OXIDATION OF SUBSTRATES ENERGY DURING SESSION OF AEROBIC TRAINING WITH AND WITHOUT BLOOD FLOW RESTRICTION

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Abstract

The aerobic training (AT) performed at high intensity can promote cardiorespiratory improvement and lead to a higher fat oxidation rates when compared to AT performed at low intensity. However, recent studies have shown that AT when performed at low intensity with blood flow restriction is able to promote similar cardiorespiratory improvement of AT at high intensity, but there is no study about fat oxidation comparing these two types of AT protocol.

Key words: blood flow restriction, substrate oxidation, oxygen consumption.

Introduction

It is known that the AT performed at high intensity, is able to optimize the cardiorespiratory fitness improvement when compared to AT with moderate and/or low intensity (ATLI) (HURLEY, 1989), besides a superior increase in oxidation rate of fat and carbohydrate molecules (Romijn, 1993), contributing to weight management and increasing health of the population (ACSM, 2011). However, recent studies have shown surprising results with a new aerobic training protocol with blood flow restriction (AT-BFR), used with low intensity ($\leq 40\% \text{VO}_{2\text{max}}$), but promotes significant improvement in cardiorespiratory fitness (ABE et al, 2010; OZAKI et al, 2011).

However, there are no studies investigating the rate fat oxidation and carbohydrate in a AT-BFR session, therefore the aim of this study was to compare these oxidation rates in a session ATLI and AT-BFR in cicloergômetro, both with $40\% \text{VO}_{2\text{max}}$.

Results and Discussion

Twelve males were part of the two experimental conditions (age 24.5 ± 4.04 years, BMI $25.36 \pm 3.28 \text{ kg/m}^2$, $\text{VO}_{2\text{peak}}$ $33.35 \pm 4.6 \text{ mL/kg/min}$). The sessions lasted 30 minutes of exercise on a cycle ergometer, as follows: low intensity ($40\% \text{VO}_{2\text{peak}}$ with blood flow restriction - ATBFR) and low intensity ($40\% \text{VO}_{2\text{peak}}$ - ATLO). VO_2 were collected during the. We calculate the fat and carbohydrate oxidation rates using the values of O_2 consumption and CO_2 production in equations applied for stoichiometric calculations³:

$$\text{Fat oxidation} = 1.67 \times \text{VCO}_2 - 1.67 \times \text{VO}_2$$

$$\text{CHO Oxidation} = 4.55 \times \text{VCO}_2 - 3.21 \times \text{VO}_2$$

Figure 1 shows that there was no difference between ATLI and AT-BFR in the oxidation of fats and carbohydrates ($p > 0.05$) during the exercise period. As there was no difference in the oxidation of substrates during exercise recovery period ($p > 0.05$) (Figure 2).

Substrates oxidation calculations consider only the energy expenditure from aerobic metabolism; thus, our results indicate that the upper adaptations demonstrated with AT-BFR (Abe et al., 2010) are not linked to metabolism.

Figure 1. Oxidation of energy substrates during exercise, in ATLI and AT-BFR protocols.

Figure 2. Oxidation of substrates energy during recovery, in ATLI and AT-BFR protocols.

Conclusions

We found no difference in the contribution of energy substrates (fat and carbohydrate) in ATLI compared to the AT-BFR.

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²Hurley, B F. Effects of resistive training on lipoprotein-lipid profiles: a comparison to aerobic exercise training. *MedSci Sports Exerc*; 21: 689-93, 1989.

³ Achten, J. et al. Maximal fat oxidation during exercise in trained man. *School of Sports and Exercise science*, 2003.