Effects of "living high-training low" on male/female obese adolescent's morphological indices and glucose/lipid metabolism

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Astract SessionTheme Category: Exercise prescriptions for healthy children – the impact of exercise on immunity in children and how much exercise is good for children?

Preferred Presentation Form: Oral communication

Is the presenter eligible for the Early Career Researcher Awards(poster and oral awards)? No

Abstract

Objective: This study aims to investigate the effects of 4 weeks living high-training low (HiLo) on obese adolescent's body composition, glucose/lipid metabolism and gender differences.

Method: 37 overweight and obese adolescents (13-16 old), volunteers participated in the fully closed weight-loss exercises. They were randomly divided into two groups as the normal oxygen group (n=19) and hypoxia group (n=18) and exercised an intervention for four-weeks. For the normal oxygen group, aerobic exercises and diet control intervention methods were used. Exercise intensity and individualized exercise prescription were based upon subject health condition and exercise tolerance test. Dieticians according to subject basal metabolic rate formulated a reasonable diet to ensure the calories and essential nutrient supply. For the hypoxia group, except aerobic exercise and diet control intervention, every night the subjects lived in hypoxic room equipped with hypoxia systems and they were exposed to an altitude of about 2,700 m (10 hours per day) for 4 weeks. Before and after hypoxic exposure, obesity related morphological and blood biochemical indices (blood glucose, blood lipid panel (includes 4 main lipoproteins,etc)) were separately analyzed, calculate homeostasis model assessment was used to estimate insulin resistance (HOMA-IR) and insulin secretion (HOMA-β) index.

Results:

(1) After hypoxia intervention, morphological indices, immunology indices, blood insulin and blood fat in average significantly decreased in both groups; Moreover blood glucose did not change significantly. In normal oxygen group and hypoxia group ,HOMA-IR and HOMA-β index significantly decreased. (2) Hypoxia combined with exercise and alimentary control have different effects on male/female obese adolescent's morphological indices and glucose/lipid metabolism that were shown by: 1. Male in hypoxia group showed weight, BMI and body fat significantly decreased more than normal oxygen group, the two groups lean body mass did not change significantly. Moreover, female in hypoxia group showed lean body mass significantly decreased more than normal oxygen group, the two group's weight, BMI and body fat did not change significantly.

2. Between the two groups, for male subjects HOMA-IR and HOMA-β index did not change significantly; in hypoxia group, for female subjects HOMA-β index decreased, but there was an upward trend in normal oxygen group, the two groups change significantly.

Conclusion:

(1) The two interventions methods can significantly improve the obese adolescent's morphological and glucose/lipid metabolism indices.

(2) The effects of the two interventions methods on morphological and glucose/lipid metabolism indices are due to gender differences, it should be used selectively based on the current situation.

Key words: hypoxia, exercise and alimentary, obesity, body composition, glucose/lipid metabolism, gender.