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The Effect of Resistance Training on Adiponectin and Insulin Resistance Index in Over Weight College,s Students Girl

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Abstract. Objective: Our objective was to evaluate the effect of resistance exercise on adiponectin and insulin resistance index in over weight girl student.

Subjects and methods: twenty girls' subjects voluntarily participated in our study Subjects were randomly assigned to one of two groups: Resistance training or control group. The resistance training was circuit resistance training for 12 weeks, 3 sessions per week and with 50-65% of one repetition maximum. Pre and post 12 weeks of resistance training blood samples were taken (5cc) in fasting state from all subjects. Data was analyzed via independent t test ($p \leq 0.05$).

Results: Resistance training caused a significant increase in the serum adiponectin and decrease in the Insulin Resistance levels of the overweight girl students ($\alpha = 0.05$).

Conclusions: We conclude that Resistance training caused a decrease in the insulin resistance and increase in adiponectin. This suggests that the insulin resistance effect of resistance training may be mediated even partially through increased adiponectin in over weight girl student.

Keywords: Resistance Training, Adiponectin, Insulin Resistance Index, Obesity

1. Introduction

Adipose tissue secretes multiple proteins known as adipocytokines that modulate various biological functions. One of these adipocytokines is adiponectin, which is reduced with obesity, increased insulin resistance, dyslipidaemia and diabetes. Adiponectin may be a marker for coronary artery disease (1) and seems to have protective metabolic and anti-inflammatory properties (2), which prevents atherosclerosis (3).

Physical inactivity is one of the main cardiovascular risk factors (4). Improvement in cardiovascular function by physical activity has been attributed to exercise-induced positive changes in metabolic abnormalities and risk factors that are associated with atherosclerosis (4, 5). Adiponectin and insulin resistance play an important role in the development of atherosclerosis (3). Body weight reduction as a result of endurance training increases circulating levels of adiponectin, and the increase in adiponectinaemia is associated with decrease in body mass index (BMI) and the improvement in insulin sensitivity (6). As another therapy to decrease insulin resistance along with weight reduction, exercise training might also affect adiposity metabolism and result in changes in adiponectinaemia.

In recent years, resistance training or weight training has become a very popular form of exercise to improve physical fitness, enhance performance, prevent injuries and increase muscle size (10, 11). The physiological and biochemical responses to resistance exercise are different from those exhibited in response to endurance exercise (12). There are few studies that have examined the effects of resistance training on adiponectin and insulin sensitivity (13–15) and the results are controversial. For example, recently Klimcakova et al, (14) have reported no changes in adiponectin concentration in response to 3 months of resistance training, while Fatouros et al, (13) investigated the effects of 6 months of resistance training with different intensities and reported significant increases in adiponectin after moderate- and high-intensity training but not after low-intensity training. In addition, Brooks et al, (15) demonstrated rises in adiponectin concentration after 14 weeks of high-intensity resistance training.

No previous study has investigated the effects of these types of training on insulin resistance and adiponectin concentration in over weight Girl students. Therefore, the present study was designed 1) to determine the effects of resistance exercise on insulin resistance and adiponectin concentration and 2) to explore the relationship between adiponectin and body composition changes in response to this training protocol.

2. Material and methods

The research was semi-experimental. Twenty girls (age 20-30) volunteered to participate in this study. They signed a written informed consent form after approval by the committee of Medical ethics, Shahre Gods University. Subjects were randomly assigned to one of the two groups: resistance training group (n=10) or control group (n=10). All subjects were asked to complete a personal health and medical history questionnaire, which served as a screening tool. All subjects were non-smokers and had no history of any kind of medical condition that would prevent them from participating in the exercise intervention. The university's ethics committee approved the experimental procedures and study protocols, which were fully explained to all subjects. A written consent form was signed by each subject after having read and understood the details of the experiments.

3. Resistance training

Resistance training consisted of 50–60 min of circuit weight training per day, 3 days a week, for 12 weeks. This training was circularly performed in 11 stations and included four sets with 12 maximal repetitions at 50–60% of 1-RM in each station. Each exercise and set was separated by 30 s rest. General and specific warm-up were performed prior to each training session, as explained for the 1-RM determination, and each training session was followed by cool-down.

4. Blood sampling and analysis

Blood samples were obtained from all subjects at 0800 h after an overnight fast before and after the training programmes. Fasting sera kept at –80 °C were used to measure serum adiponectin concentrations by ELISA (Biovendor, Germany). Insulin resistance in fasting state was determined using a homeostasis model assessment (HOMA-IR) and was calculated from fasting insulin (IF) and fasting glucose (GF) as follows: HOMA-IR= (IFxGF)/22.5 (16).

5. Statistical methods

Data collected from descriptive statistics was applied to estimate central indicators, distribution and to draw tables and for deductive statistics, Smirnov-Colmegrov test was used to distribute natural data and Levin test was used to harmonize them. Independent T test was applied to consider significant differences of means pre- and post-training of tow group. Values are presented as mean (±S.D.) unless otherwise stated. All statistical operations were done by SPSS/14 at $\alpha \leq 0.05$.

6. Results

Table 1 shows physical, physiological and biochemistry variables of the study cases. There was no significant difference in variables between control and resistance group in pre test which is indicated their random and harmonious distribution in two groups. The variables were assessed again after 12-week resistance training. Table 1 shows statistical findings and significant differences of these properties from pre-training through post-training of two groups in variable weight, body fat percent, adiponectin and insulin resistance index.

7. physical, physiological and biochemistry variables in tow group

Group Index	Resistance		Control		P
	Pre test	Pos test	Pre test	Pos test	-
Age (year)	22.30 ± 2.77	-	22.77 ± 3.06	-	-
Height (cm)	159.40 ± 4.57	-	158.80 ± 3.99	-	-
Weight (kg)	75.48 ± 1.63	72.93 ± 1.44	75.08 ± 1.40	75.37 ± 1.37	0.002
Body mass index (kg/m^2)	29.69 ± 1.09	28.48 ± 1.35	30.12 ± 1.64	30.24 ± 1.70	0.04
Fat percentage (%)	31.58 ± 1.94	29.67 ± 1.22	31.80 ± 1.57	31.96 ± 1.65	0.01
Adiponectin (µg/ml)	8.56 ± 0.3	10.31 ± 0.4	8.80 ± 0.2	8.85 ± 0.3	0.000
Ansulin resistance	2.5 ± 0.3	1.40 ± 0.2	2.66 ± 0.2	2.84 ± 0.2	0.000

8. Discussion

The results of the current study showed an increase in serum adiponectin levels among subjects who underwent 12 weeks of resistance training, with concurrent reduction in body weight, percent body fat, BMI, and HOMA-IR.

Previous studies examining the effects of exercise training on adiponectin levels have reported conflicting results. Some have reported increased (21, 22–24) and others have reported no changes in adiponectin levels after exercise training (25– 28). Most studies that reported increased adiponectin levels after exercise training also observed significant weight loss (22, 23, 29, 30). Esposito et al, observed a 48% increase in adiponectin levels after 2 years of a combined low-energy Mediterranean diet and increased physical activity (30). A study also reported increased adiponectin levels in subject groups with normal glucose tolerance, impaired glucose tolerance, and type 2 diabetes after only 4 weeks of aerobic exercise intervention, which induced 2.0%, 3.7%, and 1.7% weight reduction, respectively (23). In addition, one of the recent studies showed that 3 months of aerobic exercise increased plasma adiponectin levels from 4.44 ± 0.47 to 5.95 ± 0.49 µg/mL, with a significant reduction in body fat mass without changes in body weight (21). On the other hand, Yokoyama et al, reported no changes in adiponectin levels after 3 weeks of combined intervention of diet and exercise, which induced slight weight loss among 40 patients with type 2 diabetes (26). In addition, Hulver et al, also reported no changes in adiponectin levels despite significant increased insulin action and no changes in body weight or fat mass (27).

Few resistance-training studies that have investigated changes in adiponectin have also reported conflicting results (13–15). Klimcakova et al, reported no changes in adiponectin concentration in response to 3 months of resistance training performed three a week at 60–70% of 1-RM with 12–15 repetitions for each exercise (30–45 min per session) (14). In an interesting study, Fatouros et al, investigated the effects of 6 months of resistance training at different intensities (low, moderate and high intensities) on adiponectin concentration in elderly individuals. They reported significant increases in adiponectin after moderate- and high-intensity training but not after low-intensity training, which were accompanied by weight reductions (13). Recently, Brooks et al, demonstrated significant increases in adiponectin concentration after 14 weeks of high-intensity resistance training (15). From these previous studies, we can speculate that weight loss, more specifically body fat loss, is necessary for the exercise training effects on adiponectin to be revealed.

In the present study, 12 weeks of resistance training increased insulin sensitivity. These findings confirm those of previous studies that found improvement in insulin sensitivity after exercise training in obese and healthy individuals (2, 8, 9). Several mechanisms have been proposed to be responsible for the increases in insulin sensitivity after exercise training (17–20). These include increased post-receptor insulin signalling (18), increased glucose transporter protein and mRNA (19), increased activity of glycogen syntheses and hexokinase (29), increased muscle glucose delivery and changes in muscle composition (14). restoring insulin sensitivity by circuit weight training might be mediated mainly by mechanisms other than adiponectin, for instance, by the AMP-activated protein kinase pathway (7).

9. Conclusions

This study demonstrates that 12 weeks of circuit weight training improved body composition, insulin sensitivity, and adiponectin levels in over weight girl student. Our results suggest that overweight and obese girl should be encouraged to increase their physical activity levels to prevent early development of chronic diseases related to obesity.

10.Reference

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