TACSM Abstract

The Effect of Short and Long Recovery Periods on the Contribution of Oxidative Processes to Energy Expenditure During Multiple Bouts of Supramaximal Exercise

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ABSTRACT

The contribution of oxidative energy production to multiple sprint exercise is of interest due to implications for the training needs of people engaging in anaerobic activities. The purpose of this study was to examine the effect of short and long active recovery durations on oxidative and anaerobic contributions to energy output during maximal intensity cycle ergometry. Six male subjects, including well-trained endurance athletes and well-trained strength athletes, completed the study. After a VO_{2max} test on the bicycle ergometer, each subject completed two conditions: a short recovery condition (SRC) and a long recovery condition (LRC). The SRC consisted of 10, 10-sec. supramaximal sprints with 30-sec. recovery periods. The LRC consisted of 10, 10-sec supramaximal sprints with 3-min. recovery periods. The load applied to the ergometer was 1.2 g/kg and the RPM during the sprints varied based on the maximal output. During recovery, no load was applied and subjects maintained a cadence of 80 RPM. Oxygen uptake was measured during the entirety of both conditions and peak power and total work were calculated from two, 5-sec RPM averages generated during the sprints. Blood samples were taken pre-exercise, after sprints 4, 7, and 10, and 3 minutes post-exercise. Peak power and total work were significantly greater ($p < 0.05$) in the LRC (1091.3 $\pm$ 88.7 W and 1363.6 $\pm$ 34.6 kg-m) compared to the SRC (915.3 $\pm$ 109.2 W and 1161.6 $\pm$ 33.9 kg-m). In addition, peak power decayed by 21.7% over the 10 sprints in the SRC compared to no decay in the LRC. Oxygen uptake averaged 28.3 $\pm$ 0.9 ml/kg/min for the entirety of the LRC; whereas, in the SRC there was a large increase in oxygen uptake during the second sprint that remained elevated and averaged 47 $\pm$ 1.5 ml/kg/min for the remaining 8 sprints. There was no difference in blood lactate concentrations between conditions. The heightened aerobic response and the lower work and power outputs seen in the SRC are suggestive of a decrement in both anaerobic glycolysis and phosphocreatine (PCr) activity as successive sprints were completed. After repeated bouts of explosive exercise with short rest periods, oxidative processes play a more important role in energy production, most likely due to fatigue occurring in the anaerobic energy producing systems. These findings point to the need for enhancing the aerobic capacity of athletes engaging in consecutive high intensity bouts of exercise when rest intervals are short.