Journal of Sports Physiology and Athletic Conditioning (J.S.P.A.C). 2021; 1 (1): 67-74

Research Article

High Intensity Interval Training on Adiponectin And ALT, AST, ALP Enzymes In obese And Overweight Boys

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Received: 28 July 2021
Revised: 30 July 2021
Accepted: 16 August 2021

Abstract

Background: This study was conducted to evaluate the effect of eight weeks of High Intensity Interval Training (HIIT) on adiponectin and AST, ALT, and ALP enzymes in obese and overweight boy.
Materials and Methods: Subjects were 22 boys aged 12-14 years old, who were randomly assigned to experimental and control groups. Experimental group: mean weight 80.08 ± 16.08, Vo2max was 36.56 ± 2.49, and BMI was 30.27 ± 5.9 and control group: mean weight 67.91 ± 7.95, and Vo2max was 44.4 ± 2.75, 38 and BMI of 60.26 ± 6.3. The experimental group performed eight weeks of HIIT training with 80% HRR intensity at 10 turns of 60 seconds, with 60 seconds rest on exercise bikes for 3 days a week. Blood samples were taken 24 and 48 hours before and after the training, ANCOVA were used for data analysis using SPSS 21 software at a significant level ($p < 0.05$).
Results: The results showed that HIIT reduced the levels of Adiponectin and AST and ALP enzymes, but this was not significant ($P \geq 0.05$). This exercise also reduced ALT and fat percentage and increased Vo2max in subjects, with changes in all three variables significant ($P \leq 0 / 05$).
Conclusion: It seems HIIT can reduce the percentage of fat and ALT enzyme in children, which can help prevent many metabolic diseases. Also, HIIT can play a role in liver health in overweight and obese children.

Keywords:
Adiponectin, ALT, AST, ALP, HIIT, Overweight

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1. Introduction

Recently, obesity is increasing in most countries of the world (1), which according to Iranian studies is no exception to this (2). Obesity in childhood is a problem that endangers the health of the child. Obesity in childhood can be the cause of obesity in adulthood (2-3). Obesity can carry risks such as type 2 diabetes, plasma lipid deficiency (4), and cardiovascular disease and hypertension (5). Adipose tissue is no longer known as storage and non-secretory tissue, but as an active endocrine tissue that can secrete many regulatory factors such as Adipocytokines (6). Adipocytokines have important functions in the peripheral and central nervous systems (7). Adiponectin is the most abundant plasma protein (0.01%) and the only adipokine secreted from white adipose tissue with anti-inflammatory and anti-atherosclerotic properties (8). The adiponectin gene is known to cause obesity and metabolic diseases in humans (9). Adiponectin increases energy expenditure and fat breakdown, especially fatty acid oxidation, by activating adenosine monophosphate activating protein kinase (AMPK) as well as increasing insulin sensitivity (10-11). Adiponectin can be considered a resistant and important factor in the pathogenesis of several processes related to cardiovascular disease. Adiponectin acts as an anti-atherosclerotic agent by acting on endothelial cells due to its beneficial lipid, glucose metabolism and insulin sensitive effects. It has generally been observed that plasma concentrations of adiponectin are lower in patients with diabetes and cardiovascular disease (10). Plasma levels of adiponectin are inversely related to fat mass and insulin resistance index. Adiponectin levels tend to decrease in people with morbid obesity (11).

Lifestyle changes and long-term weight loss can restore adiponectin levels to their original state (12). On the other hand, studies have shown that increased body fat, which is associated with abdominal obesity, can cause fatty liver disease (13). The fats we consume normally are metabolized in the liver, and fatty liver syndrome occurs when liver cells accumulate fat droplets (triglycerides) that cause non-alcoholic fatty liver (14). Enzymes commonly measured in liver disease include aspartate aminotransferase (AST), alanine aminotransferase (ALT), alkaline phosphatase (ALP), gamma-glutamyl transferase (GGT), and the enzyme lactate dehydrogenase (LDH). Elevated serum transaminase activity is important. In most liver diseases, ALT activity is higher than AST. Although serum activity in both AST and ALT enzymes increases when it affects liver disease, ALT is a specific enzyme. It is for the liver. The ratio of AST to ALT is used in the differential diagnosis of liver disease. If this ratio is less than one, it is a minor injury and if it is more than one, it is chronic liver disease. ALP works in most parts of the body, for example, membranes and Cell levels in the mucosa of the small intestine and the tubules of the kidney, bone, liver, and placenta are related (15). Reports have shown that swimming, running, and cycling exercises significantly increase serum adiponectin. This increase is correlated with a decrease in BMI and therefore adiponectin has been introduced as one of the indicators that body composition change (16). Physical activity causes changes in adipokine levels such as a decrease in proinflammatory cytokines and an increase in anti-inflammatory cytokines. Changes in the levels of the four variables leptin,

On the other hand, there is a hypothesis that the more energy is consumed during exercise and sports activity and the body is under pressure of metabolism, the more adiponectin is expressed (18). Research has also shown that intense high intensity interval training can change body composition by reducing fat mass (19). Reported that 16 weeks of voluntary running with an intensity of 50 to 75% VO2 max on a treadmill was effective in treating fatty liver disease. Davoodi et al. 50 to 70% of VO2 max with increasing exercise load on liver enzymes of 24 fatty liver patients. They observed that the serum AST and ALT levels in the experimental group were significantly lower than in the control group (14). Numerous studies on adiponectin levels have been influenced by exercise, but the effect of very intense intermittent training on adiponectin levels has been limited, and the effect of very intense intermittent training (HIIT) on liver enzyme levels has not been extensively studied. Therefore, objective of this study was effect of eight weeks of High Intensity Interval Training on adiponectin and AST, ALT, and ALP enzymes in obese and overweight boy.

2. Materials and Methods

The statistical population of the study included all boys aged 12-14 years old who were obese and overweight in the first year of high school work and thought, located in district one of Tehran. The statistical samples of this study were 45 students aged 12-14 years (seventh and eighth grades) who were all purposefully selected according to the table of percentiles of obesity and overweight in children and adolescents. Twenty-two of them were randomly divided into experimental and control groups.

The pre-test and post-test program and the training protocol were explained to the parents and they signed the consent form and written consent was obtained from them. Pre-tests including height, weight, BMI, VO2max fat percentage, and blood sampling were performed to measure adiponectin and ALT, AST, and ALP enzymes before training. The experimental group then performed eight weeks of HIIT for three sessions per week and 40 minutes per exercise session. The exercise consisted of 10 minutes of warm-up with low-pressure stretching and kinetic movements, 20 minutes of intensity interval training and 10 minutes of cooling down and returning to baseline. The exercise training protocol was 60 second activity on bike with 80% HRR intensity at 10 turns with 60 second rest after each activity. (Figure1) Which was performed using a resting heart rate and placed in the Karvonen formula for each subject (20). This exercise protocol was performed on a standard stationary bike. Then, after the post-test, height, weight, BMI, fat percentage, VO2max, and taking a second blood sample was taken. To reject or accept the hypotheses from the significant level, the significance level was considered $p \leq 0.05$. The measuring instrument used included a scale and a body composition measuring device Omron BF511 made in Japan. Seca gauge model 206 made in Germany, stationary bike model Sports Top B890P made in Taiwan, Polar heart rate monitor model AXN300 made in Finland, adiponectin kit made by Mediagnost company in Germany with a sensitivity of 0.6 g / ml, AST and ALT enzyme kits made by Bioorx Fars Iran with UV4 and UV3 sensitivity, respectively, ALP enzyme kit made by Pars Azmoun Iran with UV3 sensitivity.

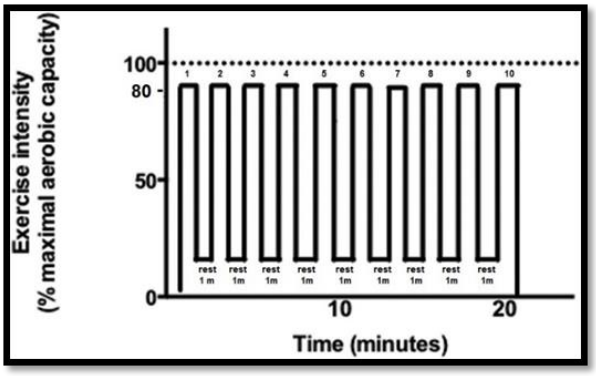

Figure 1. High Intensity Interval Training Protocol

3. Results

Mean and standard deviation of adiponectin, AST, ALT, ALP, VO2max, body fat percentage, BMI, and bodyweight of subjects before and after the protocol is presented in Table 1. The results showed that there was no significant difference between adiponectin, AST, ALP, BMI, and body weight in the two groups (P <0.05). However, body fat percentage (p = 0.010), ALT (p = 0.042), VO2max (p = 0.038) decreased significantly after 8 weeks of training compared to the pretest.

Table 1.covariance analysis for inter-group

Research groups / Variable		Control group	Training group	Sig
Adiponectin (µg/ml)	Pre-test	5/43 ± 2/90	5/27 ± 1/76	0/837
	Post test	5/21 ± 2/89	5/18 ± 1/68	
AST (U/L)	Pre-test	26/08 ± 4/46	23/90 ± 4/28	0/414
	Post test	23/00 ± 3/71	20/30 ± 5/65	
ALT (U/L)	Pre-test	19/41 ± 4/46	18/20 ± 3/67	0/042*
	Post test	18/25 ± 4/55	14/90 ± 2/37	
ALP (U/L)	Pre-test	985/50 ± 275/17	770/5 ± 158/00	0/820
	Post test	878/25 ± 206/22	755/80 ± 169/53	
VO2max (ml/kg/min)	Pre-test	38/44 ± 2/75	36/56 ± 2/49	0/038*
	Post test	39/31 ± 3/16	39/66 ± 2/54	
Percentage of body fat %	Pre-test	31/62 ± 4/74	35/05 ± 6/38	0/010*
	Post test	31/85 ± 4/94	33/58 ± 6/83	
BMI Kg/m²	Pre-test	26/60 ± 3/08	30/27 ± 5/09	0/582
	Post test	26/55 ± 2/97	30/00 ± 5/12	
body weight Kg	Pre-test	67/51 ± 7/95	80/53 ± 16/08	0/787
	Post test	67/70 ± 7/90	80/28 ± 15/90	

* Significance level (P ≤ 0.5) was considered

4. Discussion

Considering that adiponectin levels can play an important role in preventing metabolic and cardiovascular diseases, in this study we tried to show the effect of HIIT type exercises on adiponectin levels in obese and overweight children. The results of this study showed that eight weeks of HIIT training reduced adiponectin levels in obese and overweight boys but was not significant. Kordi et al., (2013) showed that the concentration of adiponectin increased significantly after 6 weeks of HIIT training in the experimental group. (21). In another study by Avazpor et al., Effect of 8 Weeks of High Intensity Interval Training on Plasma Levels of Adiponectin and Leptin in Overweight Nurses were studied, they showed an increase in adiponectin levels. (22). Racil et al., Also reported high intensity interval training increase adiponectin levels in obese young females (23). The mentioned researche have not similar result with present study.

Gerosa-Neto et al. Observed a decrease in adiponectin levels after long-term high-intensity interval training in overweight/obese adults. (24) Ryan et al., Also did not see any change in adiponectin levels after 6 months of endurance training in obese and overweight women (25). Probably in studies that have shown a significant effect of adiponectin due to the time of the training period and the age of the subjects and the cost of calories consumed during exercise. The present study showed that the effect of HIIT on the ALT enzyme was significant and had no significant effect on AST, ALP enzymes. Quantitative research has examined the effect of HIIT exercises training on these enzymes. Shamsoddini et al., Observed a decrease in ALT with aerobic and resistance exercise training on hepatic fat in iranian men with nonalcoholic fatty liver disease (26).

In a study, Barani et al., Investigated the effect of resistance and combination exercises (resistance and aerobic movements) on serum levels of ALT, AST, ALP enzymes in women with a fatty liver that ALP level decreased significantly only in the resistance group. But the levels of AST and ALT did not change (27). Davoodi et al. Reported in their research that regular aerobic and endurance training can reduce ALT and AST levels (14). Most studies have reported that patients with non-alcoholic fatty liver and overweight and obese can lose weight Through endurance training and diet planning, can help significantly improve serum ALT (28). Some researchers, such as 29. Omagari et al., have suggested nutritional therapies for fatty liver disease rather than endurance exercise and other types. (29). In the study, Barani et al., Examined two models of resistance and combination training in women with fatty liver disease. The ALP level varied in the resistance group (27). The research mentioned in this section does not specifically use HIIT exercises and training protocols. HIIT training models can be varied, the intensities used in these training, as well as the rest times between these intensities and the type of rest (active or inactive), number of repetitions, and repetitions of training sessions per week are all variable factors that can have different effects and adaptations.

It is inferred that different training protocols can have different effects and results. Subjects may also have different responses to exercise training, depending on their age and level of fitness, as well as their ideal health and weight. Being in puberty the presence of growth hormones and testosterone in different sexes can affect the quality of exercise training.

5. Conclusion

It seems HIIT can reduce the percentage of fat and ALT enzyme in children, which can help prevent many metabolic diseases. Also, HIIT can play a role in liver health in overweight and obese children.

Acknowledgements

The authors would like to thanks all the participants who participated in this research.

Funding

None

Compliance with ethical standards

Conflict of interest the authors declare that they have no conflict of interest.

Ethical approval the research was conducted with regard to the ethical principles (Thesis Code: 28321404952008).

Informed consent Informed consent was obtained from all participants.

Author contributions

Conceptualization: E.Z.,S.G.T.,M.H.; Methodology: E.Z.,S.G.T.,M.H.; Software: E.Z.,S.G.T.,M.H.; Validation: E.Z.,S.G.T.,M.H.; Formal analysis: E.Z.,S.G.T.,M.H.; Investigation E.Z.,S.G.T.,M.H.; Resources: E.Z.,S.G.T.,M.H.; Data curation E.Z.,S.G.T.,M.H.; Writing - original draft: E.Z.,S.G.T.,M.H.; Writing - review & editing: E.Z.,S.G.T.,M.H.; Visualization: E.Z.,S.G.T.,M.H.; Supervision: E.Z.,S.G.T.,M.H.; Project administration: E.Z.,S.G.T.,M.H.; Funding acquisition: E.Z.,S.G.T.,M.H.;

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