Case study: Psycho-physiological parameters and pacing strategy associated with a 6 days 6 nights ultra-endurance event on bike

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Introduction

Most of the studies concerning ultra-endurance events analyzed food and fluid intake, blood samples and physiological adaptations (Schumacher *et al*. 2010). But no study has analyzed the emotional dimension taking into account the importance of this parameter in the performance. This case study analyzed the longitudinal performance of a cyclist during a 6 days event on home trainer (HT) from a holistic approach considering physical and psychological parameters.

Method

In February 2014, the subject rode a non-stop 6 days event on HT with a fixed gear bicycle (Look© KG495) in a hospital (Evreux, France). The HT was connected to a specific software (Bkool®) that allowed the simulation of an event on velodrome. Power output (PO, W, SRM) and heart rate (HR, beat/min) were continuously recorded during the exercise. The rate of perceived exertion (RPE, CR10 Borg scale) and pleasure (on a 10 items Lickert scale) were assessed by the subject to determine the affective load (AL = RPE - Pleasure) (Baron *et al*., 2011). At the same time a blood sample was collected to measure the glycaemia (LifeScan One Touch®, Zug, Switzerland). These measures were realized every four hours provided that the last food or fluid intake (except water) was been taken at least two hours before. A non-parametric Friedman Repeated Measures Analysis of Variance (ANOVA) on Ranks was used to analyze the differences on PO, HR and AL values over the 6 days. Pearson's zero-order correlation coefficients were computed by the least squares method to describe the relationship between selected variables.

Results

During the firsts three days, PO remained relatively constant before to significantly ($P<0.05$) decreases until the end of the event (Figure 1). HR followed the same pattern except that the values began to significantly decrease ($P<0.05$) since the third day (Figure 1). Glycaemia remained at normal values (traditionally fixed between 0.7 and 1.4 g/l) during the entire event (Figure 2). AL was often below to 0 even if sometimes it increased strongly (Figure 2). A

moderate relationship was observed between AL and glycaemia (r = -0.63; P<0.05). Indeed, when AL increased, glycaemia tended to decrease and vice-versa.

Discussion

During the first three days, there was no significant difference on PO. After the third day, PO became to significantly decrease by 5.2%, 6.4% and 7.8% each day until the end (Figure 1). Most of the studies concerning ultra-endurance athletes showed that they are able to sustain a same level of intensity until the end (Knechtle *et al*., 2014). Nevertheless, the goal of our athlete was to break the world record. In the last days, he voluntarily decreased the level of intensity probably to optimize the pacing strategy of effort to break the record. On the third day a drop of the average HR was measured (-5.4%) with a PO remained stable (Figure 1). This is in agreement with findings from multiday events in professional road cycling and ultra-endurance events (Faria *et al*, 2005). It might be possible that the phenomenon indicates some kind of training adaptations. When the AL increased significantly, the subject reacted quickly to decrease it. So it would seem that the subject was trying to get a low AL in order to maintain an optimal level of PO. Moreover, the moderate correlation observed between AL and glycaemia showed that when AL increased strongly, glycaemia decreased directly (Figure 2). The intentional efforts performed to regulate the emotions and keep self-control use physiological resources such as glucose (Gailliot *et al*., 2007; Lane *et al*., 2011). When the subject had to react to unexpected events (as mechanical problems), the first mental processes for decreasing AL seemed to be costly in energy. But the rest of the time, when the subject kept the control his emotions (thanks to controlled mental processes as autohypnosis), the glycaemia remained constant.

To conclude, this case study demonstrated the importance to elaborate psychological strategies to optimize pacing strategy of an event like to a 6 days 6 nights ultra-endurance on bike.
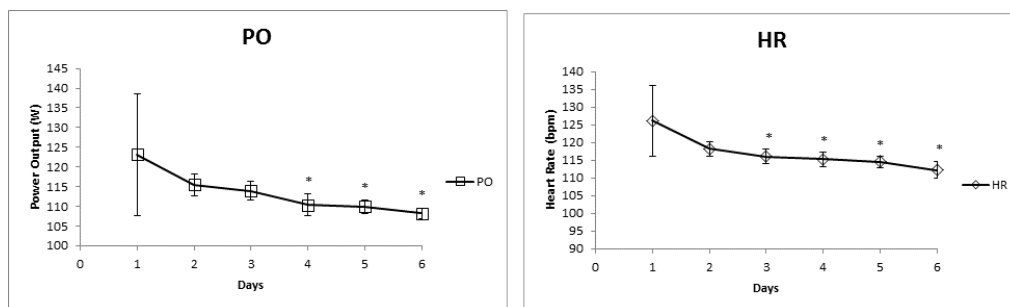

Figure 1: Evolution of Power Output and Heart rate over the 6 days of effort. * indicates significant differences compared with the other days (P<0.05).
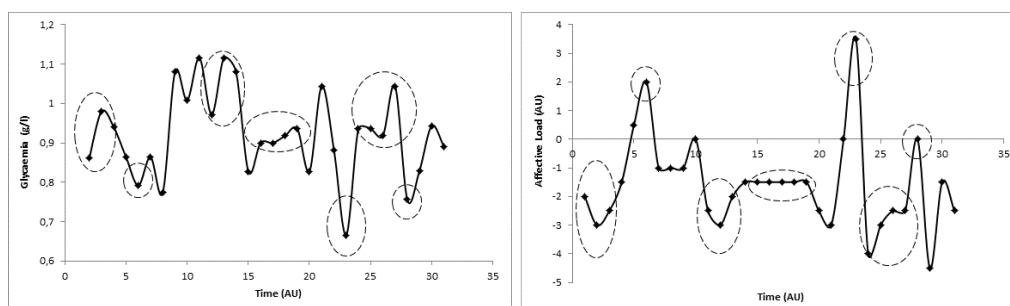

Figure 2: Evolution of glycaemia and affective load over the 6 days of effort.

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