Effectiveness of Aerobic and Strength Training in Causing Weight Loss and Favourable Body Composition in Females

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Abstract

The present study was conducted on 120 females ranging in age from 20 to 40 years to determine the effectivity of different exercise programmes in causing weight loss and favourable body composition. Based on the results of the study, it is concluded that both the strength training and aerobic exercise programs exhibit great potentials for weight management. Aerobic training has been observed to decrease body weight from both the fat and muscle compartments while strength training conserved the lean body mass and reduced the fat compartment and thus caused favourable body composition in females.

Key Words: Fat Free Mass, Body Composition, Resting Metabolic Rate, Females, Aerobic Training, Strength Training

Introduction

Obesity is a risk factor for several health problems including diabetes mellitus, arthritis, cardiovascular disease (CVD), and kidney dysfunction *(Stone et al., 1991).* Aerobic exercise has been widely prescribed and utilized as a means of weight control and fat loss. There is also evidence indicating that strength exercise is an effective means of influencing body composition. *Gettman and Pollock (1981)* summarized the effects of five weight training and six circuit weight training studies on changes in body composition. The studies showed a mean decrease in body weight of 0.12kg, increase in lean body mass of 1.5kg, and a decrease in fat mass of 1.7kg. The added benefit of strength training to an aerobic exercise program (caloric expenditure) is its effect on developing and maintaining muscle mass and metabolic rate.

Metabolic rate decreases with age and a primary factor influencing this decrease is reduced fat-free mass. *Campbell et al. (1995)* reported that resting metabolic rate and energy intake required to maintain body weight significantly increased in older adults following 12 weeks of strength training. These data are in agreement with *Pratley et al. (1994).* Thus it appears that resistance exercise should be a part of a well-rounded program including aerobic endurance exercise for weight loss and controlling weight with age.

For years the intrinsic worth and values of aerobic exercise have been adorned and celebrated while the benefits of resistance training have been minimized to that of building muscles and improving sports performance. More recently, the traditional perception of resistance training has undergone revitalization due to scientific evidence suggesting powerful health status betterment. In fact, there are a lot of voices that resistance training is the superior and only form of exercise you need. How the pendulum has changed! The good news is that the indications support significant claims for aerobics and resistance training for improvement in health. Therefore, the purpose of this article is to compare the effect of resistance training and aerobic exercise in influencing body weight and composition in females.

Materials and Methods

A total of 120 females ranging in age from 20 to 40 years comprised the subjects of the study. They were grouped into the following four categories of 30 subjects each on random basis.

Group	N	Exercise Programme	Duration	Frequency
I	30	Aerobic	6 Weeks	5 Days/Week
II	30	Control	6 Weeks	No training
III	30	Mixed (Aerobic+Strength	6 Weeks	5 Days/Week
IV	30	Strength	6 Weeks	5 Days/Week

The details of the exercise programmes are given below:

A. *Aerobic Exercise Protocol*

Based on the principles of aerobic exercise prescription, the aerobic exercise protocol was prepared and included the following important components.

Warm Up (10 minutes)
Mode of Exercise (Brisk Walking)
Exercise Period (30 minutes/session, 5 days/week for 6 weeks)
Cool Down (slow walking plus static stretching exercises for 8-10 minutes)

Following is the list of warm up exercises, which closely resembles the actions central to the training programme. Standing Spinal Twist, Low Back Press, Side Bends, Crossed Leg, Seated Straight Leg, Legs Spread, Legs Spread progression, Side Stretch, Double Knee to the Shoulders, Abdominal Stretch, Inverted Hurdler.

B. *Strengthening Exercise Programme*

Following strengthening exercise programme was designed for administration to a group of females in the present study. The exercise programme consisted of the following components as is typical of any strength exercise programme.

Warm up: Same exercises as given under the sub heading of warm up in the aerobic exercise protocol were given for warm up.

Stretching Exercises: Shoulder Stretch-Anterior & Posterior, Back Extensions Lying & Cross Over Stretch Lying, Back Stretch- Upper One Arm Rows, Push Ups Wide, Neck Stretch Chin-Shoulder, Lying Oblique & Vertical Leg Crunches, Quadriceps Stretch Lying and Toe Drag

Strengthening Exercises: Back Extensions Standing, Fly Dumbbells, Shrug Dumbbells, Abdominal Oblique Twists, Step Ups

Cool Down: Exercises given under the subheading of cool down in the aerobic exercise protocol were used after the strengthening/stretching exercises for cool down.

The focus of strength training programme was to develop muscular strength endurance and to achieve this, high repetition, low resistance principle was followed. While administering strengthening exercises to the subjects, a mixture of stretching and strengthening exercises were used in the protocol. Each exercise was repeated 8-12 times and carried in sets of 2-4 with interval of about 40 seconds. Where stretching was involved, the subject in general was instructed to hold the stretch for 10 or more seconds.

C. *Mixed Exercise Protocol*

This exercise protocol comprised of both aerobic as well as strengthening exercises. The details of these protocols have already been given above. The aerobic and the strengthening exercises were used alternately during the six weeks period. By alternating, it is meant that on one-day aerobic exercise programme was given and the following session was devoted to the strength building exercises. Frequency of exercise programme was

kept five days/week. The subjects performed warm up and cool down exercises in the same manner as described for other exercise programmes.

Statistical Analysis

SPSS version 10.0 was used for the statistical analysis of the data collected on females of the present study. Usual statistical derivatives like mean and standard deviation were obtained for the various variables before and after the exercise programmes for the different groups.

To test the impact of different types of exercise programmes, paired 't' test was applied.

Results & Discussion

The impact of aerobic training strongly indicated a significant reduction in the % body fat in this group of females (table 1, fig. 1).

Table 1. Effect of different types of exercise programmes on various body components

Parameter	Exercise Programme	N	Before Training	After Training	Change
Body Weight, kg	Aerobic	30	63.92	61.60	-2.32*
	Control	30	63.05	62.95	-0.10
	Mixed	30	59.90	57.80	-2.10*
	Strength	30	61.98	61.58	-0.40
% Body Fat	Aerobic	30	35.50	34.86	-0.64
	Control	30	36.08	36.01	-0.07
	Mixed	30	35.27	34.64	-0.63*
	Strength	30	35.69	35.16	-0.53*
Body Fat, kg	Aerobic	30	22.69	21.47	-1.22*
	Control	30	22.75	22.67	-0.08
	Mixed	30	21.13	20.02	-1.10*
	Strength	30	22.12	21.65	-0.47
Lean body Mass, kg	Aerobic	30	41.23	40.13	-1.10*
	Control	30	40.30	40.28	-0.02
	Mixed	30	38.77	37.78	-0.99*
	Strength	30	39.86	39.93	0.07

* Significant at 5% level

On an average 0.64% fat reduction was seen in the aerobic group of females after the completion of the program. The aerobic group of females lost 2.32 kg in body weight after undergoing six weeks of aerobic training, out of which 1.2 kg came from the fat stores and the rest 1.1 kg from the lean body mass compartment. Six weeks of strength exercises also successfully reduced the % body fat of the subjects by 0.53%. In absolute terms, strength exercise programmme on an average resulted in a decrease of 0.47 kgs of fat from the bodies of the subjects, which is relatively much lower than a corresponding value of 1.2 kgs detected in the aerobic group of females (Table 1 & Figure1).

Interestingly the subjects who underwent strength training for six weeks demonstrated a small gain of 0.07 kgs in lean body mass after the completion of the program. This can be explained based on the findings of many investigators, who have reported different responses in muscle protein metabolism depending upon the type of exercise. For example muscle protein synthesis has been shown to be stimulated by resistance exercise as long as the intensity of exercise is enough to challenge the muscles *(Chesley et al, 1992; Farrell et al; 1999; Phillips et al, 1999 and Tipton & Wolfe, 2001).* Resistance exercise causes increase in muscle protein breakdown but not as much as protein synthesis *(Biolo, 1995 and Phillips et al, 1999).* The relationship between these two parameters (rate of muscle protein synthesis and muscle protein breakdown) represents the metabolic basis of muscle growth. Keeping in view the physiological principles of strength training, this change seems to be in accordance. Stressing of muscles by weights as is followed in the

present study, leads to hypertrophy of the muscles by adding mass to it.

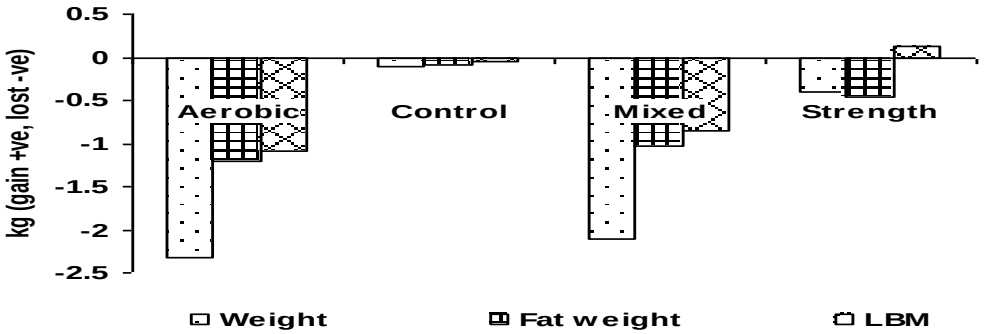

Figure 1. Effect of Exercise Programmes on Weight and its Components

Percent body fat has been found to decrease by 0.63% after six weeks of mixed exercise regimen, which is almost similar to the effect, noticed in the aerobic group of females. In absolute terms mixed training has caused a decrease of 1.1 kgs of fat and 0.99 kgs of lean body mass i.e. a total of 2.1 kg reduction in body weight.

In the control group no significant impact was observed after the completion of the study.

Conclusions

Based on the results of the study, it is concluded that both resistance training and aerobic exercise programs exhibit great potentials for weight management. Aerobic training has been observed to decrease body weight from both the fat and muscle compartments while strength training conserved the lean body mass and reduced the fat compartment and thus caused favourable body composition in females. If health and fitness professionals prescribe to the new expanding model of 'physical activity for the enhancement of health,' it is recommended that program prescriptions need to include aerobic exercise and resistance training in optimum proportions. Instead of debating the pros and cons of aerobic vs. resistance training, perhaps there is a need to focus now on how to best design optimal workout programs for the demands of the next century.

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