



**EFFECTS OF YOGIC TRAINING AEROBIC TRAINING AND DETRAINING ON MUSCULAR ENDURANCE OF COLLEGE MALE STUDENTS**

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**ABSTRACT**

The purpose of the study is to find out the effects of yogic training, aerobic training and detraining on muscular endurance of college male students. For this study 45 (forty five) healthy untrained subjects were selected on random basis. The students were selected from Dr.R.K.Shanmugam College of Arts & Science, Indili, Kallakurichi T.K Villupuram (Dt) in Tamil Nadu, India. The subject's age were ranged between 18 to 21 years. The selected subjects were divided into three groups, each group consist of fifteen (15) subjects. Group I underwent yogic training, group II underwent aerobic training and group III acted as a control group. The selected asanas and pranayama were given to yogic training group. The selected aerobic dance steps assigned for aerobic training group. The duration of the training period was stipulated to 12 weeks for 5 days per week (45 minutes). Control group was kept under control without any training. The muscular endurance was measured by using bent knee sit-ups test. Prior to and after the end of practice period all the subjects were tested on selected muscular endurance. The results of pre, mid, post, first, second, and third cessation test were compared statistically analyzed by using two-way factorial analysis of variance with last factor repeated measures. The 'F' ratio value was statistically analyzed and tested for significant difference at 0.05 level of confidence.

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**INTRODUCTION**

The best way to keep physical activity and exercises a permanent part of one's life is to make it fun and enjoyable. If people are given different options of what they can do and have easy access to those options, they are more likely to participate in physical activity and exercises. This allows people to have a positive attitude towards physical fitness. It's also helpful if people are knowledgeable about the rewards of physical activity and exercises. The challenge facing the fitness professional is how to best manipulate, progressively overload and inter mix intensity, duration and frequency with a variety of modes of activity to help the clients reach their goals. Fortunately a number of different training programs are available to the fitness professional including yogic training and aerobic training. Detraining refers to the cessation of regular physical training, the effect of stop training are quite minor compared with those from immobilization. In general, the greater the gains during training, the greater the decrease during detraining simply because, the well trained person has more to lose than the untrained person. Detraining causes muscle atrophy, which is accompanied by loss in muscular endurance. However muscles require only minimal stimulation to retain these qualities during periods of reduced activity.

**Muscular Endurance**

Muscular endurance is defined as the ability of the muscles to sustain repeated productions of force at low to moderate intensities over an extend amount of time. It indicates that your muscles are strong enough to move for long periods of time and can complete numerous repetitions. In physical education program each day during the warming up phase of each lesson students must develop muscles endurance by participating in sets of abdominal exercises in increasing numbers as the time passes.

Abdominal muscles can promote health related problems by contributing to a misalignment of the spine. When weak abdominal muscles add strain to the lower back muscles, lower back problems can result. Many research studies conducted to investigate the ways to provide relief to people who suffer from back pain have demonstrated that improving the endurance of the abdominal muscles can decrease the incidence and severity of the pain.

**METHODOLOGY**

The purpose of the study is to find out the effects of yogic training aerobic training and detraining on muscular endurance of college male students. Forty five healthy, untrained students were selected from Dr.R.K.Shanmugam College of Arts & Science, Indili, Kallakurichi T.K,

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Villupuram Dt, Tamil Nadu. The subject's age ranged from 18 to 21 years. The selected subjects were divided into three groups with fifteen subjects in each group selected randomly, with two experimental groups and one control group. Experimental Group I underwent the yogic training in selected asanas and pranayama. Experimental Group II underwent the selected aerobic dance with music's programme. The training periods of experimental groups were twelve weeks, five days per week with duration of 45 minutes. Control group did not undergo any training programme rather than their routine work. The muscular endurance was measured by using bent knee sit-ups tests. The data were collected on muscular endurance for all the three groups before the experimental period ( pre test), after six weeks of training ( mid test) and after twelve weeks of the training period (post test) respectively. After training period data collection the detraining period data were collected on muscular endurance once in ten days for three times. During this period the subjects were not allowed to participate in any training programme.

In order to test the effect of training, the collected data from all the three groups before, during and after experimentation on muscular endurance was statistically analyzed by using two-way (3x3) factorial analysis of variance with last factor repeated measures.

The data collected from the three groups at post experimentation and detraining (three cessation) on muscular endurance was statistically analyzed by using two way (3x4) factorial ANOVA with last factor repeated measures.

Whenever, two-way factorial ANOVA with last factor repeated the obtained 'F' ratio interaction values are found to be significant, the simple effect test is used. When the obtained 'F' ratio value in the simple effect is found significant, the Scheffe's test is applied as post hoc test to determine which of the paired mean had significant differences. In all the cases the level of confidence is fixed at 0.05 to test the significance.

**Table 1** The Mean and Standard Deviation Values on Muscular Endurance of Pretest, Mid Test, Post Test, First Cessation, Second Cessation Andthird Cessationperiod Scores of Yogic, Aerobic Andcontrol Groups

Groups		Pre test	Mid test	Post test	First Cessation	Second Cessation	Third Cessation
Yogic group	Mean	17.47	21.27	23.67	21.53	20.27	18.87
	S.D	7.745	7.750	7.789	7.501	7.392	7.444
Aerobic group	Mean	17.60	23.93	27.60	23.27	21.47	19.53
	S.D	3.906	3.453	3.460	2.890	2.850	2.588
Control group	Mean	17.67	17.73	17.80	17.80	17.73	17.73
	S.D	5.052	4.964	4.843	4.843	4.713	4.682

The table 1 showed that the pre, mid, post, first cessation, second cessation and third cessation test of mean and standard deviation values on muscular endurance for yogic, aerobic and control groups respectively during training and detraining periods.

The data on muscular endurance during training period have been analyzed by two-way factorial ANOVA (3 x 3) with repeated measures on last factor and the results are presented in table 2.

**Table 2** Two Way Analysis of Variance With Last Factor Repeated Measures on Muscular Endurance of Control And Experimental Groups At Three Different Testing Periods

Source of Variance	Sum of Squares	df	Mean Squares	Obtained "F" ratio
Rows (Groups)	639.748	2	319.874	3.293*
Error	4079.911	42	97.141	
Columns (Testing Periods)	680.726	2	340.363	989.671*
Interaction (Groups X Testing Periods)	380.385	4	95.096	276.511*
Error	28.889	84	0.344	

\*Significant at 0.05 level  
Table values required for significance at 0.05 level with df 2, 42; 2, 84 and 4, 84 are 3.222, 3.106 and 2.482 respectively

From the table 2 it is clear that the obtained 'F' ratio for groups is 3.293, which is greater than the table value of 3.222 with df. 2 and 42 required for significance at 0.05 level of confidence. The result of the study indicates that, significant differences exist among the experimental and control groups irrespective of different stages of testing on muscular endurance.

The obtained 'F' ratio for different stages of testing period is 989.671, which is greater than the table value of 3.106 with df. 2 and 84 required for significance at 0.05 level of confidence. The result of the study indicates that muscular endurance differs significantly among different stages of testing irrespective of groups.

The obtained 'F' ratio value of interaction (groups x testing periods) is 276.511, which is greater than the table value of 2.482 with df. 4 and 84 required for significance at 0.05 level of confidence. The result of the study shows that significant difference exists among groups at each test and also significant difference between tests for each group on muscular endurance.

The results of the study indicate that significant differences exist in the interaction effect (between groups and tests) on muscular endurance. Since the interaction effect is significant, the simple effect test has been applied as follow up test and it is presented in table 3

**Table 3** The Simple Effect Scores of Groups (Rows) At Three Different Stages of Testing (Columns) on Muscular Endurance

Source of Variance	Sum of Squares	df	Mean Squares	Obtained "F" ratio
Groups and Pre test	0.156	2	0.078	0.227
Groups and Mid test	145.089	2	72.545	210.885*
Groups and Post test	364.822	2	182.411	530.265*
Tests and Control Group	0.067	2	0.034	0.097
Tests and Yogic Group	146.600	2	73.300	213.081*
Tests and Aerobic Group	151.667	2	75.834	220.446*
Error	28.889	84	0.344	

\*Significant at .05 level of confidence  
Table values required for significance at 0.05 level with df 2 and 84, is 3.106.

Table 3 shows that the obtained 'F' ratio values for groups at mid and post test are 210.885 and 530.265 respectively, which are higher than the table value of 3.106 with df. 2 and 84 required for significance at 0.05 level of confidence. The result of the study indicates that significant difference on muscular endurance exists between groups at mid and post test.

Further, it denotes that the obtained 'F' ratio values for tests of yogic and aerobic group are 213.081 and 220.446 respectively, which are higher than the table value of 3.106 with df. 2 and 84 required for significance at 0.05 level of confidence. The result of the study indicates that there is significant increase on muscular endurance among the tests of yogic and aerobic group.

Whenever, the obtained 'F' ratio value is found to be significant, the Scheffe's post hoc test is applied to find out the paired mean differences, and it is presented in tables 4 and 5

**Table 4** Scheffe's test for the differences between the paired means of different groups at each testing periods during Training on muscular endurance

Testing Periods	Yogic Group	Aerobic Group	Control Group	Mean Difference
Pre test	17.47	-	17.67	0.20
	-	17.60	17.67	0.07
	17.47	17.60	-	0.13
Mid test	21.27	-	17.73	3.54*
	-	23.93	17.73	6.20*
	21.27	23.93	-	2.66*
Post test	23.67	-	17.80	5.87*
	-	27.60	17.80	9.80*
	23.67	27.60	-	3.93*

\* Significant at 0.05 level.  
The confidence interval required for significance at 0.05 level is 0.541.

From the above table it has been observed that the mean difference values on muscular endurance during the mid test between the yogic and control group are 3.54, aerobic and control group are 6.20 and yogic and aerobic group are 2.66. The post test between the yogic and control group are 5.87, aerobic and control group are 9.80 and yogic and aerobic group are 3.93. Since the calculated value for both the experimental groups is higher than the required value 0.541 at 0.05 level of confidence interval. Therefore there is significant difference among the three groups which denotes that both the experimental groups are significantly better on muscular endurance than the control group. Finally the result reveals that the aerobic group is superior to yogic group and the yogic group is better than the control group. Hence the hypothesis has been accepted.

**Table 5** Scheffe's test for the differences between the paired means of each group at different testing periods during Training on muscular endurance

	Pre test	Mid test	Post test	Mean Difference
Yogic Group	17.47	21.27	-	3.80*
	17.47	-	23.67	6.20*
	-	21.27	23.67	2.40*
Aerobic Group	17.60	23.93	-	6.33*
	17.60	-	27.60	10.00*
	-	23.93	27.60	3.67*
Control Group	17.67	17.73	-	0.06
	17.67	-	17.80	0.13
	-	17.73	17.80	0.07

\* Significant at 0.05 level.  
The confidence interval required for significance at 0.05 level is 0.541.

Table 5 reveals that the mean difference values on muscular endurance of the yogic group during the pre test to mid test are 3.80, pre test to post test are 6.20 and mid test to post test are 2.40. The mean difference of aerobic group pre test to mid test is 6.33, pre test to post test are 10.00 and mid test to post

test are 3.67. Since the calculated value is higher than the required value 0.541 at 0.05 level of confidence interval. Therefore there is significant difference during the pre test to mid test, pre test to post test and mid test to post test period. The result reveals that the muscular endurance is found to be more effective during the pre test to mid test when compared to the mid to post test period. Hence the hypothesis has been accepted.

The data on muscular endurance during detraining (cessation) period have been analyzed by two-way factorial ANOVA (3 x 4) with repeated measures on last factor and the results are presented in table 6

**Table 6** Two Way Analysis of Variance With Last Factor Repeated Measures on Muscular Endurance of Control And Experimental Groups At Four Different Testing Periods

Source of Variance	Sum of Squares	df	Mean Squares	Obtained "F" ratio
Rows (Groups)	831.744	2	415.872	3.580*
Error	4878.500	42	116.155	
Columns (Testing Periods)	457.994	3	151.665	289.981*
Interaction (Groups X Testing Periods)	265.856	6	44.309	84.719*
Error	65.900	126	0.532	

\*Significant at 0.05 level.  
Table values required for significance at 0.05 level with df 2, 42; 3, 126 and 6, 126 are 3.22, 2.68 and 2.17 respectively

From the table 6 the obtained 'F' ratio for groups is 3.580, which is greater than the table value of 3.222 with df. 2 and 42 required for significance at 0.05 level of confidence. The result of the study indicates that, significant differences exist among the experimental and control groups irrespective of different stages of testing on muscular endurance.

The obtained 'F' ratio for different stages of testing period is 289.981, which is greater than the table value of 2.68 with df. 3 and 126 required for significance at 0.05 level of confidence. The result of the study indicates that muscular endurance differs significantly among different stages of testing irrespective of groups.

The obtained 'F' ratio value of interaction (groups x testing periods) is 84.719, which is greater than the table value of 2.17 with df. 6 and 126 required for significance at 0.05 level of confidence. The result of the study shows that significant difference exists among groups at each test and also significant difference between tests for each group on muscular endurance.

**Table 7** The simple effect scores of groups (rows) at four different Stages of testing (columns) on muscular endurance

Source of Variance	Sum of Squares	df	Mean Squares	Obtained "F" ratio
Groups and Post test	364.822	2	182.411	342.878*
Groups and First Cessation	117.067	2	58.534	110.025*
Groups and Second Cessation	54.489	2	27.245	51.211*
Groups and Third Cessation	12.422	2	6.211	11.675*
Tests and Control Group	0.220	3	0.073	0.138
Tests and Yogic Group	62.283	3	20.761	39.024*
Tests and Aerobic Group	177.978	3	59.326	111.515*
Error	65.900	126	0.532	

\*Significant at .05 level of confidence  
Table values required for significance at 0.05 levels with df 2 and 126, & 3 and 126 are 3.069 and 2.679 respectively

The results of the study indicate that significant differences exist in the interaction effect (between groups and tests) on muscular endurance. Since the interaction effect is significant, the simple effect test has been applied as follow up test and it is presented in table 7

Table 7 shows that the obtained 'F' ratio values for groups at post test, first, second and third cessation are 342.878, 110.025, 51.211 and 11.675 respectively, which are higher than the table value of 3.069 with df. 2 and 126 required for significance at 0.05 level of confidence. The result of the study indicates that significant difference on muscular endurance exists between groups at post test, first, second and third cessation.

Further, it denotes that the obtained 'F' ratio values for tests of yogic and aerobic group are 39.024 and 111.515 respectively, which are higher than the table value of 2.679 with df. 3 and 126 required for significance at 0.05 level of confidence. The result of the study indicates that there is significant decrease on muscular endurance among the tests of yogic and aerobic group.

Whenever, the obtained 'F' ratio value is found to be significant, the Scheffe's post hoc test is applied to find out the paired mean differences, and it is presented in tables 8 and 9.

**Table 8** Scheffe's test for the differences between the paired means of different groups at each testing periods during training Cessation on muscular endurance

Testing Periods	Yogic Group	Aerobic Group	Control Group	Mean Difference
Posttest	23.67	-	17.80	5.87*
	-	27.60	17.80	9.80*
First Cessation	23.67	27.60	-	3.93*
	21.53	-	17.80	3.73*
Second Cessation	-	23.27	17.80	5.47*
	21.53	23.27	-	1.74*
Third Cessation	20.27	-	17.73	2.54*
	-	21.47	17.73	3.74*
Mean Difference	20.27	21.47	-	1.20*
	19.07	-	17.73	1.34*
Total	-	19.53	17.73	1.80*
	19.07	19.53	-	0.46

\* Significant at 0.05 level. The confidence interval required for significance at 0.05 level is 0.673.

Table 8 reveals that the mean difference on muscular endurance is found to be significant for the three groups during the post test, first, second and third cessation. In order to find out which of the following groups has decreased significantly on muscular endurance, the Scheffe's test for the difference between the paired means has been calculated and given in the below table 9

It is observed from the table 9 that the mean difference of the yogic group during the post test to first, second and third cessation are 2.14, 3.40 and 4.80 respectively. The mean differences between first to second, third cessation and second to third cessation are 1.26, 2.66 and 1.40 respectively for the yogic group. The aerobic group during the post test to first, second and third cessation are 4.33, 6.13 and 8.07 respectively. The mean differences between first to second, third cessation and second to third cessation are 1.80, 3.74 and 1.94 respectively for the aerobic group. Since the above mentioned mean difference value of the yogic and aerobic group are higher than the confidence interval value 0.673 at 0.05 level of significance, it is inferred that there is gradual

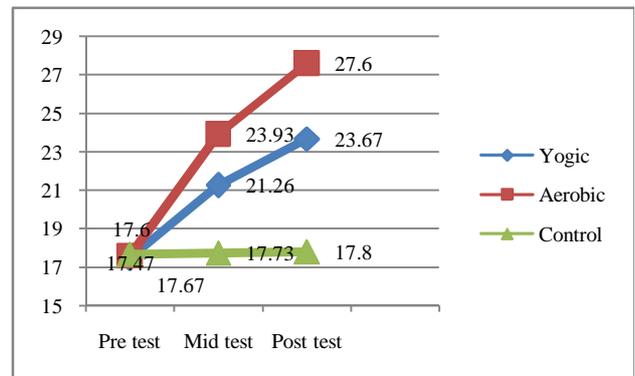
decrease of muscular endurance among the cessation period of both the experimental groups.

**Table 9** Scheffe's test for the differences between the paired means of each group at different testing periods during training cessation on muscular endurance

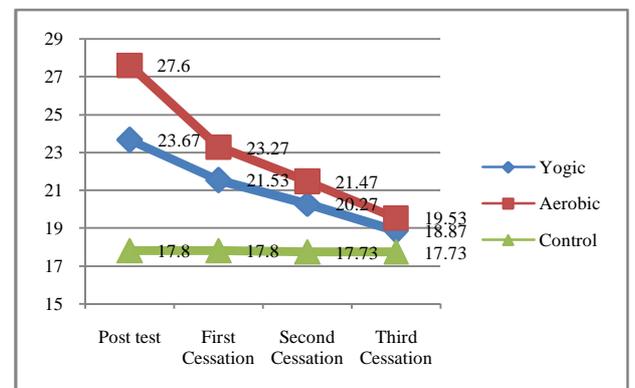
	Post test	First Cessation	Second Cessation	Third Cessation	Mean Difference
Yogic Group	23.67	21.53	-	-	2.14*
	23.67	-	20.27	-	3.40*
	23.67	-	-	18.87	4.80*
	-	21.53	20.27	-	1.26*
	-	21.53	-	18.87	2.66*
	-	-	20.27	18.87	1.40*
Aerobic Group	27.60	23.27	-	-	4.33*
	27.60	-	21.47	-	6.13*
	27.60	-	-	19.53	8.07*
	-	23.27	21.47	-	1.80*
	-	23.27	-	19.53	3.74*
	-	-	21.47	19.53	1.94*
Control Group	17.80	17.80	-	-	0.00
	17.80	-	17.73	-	0.07
	17.80	-	-	17.73	0.07
	-	17.80	17.73	-	0.07
	-	17.80	-	17.73	0.07
	-	-	17.73	17.73	0.00

\* Significant at 0.05 level. The confidence interval required for significance at 0.05 level is 0.673.

Finally the result reveals that the mean differences of aerobic group is higher than the yogic group so it is concluded that the aerobic group has gradually decreased on muscular endurance than the yogic group during the different cessation. The increase, decrease on muscular endurance is graphically represented in figure 1 to 2.



**Figure 1** The pretest mid test and post test mean values of yogic aerobic and control groups on Muscular endurance



**Figure 2** The Post Test, First Cessation, Second Cessation And Third Cessation Period Scores of Yogic Aerobic And Control Groups on Muscular Endurance

## DISCUSSION ON FINDINGS

The results of the present study indicates that both the experimental groups have significantly increased in the muscular endurance when compared to the control group during training period. The result of the study is in consonance with Madanmohan *et.al*, (2008), Chen *et.al*, (2009) Tran *et.al*, (2001) and Agro (1988).

Further, the improvement of muscular endurance is significantly higher the aerobic group when compared to the yogic group during training periods. The result of the study is in consonance with Ravikumar (2010) and Punithavathi (2010). But during the training cessation periods Muscular endurance is both the experimental groups have significantly reduced in a gradual manner for first, second and third cessation period. Finally aerobic training group is seen that the muscular endurance has significantly reduced when compared to the yogic group during training cessation periods.

Since the investigators have not come across similar studies on yogic training and aerobic training followed by detraining period above the variables, it was unable for him to mention relevant studies. But some scholars have conducted studies on circuit training followed by detraining, plyometric training followed by detraining and weight training followed by detraining on some physical and physiological variables.

## CONCLUSIONS

It was concluded from the result of the study that muscular endurance can be improved significantly due to twelve weeks of yogic training and aerobic training during mid and post test period. The aerobic training group is better improved compare than the yogic training group, during the testing periods namely pre to mid and mid to post test. The pre to mid test results reveal to be better than mid to post test period. The effect on muscular endurance for both the training groups has gradually decreased up to third cessation period during the detraining period, the effect of muscular endurance of aerobic training group has decreased faster when compare to the yogic training group.

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