INFLUENCE OF EXPERIENCE AND LEG PREFERENCE ON MECHANICAL EFFICIENCY OF CYCLING

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INTRODUCTION

Cycling performance is related to factors such as maximal power output, aerobic conditioning, anerobic threshold and muscle efficiency [1]. Muscle efficiency has been examined in the context of its relationship with cycling performance and pedaling technique. Accordingly, muscle efficiency depicts the effectiviness in work production, consequently it is an important variable for performance assessment [2].

Previously, bilateral asymmetries in favour of the preferred leg for work or power [3] and torque [4] were found in cyclists. Higher performance of the preferred leg in these cases could be related to improved muscle efficiency of this leg, for instance, minimizing the fatigue process. Therefore, the purpose of this study was to examine the influence of cycling experience and leg preference on mechanical efficiency of cycling. Furthermore, to determine if the preferred leg presents higher efficiency during cycling.

METHODS

After signing an informed consent term (Ethical Committee Board #2007945), thirteen subjects trained for cycling (mean age 31±8 yrs, body mass 76±9 kg, height 1.78±0.08 m, VO_2 4.37±0.5 L/min) and nine healthy subjects (mean age 24±3 yrs, body mass 75±11 kg, height 1.76±0.08 m, VO_2 3.48±0.4 L/min) were evaluated in three 10-min square wave (constant workloa) cycling trials. Cyclists used their own bicycles mounted on a Computrainer ProLab (Racermate Inc., USA) and the healthy subjects were evaluated pedaling on an individually Velotron Dynafit (Racermate Inc., USA) individually fitted. The subjects completed an incremental maximal cycling test for determination of the second ventilatory threshold (VT2). The workload for the bilateral square wave trial corresponded to 70% of workload at VT2. The workload selected for unilateral trials was set at 50% of the workload for the bilateral square wave trial and were performed randomly for the preferred and non-preferred legs. Lateral preference was determined using the Waterloo Inventory. During the 10-min cycling trials, gas exchanges were properly monitored. A 6-min period of steady-state oxygen uptake was used to calculate net mechanical efficiency using Lusk's tables [5]. Data were averaged for 6min and compared by analysis of variance in a mixed model (3 protocols x 2 groups), with Bonferroni post-hoc corrections when suitable. The statistical package used was the SPSS 13.0 and a significance level was set at 0.05.

RESULTS AND DISCUSSION

Figure 1 depicts net mechanical efficiency for both the groups in the three protocols. No effect of experience was found [$F(1,12)=0.174$; $P=0.684$; $\chi^2=0.14$] as well as no interaction between the groups and protocol [$F(2,24)=0.315$; $P=0.733$; $\chi^2=0.026$]. The protocol resulted in a statistically significant difference [$F(2,24)=111.59$; $P<0.01$; $\chi^2=0.903$] between the unilateral and the bilateral trials, for both the groups. Reduced muscle efficiency was found during unilateral pedaling.

For the upper extremity, the extensive use of the preferred limb combined with muscle recruitment lead to a muscular fine-tuning resulting in frequent performance asymmetry [6]. Nevertheless, our muscle efficiency results do not support the leg preference by eliciting higher efficiency for the preferred leg, which suggests that muscle efficiency may not be a factor determinant of leg asymmetries. This might result from the similar demand of both legs during daily tasks and sports.

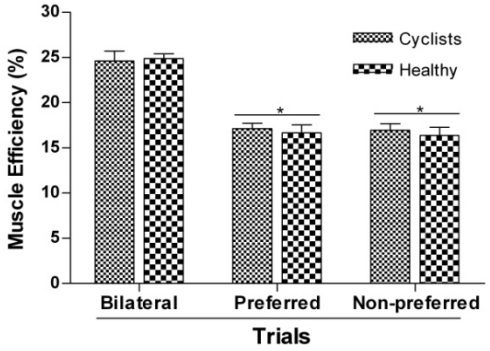

Figure 1: Cycling mechanical efficiency for cyclists and healthy subjects in bilateral, preferred and non-preferred trials. * Indicates statistical significant difference compared to the bilateral trial ($P<0.05$).

CONCLUSIONS

Our study showed that cycling experience and leg preference have **no** effect on muscle efficiency of cycling. Analyses of muscle activation are being performed to complement this investigation.

ACKNOWLEDGEMENTS

Felipe P Carpes was the recipient of the 2008 ISB International Travel Grant from the ISB. Thanks for Giovani Cunha, Geoff Smith and Erica Enevold for technical support.

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