P19-Time spent at high level of maximal oxygen uptake during two models of intermittent exercise (15s-15s vs. 30s-30s) in highly endurance trained athletes.

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The aim of this study was to analyze the effects of intermittent exercise model (15s-15s/30s-30s) on time spent at high percentage of VO_2max (t95 VO_2max and t90 VO_2max) during an intensive and short intermittent session. Ten endurance trained male athletes performed three track running tests: a maximal graded test to determine their VO_2max and their maximal aerobic velocity (MAV) and two randomized intermittent exercises (two series of 10 min) during which measurement of gas exchange values was performed: one consisting of repeated 30s run at MAV alternated with 30s active recovery at 50%MAV (IE30) and another alternating 15s runs and 15s recovery (IE15) at the same intensity than during IE30. MAV and VO_2max were respectively 20.6±0.5 km.h^{-1} and 68±6 ml.kg^{-1}.min^{-1}. Blood lactate concentration was significantly higher during IE30 (12.3 *vs.*8.2 mmol.L^{-1}). t90 VO_2max and t95 VO_2max did not differ significantly according to the type of exercise, even if they were slightly higher during IE15 (546 *vs.* 487 s and 325 *vs.* 263 s). VO_2 remains more constant during IE15 than during IE30. Hence, during recoveries, VO_2 decreases more during IE30 than during IE15. Moreover, the quantity of oxygen consumed during these two exercises did not differ significantly (13915±1241 *vs.*13699±1205 ml respectively for IE15 and IE30). Consequently, for a same workload, IE15 and IE30 seem to be similar to stimulate aerobic metabolism and to develop VO_2max in highly trained athletes.

Keywords: Interval-Training, Oxygen uptake, Aerobic Performance, Athletics.

INTRODUCTION

Maximal oxygen uptake (VO_2max) is generally used to assess the aerobic training effects. To develop VO_2max, it is recommended to solicit VO_2max or a high percentage of VO_2max (Wenger and Bell, 1986; Billat et al., 2000; Midgley and Mc Naughton, 2006; Thevenet et al., 2007) and to maintain this intensity (Wenger and Bell, 1986; Tabata et al., 1996; Tardieu-Berger et al., 2004). Midgley and McNaughton (2006) suggested that for high intermittent exercises to allow an optimal enhancement of VO_2max, the exercise and recovery duration should be between 15s and 30s. The 15s-15s intermittent exercise is often used in team sports (soccer, rugby…) and the 30s-30s model is more specific to athletics. However, to the best of our knowledge there is no data concerning the efficiency of these two models of intermittent exercises.

AIM OF THE STUDY

Consequently, the aim of this study was to analyze the effects of intermittent exercise models (15s-15s/30s-30s) on time spent at a high percentage of VO_2max (t95%VO_2max and t90VO_2max) during a single short intermittent session. We hypothesized that, as the duration of exercise is higher during the 30s-30s, the time spent at high percentage of VO_2max will be higher during this model than during the 15s-15s one.

EXPERIMENTAL DESIGN

Ten national endurance trained male athletes (25.3±3.6 years; 177.2±6 cm; 64.2±7.4 kg; 7.8±2.0 % of fat mass) gave their written consent to participate to this study. They performed three field tests: a maximal graded test until exhaustion to determine their VO_2max (68 ± 6 ml.kg^{-1}.min^{-1}) and their maximal aerobic velocity (MAV; 20.6 ± 0.5 km.h^{-1}), and two randomized intermittent exercises (two series of 10 min): one consisting of repeated 30s run at MAV alternated with 30s active recovery at 50%MAV (IE30) and another alternating 15s runs and 15s recovery (IE15) at the same intensity than during IE30. During the three tests respiratory gas exchange was measured breath-by-breath using a portable telemetric system (Cosmed K4b^2). Times spent above high level of VO_2 were determined from the VO_2 values

higher or equal to respectively 95% ($t95\%VO_{2max}$) and 90% of VO_{2max} ($t90\%VO_{2max}$). Blood lactate concentration was determined at rest, at the end of the warm-up (during IE exercises) and 3 min after the end of each series.

RESULTS

Heart rate values measured during IE15 and IE30 were not statistically different. $t95VO_2max$ and $t90VO_2max$ were higher during IE15 than during IE30 (546 *vs.* 487 s and 325 *vs.* 263 s, respectively) but did not differ significantly. VO_2 remains more constant during IE15 than during IE30. Hence, during recoveries, VO_2 decreases more during IE30 than during IE15. Moreover, the quantity of oxygen consumed during these two exercises did not differ significantly (13915±1241 *vs.*13699±1205 ml respectively for IE15 and IE30). Blood lactate concentration was significantly higher during IE30 (12.3 *vs.*8.2 $mmol.L^{-1}$).

CONCLUSION

In conclusion, $t95VO_2max$ and $t90VO_2max$ are greater during IE15 but the differences are not statistically significant. Nevertheless, for a same workload, IE15 and IE30 seem to be similar to stimulate aerobic metabolism and to develop VO_2max in highly trained athletes.

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