



Fitness programs impact on Basal Metabolic Rate

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Abstract:

This study was focused on impact of light aerobic exercise and Yogic exercise programs on Basal Metabolic Rate of rural senior citizens of district Bulandshahr. Two fitness programs i.e., light aerobic exercise program (brisk walk/ slow jogging) and yogic exercise program (common yoga protocol given by Ministry of AYUSH) were administrated as research tool, for this study. 90 subjects of age 60-65 years have taken and divided in to three equal groups i.e., two experimental and one control group. Experimental treatments were given for 16 weeks on alternate days for 45-60 minutes. ANOVA, ANCOVA and Post hoc (LSD) test were used as statistical technique. Significant improvement was found in Basal Metabolic Rate because of the experimental treatment namely Light aerobic exercise whereas no significant improvement found in yogic exercise program.

Keywords: Rural, Senior citizens, Basal Metabolic Rate, Light aerobic, Fitness, yogic.

1. Introduction

Basic components in energy balance include energy intake, energy expenditure, and energy storage. Total daily energy expenditure is composed of basal metabolic rate (BMR), thermal effect of food (TEF) and energy expenditure through physical activity, the latter being subdivided into the energy used specifically in exercise training and energy in activities not associated with exercise. Interest towards BMR was first manifested a long time ago out of the need to understand the biology and etiology of obesity and, secondly, following a publication by FAO/WHO/UNU in 1985 in which, for the first time, the use of energy expenditure –specifically BMR- was proposed as a predictor of daily energy expenditure instead of the amount of energy expended.

The Mifflin-St. Jeor equation is the only equation that permits the valid estimation of BMR in obese subjects. Obesity has become a public health problem since it is strongly associated with an increase in morbidity and mortality. Obesity rates have increased exponentially over the years, with grade 1 obesity (BMI: 30 to 35 kg/m²) being the most frequent.

This study was focused on impact of light aerobic exercise and Yogic exercise programs on Basal metabolic rate of senior citizens of rural area of dist. Bulandshahr.

2. Methodology

The researchers administrated the brisk walk/ slow jogging (light aerobic exercise program) and common yoga protocol given by Ministry of AYUSH (yogic exercise program) as research tool, for this study. 90 subjects of age 60-65 years has taken, two investigational groups (A, and B) and one control group (group C) of 30 subjects each were formed randomly. Administered various duration of light aerobic and yogic exercise programs 3 session /week for 16 weeks duration and each group trained on alternative days. The group C didn't take part in any exercise program except their daily schedule. The pre and post test were taken for all the subjects before and after the training respectively. BMR are measured with the use of Mifflin St. Jeor derived formula, weighing machine and stadiometer.

Mifflin St. Jeor derived formula was used to find the resting metabolic rate. Subject's age, height and weight was taken to calculate daily calories expenditure. To calculate Basal Metabolic Rate (BMR) following equation was used.

Result: BMR assessed with this formula $(10 \times \text{weight (kg)} + 6.25 \times \text{height (cm)} - 5 \times \text{Age} + 5)$.

3. Light Aerobic Exercise Program

Warm-up (5-10 Minutes)

Main Training(25-40 Minutes)

Cool down/ Stretching Exercise (10 Minutes)

For First Month Mode - Brisk Walking/Slow Jogging
Intensity - 50-55%
Frequency - Three Times Per Week (Alternative Days)
Total Duration - 45mins

For Second Month Mode - Brisk Walking/Slow Jogging
Intensity - 55-60%
Frequency - Three Times Per Week (Alternative Days)
Total Duration - 45mins

For Third Month Mode - Brisk Walking/Slow Jogging
Intensity - 55-60%
Frequency - Three Times Per Week (Alternative Days)
Total Duration - 60 mins

For Forth Month Mode -Brisk Walking/Slow Jogging
Intensity - 60-65%,
Frequency - Three Times Per Week (Alternative Days)
Total Duration - 60 mins

Karvonen Method for Determining Intensity

Target heart rate = $X\% \text{ Intensity (HR max.- RHR) +RHR}$

HR max. = $(220-\text{age})$, RHR=Resting Heart rate

4. Yogic Exercise Program

COMMON YOGA PROTOCOL

Duration: 45–60 minutes

Prayer: Namaskara Mudra **2 minutes**
Sanghachhadhwam samvadadhvam
Sam vo manaamsi jaanataam
Devaa bhaagam yathaa poorve
Samjaanaanaa upaasate
Shantih Shantih Shantih

Warm Up / Sadilaja / Chaalan Kriya **6 minutes**
(Neck, Shoulders, Trunk & Knees movements etc.)

Yoga Asana (Yoga Postures) **18 minutes**

Standing Postures - Tadasana, Vrksahasana, Padhasanasana, Ardha-cakrasana, Trikonasana.

Sitting Postures - Bhadradasana, Vajrasana, Ardha-ushtraasana, Shashakasana, Uttanamandukasana, Vakrasana.

Prone Lying Postures - Makarasana, Bhujangasana, Salabhasana

Supine Lying Postures -Setubandhasana, Uttanapadasana, Ardhalasana, Pavanamuktasana, Savasana

Kapaala Bhaati

3-6 minutes

Each cycle will be followed deep breathing

Pranayama

6-12 minutes

Anuloma-viloma Pranayama

(5rounds)

Sheetali Pranayama

(5rounds)

Bhrahmari Pranayama

(5rounds)

Bhastrika Pranayama

(5rounds)

Dhyana/Meditation

8 minutes

Meditative Posture (eyes closed) and hands in Gyana Mudra

Shaanti Paatha

2 Minutes

5. Statistical techniques

In order to investigate the fitness programs impact on systolic and diastolic blood pressure assessment among rural senior citizens, descriptive statistics (Mean, SD and Range), analysis of variance ANOVA and analysis of covariance (ANCOVA) were used at the 0.05 level of significance.

Further for comparing adjusted mean scores of Experimental Groups and Control Group of systolic and diastolic blood pressure Least Significant difference (LSD) Post Hoc test was used if F value was found significant in ANCOVA.

6. Results and findings

Table 1: Descriptive Statistics of Pre-Test and Post-Test of Experimental Groups and Control Group in BMR

Groups		Mean	SD	Minimum	Maximum	Range
Group A	Pre-Test	1429.70	144.36	1226.00	1895.00	669.00
	Post-Test	1406.63	138.56	1224.00	1866.00	642.00
Group B	Pre-Test	1440.53	140.43	1160.00	1711.00	551.00
	Post-Test	1429.96	133.86	1107.00	1699.00	592.00
Group C	Pre-Test	1433.86	117.28	1237.00	1817.00	580.00
	Post-Test	1433.80	118.92	1239.00	1833.00	594.00

Table- 1 showed that Group A (light aerobic exercise Group) pre mean scores 1429.70 with standard deviation values 144.36 was found lowest and Group B (yogic exercise Group) pre mean scores 1440.53 with standard deviation values 140.43 was found highest in BMR (basal metabolic rate) among all the groups. Although post mean scores 1406.63 with standard deviation values 138.56 was found lowest in Group A whereas post mean scores 1433.80 with standard deviation values 118.92 was found highest in Group C (control group) among all the groups.

Table 2A: Analysis of Variance of Means of Experimental Group and Control Group in BMR

		Sum of Squares	Df	Mean Square	F	Sig.
Post Test	Between Groups	12073.889	2	6036.944	0.355	.702
	Within Groups	1477974.067	87	16988.208		
	Total	1490047.956	89			
Pre Test	Between Groups	1791.667	2	895.833	0.049	.952
	Within Groups	1575251.233	87	18106.336		
	Total	1577042.900	89			

*Significant at .05 level

F value required to be significant at 2, 87 df =3.09

In relation to post test, Table 2A revealed that the obtained 'F' value of 0.355 was found to be insignificant at 0.05 level, in case of BMR (basal metabolic rate) since this value was found lower than the tabulated value 3.09 at 2, 87 df.

In relation to pre test, insignificant difference was also found among experimental groups and control group pertaining to BMR (basal metabolic rate), since 'F' value of 0.049 was found lower than the tabulated value 3.09 at 2, 87 df at 0.05 level. It means that experimental groups and control groups pre-experimental differences were not found significant.

Table 2 B Analysis of Co-Variance of Adjusted Post Test Means of Experimental Groups and Control Group in BMR

	Sum of Squares	Df	Mean Square	F	Sig.
Contrast	8121.214	2	4060.607	4.888	.010
Error	71449.492	86	830.808		

*Significant at .05 level

F value required to be significant at 2, 86 df =3.09

Table 2B revealed that the obtained 'F' value of 4.888 was found to be significant at 0.05 level, in case of BMR (basal metabolic rate), since this value was found greater than the tabulated value 3.09 at 2, 86 df.

It evident that the adjusted mean scores of BMR (basal metabolic rate) of Group A (light aerobic exercise Group), Group B (yogic exercise Group) and Group C (control group) differ significantly by taking their pre BMR (basal metabolic rate) as covariate.

In order to know which group adjusted mean score of BMR (basal metabolic rate) differ significantly from other, the data were further analyzed with the help of LSD post-hoc test and the results are given in table-1C.

Table 2C: Post Hoc Comparison of Adjusted Post Test Means of Experimental Groups and Control Group in Relation to BMR

Group A	Group B	Group C	Mean Difference	Sig.
1411.358	1421.788		-10.430	.165
1411.358		1434.587	-23.229*	.002
	1421.788	1434.587	-12.800	.089

Table – 1C showed adjusted post test means of experimental groups and control group. The adjusted means of experimental group A (light aerobic exercise Group), experimental group B (yogic exercise Group) and control group C were 1411.358, 1421.788 and 1434.587, respectively.

The mean difference between experimental group A and experimental group B was -10.430 which is insignificant at 0.05 level. It may therefore be said that both groups were found to have the BMR (basal metabolic rate) to the same extent.

The mean difference between experimental group A and control group C was -23.229 which is significant at 0.05 level. It may therefore be said that group A was found to have significantly better BMR (basal metabolic rate) as compared to control group C.

The mean difference between experimental group B and control group C was -12.800 which is insignificant at 0.05 level. It may therefore be said that group B and group C were found to have the BMR (basal metabolic rate) to the same extent.

The graphical representation of adjusted mean score of BMR (basal metabolic rate) between experimental groups and control group is presented in Figure-1.

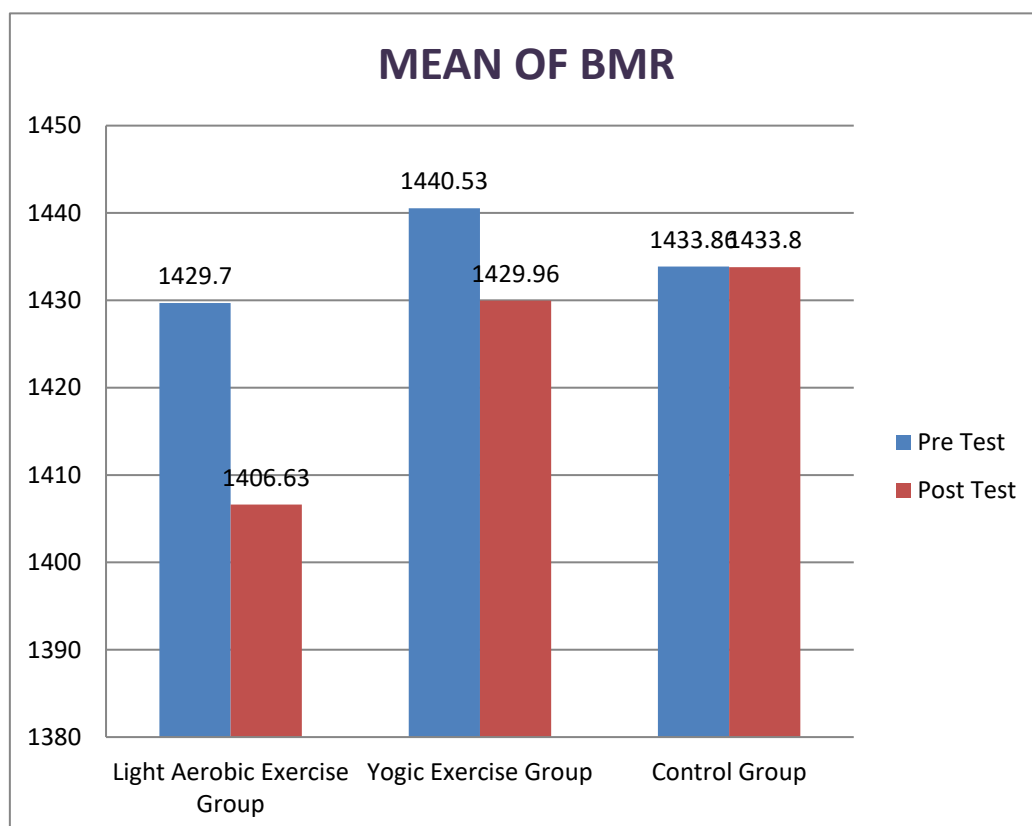


Figure 1: Mean of BMR with Experimental Groups and Control Group

7. Discussion and findings

The results of the study clearly indicate that light aerobic programs (sixteen week) brought significant improvement whereas yogic exercise program (sixteen week) was not found significant improvement in the Basal metabolic rate of rural senior citizen.

8. Conclusion

Based on the Results and findings and within the limitations of the present study, Significant improvement was found in Basal metabolic rate as a result of the experimental treatment namely Light aerobic exercise whereas no significant improvement was found as a result of yogic exercise program of 16 weeks.

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