

The Influence of Intermittent Hypoxia on Erythropoietin Levels in Older Adults

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ABSTRACT

Few minutes of hypoxia exposure stabilizes hypoxia-inducible factors, resulting in erythropoietin (EPO) gene transcription and production. A brief intermittent hypoxia exposure increased EPO levels in young healthy adults, suggesting that a single session of intermittent hypoxia has the potential to increase oxygen-carrying capacity. **PURPOSE:** To determine the effect of a single session of intermittent hypoxia on serum EPO levels and hemoglobin mass among older adults. We hypothesized that a single session of intermittent hypoxia would raise serum EPO levels and lead to an increase in hemoglobin mass in older adults. **METHODS:** Seventeen participants (8 women, age: 54 ± 8 years, height: 177 ± 10 cm, weight: 76 ± 14 kg, BMI: 24 ± 4 kg/m²) were randomly assigned to an intermittent hypoxia group (IH, n=11) or an intermittent normoxia group (IN, n=6). Intermittent hypoxia consisted of eight 4-minute cycles at a targeted arterial oxygen saturation of 80% interspersed with normoxic cycles to resaturation. Air was made hypoxic by titrating nitrogen into the breathing circuit. Intermittent normoxia consisted of the same protocol, but nitrogen was not added to the breathing circuit. Pulmonary gas exchange, arterial oxygen saturation, and hemodynamics were continuously measured throughout both protocols. EPO levels were measured before and 4.5 hours after the beginning of each protocol. Hemoglobin mass was assessed via carbon monoxide rebreathing the day before and seven days following intermittent hypoxia or normoxia. **RESULTS:** Intermittent hypoxia lowered arterial oxygen saturation (98 ± 1 to 82 ± 3 %, $p < 0.01$), which resulted in a lower fraction of inspired oxygen (20.8 ± 0.1 to 10.9 ± 1.0 %, $p < 0.01$). There was no significant change in EPO levels in either condition (IH: 10.4 ± 2.9 to 13.3 ± 4.2 ; IN: 5.6 ± 2.4 to 6.5 ± 2.9 mU/ml, main effect for time $p = 0.12$). Similarly, there was no change in hemoglobin mass in response to both conditions (IH: 752 ± 189 to 754 ± 189 ; IN: 858 ± 177 to 879 ± 157 g, main effect for time $p = 0.87$). Intermittent hypoxia did not affect mean arterial pressure (87 ± 15 to 88 ± 14 mmHg, $p = 0.18$) or cardiac output (5.5 ± 1.5 to 5.7 ± 1.5 L/min, $p = 0.22$), but increased heart rate (62 ± 9 to 68 ± 9 bpm, $p < 0.01$). **CONCLUSION:** A single session of eight 4-minute cycles of intermittent hypoxia did not increase serum EPO levels in older adults.