Effects of a prior exhausting exercise on peak O_2 uptake, lactate and ventilatory thresholds during ramp exercise in men

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Aim: Aim of this study was to evaluate the effects of prior exhausting exercise on maximum performance, lactate (LaT), first ($\dot{V}ET_1$) and second ($\dot{V}ET_2$) ventilatory thresholds during a ramp exercise.
Methods: Eight young males performed a maximum ramp (25 $W \cdot min^{-1}$) cycloergometric test before and after an exhausting exercise (90% $\dot{V}O_{2\ peak}$). During tests, measurements of gas exchange (breath-by-breath), power and lactate concentration ($[La^-]$) were obtained. Expressed as $\dot{V}O_2$ ($L \cdot min^{-1}$), LaT, $\dot{V}ET_1$, $\dot{V}ET_2$ and the amplitude of the isocapnic buffering range of exercise ($\dot{V}ET_2$ - $\dot{V}ET_1$) were then calculated.
Results: After exhaustion: i) peak power and $\dot{V}O_{2\ peak}$ decreased from 247±11 W to 234±12 W and from 2.77±0.15 $L \cdot min^{-1}$ to 2.65±0.14 $L \cdot min^{-1}$, respectively ($P<0.05$); ii) LaT occurred at higher $\dot{V}O_2$ (2.15±0.15 *vs*. 1.96±0.10 $L \cdot min^{-1}$, $P<0.05$), whereas $\dot{V}ET_1$ was similar in both tests; iii) $\dot{V}ET_2$ appeared at lower $\dot{V}O_2$ (2.47±0.17 *vs*. 2.63±0.16 $L \cdot min^{-1}$, $P<0.05$); iv) as a consequence, $\dot{V}ET_2$ - $\dot{V}ET_1$ decreased significantly by 21±4% ($P<0.05$).
Conclusions: Prior exhausting exercise affected metabolic and respiratory response of following exercise by reducing maximum performance, shifting LaT toward higher $\dot{V}O_2$ values, anticipating $\dot{V}ET_2$ and reducing the buffered area of exercise. The similarity in $\dot{V}ET_1$ before and after the exhausting exercise, together with LaT shift, may suggest that after exhaustion La^- production was similar but La^- appearance in plasma delayed. Assuming that $\dot{V}ET_1$ is due to bicarbonate buffering of H^+ in response to the systematic increase in blood La^-, and that $\dot{V}ET_2$ is associated with the ongoing metabolic acidosis, when bicarbonate is overwhelmed by the growing blood La^- accumulation, we conclude that prior exhausting exercise altered acid-base status and the activity of the enzymes involved in CO_2 transport and buffering systems.