

## The Effect of Work Rate on Oxygen Uptake Kinetics during Exhaustive Severe Intensity Cycling Exercise

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### ABSTRACT

During exhaustive severe intensity exercise, the oxygen uptake ( $\text{VO}_2$ ) increases exponentially, with a time constant of  $\sim 30$  s. After  $\sim 1$  to 2 min, a slow component emerges and drives the  $\text{VO}_2$  to its maximum. There are clear differences in the  $\text{VO}_2$  response profile across exercise intensity domains. These disparities might not be attributable to metabolic demand but, rather, to characteristics of the various intensity domains, such as the consequences of lactic acid production. **PURPOSE:** To investigate the role of exercise intensity on the  $\text{VO}_2$  response profile at intensities wholly within the severe domain. **METHODS:** Four women (mean  $\pm$  SD: age  $22 \pm 2$  years, height  $167 \pm 7$  cm, mass  $66 \pm 5$  kg) and eight men (age  $23 \pm 2$  yr, height  $179 \pm 9$  cm, mass  $78 \pm 10$  kg) performed exhaustive constant-power cycle ergometer tests at two different severe intensity work rates ( $263 \pm 78$  W and  $214 \pm 64$  W). Smoothed breath-by-breath  $\text{VO}_2$  data were fitted to a two-component (primary response and slow component) model using iterative regression. **RESULTS:** Times to exhaustion were  $217 \pm 27$  s and  $590 \pm 82$  s, respectively. The  $\text{VO}_{2\text{max}}$  values were the same at the two different work rates ( $2973 \pm 691$  ml $\cdot$ min $^{-1}$  and  $3011 \pm 728$  ml $\cdot$ min $^{-1}$ ). The amplitude of the primary response was greater ( $p < 0.05$ ) at the higher work rate ( $2095 \pm 716$  ml $\cdot$ min $^{-1}$ ) than at the lower work rate ( $1857 \pm 618$  ml $\cdot$ min $^{-1}$ ) and the amplitude of the slow component was smaller ( $367 \pm 177$  ml $\cdot$ min $^{-1}$  vs  $645 \pm 347$  ml $\cdot$ min $^{-1}$ ). In addition, the time delay before the emergence of the slow component was shorter at the higher work rate ( $92 \pm 22$  s vs  $116 \pm 42$  s). **CONCLUSION:** The results show that exercise intensity *per se* affects the  $\text{VO}_2$  response profile within the severe intensity domain and suggest that metabolic demand drives the primary response of  $\text{VO}_2$  kinetics within this domain.

