

# A case report on effects of combined aerobic training and resistance training in obesity

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## Abstract

**Objective:** To know the effect of combined aerobic training and resistance training in obesity. **Method:** The subject was a 40 years old female, weighing 83 kg and BMI of 31.62 kg/m<sup>2</sup>. The pre-training VO<sub>2</sub>max was 25.09 ml/kg/min. The subject was trained with combined aerobic training for 15 min/day and resistance training for 15 min/day. This session was given for 6 days/week and it was given for 12 weeks. **Outcome measure:** BMI and VO<sub>2</sub>max were taken. **Result:** There was significant decrease in BMI and increase in VO<sub>2</sub>max values. **Conclusion:** This study reveals that combined aerobic training and resistance training gives significant reduction in BMI and increase in VO<sub>2</sub>max values. **Key Words:** combined aerobic training, obesity.

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## INTRODUCTION

Obesity has often been related with a sedentary life style since exercise increases energy expenditure and inactivity promotes fat deposition in human and animal models. The benefits of exercise for the obese subjects are almost universally accepted, and a number of plans for the management of obesity include exercise as a main component. However, the obese subjects are often reluctant to perform exercise. The reasons given for not doing minimal exercise vary, but references to an early – even immediate – onset of fatigue are common: the obese subject tires sooner (or faster) than the lean. In addition, it is very difficult for the obese to train for sport, except for powerful – and extremely short – bursts of activity, after which they become fatigued.<sup>1</sup> Physical activity is a major modifiable determinant of chronic disease. The Australian National Physical Activity Guidelines for Adults

recommend that for good health, adults should “put together at least 30 min of moderate-intensity physical activity on most, preferably all, days”. However, it is not known if this recommendation is adequate for improvement in cardiovascular disease (CVD) risk factors in overweight and obese individuals. Despite the acknowledged role of 30 minutes of daily physical activity on general health improvements in an otherwise healthy but sedentary population, less is known of the adequacy of this level of exercise for health improvements in those who are overweight or obese.<sup>2</sup> The lack of physical activity in daily life induces obesity and increases the risk of hypokinetic diseases; diabetes mellitus, hypertension, heart diseases, etc. The major cause for the risk of hypokinetic diseases is obesity. Since various types of diseases are induced by obesity rather than the serious aspect of obesity alone, they become an issue as well.<sup>3</sup> Aerobic training is characterized by the execution of cyclic exercises that carried out with large muscle groups contracting at mild to moderate intensities for a long period of time. On the other hand resistance exercise training is characterized by the execution of exercises in which muscles from a specific body segment are contracted against a force that opposes the movement.<sup>4</sup> For the last 30 years obesity has been primarily diagnosed by using the body mass index (BMI). This measurement was first described by Adolphus Quetelet in the mid 19<sup>th</sup> century based on the observation that body weight was proportional to the square of the

height in adults with normal body frames.<sup>5</sup> The measure of maximal oxygen uptake ( $VO_{2max}$ ) is used for many purposes including diagnostic tests, quantifying training intensity for aerobic exercise prescription, monitoring the effects of aerobic training programs, and classifying the individual for health risk.<sup>6</sup>

### CASE DESCRIPTION

Subject was a 40 years old female with mild obesity. Subject was asked to perform a combined training of aerobic exercises as well as resistance exercises. Height and weight were assessed. Body mass index (BMI) was calculated as weight (kg)/height (m<sup>2</sup>). Resting heart rate (RHR) was estimated and target heart rate (THR) was calculated by Karvonen's formula. Physical activity and  $VO_{2max}$  of subject were estimated by University of Houston non exercise test. The subject performed 15-min of aerobic and 15-min of resistance exercise 5 days/week. Three assessment visits were conducted. The participant was requested to keep food intake and physical activity the same as before the study. Each of the sessions was composed of 10 minutes warm-up and cool-down respectively. The subject was advised to perform the following exercises in the session

#### Aerobic and Resistance Training

Each of the sessions was composed of 10 minutes warm-up and cool-down respectively. The aerobic training was performed 15 minutes a day, 6 days a week at 50-60% of HR max during 1–12 weeks (side by side, step touch, lunge side, v-step, grapevine, diamond step, single hamstring walking, heel touch, sit-up, push up, fast walking, heel side, knee-up, jumping jack). The resistance training was 15 minutes a day (two sets of 10 repetitions at 10-RM for leg press, leg curl, leg extension, bench press and rear deltoid row, with each set completed in approximately 30-sec with 1-min rest). Starting workload levels for each piece of equipment were tested by participants and if more than 10 repetitions were achieved, the weight was increased and after a short rest participants tried again.

#### Outcomes

BMI and  $VO_{2max}$  were calculated by weight (kg)/height(m<sup>2</sup>) and university of Houston non exercise test respectively before and after the 12 week session.

## RESULT

**Table 1:** Baseline Components Pre and Post Treatment

Components	Pre Treatment	Post Treatment	Difference
Height (cm)	162	162	0
Weight (kg)	83	78	5
Body mass index (kg/m <sup>2</sup> )	31.62	29.77	1.85
Resting heart rate (beats/minute)	80	74	6
Target heart rate (beats/minute)	150	127	13
Physical activity rate	4	6	2
$VO_{2max}$ (ml/kg/min)	25.09	30.32	4.23

Before and after 12 week program of aerobic and resistance training, there was a significant decrease in body mass index (BMI), that came around a difference of 1.85 kg/m<sup>2</sup>. There was a noticeable increase in  $VO_{2max}$  value, that is a difference of 5.23 ml/kg/min. The pre training and post training weight of the participant was 83 kg and 78 kg respectively. (Table no 1)

## DISCUSSION

A single, moderate- intensity 30-min about of aerobic and resistance exercise improves risk factors associated with cardiovascular disease in overweight and obese adults. Thus, we conducted a 12-week chronic study on a 40 year old female to explore the impact of a combined exercise program of aerobic and resistance training at a moderate-intensity for 30 min, five days/ week. Significant decreases in body weight and BMI were seen in the subject. Similarly, significant improvements were demonstrated in  $VO_{2max}$ .<sup>2</sup> BMI appears to be the best index of obesity, as it approximates adiposity and fat distribution in adults. There is an increasing evidence shows that the association between BMI, percentage of body fat and body fat distribution differ across populations.<sup>7</sup> There is also increase in the physical activity of the subject, which has been found to decrease the accumulation of visceral fat. Decreased physical activity may facilitate accumulation of visceral fat, due to which there can be increase in body weight and thereby BMI also.<sup>9</sup> Decreased visceral fat is due to activation of lipolysis through catecholamine stimulation.<sup>3</sup> Peak oxygen consumption ( $VO_{2peak}$ ), a criterion measure of cardio respiratory fitness, is most commonly measured by indirect calorimetry during an incrementally graded exercise test to exhaustion using treadmill or bicycle ergometry protocols.<sup>8</sup> Our study shows increase in  $VO_{2max}$  in the subject.  $VO_{2max}$  is partly due to heredity and partly due to training. The combined aerobic and resistance training shows major improvement in  $VO_{2max}$ .<sup>3</sup> Our study involved moderate intensity exercises of 50-60% of maximum heart rate which results in improved

VO<sub>2max</sub>. It has been studied that moderate intensity exercise results in faster activation of pyruvate dehydrogenase (PDH), which provides greater substrate availability to the mitochondrial tricarboxylic acid cycle and electron transport chain (ETC).<sup>10</sup>

## CONCLUSION

This study reveals that combined aerobic training and resistance training give significant reduction in BMI and increase in VO<sub>2max</sub> values.

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