Effect Of High Intensity Interval Training On Body Composition And Anthropometric Characteristics Of Overweight Young Adults Using Rowing Machine

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Abstract: The study is conducted to determine the effect of a 12-week High Intensity Intermittent Exercise (HIIE) intervention on anthropometric characteristics include total body water, total body weight, body fat, waist to hip circumference ratio, body mass index, girth measurements include neck, chest, bicep, forearm, waist, thigh, calf, waist to hip ratio of overweight males adolescents. The 50 participants of this study were randomly assigned to either exercise or to control group. The intervention group (n=25) received HIIE at frequency three times per week, 20 minutes per session, for 12 weeks. The results of high intensity intermittent exercise HIIE and control groups (n=25) have been shown on body composition of overweight males, the experimental group was significantly reduced total body water by 2.39 kg, total body weight was not significantly but reduced by 2.33 kg, body fat was significantly reduced 1.86 %, waist to hip circumference ratio was also reduced by 0.01 and body mass index was also reduced by 1.7 kg/m². On the other hand, the control group slightly increased in body water, body weight, % body fat, waist to hip, body mass index. The HIIE on girth measurements of overweight males, the experimental group was significantly reduced neck size by 2.72 cm, chest was significantly reduced by 5.08 cm, bicep significantly reduced 2.74 cm, forearm significantly reduced by 1.2 cm, waist significantly reduced by 4.93 cm, thigh was also reduced by 1.68 cm but not significant, hips significantly
reduced by 4.42 cm, calf significantly reduced by 2.49 cm and waist to hip circumference ratio was also reduced by 0.01. On the other hand, the control group slightly increased in neck, chest, bicep, forearm, waist, thigh, hips, calf, waist to hip ratio.

**Keywords:** High Intensity Intermittent Exercise, Body Composition, Girth Measurements, Weight Reduction, Fat Analysis.

**INTRODUCTION**

Obesity levels is continue to increase in both developed and developing countries [1]. As being overweight is linked with numerous health problems, influential fat loss strategies are required [2]. While dieting has been the major fat loss method, aerobic exercise programs have been displayed increase cardiorespiratory fitness [3] and preserve fat-free mass [4]. Most aerobic exercise interventions have consisted of moderate-intensity steady-state exercise, for about 30 to 40 min for 3 to 4 days per week, over a four- to six-month period. As a great disappointment, these kinds of exercise programs have resulted in minimal fat loss [5, 6]. On the other hand, high intensity intermittent exercise (HIIT) has been shown to result in greater fat loss [7]. The lack of increase in fat free mass (FFM) accompanying steady-state exercise is in agreement with prior research in this area of research [8]. Related to abdominal fat, 15 weeks of HIIE leading to a 0.15 kg reduction of fat in previously untrained young women [9]. As women in this study having moderate levels of abdominal fat it is feasible that the greater abdominal, trunk and visceral fat of men may show greater reductions after experiencing HIIE. Therefore, the purpose of this study was to examine the effects of 20 minutes duration sessions of high intensity interval exercises (HIIE), repeated three times weekly for 12 weeks, on the body composition of overweighted males subjects. It was hypothesized that HIIE would result in significant reductions in anthropometric characteristics includes total body water, total body weight, body fat, waist to hip circumference ratio, body mass index and girth measurements. Some latest studies in the field of physical educations have been reported in [10-20].

**METHODOLOGY**

**Subjects:** Fifty inactive, overweighted males are volunteered from a college male population and randomly allocated into either exercise (n = 25) or control groups (n = 25). The exercise and control groups were similar with respect to their age group (24.7 ± 4.8 and 25.1 ± 3.9 years) and body mass index (28.1 ± 3.0 and 28.7 ± 2.2 kg/m²). This research study of HIIT and its effects on anthropometric characteristic of healthy young auditing, also received approval from a University Research Ethics Committee.
**Procedure:** All participants were advised for pre and post body composition analysis fat tests for control and exercise groups. Which were completed at the same time of the day.

**Diet:** Subjects in both exercise and control groups were advised to maintain their normal eating habits during the study.

**Body Composition:** A body fat test machine Bio Impedence Analyzer, (InBody 570 body composition analyzer) has been used to record both groups pre and post-testing for control and exercise group, it can be measured total body water, total body weight, body fat, waist to hip ratio and body mass index.

**High Intensity Intermittent Exercise Training:** The twenty five subjects of exercise group completed HIIT exercise under skilled supervision, HIIT training plan included 10 sprints, 10 recoveries, (45 seconds each sprint with 75 seconds rest intervals) continuously throughout intervention period of 12 weeks, each session consisted 20 minutes training. The HIIE workload was set at 80% -90% of each subject’s maximum heart rate (MHR) peak at between 150-170 bpm. Subjects performed 5 min of warm-up at beginning and cool down at the end of exercise, in each exercise session. Whereas rating of perceived exertion RPE was assessed at each 5 min intervals.

**Statistical Analysis:** Data were analyzed with a statistical package for social science for Windows software (SPSS 23.0). Paired sample t-test was used for the analysis of anthropometric characteristics and total girth measurements of the body.

**RESULTS**
There was no significant difference between the two groups for body mass index (BMI) (Table 1), and age before the training program.

| Table 1 Changed in body composition, body water, body weight, % body fat, waist to hip circumstance ratio, body mass index |
| --- | --- | --- | --- | --- |
| **Exercise** | **Control** | **Pre Test** | **Post Test** | **Pre Test** | **Post Test** |
| Body Water | Kg | 44.96 ± 4.8 | 42.57 ± 4.9** | 45.02 ± 2.7 | 45.57 ± 1.9 |
| Body Weight | Kg | 83.08 ± 10.05 | 80.75 ± 10.17 | 82.45 ± 9.27 | 83.68 ± 7.98 |
| Percent Body Fat | % | 27.18 ± 5.89 | 25.32 ± 5.78** | 28.41 ± 4.12 | 28.72 ± 3.94 |
| Waist Hip Ratio | ratio | 1.02 ± 0.01 | 1.01 ± 0.01* | 1.04 ± 0.01 | 1.05 ± 0.01 |
| Body Mass Index | Kg/m² | 28.18 ± 3.03 | 26.48 ± 2.71** | 28.78 ± 2.24 | 28.97 ± 1.85 |
The results of high intensity intermittent exercise HIIE and control groups have been shown in Table 1. The effects of high intensity intermittent HIIE on anthropometric characteristics of overweight males, the experimental group was significantly reduced total body water by 2.39 kg with $t(24) = 19.032, p < 0.0004$, total body weight was not significantly but reduced by 2.33 kg with $t(24) = 1.963, p < 0.061$. body fat significantly reduced 1.86% with $t(24) = 11.185, p < 0.0007$, waist to hip circumference ratio was also reduced by 0.01 with $t(24) = 2.278, p < 0.032$ and body mass index was also reduced by 1.7 kg/m² with $t(24) = 12.399, p < 0.0005$. On the other hand, the control group slightly increased in body water, body weight, % body fat, waist to hip, body mass index. Figure 1 represents the body composition comparison of pre and post test in experimental and control groups and Figure 2 represents the comparison anthropometric characteristics of pre test and post test for experimental and control groups.

The analysis of girth measurements of exercise and control groups have been shown in Table 2. The HIIE on girth measurements of overweight males, the experimental group was significantly reduced neck size by 2.72 cm with $t(24) = 20.097, p < 0.0005$, chest was significantly reduced by 5.08 cm with $t(24) = 8.642, p < 0.0021$, bicep significantly reduced 2.74 cm with $t(24) = 13.500, p < 0.0043$, forearm significantly was also reduced by 1.22 cm with $t(24) = 13.668, p < 0.009$, waist significantly reduced by 4.93 cm with $t(24) = 10.095, p < 0.006$, thigh was also reduced by 1.68 cm but not significant with $t(24) = 1.397, p < 1.75$, hips significantly reduced by 4.42 cm with $t(24) = 6.783, p < 0.003$, calf significantly reduced by 2.49 cm with $t(24) = 27.765, p < 0.001$ and waist to hip circumference ratio was also reduced by 0.01 with $t(24) = 2.278, p < 0.032$. On the other hand, the control group slightly increased in neck, chest, bicep, forearm, waist, thigh, hips, calf, waist to hip ratio. Figure 3 represents the girth measurement of pre and post-test in experimental and control groups and Figure 4 represents the comparison of pre and post-test for experimental and control groups of girth measurement.

**Figure 1** Anthropometric characteristics of pre test and post test in experimental and control groups
**Figure 2 Comparison of anthropometric characteristics of pre test and post test for experimental and control groups**

**Table 2 Analysis of Girth Measurements**

<table>
<thead>
<tr>
<th></th>
<th>Exercise</th>
<th>Control</th>
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<tbody>
<tr>
<td></td>
<td>Pre Test</td>
<td>Post Test</td>
</tr>
<tr>
<td>Neck cm</td>
<td>40.81 ± 1.75</td>
<td>37.43 ± 12.45**</td>
</tr>
</tbody>
</table>
DISCUSSION
The major findings of this study were that high intensity intermittent exercise (HIIE) induced group significantly increased in anthropometric characteristics, total body water, reduced total body weight, body fat, waist to hip ratio, girth measurements include reduce neck, chest, biceps, waist, hip, thighs, calf, waist to hip ratio. Thus, collectively these data show that high intensity intermittent exercise (HIIE) is an attractive feature of this mode of exercise as aerobic fitness is an important predictor of positive outcomes. Ours diverge from earlier findings possibly because the difference between the lean body mass (LBW) or the body surface area (BSA) and the total body water (TBW) was relatively small concerning iodine dose per contrast enhancement IDCE reported earlier [21]. They also align with literature from the previous decade [22-24] and recent
systematic reviews [25]. Indeed, the greater elevation of post-exercise energy expenditures (EEE) was deemed as one of the potential contributors to the promising effects of HIIT and sprint interval training (SIT) interventions on fat loss [26]. Both types of intermittent trainings (IT) promoted reductions in body mass, markers of subcutaneous fat (skinfolds) and waist circumference, which is in agreement with the suggestion of Astorino and Schubert (2018) that HIIT and SIT increase whole-body fat oxidation [27]. Physical activity may also reduce body fat, preferentially from the abdominal area. For example, in a small but intensive study where energy balance was held constant, exercise reduced abdominal fat despite unchanged body weight [28].

**Figure 4 Comparison of pre and post-test for experimental and control groups of grith measurements**

In keeping with earlier twin studies, the overall heritability estimates for physical activity in this study were 79 and 78% (males and females) for BMI, 56 and 71% for waist circumference (WC) and 55 and 54% for physical activity. The heritability estimates for BMI have ranged from 45–85% in earlier twin studies [29-30]. Studies of BMI change about past physical activity and found that the genetic influence on BMI change in men was detected at medium and high physical activity levels only. However, genetic influences on weight change appear to be rather distinct from those on BMI [31]. Few studies have assessed the modifying effect of physical activity on the genetic influences on obesity, Heitmann et al [32]. The heritability of exercise participation ranged from 27 to 70% in a large pooled twin sample from seven countries [33]. In a study of 325 female and 299 male Danish twin pairs, the heritability of waist circumference (WC) was 61% for men and 48% for women [34]. Waist circumference (WC) was measured at the level of the smallest circumference above the umbilicus and below the xiphoid appendix [35]. Abdominal obesity is a
more significant risk factor for metabolic diseases than general obesity indicators [36]. Since BMI cannot distinguish between fat and lean mass, waist circumference WC is more reflective of visceral obesity than body mass index (BMI) [37]. Consistent with other research results [38-41]. Due to the changes in the body fat distribution during the menopausal state, the abdominal fat deposition in postmenopausal women becomes more obvious [42].

CONCLUSION
Research examining the effects of 12 week High Intensity Intermittent Exercise (HIIE) intervention on anthropometric characteristics such as total body water, total body weight, body fat, waist to hip circumference ratio, body mass index, anthropometric characteristics also include neck, chest, bicep, forearm, waist, thigh, calf, waist-hip ratio of overweight young adults. Participants were randomly assigned to either exercise or control group. The intervention group received HIIE three times per week, 20 minutes per session, for 12 weeks. The results of high-intensity intermittent exercise and control groups have been shown on anthropometric characteristics of overweight young adults, the experimental group was significantly reduced total body water by 2.39 kg, total body weight was not significantly but reduced by 2.33 kg, body fat was significantly reduced 1.86 %, waist to hip circumference ratio was also reduced by 0.01 and body mass index was also reduced by 1.7 kg/m². On the other hand, the control group slightly increased in body water, body weight, % body fat, waist to hip, body mass index. The high intensity intermentent exercise (HIIE) on girth measurement of overweight young adults, the experimental group was significantly reduced neck size by 2.72 cm, chest was significantly reduced by 5.08 cm, bicep significantly reduced 2.74 cm, forearm significantly reduced by 1.22 cm, waist significantly reduced by 4.93 cm, thigh was also reduced by 1.68 cm but not significant, hips significantly reduced by 4.42 cm, calf significantly reduced by 2.49 cm and waist to hip circumference ratio was also reduced by 0.01. On the other hand, the control group slightly increased in neck, chest, bicep, forearm, waist, thigh, hips, calf, waist to hip ratio.

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