-duration relationship as well as parameter estimates of critical power might be a practical means of assessing a cyclist's fitness.

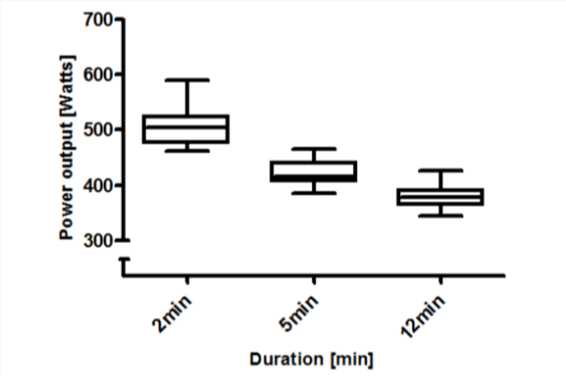

Figure 1. Graph 1: Mean power outputs of the pre - season Critical Power Test.

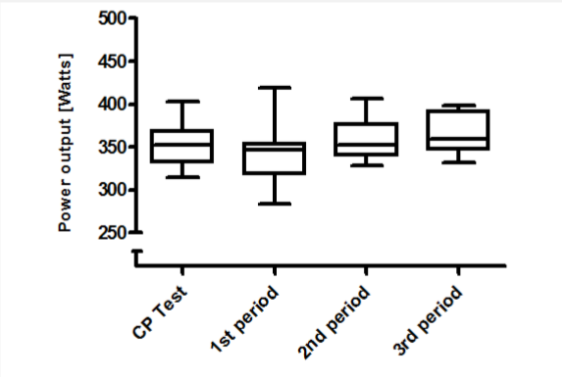

Figure 2. Variations in Critical power before and during the season.

Keywords: cycling, power-duration relationship, critical power