

Please read the instructions on page 11 before typing/ printing.

**Effects of cycling position on metabolic factors**

Grappe F, Candau R, Rouillon JD, UFR STAPS, Université de Besançon

The purpose of the study was to analysed the effects of 3 cycling positions, upright posture (UP), dropped posture (DP) and aero-cycling posture (AP), on metabolic factors. Nine male competitive cyclists exercised on a cycle ergometer Monark (818 E) specially equipped. After a 10 min warm-up period, subjects performed 3 exercises of 10 min in the 3 positions at 70 % of their maximal external power at 70 rpm, followed by 5 min of active recovery where subjects could answer a Borg rating scale of perceived exertion (RPE). Cycling postures was systematically permuted to avoid an order effect.  $\dot{V}O_2$  (l.min<sup>-1</sup>),  $\dot{V}_E$  (l.min<sup>-1</sup>),  $V_T$  (l), RR (br.min<sup>-1</sup>), respiratory equivalent (RE), HR (beats.min<sup>-1</sup>), blood lactate (La) and blood pH were analysed from 3th to 10th min by analysis of variance (ANOVA).  $\dot{V}O_2$ ,  $\dot{V}_E$ ,  $V_T$ , RR and RE was averaged every 15 sec and HR every min. Capillary blood samples were drawn at the 5th and 10th min. Results were summarized in table 1. The upper values of HR and La in DP vs UP which confirmed the increasing of perceived exertion in DP, had no effect on  $\dot{V}O_2$ . The  $\dot{V}O_2$  increasing in AP vs the two others postures, might be explained by a larger muscle mass involvement and/or by a greater stroke volume and thus greater cardiac output and/or by a best perfusion. Increasing of La in DP and AP released H<sup>+</sup> ions which stimulated the bulb of respiratory center involving a greater increasing of  $\dot{V}_E$  in DP.  $\dot{V}_E$  involved an hypocapnia which allowed to bring back the pH in the 3 positions to tolerable values by the organism.  $\dot{V}_E$  alterations resulted of RR changes,  $V_T$  remaining unchanged between the 3 postures. RE values suggested that respiratory efficiency was more altered in DP vs the others positions. Results of this study showed that greater changes occurred in DP and trunk bending forward involved no effect on  $V_T$ .

Table 1: Metabolic values averaged from the 3th to the 10th min expressed in percentage of the mean value of the 3 positions. UP, DP and AP.  $\Delta$ ,  $\nabla$ ,  $\dagger$ ,  $\ddagger$  significant (p<0.01) respectively from UP vs DP, UP vs AP and DP vs AP.

	UP	DP	AP
La	88.9 ± 14.40 (•Δ)	105.9 ± 9.7 (•†)	105.1 ± 14.4 (Δ)
pH	99.9 ± 0.9	100.2 ± 0.6	99.8 ± 0.7
HR	99.4 ± 1.8 (•Δ)	100.4 ± 1.1 (•†)	100.2 ± 1.0 (Δ)
$\dot{V}O_2$	99.6 ± 0.9 (Δ)	99.4 ± 2.5 (•†)	101.0 ± 2.6 (Δ•†)
RR	96.8 ± 6.0 (•Δ)	102.6 ± 3.6 (••†)	100.8 ± 5.6 (Δ•†)
$\dot{V}_E$	97.2 ± 3.5 (•Δ)	102.7 ± 2.5 (••†)	100.1 ± 2.3 (Δ•†)
RE	97.5 ± 3.2 (•Δ)	103.4 ± 3.7 (••†)	99.2 ± 1.9 (Δ•†)
$V_T$	100.4 ± 3.0	100.1 ± 1.9	99.5 ± 3.4
RPE	94.5 ± 6.5 (•†)	106.1 ± 8.1 (••†)	99.4 ± 7.8

KEY WORDS: Ventilatory response, heart rate, lactate, pH, perceived exertion, cycle ergometry, position

I prefer

- oral presentation       video presentation       poster presentation

and session of

- sports medicine       biomechanics and physiology of sports  
 sport psychology       social and psychosocial aspects of sports

Please send original and two copies by January 31, 1994 to:

**THE WAY TO WIN**

THE FINNISH SOCIETY FOR RESEARCH IN SPORT AND PHYSICAL EDUCATION  
STADION, FIN-00250 HELSINKI, FINLAND

Author's signature



Date

20/01/94

Mailing address

Laboratoire des Sciences du Sport  
2, place Saint Jacques - 25030 BESANCON CEDEX  
FRANCE