Effects of six weeks of intermittent sprint training in normoxia and hypoxia on cycling performance.

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Introduction: The traditional training method to improve aerobic performance in athletes is to perform prolonged training sessions (> 60 min) at low to moderate intensities. However, recent studies have also indicated that aerobic performance can be improved by intermittent sprint training (IST) (1,2,3,4). We investigated the effects of six weeks of IST in either normoxia (20.9%O₂) or hypoxia (14.4%O₂ = equivalent to ~3000m altitude) on cycling performance. We hypothesized that IST in hypoxia is more effective than IST in normoxia to improve aerobic performance and oxidative capacity.

Methods: Twenty-nine moderately active individuals (age = 25.6 ± 1.4 yr, VO₂max = 54.3 ± 1.5 mL kg⁻¹ min⁻¹) volunteered to take part in the study. Subjects were matched and assigned to one of three groups: IST on a cycle ergometer in hypoxia (n =10, HYP), IST in normoxia (n = 9, NOR) and an inactive control group (n = 10, CON). Before and at the end of the intervention period subjects participated in two exercise test sessions, one in normoxia and one in hypoxia (14.4%O₂). An exercise test session consisted of an incremental cycling exercise test to exhaustion as well as a simulated 10-min time trial (TT). The training groups trained three times weekly with training load increasing from 4 30-sec sprints per session in wk 1, to 9 sprints per session in wk 6. The sprints were interspersed by 4.5 min active recovery periods.

Results: In normoxia, a significant increase was found in VO₂max (NOR: +12.7%; HYP: + 7.4%) with no differences between the groups. In HYP, but not in NOR, a significant increase was found in the power output at the lactate threshold (+ 9.3%), the onset of blood accumulation (OBLA) (+8.5%) and exhaustion (+ 5.3%). Mean TT power output was increased to the same degree in both groups (NOR: +6.3%; HYP: +5.5%). In hypoxia, VO₂max was unchanged in both groups. In HYP, but not in NOR, a significant increase was found in power output at the OBLA (+12.0%). Power output at exhaustion was increased in both groups (NOR: +3.8%; HYP: +7.1%). Mean TT power output was increased to the same degree in both groups (NOR: +7.5%, HYP: +7.2%).

Conclusions: These results demonstrate that IST in hypoxia is more effective that IST in normoxia to improve submaximal lactate thresholds and oxidative capacity. In the conditions of this study, aerobic performance was increased to the same degree in both training groups.

References: