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Effect of different exercise-to-rest ratios during repeated-sprint training in hypoxia included in a classical altitude camp

Bouten, J., Brick, M., Saboua, A., Hadjaj, J.L., Piscione, J., Margot, C., Doucende, G., Bourrel, N., Millet, G.P., Brocherie, F.

INSEP

INTRODUCTION:
Repeated-sprint training in hypoxia (RSH) is a popular and effective way of improving physical performance compared to similar training in normoxia. Repeated sprint training consists of "all-out" efforts of short duration (< 30 s) interspersed with short incomplete recoveries (<60 s) [1]. RSH efficiency relies on hypoxia severity, but also on effort duration and exercise-to-rest ratio [2,3]. However, the responses to RSH when combined with prolonged altitude exposure remain scarce. The aim of this study was therefore to assess the effect of two RSH training protocols with different exercise-to-rest ratios during a classical altitude camp.
METHODS:
16 players from the French national female rugby sevens team completed a 3-week natural "live high-train high" altitude camp at Font Romeu (1800 m asl) in preparation of the 2022 Rugby World Cup sevens. This camp included 5 RSH sessions performed on a bicycle ergometer in a hypoxic room (simulated altitude of 3000 m asl) with varying exercise-to-rest ratios of 1:2 to 1:3 (velocity-based group, n = 7) or 1:2 to 1:5 (aerobic-dominant group, n = 9) based on players' physical profile. Heart rate, peripheral oxygen saturation (SpO2) and rating of perceived exertion (RPE) were monitored during the first and last RSH session, as well as peak power output (PPO), mean power output (MPO) and sprint decrement score (Sdec).
RESULTS:
PPO and MPO significantly improved from the first to the last training session (main effect, PPO: from 895 ± 104 to 977 ± 127 W, $p < 0.001$, Cohen's $d = 0.70$; MPO: from 690 ± 74 to 744 ± 93 W, $p < 0.001$, Cohen's $d = 0.63$), irrespective of the training protocol (interaction effect: $p > 0.05$). Sdec remained unchanged from the first to the last session (22.5 ± 5.7 vs 23.4 ± 7.6%, main effect: $p > 0.05$, Cohen's $d = 0.13$). The acute decrease in SpO2 remained similar throughout the training period despite a large effect size (82 ± 4 vs. 79 ± 5%, $p > 0.05$, Cohen's $d = 0.75$), without any group nor interaction effects (both $p > 0.05$). Interestingly, the velocity-dominant group perceived RSH training as harder than the aerobic-dominant group (RPE: 18.1 ± 0.8 vs. 16.6 ± 1.8 AU, $p < 0.01$, Cohen's $d = 1.12$), without any evolution over the training period ($p > 0.05$).
CONCLUSION:
Adding five sessions of repeated-sprint training in hypoxia results in performance improvements during a classical altitude camp, independently of the imposed exercise-to-rest ratios. Whether manipulating exercise and recovery duration results in different beneficial effects of the metabolic pathways under hypoxic stress needs further investigations, as well as their combination with chronic hypoxia-induced haematological adaptations.

Topic: **Training and Testing**

Presentation **Oral**