The effect of eight week aerobic exercise on airway trachea indexes (FEV1, FVC, FEV1.FVC & FEF25-75) and vo2max level in overweighed male students of Ahvaz Payam Noor University

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Abstract

The aim of this study was to investigate the effects of eight week aerobic exercises on some of airway trachea indexes (FEV1, FVC, FEV1.FVC & FEF25-75) and vo2max level in overweighed Male Students of Ahwaz Payam Noor University. For this reason we use male college students (n=40) and (age 21.06±3 years old, length 171.20±7 CM, weight 82.06±7 Kg, body mass index 26.04± 1 Kg.M2) as research sample who did not do any sport. Then was measured the Vo2max level by sub maximal incremental Bruce test on treadmill. Also the airway trachea indexes (FEV1, FVC, FEV1.FVC & FEF25-75) were measured by digital spirometer. All of subjects followed the aerobic exercise protocol for 8-week and 3 sessions in a week as 70 to 85 percent of HRR. Data analyzed by independent test(t-test) method at p value(p=0.05) revealed that 8-week aerobic exercises with 70 to 85 percent of HRR related to significant enhancement in airway trachea indexes(FEV1,FVC,FEV1.FVC & FEF25-75) and vo2max level.

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Keywords: Aerobic Exercise, Airway Trachea Indexes, Vo2max, Overweighed, HRR;

1. Introduction

Obesity has been considered as one of the most worrisome health problems in western countries. More dramatic is that this epidemic has reached young individuals. The rate of obesity in children and adolescents has doubled in the past 3 decades in the United States (Maurício, 2005; Ogden, 2002). Obesity (Body mass index or BMI ≥ 30 kg.m2) is the most common metabolic disease in the world and its prevalence has risen worldwide, particularly in the United States (Troiano, 1995). These statistics have directed our attention to a new challenge on human obesity. In recent years, our understanding about the implications of adulthood obesity has improved considerably. We have learned that cardiovascular functioning and regulatory mechanisms are altered substantially in human obesity (Akshay , 2009; Negrão, 2001).Hypo caloric diet and regular exercise has been recommended as a no pharmacological treatment to obese adult individuals. This regimen reduces body weight, preserves lean body mass,
and improves insulin sensitivity (Kuniyoshi, 2003) Obesity may be associated with a reduction in vital capacity (VC) and forced expiratory volume in one second (FEV1), depending upon the age, type of body fat distribution (with central fat distribution having a relatively greater effect) (Trombetta, 2003), and severity of obesity. Previous studies have created the impression that only morbid obesity is associated with this restriction of VC (Lazarus, 1997; Douglas, 1972) but a recent large French population-based study by Leone et al. demonstrated that even mild abdominal obesity, even with a normal BMI, is associated with lower VC and FEV1 in both men and women (Sugerman, 1987). Obesity affects various resting respiratory physiologic parameters such as compliance, neuromuscular strength, and work of breathing, lung volumes, spirometric measures, respiratory resistance, diffusing capacity and gas exchange (Troiano, 1995). FEV1/VC ratio is usually normal or increased with obesity - the latter is thought to occur because of peripheral airway obstruction and then gas trapping reduces the VC disproportionately (Lazarus, 1997). The implication is that while obesity may affect small airway function, it may not affect large airways (Leone, 2009). Although the drug treatments are useful to treatment of the pulmonary diseases, but sports activities can be a major share in the treatment.

The major effects of exercises (aerobic and non-aerobic) are the enhancing of breathing efficiency and to decrease pulmonary resistance. Increase in physical exercise, on the other hand, could help increase in pulmonary function and decrease in fat percentage (Kippelen, 2005). The health improvement and cardiovascular system means that the organism can consume much of oxygen along every severe activity and it can flow a lot of blood in every heart rate (Pelegrino, 2009). In among of sports activities can be to aerobic pointed out. Aerobic exercises being say to long sport activities that to do, it needs to oxygen (Brosnahan, 2004). This kind of exercise activates the systems that they provide oxygen for body cells and by it the oxygen prepared to active muscles through blood flow. For establishing this kind of cellular aerobic metabolism, the intensity of training should be in at least and long term. Follow the aerobic exercise is created the good and useful changes in lungs, heart and blood vessels. In other words with doing aerobic exercises, the body transferred more O2, CO2 inside and outside of the lungs respectively and to better done transfer of oxygen to fibers finally (Paluska, 2000). So in this study we hypothesized that eight weeks aerobic exercises affect on (FEV1, FVC, and FEV1.FVC & FEF25-75) pulmonary indices in overweight Male Students of Ahvaz Payam Noor University.

2. Method

This study method is of semi-experimental type. The study design is pretest and post-test type with control group. All participants in this research were students of Payam Noor University in Ahvaz city in the year 2010.

2.1. Participants

Forty male students (age 21.06±3 years old, length 171.20±7 CM, weight 82.06±7 Kg, body mass index 26.04±1 Kg.M2) who had had no regular exercise for at least 2 months were selected to this study.

2.1.1. Measurements

BMI index was used to determine type I obese students (or overweighted students) and then selected them as statistical sample. Such as students weighted using SECA medical balance (made in Germany of 0.1 gr precision) followed by it was divided in to height square Hence, 40 people of those having 25 to 29.9 BMI referred to type I obese people were selected as statistical sample and then (FEV1, FVC, FEV1.FVC & FEF25-75) indices were measured using Pyrometer as pre-test. The subjects were selected as random sampling, then divided into two groups (experimental group; n=20 and control group; n=20). Before beginning exercise the subject's VO2max level measured by Bruce test on treadmill. All subjects having been familiarized with the exercise procedure, all subjects (Control and Experimental groups) were asked to do a performance pre-test (spirometer) and then the experimental group followed the aerobic exercise program for 8 weeks-3 sessions in a week and each session lasted 40 minutes, while control group did receive no exercise. After two weeks and having establishing relative adaptation of the subjects to physical activity, the exercise intensity increased. All of pulmonary indexes (FEV1, FVC, FEV1.FVC &
FEF25-75) and vo2max level were measured at the end of 8th week. The results were analyzed using methods of independent t-test method. Significance was taken as p<0.05 for all tests.

2.1.1. Training protocol
The protocol of an aerobic practice session was as follow:
1- Warm up (5 minutes).
2- Original activity.
A: The subjects run 35 minutes with 70% maximal heart rate.
B: Rest (5 minutes) with walking and jogging.
D: Active rest (3 minutes).
3- Cool down (5 minutes).

3. Tables
The results show that there is no significant difference between experimental and control groups at the beginning of research. But considering the study result using independent t-test followed by eight weeks exercise show that a significant difference (p-value≤0.05) was observed in (FEV1, FVC, FEV1.FVC & FEF25-75) pulmonary indices. The Characteristics average of subjects such as age, height, weight and body mass index (BMI) are in table 1.

Table 1: Characteristics of subjects (experimental and control groups)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Experimental group</th>
<th>Control group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>171.20±5.7</td>
<td>172.1±4.2</td>
</tr>
<tr>
<td>Weight</td>
<td>82.06±7</td>
<td>81.5±7</td>
</tr>
<tr>
<td>Age</td>
<td>21.06±3.1</td>
<td>21.2±3</td>
</tr>
<tr>
<td>BMI(kg.m2)</td>
<td>26.04±1</td>
<td>26.5±1</td>
</tr>
<tr>
<td>V02 max(ml.kg.min)</td>
<td>27.7±2.32</td>
<td>27.3±2.12</td>
</tr>
</tbody>
</table>

Findings research about independent variables is shown in table 2.

Table 2: the pulmonary indexes values of experimental group in pre and post test

<table>
<thead>
<tr>
<th>Pulmonary indexes</th>
<th>Pre-test</th>
<th>Pre SD</th>
<th>Post test</th>
<th>Post SD</th>
<th>T</th>
<th>df</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>FEV1</td>
<td>83.19</td>
<td>5.17</td>
<td>88.32</td>
<td>7.23</td>
<td>6.54</td>
<td>19</td>
<td>P = 0.001</td>
</tr>
<tr>
<td>FVC</td>
<td>77.53</td>
<td>4.61</td>
<td>82.20</td>
<td>6.24</td>
<td>6.12</td>
<td>19</td>
<td>P = 0.005</td>
</tr>
<tr>
<td>FEV1.FVC</td>
<td>76.48</td>
<td>3.63</td>
<td>79.05</td>
<td>5.23</td>
<td>5.33</td>
<td>19</td>
<td>P = 0.005</td>
</tr>
<tr>
<td>FEF25-75</td>
<td>74.35</td>
<td>4.75</td>
<td>77.61</td>
<td>5.12</td>
<td>6.35</td>
<td>19</td>
<td>P = 0.001</td>
</tr>
</tbody>
</table>

4. Figures
Information related to post-test scores also showed that the experimental group in post test had higher (FEV1, FVC, FEV1.FVC & FEF25-75) scores than pre test, that this result indicating positive effects of aerobic exercise on these study variables (See Figure 1).
5. Discussion and conclusion

FVC index is one of the methods to represent airways, expiratory resistance and lung capacity, also FVC index value depends on the lungs elastic and airways resistance (Guyton, 2005). The results of this study show that there are significant differences in FVC index test in practice group in post-test. It seems to increase in FVC after eight weeks of aerobic exercise due to increased volume of the lungs and also the lungs elastic return. On the other hand FVC affected by the rib muscles. Therefore, improvement in respiratory muscle strength and endurance will increase the FVC in turn. Khalili (2009), in his research concluded aerobic exercise training in children with mental disabilities leads to improve the lung function parameters (FVC and FEV1). Richard L. Jones (2006), examined the effects of BMI on the lung volume and concluded that aerobic exercise can reduce the resistance of airways to increase indices VC, TLC, FVC, and FEV1. Indices FEV1 indicates the respiratory performance that will reduced by obstructive pulmonary disease or asthma considerably. Akshay (2009), researched and demonstrated that even mild abdominal obesity, even with a normal BMI, is associated with lower VC and FEV1 in both men and women.

FEV1.FVC Indicators is variable and depends on the expiratory muscles and expiratory muscles and when expiratory muscles are weak, the person's ability decreases to drop quickly exhaled and FEV1.FVC index decrease. The possible increase in FEV1.FVC value after exercise test can be attributed to further increase in the volume ratio of FEV1 to FVC in this group. The results show that there are significantly different among the FEV1.FVC indicators after exercise in experimental group in post test. We concluded that aerobic exercises can strengthen the expiration muscles and increases the FEV1.FVC index. Watson (1996), investigate the fitness and physical characteristics in the success of GAELIC footballers and he find that all of indexes (FVC, FEV1 and FEV1.FVC) has increased in the players following the aerobic training courses. FEF25-75 index is a linear slope that is drawn between the points on curves 25 and 75 percent of the FVC. Increases in FEV1.FVC and FEF25-75 indices are affected by exercise volume period (duration) more. William (2003) in his plan about changes in pulmonary function following exercise was use from of different duration and intensity of exercises and he concluded that among of the above-mentioned indicators, the duration has meaningful effect and intensity cannot change FVC significantly. since the bronchial tree, greatly influenced by nor-epinephrine and epinephrine in the circulation that are released into the blood by stimulating the central part of SSR adrenal glands so increasing the intensity and volume of exercise (aerobic and anaerobic) increases the secretion of these hormones in to the blood. Both hormones, epinephrine especially due to the stronger stimulatory effect on beta receptors are causes dilation of bronchial tree. Other contributing factors are type of exercise, intensity, duration and how is exercise. The severity and duration of exercise is more, bronchospasm caused by exercise would be worse (Brosnahan, 2004). That means

![Figure 1. FEV1, FVC, FEV1.FVC and FEF25-75 indexes in pre test and post test](image-url)
the lung volume measurements after aerobic exercise training immediately shows the inverse results of exercise that caused by inflammation lung or drying airways. Therefore, to measure effects of aerobic exercise should be attempted hours or days later. In conclusion, aerobic exercise had significant effect on lung function and trachea indexes in male over weighted student. However further research is required to determine whether trachea indexes could be increased by combining training and diet regimen.

Acknowledgements

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