



EFFECT OF PHYSICAL EXERCISE TRAINING TO IMPROVE PHYSICAL FITNESS IN OVERWEIGHT MIDDLE-AGED WOMEN

Biological Science

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ABSTRACT

Middle aged females are the main culprits who suffer with obesity, may be, due to hormonal imbalance due to menopausal stage. Obesity is a complication which is actually reason behind other pathophysiological conditions. Hypertension, dyslipidaemia, CHD, type 2 diabetes, and sleep apnea, gynaecological abnormalities in females, osteoarthritis gall bladder stone are some of them. Although physical exercise could be main component for the weight loss therapy but helpful in achieving the improvement in cardiovascular function, muscle strength. Physical exercises of varied intensities with controlled diet can lead to multiple positive impacts on health. Intense physical exercise resulted in increase the carbohydrate and fat oxidation.

KEYWORDS

Physical exercise, oxidation, obesity, muscle strength

INTRODUCTION

“Obesity is a disease” is a fact and it took over more than three decades to ascertain that it requires a medical attention. There are many other complications associated with it namely hypertension, dyslipidaemia, CHD, type 2 diabetes, and sleep apnea, gynaecological abnormalities in females, osteoarthritis gall bladder stone etc (1).

Although, the decision of the American Medical Association (AMA) in June 2013 to declare the obesity as a disease raised many queries. On the other hand, acceptance of the fact lead the approach towards its prevention and treatment. Obesity can be defined as a condition which is a result of personal choices of an individual for his/her own health but could be reversed at any time point of age.

Opting physical exercise has been revealed to recover physical function and body activity. Physical activity is an important component of weight loss therapy and sustained physical activity is most helpful in prevention of weight regain (2,3).

Moreover, it prevents or reduces the risks for coronary vascular disease (CVD) and type 2 diabetes (4). Further, lowers the consequences associated with obesity like rates of mortality and onset of many other diseases (5,6,7). The main disadvantage of the overweight/obesity is its negative impact on physical fitness (8,9).

More energy intake with less physical exercise results in the obesity due to positive energy balance (10,11).

Optimum heart and muscular function, body flexibility along body composition determines the physical fitness. These are important markers to decide health and wellbeing (12, 13, 27)

For most obese persons, physical exercise should be initiated slowly and intensity should be increased gradually.

Physical exercise has been used for the treatment of obesity. It is enormously helpful in achieving the improvement in cardiovascular function, muscle strength in overweight people (14,15, 28) as it causes the decrease in body fat. Self-monitoring is an integral part of the weight loss therapy.

Many studies have already reported that physical exercise increase the fat oxidation rate but the carbohydrate oxidation occurs at priority (16, 17, 29). More the intensity of the physical exercise training, more will be the impact on health parameters.

So, considering the evidences, it is judicious to train obese or overweight individuals at this some specific intensity because the primary goal of treating obesity is to burn fat more effectively.

The purpose of the current study was to investigate the changes in body composition, cardiorespiratory fitness, muscle strength, and flexibility in a group of overweight/obese middle-aged women before and/or

after a 15-week training program.

Overweight/obesity is more prevalent in middle aged females which makes it necessary to promote physical training regime to make them active and reduce their sedentary life style (18,19). For this, it becomes mandatory to measure the present activity/sedentary lifestyle to compare with after undergoing 15-week training regime. Strict physical training with diet restrictions will help us understand in better way about following improved health outcomes:

- The relationship between existing physical activity and after undergoing physical training program,
- The prescribed physical activity and diet restrictions will produce favourable health outcomes.
- Better understanding of elements and causes of physical activity and sedentary behaviour, and further
- The influence of training regime and interventions undertaken to reduce prevalence of obesity specifically in middle aged women.
- The physical activity training regime is deliberated specifically to ensure for middle aged women are necessary to confirm to avoid any discontinuity/irregularity (20).

MATERIAL AND METHODS:

According to the above discussion, a study of a 15 weeks intervention including physical activity and restricted diet schedule was planned to analyse the impact on reducing the fat content and body weight, body fat percentage, waist/hip ratio. Moreover, to see the physical fitness, improved body flexibility and muscular function.

METHODOLOGY:

60 middle aged overweight women of age group of 45 to 59 years, (BMI>25 kg/m² and percentage body fat>30%) were divided into four groups named as (1) Control training (CT) group (2) physical training (PT) group (3) diet group (D) only (4) Combined Therapy group (physical training and diet (PT+D) group).

CT group was asked to maintain their usual lifestyle

PT group asked to follow strict physical training module

D group was asked to follow the restricted diet schedule only

PT+D group was asked to follow both training and restricted diet module

All the four groups were observed for 15 weeks but the CT and D groups were instructed not to follow any mild/intensive exercise schedule of any kind.

Females having severe to chronic pathological conditions of CVD, hypertension, and type 2 diabetes or any other were excluded.

The experimental details of the study were explained to the participants before the baseline test, and a written informed consent to the study was obtained from each of them.

Various parameters including physical measurements, clinical and

anthropometric were measured in the beginning and after the completion of the physical training schedule:

- A. Demographic data
- B. Physical parameters

- 1. BMI
- 2. Height
- 3. Weight
- 4. Waist and hip circumferences
- B. Clinical parameters

- 1. Medical history of hypertension, CVD and Diabetes
- 2. Serum lipid levels
- 3. Blood glucose levels

Height and weight were measured with light clothing and without shoes. Waist and hip circumferences were measured with a tape measure at the midpoint between the lowest rib margin and the iliac crest and at the level of the major trochanter, respectively. Blood pressure was measured while the subjects were sitting after they had rested for 5 min.

All the participants were asked to go for testing the total lipid profile and fasting blood glucose levels and the values were noted at the beginning as all the participants were already undergoing for one.as at the completion of the physical training module.

BMI was calculated according to the CDC Definition for BMI: BMI = Weight (kg)/ Height (M) x height

Physical Training (PT) Groups:

The PT group undertook 15 weeks of exercise training according to the following schedule:

- a. 1:30 hour per day and 6 days/week.
- b. 20-minute warm-up period (walking and jogging and skeletal muscle stretches)
- c. 45 minutes of walking or running.
- d. Short breaks of 1 to 2 minutes and allowed to drink water when it

- was necessary
- e. 15 minute slow walking and stretching.

Each training session was closely monitored by the trainers.

Diet Monitoring: Planned balanced diet for the whole training period and monitored/recorded regularly. The amount and percent of the food were assessed for daily intake of calories and calculated by multiplying according to the standard values (carbohydrate provides 4 kcal/g of energy, fat 9 kcal/g, and protein 4 kcal/g).

Statistical analyses:

All the descriptive values were presented as mean ± standard deviation. A p value of < 0.05 was tested as statistically significant. Data was analysed by using the SPSS version 16 for Windows (SPSS Inc., Chicago, IL, USA).

RESULTS AND DISCUSSION

The total data was recorded and analysed statistically after the completion of the 15 weeks training schedule prescribed for all the four groups without any physical injury recorded during training.

There was significant difference in the nutritional variables between all the four groups due to daily energy and macronutrient intake. 15 weeks of training significantly decreased body mass, BMI, fat %, fat mass, abdominal fat, and BP for the participants of the PT group in comparison to the CT group but the results are observed to highly significant in case of PT+D group even in comparison to the PT and D groups only. There was no change in these variables within the CT group.

Following the 15 weeks of supervised exercise training, the PT group achieved significant improvements in body composition, cardiovascular function, skeletal muscle strength, and body flexibility; whereas there were no changes in these variables of the CT group participants in comparison within the group only. The females in the PT+D group are found to be more active with improved muscular strength to larger extent as compared to PT and D groups even.

Table 1: Anthropometric characteristics of the study participants.

Variables	CT group (n=15)		PT group (n=15)		D group (n=15)		PT+D group (n=15)	
	Initial	Final	Initial	Final	Initial	Final	Initial	Final
Age (yrs)	52.7±5.4		53.5±6.2		54.5±3.2		51.3±4.4	
Body mass (kg)	69.8±3.2	68.8±4.2	73.2±4.5	66.9±4.2*	71.0±5.6	68.5±6.4*	71.5±6.4	63.5±6.3**
BMI (kg/m ²)	28.2±2.9	28.3±3.1	29.5±3.2	27.1±3.8*	30.2±3.4	28.8±4.1*	29.4±4.6	24.6±4.3**
Abdominal fat (kg)	2.4±0.3	2.4±0.4	2.7±1.2	2.1±1.1*	3.2±.21	2.5±.32*	3.1±.21	2.5±.23*
Systolic BP (mmHg)	133±4	132±5	130±5	112±6*	84.0±6.5	80.3±7.2*	134±12	120±5**
Diastolic BP (mmHg)	84±6	83±4	85±7	82±4*	83±3	80±4*	87±6	80±3**
WC (cm)	96.5± 6.7	97.34±7.5	99.22±7.5	96.45±6.4*	92.34±7.3	85.67±7.1*	98.75± 6.9	80.22±8.2**

Data are presented as mean ± standard deviation. *p < 0.05. **p < 0.01.

BMI: Body Mass Index; WC: Waist circumference; BP: Blood Pressure

Table 2: Comparison of the biochemical parameters

Clinical Parameters	CT group (n=15)	PT group (n=15)	D group (n=15)	PT+D group (n=15)
Glucose [mg/dl]	115.58±34.5	98.60±10.2**	110.35±34.5	90.45±9.4**
Total Cholesterol (TC) [mg/dl]	196.17±48.5	150.48±35.2**	163.25±34.3	160.37±24.2**
Triglycerides (TG) [mg/dl]	158.33±78.4	150.56±34.3*	155.21±73.8	135.5±25.3**
HDL-Cholesterol [mg/dl]	43.18±5.3	43.34±5.6	44.10±4.4	45.13±3.7**
LDL-Cholesterol [mg/dl]	134.33±22.34	79.94±45.5**	120.24±34.4	105.23±24.4**
VLDL-Cholesterol [mg/dl]	36.14±7.2	29.93±14.7**	32.13±11.3	25.3±5.4**
Total lipids [mg/dl]	553.4±79.5	456.4±144.6*	514.5±112.2	425.4±54.2**
TC:HDL Ratio	4.54±2.2	3.47±1.4	3.70±1.4	3.56±2.1*
LDL:HDL Ratio	3.11±.12	1.85±1.2	2.73±1.2	2.33±.22*
Creatinine	1.10±0.11	0.89±.21**	1.02±.10	0.65±.11**
Body fat (%)	32.60±8.12	29.24±5.32	31.12±5.02	25.24±5.4**

Data are presented as mean ± standard deviation. *p < 0.05. **p < 0.01.

Body muscular strength of the PT group improved significantly but in PT+D group achieved to highly significant levels, as observed by the strong hand grip was observed on completion of the training module in the PT+D group as compared with the only PT and D groups. Hand grip is not changed to much extent within the CT group. Abdominal fat mass found to be decreased significantly as BMI also observed to be lowered (p < 0.01) before training (p < 0.05) and after training. The significant correlation is found between the change of abdominal fat mass and body muscle strengths and flexibility following the physical training module along with the diet restrictions.

Table 3 Trunk muscle strength and body flexibility variables of the participants.

Variables	CT group (n=15)		PT group (n=15)		D group (n=15)		PT+D group (n=15)	
	Initial	Final	Initial	Final	Initial	Final	Initial	Final
Trunk flexion (Kg)	25.7±6.2	24.6±5.4	26.7±7.2	39.7±7.8*	26.5±4.4	27.5±4.6	26.5±4.4	45.3±6.8**
Trunk extension (kg)	20.2±3.4	19.8±3.6	22.2±4.5	32.2±7.5*	22.5±3.4	23.4±5.4	22.5±3.4	42.7±5.5**
Trunk right lateral rotation (kg)	24.3±2.4	25.2±5.2	25.2±3.5	41.6±5.3*	25.4±5.4	27.4±4.3	25.4±5.4	47.6±6.3**
Trunk left lateral rotation (kg)	26.7±6.3	27.1±4.6	27.9±4.7	43.3±4.5*	27.9±4.7	28.7±5.2	27.9±4.7	48.2±5.7**
Right hand grip capacity (kg)	30.3±4.5	29.8±3.5	28.1±5.7	38.2±3.8*	31.7±4.3	33.7±4.7	31.7±4.3	49.1±4.2**
Left hand grip capacity (kg)	27.5±4.6	28.2±3.7	27.3±5.1	36.3±3.3*	28.5±3.9	30.5±5.3	28.5±3.9	46.4±6.3**

Data are presented as mean ± standard deviation. *p < 0.05 **p < 0.01 Following 15 weeks of physical training module, the body fat composition, BMI, Body fat percentage, waist-hip ratio found decreased in PT group in comparison to the CT group. On the other hand, hypertension, cardiac function, muscular strength and hand grip are observed to be improved to much significant extent in PT+D group as compared with the PT and CT groups.

The overall body flexibility and the activity level of the participants of the PT group is improved to the significant level but PT+D group to highly significant levels as compared to the CT group.

Not much changes are observed within the CT group itself and the parameters observed were remained constant.

Most important observation in this study was decrease in body fat percentage which ultimately brought down the abdominal fat. Due to which there is decrease in BMI and waist-hip ratio which helped in lowering the body weight (10, 11, 21).

Lowering the body fat percentage or fat mass along with body weight brought positive changes in the physical activity levels of participating individuals as evidenced by the increased hand grip and muscular strength. (15, 16, 22)

Decrease in the fat mass will definitely be helpful in lowering the risk of CVD, hypertension, type 2 diabetes and metabolic syndrome too. (20, 22, 23) The same result has been found in young overweight women following 8 weeks of training Hypertension is a major risk factor of cardiovascular disease, renal disease, and mortality (24)

Results suggest that the improved muscle strengths might be obtained because of walking and jogging during the training, but not from the abdominal fat loss. The hand grip strength was measured as a general marker of muscle strength of the body. It may be explained due to the major exercise mode of the present study being walking or running, although not much upper limb exercise was done. Body flexibility was also improved in the PT group but in PT+D group to the highly significant levels. Consequently, physical training with diet restrictions can improve core muscle strength and flexibility, which are important components of health-related physical fitness (14, 21, 22, 25, 26). Following only dietary restrictions or only physical activity don't show any positive outcomes but physical activity along with the dietary restriction/ planned diet schedule can do wonders in improving the hearth and muscular strength.

Physical exercise schedule can be made more intense gradually starting from mild walking and jogging to more intense exercises including all the necessary dietary supplements into routine food. This module can help in building the stamina and improving the muscular strength (25, 26, 27).

The current study has some limitations as the physical training module has not set intensity and time duration of the physical exercise training module. Moreover, every participating individual has her own limitations of activity levels, even though this study has shown positive outcomes but these outcomes are not comparable to the physical fitness regimes set with more intense exercises (28).

This study has established that the 15-week physical training with diet restrictions provided constructive and convincing outcomes in improving the body composition, CVD function, overall muscular strength and flexibility in middle-aged women.

Outcomes of this study finally suggests that the physical activity even of average intensity with modified/improved dietary patterns can have the large positive impact on health outcomes (28, 29).

CONCLUSIONS:

The 15-week physical training module with restricted diet plan works to bring about the positive changes in improving the physical fitness in obese middle aged women.

Conflicts of interest:

All authors have no conflicts of interest to declare.

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