

The Effect of Pedaling Cadence on the Kinetics of Oxygen Uptake during Severe Intensity Exercise

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ABSTRACT

During exhaustive severe intensity exercise, the oxygen uptake (VO_2) increases exponentially, with a time constant of ~ 30 s. After ~ 1 to 2 min, a slow component emerges and drives the VO_2 to its maximum. Pedaling cadence contributes to the metabolic demand at a given work rate and affects several responses to cycling exercise. **PURPOSE:** To determine the effect of pedaling cadence on parameters of the two-component VO_2 response profile during severe intensity exercise. **METHODS:** Eight women (mean \pm SD: age 22 ± 1 yr, height 161 ± 6 cm, and weight 58.8 ± 2.3 kg) and 10 men (age 23 ± 1 yr, height 180 ± 6 cm, and weight 82.9 ± 4.4 kg) performed exhaustive constant-power cycle ergometer tests using pedaling cadences of 60 rpm, 80 rpm, and 100 rpm. **RESULTS:** Times to exhaustion were smaller at higher cadences ($220 \pm 85 < 299 \pm 118 < 368 \pm 168$ s), whereas $\text{VO}_{2\text{max}}$ values were the same at all cadences ($2786 \pm 729 = 2768 \pm 749 = 2774 \pm 732$ ml/min). The mean response time of the primary response was faster at higher pedaling cadences ($27 \pm 5 < 32 \pm 5 < 37 \pm 5$ s); the amplitude of the primary response was greater at the highest cadence ($2045 \pm 577 > 1890 \pm 493 = 1899 \pm 515$ ml/min); and the time delay before the slow component was smaller at higher cadences ($85 \pm 11 < 105 \pm 17 < 118 \pm 19$ s). **CONCLUSION:** These results demonstrate that pedaling cadence affects the VO_2 response profile. The higher cadences speed the primary or fundamental response and hasten the emergence of the slow component. This may have implications for the sport of cycling and should be considered when evaluating cardio-respiratory and metabolic responses to cycle ergometer exercise.

