

## Research Article

# Effects of Exercise Training under Hyperbaric Oxygen on Oxidative Stress Markers and Endurance Performance in Young Soccer Players: A Pilot Study

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The aim of the present study was to determine the effects of three weeks of hyperbaric oxygen (HBO<sub>2</sub>) training on oxidative stress markers and endurance performance in young soccer players. Participants ( $18.6 \pm 1.6$  years) were randomized into hyperbaric-hyperoxic (HH) training (□) and normobaric normoxic (NN) training (□) groups. Immediately before and after the 5th,

10th, and 15th training sessions, plasma oxidative stress markers (lipid hydroperoxides and uric acid), plasma antioxidant capacity (6-hydroxy-2,5,7,8-tetramethylchroman-2-carboxylic acid [TROLOX]), arterial blood gases, acid-base balance, bases excess (BE), and blood lactate analyses were performed. Before and after intervention, maximal oxygen uptake (VO<sub>2</sub>max) and peak power output (PPO) were determined. Neither HH nor NN experienced significant changes on oxidative stress markers or antioxidant capacity during intervention. VO<sub>2</sub>max and PPO were improved (moderate effect size) after HH training. The results suggest that HBO<sub>2</sub> endurance training does not increase oxidative stress markers and improves endurance performance in young soccer players. Our findings warrant future investigation to corroborate that HBO<sub>2</sub> endurance training could be a potential training approach for highly competitive young soccer players.

## 1. Introduction

Hyperbaric oxygen (HBO<sub>2</sub>) therapy is the medical administration of 100% oxygen (O<sub>2</sub>) at pressures higher than 1 absolute atmosphere (ATA) and during the last decade elite and competitive athletes have used HBO<sub>2</sub> to accelerate the recovery after injuries or exercise-induced muscle damage [1–3].

O<sub>2</sub> plays an essential role in cell metabolism and its availability is a principal determinant of maximal O<sub>2</sub> uptake (VO<sub>2</sub>max) [4]. Acute exposure to normobaric hyperoxia (i.e., 60% to 100% O<sub>2</sub>) increases O<sub>2</sub> availability and may improve physical performance in a dose-dependent manner [5, 6]. However, It has been shown that preexercise exposure to normobaric hyperoxia did not modify the performance during high intensity exercise [7, 8], endurance exercise [9],