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Basal Metabolic Rate and Body Composition Before and After 3 Months of Endurance Exercise

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ABSTRACT

Background: The present study was conducted to assess basal metabolic rate and body composition before and after 3 months of endurance exercise. **Methods:** 120 subjects were divided into 2 groups of 60 each. Group I was control group which was asked not to change their daily routine or join a regular physical fitness program and group II took part in an aerobic fitness program. All were subjected to measurement of body composition (DEXA) and indirect calorimetry. **Results:** The mean body mass in group I was 76.2 kg and in group II was 74.5 kg, height in group I was 1.68 meters and in group II was 1.69 meters and BMI was 27.4 kg/m2 in group I and 27.1 kg/m2 in group II. The mean basal metabolic rate in group I was 1764.2 Kcal/day before and 1642.8 Kcal/day after exercise and in group II was 1892.4 Kcal/day before and 1562.7 Kcal/day after 3 months. The difference was significant (P< 0.05). **Conclusion:** There was alteration in basal metabolic rate after 3 months of endurance exercise.

Keywords: Basal Metabolic Rate, Exercise.

INTRODUCTION

The basal metabolic rate (BMR) measures the minimum amount of energy required to maintain physiological functions at rest. After exercise basal metabolic rate (BMR) remain elevated for up to 48 hours. This observation is part of the reason for advocating programmes of weight control by means of exercise alone.[1] However, there have been no well-controlled long-term studies of the effect of exercise on metabolic rate in human beings in which diet was also taken into account. The knowledge of this rate is important in clinical applications for defining appropriate nutritional support and determining caloric needs for energy balance.[2] Several studies have reported reduced BMR with age attributed to factors such as a decreased amount of lean mass and concomitant increase in fat mass, altered contents of body water, altered body temperature, mood disorders or stress, hormonal alterations, body area, physical inactivity, individual genetics and aging.[3,4]

Resting metabolic rate accounts for 60–75% of total energy expenditure in sedentary people. Therefore, it is a major determinant of energy balance and changes in weight.[5] Factors which decrease resting metabolic rate would be associated with difficulty maintaining weight or weight loss, or frank weight gain. On the contrary, anything that increases resting metabolic rate would facilitate weight loss and maintenance of weight loss.[6] the present study wasconducted to assess basal metabolic rate and body composition before and after 3 months of endurance exercise.

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MATERIALS AND METHODS

The present study was conducted in the department of Physiology. It comprised of 120 subjects who agreed to participate in the study. Ethical approval of the study was obtained.

Data such as name, age, gender etc. was recorded. Subjects were divided into 2 groups of 60 each. Group I was control group which was asked not to change their daily routine or join a regular physical fitness program and group II took part in an aerobic fitness program consisting of working on cycle ergometer three times a week (60 minutes) on alternate days for three months, at heart rate corresponding to ventilatory threshold 1 (VT-1) intensity. All were subjected to measurement of body composition (DEXA) and indirect calorimetry. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

RESULTS

Table 1: Distribution of subjects

Groups	Group I	Group II
Status	Control	Exercise
M:F	35:25	32:28

[Table 1] shows that there were 35 males and 25 females in group I and 32 males and 28 females in group II.

Table 2: Assessment of parameters

Groups	Group I	Group II	P value
Body mass (Kg)	76.2	74.5	0.12
Height (m)	1.68	1.69	0.82
BMI (Kg/m^2)	27.4	27.1	0.91

[Table 2] shows that mean body mass in group I was 76.2 kg and in group II was 74.5 kg, height in group I was 1.68 meters and in group II was 1.69 meters and BMI was 27.4 kg/m2 in group I and 27.1 kg/m2 in group II. The difference was non- significant (P> 0.05).

Table 3: Assessment of body composition before and after 3 months

Parameters	Group I		Group II		P value
	Before	After	Before	After	
Body mass	77.2	77.8	76.9	76.1	0.12
BMI	27.3	27.8	27.6	26.1	0.28
Total fat	29.1	29.6	26.8	25.4	0.14
Total BMC	2823.7	2878.4	2911.1	2935.2	0.81
% total fat region	27.4	27.9	23.1	23.7	0.19
Total tissue	74.2	74.4	74.3	74.9	0.64
Total lean mass	51.2	51.4	53.2	53.5	0.51

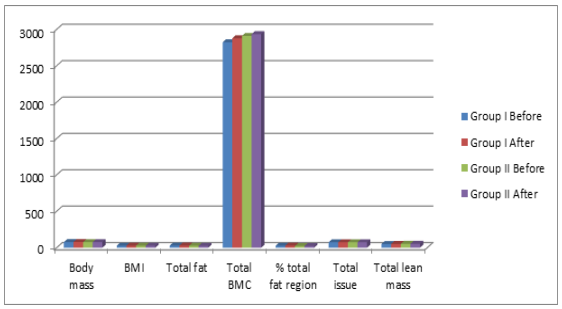

Figure 1: Assessment of body composition before and after 3 months

Table 4: Assessment of basal metabolic rate before and after 3 months

Parameters	Group I		Group II		P value
	Before	After	Before	After	
Energy expenditure	1764.2	1642.8	1892.4	1562.7	0.04

[Table 2, Figure 1] shows that mean body mass in group II was 76.9 and 76.1 before and after 3 months, BMI was 27.3 and 27.8 before and after 3 months, total fat was 26.8 and 25.4 before and after 3 months, total BMC was 2911.1 and2935.2 before and after 3 months, % total fat regionwas 23.1 and 23.7 before and after 3 months, total tissue was 74.3and 74.9 before and after 3 months and total lean mass was 53.2 and 53.5 before and after 3 months. The mean body mass in group II was 76.9 and 76.1 before and after 3 months, BMI was 27.6 and 26.1 before and after 3 months, total fat was 26.8 and 25.4 before and after 3 months, total BMC was 2911.1 and 2935.2 before and after 3 months, % total fat region was 23.1 and 23.7 before and after 3 months, total tissue was 74.3 and 74.9 before and after 3 months and total lean mass was 53.2 and 53.5 before and after 3 months. The difference was non-significant (P> 0.05).

[Table 3, Figure 2] shows that mean basal metabolic rate in group I was 1764.2 Kcal/day before and 1642.8 Kcal/day after exercise and in group II was 1892.4 Kcal/day before and 1562.7 Kcal/day after 3 months. The difference was significant (P< 0.05).

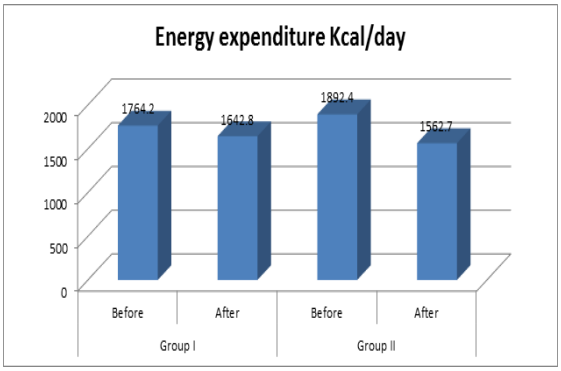

Figure 2: Assessment of basal metabolic rate before and after 3 months

DISCUSSION

Endurance exercises have been used to prompt alterations in body composition, largely due to their ability to boost energy use, particularly the use of fats, but many of the results reported are inconclusive.[7] Some studies have reported higher BMR after endurance exercise, while others found no significant alterations and others yet only a small decrease in BMR.[8,9] The present study was conducted to assess basal metabolic rate and body composition before and after 3 months of endurance exercise.

We found that there were 35 males and 25 females in group I and 32 males and 28 females in group II. Antunes et al,[9] compared basal metabolic rate and body composition before and after an endurance-type physical fitness program. The study involved 46 sedentary aging males, aged 60-75 (66.97 ± 4.80 years), who were randomly allocated to two groups control group and experimental group, who took part in an aerobic fitness program. After the study period, the authors found a significant decrease in thyroid hormones as well as basal metabolism changes in both groups, but no changes in body composition. The experimental group, however, showed a significant increase in peak oxygen uptake and workload at VT-1 intensity. The data suggest that although an aerobic exercise program at VT-1 intensity is not enough to alter the basal metabolism and body composition of healthy seniors, it does lead to cardiovascular benefits.

We found that mean body mass in group II was 76.9 and 76.1 before and after 3 months, BMI was 27.3 and 27.8 before and after 3 months, total fat was 26.8 and 25.4 before and after 3 months, total BMC was 2911.1 and 2935.2 before and after 3 months, % total fat region was 23.1 and 23.7 before and after 3 months, total tissue was 74.3 and 74.9 before and after 3 months and total lean mass was 53.2 and 53.5 before and after 3 months. Bingham et al,[10] found that there is a sustained enhancement in metabolic rate after exercise was investigated during the course of a study in which six normal-weight volunteers (three men, three women) took part in a 9-week training programme. Baseline values were assessed in a 3-5 weeks control period of minimal activity before training. At the end of the study the subjects were capable of running for 1 hours/day, 5 days/week. Basal metabolic rate (BMR), overnight metabolic rate (OMR) and sleeping metabolic rate (SMR) were measured on three occasions: in the control period, and the beginning and end of the training periods. Average BMR in the control period was 5.91 MJ/24 h and was not changed with activity. There were no changes in OMR nor in SMR nor in BMR, OMR or SMR when expressed per kg body-weight, or per kg fat-free mass.

We found that the mean body mass in group II was 76.9 and 76.1 before and after 3 months, BMI was 27.6 and 26.1 before and after 3 months, total fat was 26.8 and 25.4 before and after 3 months, total BMC was 2911.1 and 2935.2 before and after 3 months, % total fat region was 23.1 and 23.7 before and after 3 months, total tissue was 74.3 and 74.9 before and after 3 months and total lean mass was 53.2 and 53.5 before and after 3 months.

Ballor et al,[11] found that the control group showed no change in body composition over the 12-week period. All three intervention groups had a significant decline in body mass at 6 weeks, and again at 12 weeks for an average total weight loss of 6.2 kg in the diet-only group, 6.8 kg for the diet plus aerobic exercise group, and 7.0 kg for the diet, aerobic and resistance training group (standard deviations only presented graphically). By 12 weeks there were also significant decreases in percentage body fat: 5.8, 8.0 and 4.3%, respectively. However, there were no significant differences between groups. There were no significant changes in fat-free mass in any of the groups at any time period. There were also no significant changes in resting metabolic rate within groups over time or between groups over time.

The shortcoming of the study is small sample size.

CONCLUSION

Authors found that there was alteration in basal metabolic rate after 3 months of endurance exercise.

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