

The Effect of Dynamic Intermittent Hypoxic Conditioning on Arterial Oxygen Saturation

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ABSTRACT

Background

Increases in arterial oxygen saturation (SaO₂) in response to intermittent hypoxic exposure (IHE) are well established. However, IHE protocols have historically involved static hypoxic environments. The effect of a dynamic hypoxic environment on SaO₂ is not known.

Objective

The purpose of this study was to examine the effect of dynamic IHE conditioning on SaO₂ using the Cyclical Variable Altitude Conditioning Unit.

Methods

Thirteen trained participants (9 males, age 30.1 ± 9.2 years; 4 females, age 30.3 ± 8.9 years) residing at or near sea level were exposed to a 7-week IHE conditioning protocol (mean total exposure time = 30.8 hours). Participants were exposed to a constantly varying series of hypobaric pressures simulating altitudes from sea level to 6858 m (22 500 feet) in progressive conditioning tiers, creating a dynamic hypoxic environment. SaO₂ was evaluated using pulse oximetry (SpO₂) 4 times: at 2740, 3360, and 4570 m, prior to and following the first 3 weeks of IHE, and at 4570, 5490, and 6400 m at the start and end of the final 4 weeks.

Results

SpO₂ improved 3.5%, 3.8%, and 4.1% at 2470, 3360, and 4570 m, respectively ($P < .05$), and 3.3%, 3.4%, and 5.9% at 4570, 5490, and 6400 m, respectively ($P < .05$). At 4570 m, SpO₂ increased from 81.7% ± 6.5% to 89.1% ± 3.2% over the entire 7-week conditioning period.

Discussion

The dynamic intermittent hypoxic conditioning protocol used in the present study resulted in an acclimation response, such that SpO₂ was significantly increased at all altitudes tested, with shorter exposure times than generally reported.