EFFECT OF AEROBIC EXERCISE TRAINING ON BODY COMPOSITION AND HEART RATE RECOVERY IN OVERWEIGHT AND OBESE SEDENTARY INDIAN WOMEN

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ABSTRACT

Heart rate recovery (HRR) is a good predictor of future cardiovascular complications. Aerobic exercise is an effective treatment strategy in obesity management and prevention of cardiovascular complications. It is not known whether aerobic exercise can influence the heart rate recovery in obese females. The objective of our study was to investigate the effect of 8 weeks aerobic exercise program on body composition and heart rate recovery in obese female individuals. 20 obese females in study group and 20 participants in control group were included who completed 8 weeks aerobic exercise program at an intensity of 70-85% of their heart rate maximum. Descriptive statistics and repeated measures ANOVA were used to compare the effect of aerobic exercise on the outcomes between the study and control groups. There was a significant improvement in study group following 8 weeks aerobic exercise on heart rate recovery and body composition.

KEYWORDS: Aerobic Exercise, Obesity, Metabolic Syndrome, Diabetes

INTRODUCTION

Obesity is one of the clusters of non-communicable diseases, seen not only in developed but also in developing countries. It is closely associated with some major health risk factors. It is well known that individuals with obesity are at greater risk for coronary heart disease (CHD) and several metabolic disorders. International Diabetes Federation (IDF) has identified central obesity as the unifying cardio-metabolic risk factor among individuals with the metabolic syndrome. Women in the age group between 25–45 years represent a high risk group for weight gain in adults. Average self-reported weight gain is approximately 0.60 kg per year in this age group.

It is known that weight-loss treatment benefits the health in obese individuals, several weight reduction methods have been proposed. Unfortunately, losing weight through some methods lead to decline in fat-free mass during the intervention period and induce an attenuation of fat oxidation after the intervention period which may contribute to weight regain. Therefore there is a demand to design a strong and scientifically proven exercise regimen that has a significant effect on weight reduction without any side effects. Exercise training provides an economically viable, non-pharmacological approach for eliciting beneficial adaptations in body composition and cardio-metabolic risk. In support of this contention, endurance training has been shown to be a powerful strategy for inducing abdominal fat loss, particularly with respect to abdominal visceral Fat loss.

It is well established that endurance training intensity is a primary determinant for exercise induced improvements in cardiorespiratory fitness (ACSM 2006). High intensity exercise training would be more effective than low intensity exercise training for altering body composition in obese women with the metabolic syndrome. High-amount/vigorous intensity endurance training (activity equivalent to ~20 miles·week⁻¹ of...
jogging) was more effective in reducing % body fat and fat mass compared to the two low-amount training groups. heart rate recovery (HRR) has been considered as a strong indicator of future cardiac complications. Heart rate at 1 or 2 min of recovery has been validated as a prognostic measurement and should be recorded as part of all treadmill tests. Reduction in the adrenergic response and increase in the vagal tone has been recently proposed as the main mechanism underlying improvement by exercise training. Exercise training induces chronotropic response and early heart rate recovery. Continuous rather interval exercise training has shown to improve chronotropic response and Heart rate recovery at 1 minute. The higher prevalence of obesity among young Indian female mainly attributed to lack of physical activity emphasize the need of an effective exercise regimen as the main stay of treatment and prevention of obesity related complications. There is dearth of literature pertaining to the effect of aerobic exercise on body composition and heart rate recovery in obese Indian subjects. The objective of our study was to determine the effects of aerobic exercise training regimen on body composition and heart rate recovery over a period of 8 weeks.

METHODOLOGY

Forty six females were included in this study, forty two responded giving a response rate of 91%. Two participants who were found to have history of inflammatory disorders or recent trauma were excluded from the study. The mean age of participants in the study group (n=20) was 31.4 years (SD: 5.57) in the and in the control group (n=20) was 26.2 years (SD: 5.69). After obtaining ethical clearance, a number of female overweight or obese sedentary subjects were approached and identified through verbal advertisement. The study was conducted in fitness laboratory attached to a tertiary hospital in Udupi, Karnataka. Participants with any Cardiovascular, musculoskeletal, neurological, metabolic, respiratory disorders and those on drugs that affect metabolism were excluded. Each participant was contacted either by phone call or by person. Informed consent and demographic data was obtained after a screening process for inclusion and exclusion criterion following which they were allocated into either control or study group via purposive sampling method. Baseline values for all the participants were recorded. Body weight was taken on a standard weighing machine calibrated at 0.1kg and height was measured using a wall mounted tape. Skin fold caliper and bio electrical impedance analyser were used to measure body fat percentage. Participants in the control group were told to have a healthy maintenance diet along with the same amount of physical activity they do on a day to day basis whereas participants in the study group were told to have healthy maintenance diet along with aerobic exercise (treadmill) training for 8 weeks. Polar heart rate monitor was used to monitor the heart rate response during exercise. Training was monitored using a log book and through phone. Treadmill exercise was given with an intensity of 70% to 85% of HR max for 20-45 minutes continuous exercise at 5 days per week. After 8 weeks of study duration values were recorded in both the groups. All these parameters were monitored and recorded by Physiotherapist. Adherence to the exercise program was monitored. Three readings were taken for all parameters in the study and best out of the three was selected for data analysis. Healthy maintenance diet was advised for both the groups however diet was neither restricted nor monitored. Descriptive analysis was done to compute means and standard deviation for all variables. The data was analysed by SPSS version 16 using general linear model (Repeated measures ANOVA) and compare means statistics. The test of significance was set as p ≤ 0.05.
Results

Table 1: Comparison of Results between the Groups using Repeated Measures ANOVA

<table>
<thead>
<tr>
<th>Variable</th>
<th>Study Group</th>
<th>Control Group</th>
<th>P Values</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre</td>
<td>Post</td>
<td>Pre</td>
</tr>
<tr>
<td>BMI</td>
<td>29.34±2.74</td>
<td>28.19±2.67</td>
<td>29.99±3.81</td>
</tr>
<tr>
<td>WC</td>
<td>91.43±6.29</td>
<td>87.26±5.08</td>
<td>92.84±4.92</td>
</tr>
<tr>
<td>WHR</td>
<td>0.86±0.035</td>
<td>0.83±0.04</td>
<td>0.87±0.03</td>
</tr>
<tr>
<td>Body Fat%</td>
<td>39.15±2.16</td>
<td>38.58±2.07</td>
<td>36.87±6.00</td>
</tr>
<tr>
<td>Body density</td>
<td>1.00±0.02</td>
<td>1.00±0.02</td>
<td>1.03±0.10</td>
</tr>
</tbody>
</table>

Table 2: Comparison of Heart Rate Recovery using Repeated Measures ANOVA

<table>
<thead>
<tr>
<th>Variable</th>
<th>Study Group</th>
<th>Control Group</th>
<th>P Values</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre</td>
<td>Post</td>
<td>Pre</td>
</tr>
<tr>
<td>HHR 0min</td>
<td>188.3±4.8</td>
<td>189.05±4.72</td>
<td>191.15±4.93</td>
</tr>
<tr>
<td>HRR 1min</td>
<td>176.15±6.57</td>
<td>168.75±7.47</td>
<td>177.7±6.65</td>
</tr>
<tr>
<td>HRR 3min</td>
<td>161.3±11.37</td>
<td>142.9±11.37</td>
<td>158.20±9.11</td>
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<tr>
<td>HRR 5min</td>
<td>142.1±10.88</td>
<td>118±9.37</td>
<td>129.45±9.1</td>
</tr>
</tbody>
</table>

Figure 1: Comparison of pre and Post Heart Rate Recovery in Control Group(Left) and Interventional Group(Right)

Discussions

We found significant improvement between the groups in BMI, waist circumference and waist hip ratio after 8 weeks of high intensity aerobic exercise training, where as there was no significant statistical change between the groups in the body fat percentage and body density (table 1). The changes could be seen as a result of benefits of high intensity aerobic training. Similarly statistically significant changes were seen in heart rate recovery at 1, 3 and 5 minutes between the
groups after 8 weeks of high intensity aerobic exercise training in overweight and obese sedentary Indian women (table 2). From previous studies it has been conferred that heart rate recovery is a strong indicator of future cardiac complications \(^{(11)}\) and heart rate at 1 or 2 min of recovery has been validated as a prognostic measurement and should be recorded as part of all treadmill tests \(^{(12)}\). Hence, our study results show that high intensity aerobic exercise training (treadmill training) for 8 weeks in overweight and obese sedentary Indian women has statistically improved heart rate recovery (p=0.01) and in turn effective to reduce cardiovascular risks and mortality.

Recent advances suggest that waist circumference alone is a better and more practical measure for body composition \(^{(7)}\). Post exercise intervention statistically significant reduction in BMI, waist circumference and waist hip ratio was noted in our study (p<0.05). This shows that aerobic (treadmill) exercise training for 8 weeks reduces fat mass in the body in turn reducing the risks associated with obesity. Future research can focus on large sample size based study and there is a need for more randomized controlled trials using heart rate recovery as a measure for predictor of future cardiovascular risk.

CONCLUSIONS

Our study has revealed that eight weeks of aerobic exercise training is effective in reducing the body mass index, waist circumference, waist hip ratio. Improvement in Heart rate recovery could also be seen with the given exercise regimen. Thereby, reducing the risks associated with obesity and physical inactivity.

REFERENCES


