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## Why was Muscle Force Improved by 2sets of 15min Hyperoxia Recovery Sessions after Intermittent Intensive Exercises?

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**key words** normobaric hyperoxia. • recovery • tissue oxygenation

### 【Purpose】

This study aimed to identify the effects and the mechanisms of normobaric hyperoxia on local muscle fatigue recovery.

### 【Methods】

Twelve male subjects performed 3 sets of intermittent isometric quadriceps exercise (3 times of no less than 30 seconds) at 70% of maximum voluntary isometric contraction (MVIC) separated by two 15 minute recovery sessions under normoxia (NOX; 20.9% O<sub>2</sub>) or hyperoxia (HOX; 30.0% O<sub>2</sub>). To avoid carryover effects from each experimental session, subjects performed the protocols on two separate occasions at least 5 days apart. Additionally, the order of NOX and HOX was randomized. To assess the degree of fatigue and recovery, six parameters were used; MVIC, blood lactate (La), oxy-hemoglobin (Oxy-Hb), deoxy-hemoglobin (Deoxy-Hb), total hemoglobin (THb) and perceived exertion (PE) measured by a visual analog scale. MVIC, La and PE were measured before and after intermittent exercises, and the data of Oxy-Hb, Deoxy-Hb and THb during the recovery sessions were analyzed.

### 【Results】

MVIC improved on average approximately 14% in HOX compared to NOX at the conclusion of the second recovery session. This was not associated with changes in La and PE, since they were similar in NOX and HOX throughout the protocol. In terms of the tissue oxygenation, the data during the second recovery session revealed significantly lower rate of Oxy-Hb and higher rate of Deoxy-Hb in NOX than in HOX ( $p < 0.05$ ). THb did not show a significant difference between the two conditions.

### 【Discussion】

Two sets of 15 minute recovery sessions in normobaric hyperoxia after intermittent exercise are effective for restoring MVIC. This recovery is associated with the maintained tissue oxygenation in HOX compared to NOX, which resulted in oxygen debt in the muscle, rather than blood lactate changes. This could be applied to a sports physical therapy field to enhance the effects of physical therapy.