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## LETTER TO THE EDITOR

### The effects of high intensity interval training on the levels of liver enzymes associated with non-alcoholic fatty liver and selected anthropometric indices in obese men



#### *Les effets de l'entraînement par intervalles de haute intensité sur les taux d'enzymes hépatiques associés à la stéatose hépatique et certains indices anthropométriques chez les hommes obèses*

#### 1. Introduction

The prevalence of non-alcoholic fatty liver (NAFLD) in adult populations in western societies is reported to be between 34% to 46% [1], while the prevalence of NAFLD in Iran is estimated to be between 21.5% and 31.5% [2]. Until now, a variety of alternative markers for abdominal fat have been studied in people with NAFLD. These markers include body mass index (BMI), waist circumference (WC), WAIST-to-height ratio (WtHR), and waist-to-hip ratio [3]. Several important studies have shown that increased physical activity promotes liver function and is protective against various environmental and physiological stresses such as cold, heat and oxygen deficits [1]. It is recommended that regular exercise increased physical fitness and can prevent liver diseases [1,4]. To date, most work has focused on endurance and resistance trainings [5] and there is limited information on the role of high intensity interval training (HIIT) on liver diseases. This training mode includes high intensity interval phases along with active rest among the repetitions, and also those willing to participate in sports prefer these training patterns to regular continuous trainings due to the reduced overall time required to complete this training mode [3].

#### 2. Methods

The present study was quasi-experimental with pre-test and post-test design and a control group. The studied population

was NAFLD male patients who were selected from private clinics in Darrehshahr, Ilam, Iran. All ethical principles have been reviewed and approved by the Committee of Research Ethics of Lorestan University.

Among the patients who voluntarily wanted to participate in the study, 30 eligible subjects were assigned in to one of the two intervention groups using block randomization with stratification on age and VO<sub>2</sub>Max: control group (13 patients with mean age of 38/69 ± 6/7 years, mean height of 171.30 ± 7.85 cm, mean weight of 95.30 ± 17.43 kg and mean BMI of 32.24 ± 3.70 kg/m<sup>2</sup>) and training group (17 patients with mean age of 39/82 ± 5/21 years, mean height of 171.24 ± 5/26 cm, mean weight of 91.64 ± 7.89 kg, and mean BMI of 31.59 ± 1.75 kg/m<sup>2</sup>). One day before the training program, in fasting state, the subjects had their ALT and AST liver enzymes were measured. Ultrasound of the liver was performed to quantify the amount of intrahepatic fat. Finally, key anthropometric indices were measured. The training group performed HIIT for eight weeks; comprising three sessions each week based on the RAST test. Finally, 48 hours after the last training session, liver ultrasound was performed again in the fasting state, blood samples were taken and key anthropometric indices were repeated.

All data are presented as mean ± standard deviation. One-way analysis of variance (ANOVA) test were used to analyze differences between the dependent variables before and after the HIIT training program. All analyses were performed by using SPSS (ver. 22.0, Chicago, IL, USA). Statistical significance was set at  $P < 0.05$ .

#### 3. Results

Before starting the training program, all subjects suffered from non-alcoholic fatty liver, but after completing the training program, only 52/94% of the subjects in the training group had a non-alcoholic fatty liver, while the subjects in the control group all continued to have non-alcoholic fatty liver. These results indicate that high intensity interval training has led to an approximately 18% improvement of the disease in the training group ( $P = 0.0001$ ). Moreover, following an eight-week period of HIIT, the levels of ALT and AST enzymes decreased significantly in the training group compared to the control group ( $P = 0.002$ ,  $P = 0.001$ ,

**Table 1** Comparing mean of liver enzymes level (AST, ALT) and anthropometric indices in pre-test and post-test.

| Variable                             | Group    | Pre-test     | Post-test                 |
|--------------------------------------|----------|--------------|---------------------------|
| ALT (U/L)                            | Training | 40/41 ± 7/36 | 30/11 ± 2/91 <sup>b</sup> |
|                                      | Control  | 36/46 ± 8/00 | 36/76 ± 7/08              |
| AST (U/L)                            | Training | 32/05 ± 4/92 | 26/00 ± 2/66 <sup>b</sup> |
|                                      | Control  | 32/86 ± 5/30 | 31/15 ± 4/14              |
| Waist-to-height ratio                | Training | 0/57 ± 0/02  | 0/55 ± 0/02               |
|                                      | Control  | 0/58 ± 0/03  | 0/58 ± 0/04               |
| Waist circumference (cm)             | Training | 98/05 ± 4/09 | 94/79 ± 4/09 <sup>a</sup> |
|                                      | Control  | 99/69 ± 8/26 | 99/87 ± 8/22              |
| Body mass index (kg/m <sup>2</sup> ) | Training | 31/59 ± 1/74 | 29/80 ± 1/41 <sup>a</sup> |
|                                      | Control  | 32/24 ± 3/70 | 32/36 ± 3/88              |
| Waist-to-hip ratio                   | Training | 0/94 ± 0/03  | 0/92 ± 0/03               |
|                                      | Control  | 0/94 ± 0/02  | 0/94 ± 0/02               |

Data are presented as means ± standard deviations

<sup>a</sup> P < 0.05; using one-way ANOVA test.

<sup>b</sup> P < 0.01; using one-way ANOVA test.

respectively). Finally, an eight-week period of HIIT led to a significant decrease of 7% in BMI ( $P=0.018$ ), 4% in waist circumference ( $P=0.035$ ) and two percent but not significant in waist-to-height ratio ( $P=0.083$ ) in the training group (Table 1). These changes were accompanied by a statistical significant of 1.8 kg reduction in body weight ( $P=0.024$ ) and an approximately 47% improvement ( $P=0.0001$ ) of the fatty liver status in men in the training group.

#### 4. Conclusion

Fatty liver is associated with obesity and lower levels of physical activity not only in adulthood, but also in adolescence and youth [1]. Moreover, significant positive correlation is reported between liver echogenicity and ALT and AST enzymes levels [5]. A variety of alternative markers for abdominal fat in people with non-alcoholic fatty liver have been studied. These markers include BMI, waist circumference, waist-to-height ratio, and waist-hip ratio. Each of these markers is correlated with body fat and abdominal fat; however, the WAIST circumference has the strongest link with abdominal fat [1–3]. The findings of this study showed that eight weeks of HIIT caused a significant reduction of waist circumference, waist circumference ratio and BMI, as well as a non-significant reduction of waist-to-hip ratio in training group compared to control group in obese men with NAFLD.

The results of this study showed that eight weeks of HIIT significantly reduced the level of liver enzymes (AST and ALT) in obese men with NAFLD. Also, after eight weeks of training, several key anthropometric indices (waist-to-height ratio, waist circumference and body mass index) decreased significantly in the training group compared to the control group. These findings suggest that HIIT may be an important non-pharmacological strategy for treating NAFLD and reducing the levels of liver enzymes associated with fatty liver. This training mode can also be used as a tool to control weight and treat obesity in obese men with non-alcoholic fatty liver.

#### Disclosure of interest

The authors declare that they have no competing interest.

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