

# Effects of resistance training under hypoxic conditions on muscle hypertrophy and strength.

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## **Abstract**

It has been reported that exercise under hypoxic conditions elevates acute growth hormone secretion after exercise compared with that under normoxic conditions. This study examined the influence of resistance training under moderate hypoxic conditions on muscle thickness, strength and hormonal responses. Thirteen healthy men were assigned into two groups matched for physical fitness level and then randomized into two groups that performed exercise under normoxic ( $FiO_2 = 20.9\%$ ) or hypoxic ( $FiO_2 = 12.7\%$ ) conditions. Three sets of elbow extensions with unilateral arm were performed to exhaustion at a workload of a 10 repetition maximum with 1-minute intervals for 3 days per week for 8 weeks. The thickness of the biceps and triceps brachii was determined using B-mode ultrasound before and after training. Blood sampling was carried out before and after exercise, as well as during the first and last training sessions. Increase in the thickness of the triceps brachii in trained arm was significantly greater in the hypoxic group than in the normoxic group. The 10 repetition maximum was significantly increased not only in the trained arm but also in the untrained arm in both groups. Serum growth hormone concentrations after exercise were significantly higher in the hypoxic group than in the normoxic group on both the first and last training sessions. These findings suggest that hypoxic resistance training elicits more muscle hypertrophy associated with a higher growth hormone secretion, but that the greater muscle hypertrophy did not necessarily contribute a greater gain of muscle strength.

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## **KEYWORDS:**

cross-education, growth hormone, hypoxia, muscle thickness, unilateral training, upper arm