PERFORMANCE AFTER PROLONGED CYCLING AT FREELY CHOSEN AND OPTIMAL PEDAL RATE

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INTRODUCTION

The major part of a long cycling road race (>3 h) consists of sub-maximal cycling [1] where cyclists exercise using high pedal rates. In fact, the freely chosen pedal rate (FCPR) is much higher than the one resulting in minimum energy turnover, i.e., the optimal pedal rate (OPR) [2]. Supposing that the choice of a high pedal rate, despite its higher energetic cost, might serve a practical purpose, we examined whether performance was higher after prolonged cycling with FCPR compared to OPR.

METHODS

Nine trained cyclists or triathletes (average±SD: 27±2 years, 73.2±6.7 kg, 179±6 cm) were tested on three different days. On day 1 the subjects performed at random order (without pauses) six 180 W, 6-min, cycle ergometer bouts with 35, 50, 65, 80, 95 rpm, and FCPR. Oxygen uptake (VO_2) was measured continuously, and subsequently plotted against pedal rate for determination of OPR. Afterwards the subjects performed a 5 min time trial test with FCPR for determination of average power output (W_{5min}), peak VO_2 and blood lactate concentration. On days 2 and 3 they cycled 2.5 h at 180 W with either their FCPR or OPR (randomised order) followed by the 5 min time trial test. VO_2 and perceived exertion (RPE) were recorded at 30 min intervals during the prolonged cycling.

RESULTS AND DISCUSSION

U-shaped relationships between pedal rate and VO_2 were observed for 8 out of 9 subjects (for one subject the minimum VO_2 occurred at the highest preset pedal rate). The mean OPR was 73±11 (range: 65-95) rpm while FCPR averaged 95±7 (range: 89-106) rpm ($p<0.05$). Initial peak values averaged for VO_2: 4.65±0.5 l min^{-1}, blood lactate concentration: 13.6±2.3 mM, and W_{5min}: 399±33 W. A workload of 180 W, accordingly, corresponded to 45±4% of the initial W_{5min}. VO_2 during the prolonged cycling was consistently ~7% higher at FCPR than at OPR ($p<0.05$) (Fig 1). RPE increased during prolonged cycling ($p<0.05$) and more so with FCPR than with OPR ($p<0.05$) (Fig 1). The final W_{5min} (359±47W after FCPR and 368±31 W after OPR) was ~10% lower than the initial value ($p<0.05$), which indicated fatigue. The tendency for a greater performance reduction following FCPR, however, did not reach statistical significance.

A high VO_2 reflects a high energy turnover, which at least theoretically, depletes the energy stores sooner. However, performance reduction may also be caused by other mechanisms e.g. linked to neuromuscular function, which could be affected by the relatively high pedal force and muscle stress that follows with the quite low OPR.

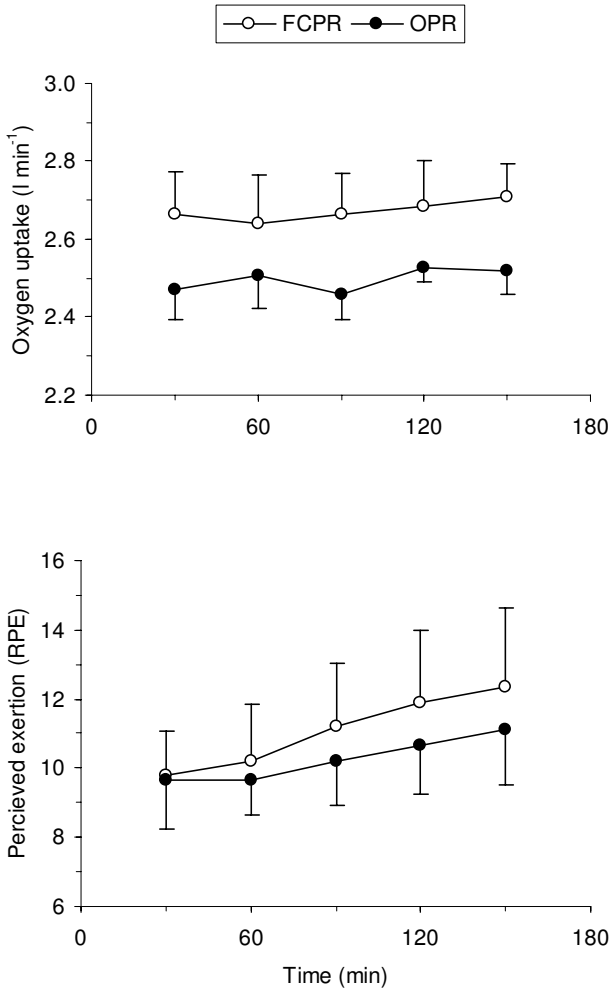

Figure 1: Oxygen uptake and perceived exertion as a function of time during 2.5 h of prolonged cycling.

CONCLUSIONS

Time trial performance was reduced after 2.5 h cycling at 180 W with FCPR and OPR. The reduction of performance did not differ between the two pedal rates, despite VO_2 and RPE being higher with FCPR.

REFERENCES

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