

**ORIGINAL ARTICLE****EVALUATION OF BASAL METABOLIC RATE & BODY COMPOSITION BEFORE AND AFTER 6 MONTHS OF ENDURANCE EXERCISE**

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**ABSTRACT:**

**Background:** The basal metabolic rate (BMR) measures the minimum amount of energy required to maintain physiological functions at rest. This study was conducted to examine the effects of a fitness-endurance program on basal metabolism and body composition of study population. **Materials & Methods:** This was a cross-sectional study conducted on 60 subjects (males-30, females-30). They were divided into 2 groups. Group I (30)(control) and group II (30)(study). Electrocardiogram (ECG) was done both at rest and with effort to assess cardiovascular parameters. Body composition was measured by DEXA scan. Basal metabolism rate was determined through indirect open circuit calorimetry, measured in laboratory standard conditions. Blood analysis was done in morning collection. T3, T4 analysis was done with competitive enzyme immunoassay and TSH with two-site immune enzymometric-assay. **Results:** The present study consisted of group I (control) and group II (study). Each group contains 15 males and 15 females. Variables such as age, height, body mass and BMI was compared in both the groups. No significant difference was found between both groups ( $P < 0.05$ ). The results of the body composition analysis was measured by DEXA in both the groups. Significant inter-group differences were observed in the variable total fat (%) in the pre- ( $p < 0.04$ ) and post-intervention ( $p < 0.03$ ) periods. No significant alterations were observed in the other analyses. On comparing groups before and after the intervention period, we found a significant reduction in basal metabolism in both groups, with a significant inter-group difference in the post-intervention condition ( $p < 0.03$ ). Comparison of T3 (ng/dl), T4 (ug/dl) and TSH (uIU/mL) in both groups. There was significant reduction in T3 and T4 in both groups ( $P < 0.05$ ). **Conclusion:** Aerobic exercise programme may alter the cardiovascular system and may not affect the basal metabolic rate in study population. However, large scale studies are required to substantiate the result obtained in this study.

**Key words:** Aerobic exercise, basal metabolic rate, electrocardiogram

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This article may be cited as: Singh RK. Evaluation of basal metabolic rate & body composition before and after 6 months of endurance exercise. J Adv Med Dent Sci Res 2016;4(6):163-166.

Access this article online	
<b>Quick Response Code</b> 	Website: <a href="http://www.jamdsr.com">www.jamdsr.com</a>
	DOI: 10.21276/jamdsr.2016.4.6.39

**INTRODUCTION**

The basal metabolic rate (BMR) measures the minimum amount of energy required to maintain physiological functions at rest. For maintaining cellular homeostasis, all living organisms spend energy. Energy consumption in humans may be divided into three parts: 60-75% of the energy consumed at rest, 10% of the thermal effect of food, 15-30% of the physical activity. This is important in clinical applications for defining appropriate nutritional support and determining caloric needs for energy balance.<sup>1</sup>

BMR may increase or decrease. Various factors such as 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 leads to decreased BMR.<sup>2</sup>

Person with low metabolic rate may have high rates of overweight and obesity and risk of fat gain. Endurance exercises due to their ability to boost energy use, especially the use of fats, have been used to prompt alterations in body composition. Few authors have reported higher BMR after endurance exercise, whereas others found no significant alterations in BMR.<sup>3</sup>

This study was conducted to examine the effects of a fitness-endurance program on basal metabolism and body composition of study population.

**MATERIALS & METHODS**

This was a cross-sectional study conducted on 60 subjects (males-30, females-30). Subjects were informed regarding

the study and informed written consent was taken. Subjects who gave their permission were included in the study. Subjects with no cardiovascular disease, subjects not on any medication such as psychotropic drug use that could alter cardiovascular function or basal metabolic rate, no metabolic disorders, no habitual physical activity and no recent surgical intervention. They were divided into 2 groups. Group I (30)(control) and group II (30)(study). Electrocardiogram (ECG) was done both at rest and with effort to assess cardiovascular parameters. There was no control over diet and subjects continued with their own eating routines.

Subjects of the control group were asked not change their daily routines or join a fitness program. The study group took part in an aerobic fitness program every three times a week for six months. Sessions were continuous with the initial duration of 20 minutes, gradually increasing to a maximum of 60 on a cycle ergometer prescribed after ergospirometric evaluation (VT-1) of variations in subjects' heart rates. In all sessions, all subjects had their arterial pressure checked and their heart frequency monitored at 5-second intervals using a Polar Advantage NV.

Body composition was measured by DEXA scan which determined it to the nearest 0.001 kg using electronic scales with subjects barefoot in light clothing. Height was measured by a stadiometer accurate to within 1 mm.

Basal metabolism rate was determined through indirect open circuit calorimetry, measured in laboratory standard conditions. Subjects were instructed not to sleep at least 8

hours at night, not to eat any food for at least 12 hours before determination of basal metabolic index, not to use any medication and caffeine for the BMR measurements and not to engage in physical activity for 48 hours preceding measurement. Measurements were made from 7:00 a.m to 8:00 a.m.

Blood analysis was done in morning collection. T3, T4 analysis was done with competitive enzyme immunoassay and TSH with two-site immune enzymometric-assay.

**RESULTS**

Table I shows distribution of subjects in group I (control) and group II (study). Each group contains 15 males and 15 females. Table II shows that variables such as age, height, body mass and BMI was compared in both the groups. No significant difference was found between both groups (P<0.05). Table II shows the results of the body composition analysis measured by DEXA in both the groups. Significant inter-group differences were observed in the variable total fat (%) in the pre- (p < 0.04) and post-intervention (p < 0.03) periods a. No significant alterations were observed in the other analyses. On comparing groups before and after the intervention period, we found a significant reduction in basal metabolism in both groups, with a significant inter-group difference in the post-intervention condition (p < 0.03). (Graph I) Graph II shows comparison of T3 (ng/dl), T4 (ug/dl) and TSH (uIU/mL) in both groups. There was significant reduction in T3 and T4 in both groups (P<0.05).

**Table I** Distribution of subjects

Group I (30)		Group II (30)	
Male	Female	Male	Female
15	15	15	15

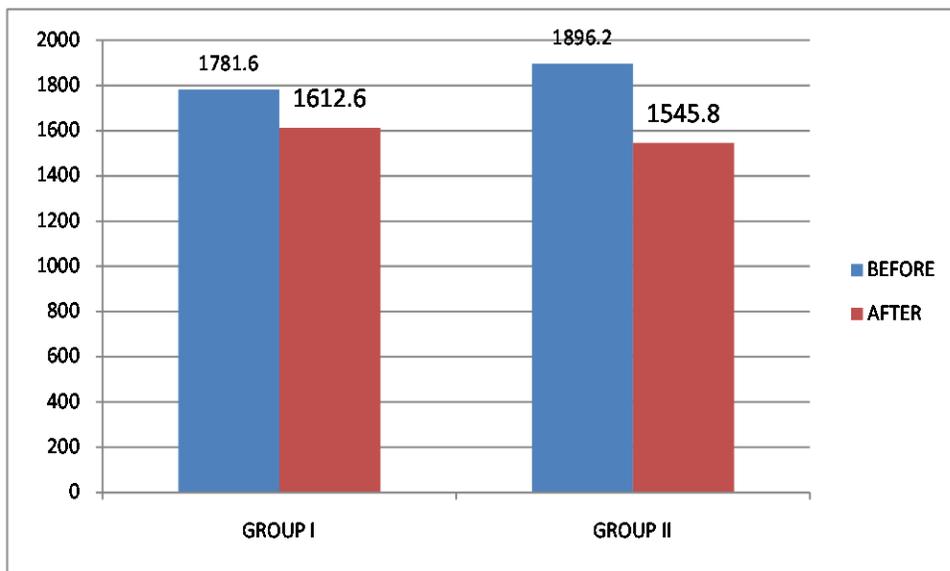
**Table II** Variables in both groups

Variable	Group I	Group II
Age	64.27 ± 3.80	67.24 ± 2.48
Height (m)	1.42 ± 0.42	1.56 ± 0.16
Body mass (Kg)	72.08 ± 12.03	76.28 ± 10.26
BMI	26.14 ± 2.012	26.02 ± 2.031

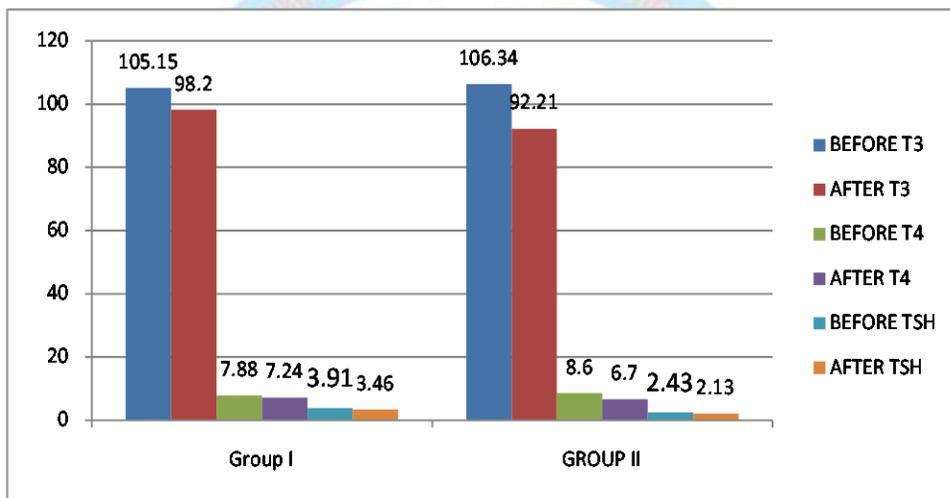
**Table III** Comparison of variable in both groups

Variables	Group I		Group II	
	Before	After	Before	After
Body mass (Kg)	77.18 ± 12.10	77.92 ± 10.84	76.26 ± 12.34	76.16 ± 12.11
BMI (WXH)	28.16 ± 3.042	27.45 ± 3.124	27.46 ± 3.624	27.06 ± 3.222
Total fat (%)	29.23 ± 3.211	29.93 ± 3.00	24.82 ± 7.52	24.70 ± 7.41
Total BMC	2842.17 ± 353.3	2857.14 ± 362.01	2856.38 ± 435.130	2866.21 ± 414.124
% total fat	28.26 ± 3.424	28.32 ± 3.411	23.02 ± 7.423	23.91 ± 7.213
Total issue	73.64 ± 9.224	73.74 ± 9.312	72.15 ± 12.84	72.05 ± 12.74
Total lean mass	52.57 ± 5.232	51.65 ± 5.888	54.23 ± 6.328	54.03 ± 6.228

**Graph I** BMR recorded in both groups



**Graph II** Level of T3, T4 and TSH in both groups



**DISCUSSION**

The rate of BMR may show alteration depending on the work we are doing. Person with low metabolic rate may have high rates of overweight and obesity and risk of fat gain.

Shock et al<sup>4</sup> indicated that healthy adults should abstained from moderate aerobic and anaerobic exercises for two hours before measurement and vigorous resistance exercise for at least 14 hours before measurement. This study was conducted to examine the effects of a fitness-endurance program on basal metabolism and body composition of study population.

This was a cross- sectional study conducted on 60 subjects (males-30, females-30). They were divided into 2 groups. Group I (30)(control) and group II (30)(study).

We evaluated variables such as age, height, body mass and BMI was compared in both the groups. No significant difference was found between both groups. Our results are in agreement with the results of Rising R et al<sup>5</sup>. However, Schmidt found more BMI in study population of atheletes in his study. We also evaluated the results of the body composition analysis measured by DEXA in both the groups. Significant inter-group differences were observed in the variable total fat (%) in the pre- (p<0.04) and post-intervention (p<0.03) periods. No significant alterations were observed in the other analyses. Our results are in agreement with Poehlman ET.<sup>6</sup>

We also compared groups before and after the intervention period, we found a significant reduction in basal

metabolism in both groups, with a significant inter-group difference in the post-intervention condition ( $p < 0.03$ ) (Graph I). Graph II shows comparison of T3 (ng/dl), T4 (ug/dl) and TSH (uIU/mL) in both groups. There was significant reduction in T3 and T4 in both groups. Ravussin E<sup>7</sup> in his study also found reduction in T3 level in subjects under study.

Yamamoto et al<sup>8</sup>. reported that it is necessary to investigate the relevance of sporting events and body composition on the BMR to establish a standard value of the BMR for athletes.

### CONCLUSION

Aerobic exercise programme may alter the cardiovascular system and may not affect the basal metabolic rate in study population. However, large scale studies are required to substantiate the result obtained in this study.

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Source of support: Nil

Conflict of interest: None declared

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