

Effect of high-intensity resistance circuit-based training in hypoxia on aerobic performance and repeat sprint ability

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Abstract

Recent acute studies have shown that high-intensity resistance circuit-based (HRC) training in hypoxia increases metabolic stress. However, no intervention studies have yet proven their effectiveness. This study aimed to analyze the effect of 8 weeks of HRC in hypoxia on aerobic performance, resting energy expenditure (REE), repeat sprint ability (RSA) and hematological variables. Twenty-eight subjects were assigned to hypoxia ($\text{FiO}_2 = 15\%$; HRC_{hyp} : $n = 15$; age: 24.6 ± 6.8 years; height: 177.4 ± 5.9 cm; weight: 74.9 ± 11.5 kg) and normoxia ($\text{FiO}_2 = 20.9\%$; HRC_{norm} : $n = 13$; age: 23.2 ± 5.2 years; height: 173.4 ± 6.2 cm; weight: 69.4 ± 7.4 kg) groups. Each training session consisted of two blocks of three exercises (Block 1: bench press, leg extension, front pull down; 2: deadlift, elbow flexion, ankle extension). Each exercise was performed at 6 repetitions maximum. Participants exercised twice weekly for 8 weeks and before and after the training program blood test, REE, RSA and treadmill running test were performed. Fatigue index in the RSA test was significantly decreased in the HRC_{hyp} (-0.9% ; $P < .01$; $\text{ES} = 2.75$) but not in the HRC_{norm} . No changes were observed in REE and hematological variables. Absolute (4.5% ; $P = .014$; $\text{ES} = 0.42$) and relative (5.2% ; $P = .008$; $\text{ES} = 0.43$) maximal oxygen uptake ($\text{VO}_{2\text{max}}$), speed at $\text{VO}_{2\text{max}}$ (4% ; $P = .010$; $\text{ES} = 0.25$) and time to exhaustion (4.1% ; $P = .012$; $\text{ES} = 0.26$) were significantly increased in HRC_{hyp} but not in the HRC_{norm} . No significant differences between groups were found. Compared with normoxic conditions, 8 weeks of HRC training under hypoxic conditions efficiently improves aerobic performance and RSA without changes in REE and red blood O_2 -carrying capacity.