Power output and affective load change during time trial according to environmental conditions

A Abel 1 and F Grappe 1

Abstract
Introduction: During cycling events, riders have to face different environmental conditions like wind or road gradient, which leads to variable resistive forces. Those resistances involve a specific pedaling cadence (PC) and crank inertial load (CIL) association and modify the level of power output (PO) (Hansen et al., 2002). The different environmental conditions also could influence the affective load (AL), defined like the difference between perception of exertion rate and pleasure (Baron et al., 2011). The purpose of this study was to analyze the influence of different environmental conditions on PO and AL.

Method: Eight amateur competitive cyclists performed five 25 ± 5min TT sessions at their maximal capacity in different environmental conditions: 1) in level ground with 3 different wind conditions: no wind (NW), headwind (HW), tailwind (TW). The wind velocity was 40 ± 5 km/h, 2) in uphill (UP) with a mean slope of 8% and 3) on Home Trainer (HT). PO was recorded from a Power Tap® power meter. Every 4 minutes, riders had to rate their exercise perceived exertion from a CR10 Borg scale and their pleasure on a "pleasure scale" to evaluate their AL. An ANOVA statistical test was used to analyze the evolution of PO and AL over the time between the different conditions.

Results: PO is significantly different between all conditions and varies over the time. Different pacing strategies are observed with a fast start and a final spurt. PO is higher in NW and TW (+ 3.5%) compared with HW and UP. There are correlations between PC and climbing speed (v) (r = 0.84, p<0.001) and between CIL and v (r = 0.92, p<0.001). AL increases over the time (p<0.05) for all the conditions and is significantly different between all conditions (p<0.05). AL is higher (+56%) in HW compared with the others conditions.

Discussion / Conclusion: PO varies significantly different between all conditions and varies over the time. Different pacing strategies are observed with a fast start and a final spurt. PO is higher in NW and TW (+ 3.5%) compared with HW and UP. There are correlations between PC and climbing speed (v) (r = 0.84, p<0.001) and between CIL and v (r = 0.92, p<0.001). AL increases over the time (p<0.05) for all the conditions and is significantly different between all conditions (p<0.05). AL is higher (+56%) in HW compared with the others conditions.

References
Baron et al., 2011: Br. J. Sports Med, 45, 511-517
Hansen et al., 2002: J Biomech, 35(2), 277-85

✉ Contact email: alexabel@orange.fr (A. Abel)

1 C3S, EA4660, Health-Sport Department, University of Franche Comte, France

Received: 1 May 2014. Accepted: 1 June 2014.