EFFECTS OF A PRIOR EXHAUSTING EXERCISE ON PEAK O2 UPTAKE, LACTATE AND VENTILATORY THRESHOLDS DURING RAMP EXERCISE IN MEN

Esposito Fabio, Vanni Rosalba, Alfieri Paola, Cè Emiliano, Veicsteinas Arsenio
(Institute of Physical Exercise, Health and Sport, University of Milan, Italy)

The effects of a bout of heavy physical activity on the physiological responses to exercise and on its potential negative impact on performance has received only modest empirical attention. In particular, prior exercise has been shown to affect the tolerance of a subsequent exercise, presumably due to many factors, among which changes in acid-base status and/or enzyme activity. Aim of this study was to evaluate the effects of a prior exhausting exercise on maximum performance, lactate threshold (LaT) and first (\(\dot{V}ET_1\)) and second (\(\dot{V}ET_2\)) ventilatory thresholds. Eight healthy young males performed a maximum ramp (25 W/min) cycloergometric test before and 5 hours after an exhausting exercise (90% of peak \(\dot{V}O_2\) peak, \(\dot{V}O_2\) peak). During ramp tests, breath-by-breath measurements of gas exchange, power output and blood lactate concentration ([La]) were obtained. Thenceforward, LaT (expressed as \(\dot{V}O_2\), L/min) was determined from the power output at which [La] increased 1.0 mM above resting values. \(\dot{V}ET_1\) (expressed as \(\dot{V}O_2\), L/min) was determined by the V-slope method, whereas \(\dot{V}ET_2\) (expressed as \(\dot{V}O_2\), L/min) was defined where \(\dot{V}E\) started to change out of proportion of \(\dot{V}CO_2\) with a concurrent decline on end-tidal CO2 partial pressure. Lastly, the amplitude of the isocapnic buffering range of exercise (\(\dot{V}ET_2 - \dot{V}ET_1\), expressed as \(\dot{V}O_2\), L/min) could be calculated as well. Comparing the ramp tests before and after the exhausting exercise, it resulted that: i) the peak power output significantly decreased from 247±11 W to 234±12 W (P<0.05), and a lower \(\dot{V}O_2\) peak (2.77±0.15 L/min vs. 2.65±0.14 L/min, P<0.05), appropriate for the reduced power output, was observed; ii) LaT occurred at higher \(\dot{V}O_2\) (1.96±0.10 L/min and 2.15±0.15 L/min before and after exhaustion, respectively; P<0.05), whereas \(\dot{V}ET_1\) was similar in both ramp tests; iii) on the contrary, \(\dot{V}ET_2\) appeared at lower \(\dot{V}O_2\) (2.63±0.16 L/min and 2.47±0.17 L/min before and after exhaustion, respectively; P<0.05), and, as a consequence, iv) \(\dot{V}ET_2 - \dot{V}ET_1\) decreased significantly by 21±4% (P<0.05). From these data, it appears that prior exhausting exercise affects the metabolic and respiratory response of a following ramp 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 is similar but La appearance in plasma is delayed. Assuming that \(\dot{V}ET_1\) is due to bicarbonate buffering of H\(^+\) in response to the systematic increase in blood La above resting values, 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 the results of the present study are compatible with the hypothesis that prior exhausting exercise alters acid-base status and the activity of the enzymes involved in CO2 transport and buffering systems. Keywords: Oxygen Consumption, Exercise Physiology, Lactate