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The Effects of one session high-intensity interval training and Pilates on irisin, vaspin, resistin levels and insulin resistance in overweight men

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Extended Abstract

Introduction

In insulin resistance, pancreatic beta cells respond to excess plasma glucose by secreting more insulin to maintain normal blood sugar and overcome the reduced ability of some tissues to respond to insulin. There is a lot of evidence pointing to the role of obesity in the onset of insulin resistance. Resistin plays a role in the pathophysiology of obesity and insulin resistance. Increased plasma resistin impairs insulin function and glucose metabolism and acts as an important link between insulin resistance and obesity. Irisin is released during exercise and causes white fat cells to change to brown or a phenotype similar to brown fat cells, thereby increasing energy expenditure through thermogenesis independent of exercise and food intake. Plasma irisin levels are increased after regular endurance training. It has been suggested that exercise-induced muscle irisin may be able to treat the metabolic disease type II diabetes in humans. Vaspin has been associated with metabolic risk factors, influences insulin resistance, and may have an anti-inflammatory role. Serum vaspin changes depend on diet, physical activity, hormonal changes, metabolic control, and fat mass.

It seems that physical activity plays a significant role in improving the metabolic status of obese people with insulin resistance. One notable exercise protocol is high-intensity interval training (HIIT), which involves intervals of very high-intensity exercise followed by periods of low-intensity active rest. HIIT is a time-efficient method of exercise training and stimulates many of the metabolic adaptations of endurance and resistance training. From the perspective of the interaction of exercise duration on obesity and insulin resistance, does a session of HIIT and Pilates exercise have an effect on vaspin, resistin, irisin, and insulin resistance in overweight men?

Method

The present quasi-experimental study was conducted in equal groups of Pilates, HIIT, and control, as a pre-test and post-test. Thirty middle-aged (30-40 years), inactive, overweight (BMI:25-30 kg/m² and %BF ≥ 25) men from Tehran were selected purposively, conveniently and voluntarily. None of the subjects used any dietary or pharmaceutical weight loss supplements and had no history of any specific disease. These men had no history of exercise during the last six months. Blood sampling and measurement of research variables were performed in the pre-test and post-test, 24 hours before and after the end of the exercise protocol. The HIIT consisted of a 30-second burst of 15 seconds of running at 120 percent of maximal aerobic speed followed by 15 seconds of rest. In the maximal aerobic speed test, the subject started running at 8 km/h after an initial warm-up. After every 120 seconds, the treadmill speed was increased by 1 km/h until the subject was



no longer able to continue on the treadmill. At this stage, the maximal aerobic speed was determined and 120 percent of it was considered as the HIIT protocol. The Pilates training program was performed for one hour in one session. The changes of variables were examined using two-way ANOVA with repeated measures and Bonferroni post hoc test. Data analysis was performed using SPSS-22 ($P \leq 0.05$).

Results

The effect of time was significant for the irisin ($p=0.0001$). Irisin levels increased in the HIIT group ($p=0.001$). In the Pilates group ($p=0.056$), a non-significant change was seen. The group effect ($p=0.0003$) and the interaction effect of time*group ($p=0.0041$) were significant in irisin. There was no significant difference between the effects of the training groups on the irisin, and only the HIIT group ($p=0.001$) had an increase in irisin compared to the Pilates and control groups. The effect of time was not significant for the insulin resistance index ($p=0.78$). The insulin resistance index did not change in any group. The group effect ($p=0.768$) and the interaction effect of time*group ($p=0.691$) were not significant for the insulin resistance index. The effect of time was significant for the resistin ($p=0.001$). Resistin levels in the HIIT ($p=0.001$) and Pilates ($p=0.006$) groups decreased in the post-test. The group effect ($p=0.003$) and the interaction effect of time*group ($p=0.005$) were significant for the resistin. There was no difference between the effects of the training groups on the resistin; however, the HIIT and Pilates groups had a decrease in resistin compared to the control group. The effect of time was significant for the vaspin ($p=0.001$). Vaspin levels in the HIIT ($p=0.05$) and Pilates ($p=0.07$) groups decreased in the post-test. The group effect ($p=0.005$) and the time*group interaction effect ($p=0.007$) were significant in the vaspin. There was no difference between the effects of the training groups on the vaspin index; however, the HIIT and Pilates groups had a decrease in vaspin compared to the control group.

Discussion and Conclusion

Serum irisin levels were significantly different in the HIIT group compared to the Pilates and control groups, which was inconsistent with the results of some studies. The reason for this discrepancy was probably the level of physical fitness and gender of the subjects, the duration and type of exercise. As with other factors, irisin regulation may also depend on the exercise protocol (exercise intensity, endurance vs. resistance, acute vs. chronic), the time of sampling after exercise, age, gender, race, and fitness. Insulin resistance levels did not change in any groups. This discrepancy is probably due to the level and gender of the subjects and the type, intensity, and duration of exercise. The relationship between cardiovascular diseases and insulin resistance and increased insulin and the specific effect of exercise on their reduction has been confirmed; in such a way that intense exercise reduces insulin resistance in the first session of exercise. Previous research findings have shown that even a single session of HIIT, short-term anaerobic testing, and moderate-to-high-intensity circuit training can improve blood glucose in type II diabetes, which was consistent with the findings of a single session of Pilates, but not with a single session of high-intensity interval training. Serum resistin levels in the HIIT and Pilates groups were reduced, which was inconsistent with the results of some previous studies. The reason for this discrepancy is the difference in the type of subjects, age and gender of the subjects, type, duration, and intensity of the prescribed exercises. HIIT and Pilates reduced serum vaspin. Serum vaspin concentrations are lower in individuals with a high level of physical fitness compared to individuals with a low level of physical fitness. Insulin sensitivity is actually an important and strong determinant of vaspin gene expression in adipose tissue, and high levels of vaspin in diabetic and obese individuals are actually a compensatory mechanism in response to reduced insulin sensitivity and reduced glucose metabolism, and the reduction in vaspin levels was attributed to increased insulin sensitivity.

According to the results of the present study, it seems that high- and moderate-intensity interval training has a significant effect on metabolic processes and, through its effect on the function of intracellular mediators, improves fat metabolism, which results in improved insulin resistance. The changes resulting from Pilates and HIIT improved resistin, vaspin, and irisin levels. In terms of the changes observed, each training method is beneficial for a specific group. Pilates may be appropriate for overweight individuals with limited mobility, and HIIT may be appropriate for overweight individuals without limitations. More time is needed to practice these two training methods to prove their effectiveness on symptoms of overweight. More research is needed to confirm these findings. **The results showed that irisin, vaspin, and resistin levels had significant changes, but no significant change was seen in insulin resistance levels. Therefore, both HIIT and Pilates caused changes and decreased serum irisin, vaspin, and resistin levels in inactive overweight men.**

Keywords: High-Intensity Interval Training, Pilates, Irisin, Vaspin, Resistin, Insulin Resistance, Overweight, Activity.

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