



## Effect of Hatha Yoga and Aerobic Training on Selected Physiological Variables of College Male Students.

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### ABSTRACT

The purpose of the study was to investigate the comparative effects of Hatha yoga, Aerobic training and combination of Hatha yoga and Aerobic training on selected physiological variables (Resting heart rate, Resting systolic blood pressure and Resting diastolic blood pressure) of college students. Hundred male students of Seva Bharati Mahavidyalaya, Kapgari, Dist- Paschim Medinipur, West Bengal, were randomly selected as the subjects for this study. The average age of the subjects was 18 years to 23 years. After that they were divided into four equal groups on random basis (Groups A, B, C & D) consisting of 25 subjects in each group. Three out of the four groups were given experimental treatments i.e. Aerobic training, Hatha yoga and combination of hatha yoga and aerobic training for a duration of ten weeks and thereafter the groups A, B, C were designated as Aerobic training group, Hatha yoga group and combination of hatha yoga and aerobic training groups respectively. While the remaining one group (Group- D) was designated as control group which were not given any experimental treatment. The analysis of co-variance statistics was applied to determine the effect of training. The effect of ten weeks' hatha yoga training, aerobic training and combination of hatha yoga and aerobic training programmes shows significant differences on physiological variables i.e. resting heart rate and systolic and diastolic blood pressure.

### KEYWORDS

#### Introduction –

The origins of hatha yoga have been traced back to the eleventh century A.D. The Sanskrit word *ha* means “sun” and *tha* means “moon” and thus hatha, or literally sun-moon yoga, strives to balance opposing parts of the physical body, the front and back, left and right, top and bottom. Some yoga masters (*yogis*) claim that hatha yoga was originally developed by enlightened teachers to help people survive during the Age of Kali, or the spiritual dark ages, in which Hindus believe we are now living.

In addition to breathing, hatha yoga utilizes asanas, or physical postures, to bring about flexibility, balance and strength in the body. Each of these postures has a definite form and precise steps for achieving the desired position and for exiting it. These yogis have scientifically developed to increase circulation and health in all parts of the body, from the muscular tissues to the glands and internal organs. Yogis claim that although hatha yoga can make the body as strong and fit as any exercise program, its real benefits come out because it is a system of maintenance and balance for the whole body.

Aerobic fitness is a complex component of physical fitness. It involves the interaction of numerous physiological processes in the cardiovascular, respiratory, and muscular system, including the capacity of the lungs to take up oxygen, the capacity of the blood in the lungs to pick up oxygen, the capacity of the heart to pump this oxygenated blood to the muscle tissues, and the capacity of the tissues to extract the oxygen from the blood and use it to generate energy in the form of ATP via the oxygen system. Thus, the combined cardiovascular and respiratory system is the oxygen supply mechanism for the muscles. As the energy demands increases in the muscles, so do the demands on the cardiovascular and respiratory system.

#### Statement of the problem

The main purpose of the study was to investigate the comparative effects of Hatha yoga, Aerobic training and combi-

nation of Hatha yoga and Aerobic training on selected physiological variables (Resting heart rate, Resting systolic blood pressure and Resting diastolic blood pressure) of college students.

#### Procedure:

Hundred male students of Seva Bharati Mahavidyalaya, Kapgari, Dist- Paschim Medinipur, West Bengal, were randomly selected as the subjects for this study. The average age of the subjects was 18 years to 23 years. The subjects participated voluntarily in the programme and before the commencement of the programme, all of them were examined by the physician to ascertain that they were free from any type of medical problems and were fit enough to go through Aerobic training, Hatha yoga training and combination of Aerobic and Hatha yoga training programmes for ten weeks. After that they were divided into four equal groups on random basis (Groups A, B, C & D) consisting of 25 subjects in each group. Three out of the four groups were given experimental treatments i.e. Aerobic training, Hatha yoga and combination of hatha yoga and aerobic training and thereafter the groups A, B, C were designated as Aerobic training group, Hatha yoga group and combination of hatha yoga and aerobic training groups respectively. While the remaining one group (Group- D) was designated as control group which were not given any experimental treatment. After pre-test a ten weeks training schedule of aerobic, hatha yoga and combination of both were administered and the completion of training a post test taken on all the selected variables.

#### Statistical Procedure

The analysis of co-variance statistics was applied to determine the effect of training.

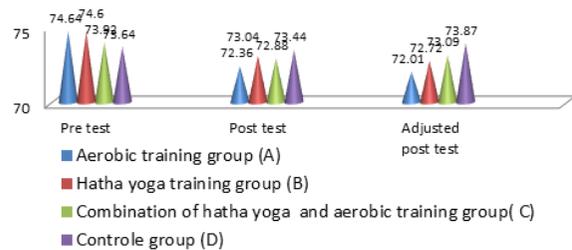
**Analysis of data and results of the study:**

**Table-1**

**Analysis of co-variance of the means of resting heart rate of three experimental groups and one control group**

Mean	Aerobic gr. (A)	Hatha yoga Gr.(B)	Combination Of Aerobic & Hatha Yoga gr.(C)	Control Gr.(D)	Ss	Df	Mss	F-ratio
Pre- test	74.64	74.6	73.92	73.64	A 18.64 W 909.36	3 96	6.12 9.47	0.65
Post-test	72.36	73.04	72.88	73.44	A 14.99 W 1005.5	3 96	10.47 2.59	0.47
Adjusted post-test	72.01	72.72	73.09	73.87	A 44.4 W 445.9	3 95	10.6 1.33	3.16*

\*Significant at 0.05 level F.05 (3, 96) =2.72 F.05 (3, 95) =2.71



**Figure: 1. Comparison of resting heart rate among, aerobic training (a), hatha yoga training (b), combination of hatha yoga and aerobic training groups (c) and one control group (d) in pre, post and adjusted post test means**

Table 1 and Figure 1, revealed no significant differences in resting heart rate in pre and post-test phases among three experimental training groups namely (aerobic training, hatha yoga training, combination of hatha yoga and aerobic training group) and one control group. The obtained 'F' value 0.65 and 0.47 were found to be lesser than required 'F' value 2.72 to be significant at 0.05 level of confidence with 3, 96 degree of freedom. However, the 'F' ratio value 3.16 for adjusted post-test mean was found to be significant for being greater than the required 'F' value 2.71 to be significant at 0.05 level of confidence with 3, 95 degree of freedom.

As in analysis of co-variance the significant difference in resting heart rate in adjusted post-test means among aerobic training, hatha yoga training, combination of hatha yoga and aerobic training group and one control group was found, further in order to find out the existence of significant difference between paired adjusted final means, the post-hoc test were computed, which was presented in table 2.

**Table-2 Paired adjusted final means and difference between means of four different groups related to resting heart rate.**

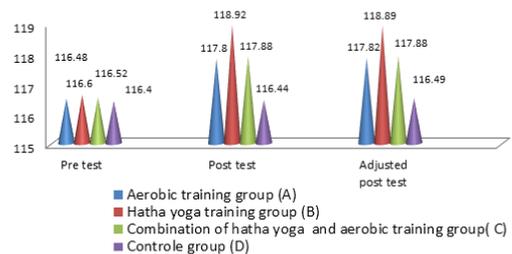
Aerobic Gr. (A)	Hatha Yoga Gr. (B)	Combination of both (C)	Control Gr. (D)	Mean Df.	Critical Df.
72.01	72.72			0.71	1.22
72.01		73.09		1.08	1.22
72.01			73.87	1.86*	1.22
	72.72	73.09		0.37	1.22
	72.72		73.87	1.15	1.22
		73.09	73.87	1.78*	1.22

\*Significant at 0.05 level of confidence.

The Table 2, (post-hoc test) in respect to the paired adjusted final means difference in resting heart rate clearly indicates significant difference between aerobic training and control group (1.86), and between combination of hatha yoga and aerobic training and control group (1.78), in which the observed mean differences values were found to be greater than that of critical

value (1.22).

However, no significant difference between other paired group mean namely between aerobic and hatha yoga training (0.71), aerobic training and combination of hatha yoga and aerobic training (1.08), hatha yoga training and combination of hatha yoga and aerobic training (0.37), and between hatha yoga training and control group (1.15) were noticed, in which the observed mean differences values were found to be lesser than that of critical value (1.22).



**Table-3 - Analysis of co-variance of means in resting systolic blood pressure of three experimental groups and one control group**

Mean	Aerobic gr. (A)	Hatha yoga Gr.(B)	Combination Of Aerobic & Hatha Yoga gr.(C)	Control Gr.(D)	Ss	Df	Mss	F-ratio
Pre- test	116.48	116.60	116.52	116.40	A 0.526 W 792.48	3 96	0.17 8.25	1.02
Post-test	117.80	118.92	117.88	116.44	A 77.60 W 314.64	3 96	25.86 3.27	7.89*
Adjusted post- test	117.82	118.89	117.88	116.49	A 72.54 W 182.37	3 95	24.18 1.91	12.59*

\*Significant at 0.05 level F.05 (3, 96) =2.72 F.05 (3, 95) =2.71

Figure.2: Comparison of resting systolic blood pressure among, aerobic training (a), hatha yoga training (b), combination of hatha yoga and aerobic training groups (c) and one control group (d) in pre, post and adjusted post test means

Table 3 and Figure 2, revealed insignificant differences in resting systolic blood pressure in pre test phase among three experimental training groups namely (aerobic training, hatha yoga training, combination of hatha yoga and aerobic training group) and one control group. The obtained 'F' value of 0.02

was found to be lesser than that of required 'F' value 2.72 to be significant at 0.05 level of confidence with 3, 96 degree of freedom. However, the 'F' ratio value in post test phase 7.89 and adjusted post- test phase (12.59) were found to be significant for being greater than the required 'F' value 2.72 and 2.71 to be significant at 0.05 level of confidence with 3, 96 and 3, 95 degree of freedom respectively.

As in analysis of co-variance the significant difference in resting systolic blood pressure in adjusted post-test means among aerobic training, hatha yoga training, combination of hatha yoga and aerobic training groups and one control group was found, further in order to find out the existence of significant differences between paired adjusted final group means, the post-hoc test was computed, which is presented in table – 3.

**Table-4**  
**Paired adjusted final means and difference between means of four different groups related to resting systolic blood pressure**

Aerobic Gr. (A)	Hatha Yoga Gr. (B)	Combination of both (C)	Control Gr. (D)	Mean Df.	Critical Df.
117.82	118.89			1.07*	0.15
117.82		117.88		0.06	0.15
117.82			116.49	1.33*	0.15
	118.89	117.88		1.01*	0.15
	118.89		116.49	2.40*	0.15
		117.88	116.49	1.39*	0.15

\*Significant at 0.05 level of confidence.

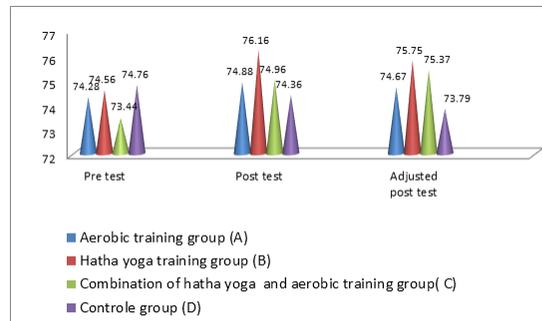
The Table 4,(post-hoc test) in respect to the paired adjusted final means difference in resting systolic blood pressure clearly indicates significant difference between aerobic training and hatha yoga training group (1.07), aerobic training and control group (1.33), hatha yoga training and combination of hatha yoga and aerobic training group (1.01), between hatha yoga training and control group (2.4) and between combination of hatha yoga and aerobic training and control group (1.39) in systolic blood pressure of college male students, which was found to be greater than that of critical values (0.15).

However, no significant difference between other paired group mean values namely aerobic training and combination of hatha yoga and aerobic training group (0.06) was noticed, in which the observed mean difference values was found to be lesser than that of critical values (0.15).

**Table-5**  
**Analysis of co-variance of means of resting diastolic blood pressure of three experimental group and one control group**

Mean	Aerobic gr. (A)	Hatha yoga Gr.(B)	Combination Of Aerobic & Hatha Yoga gr.(C)	Control Gr.(D)				F-ratio	
					Ss	Df	Mss		
Pre- test	74.28	74.56	73.44	74.76	A	25.32	3	8.44	0.50
					W	1591.9	96	16.58	
Post-test	74.88	76.16	74.96	74.36	A	43.47	3	14.49	1.09
					W	1266.7	96	13.19	
Adjusted post- test	74.67	75.75	75.37	73.79	A	54.93	3	18.30	4.35*
					W	399.15	95	4.20	

\*Significant at 0.05 level F.05 (3, 96) =2.72 F.05 (3, 95) =2.71



**FIGURE.3: Comparison of resting diastolic blood pressure among, aerobic training (a), hatha yoga training (b), combination of hatha yoga and aerobic training groups (c) and one control group (d) in pre, post and adjusted post test means**

Table 5 and Figure 3, revealed insignificant differences in resting diastolic blood pressure in pre and post-test phases among three experimental training groups namely (aerobic training, hatha yoga training, combination of hatha yoga and aerobic training groups) and one control group. The obtained 'F' value 0.50 and 1.09 were found to be lesser than that of required 'F' value 2.72 to be significant at 0.05 level of confidence with 3, 96 degree of freedom.

However, the 'F' ratio value 4.35 for adjusted post-test mean was found to be significant for being greater than the required 'F' value 2.71 to be significant at 0.05 level of confidence.

As in analysis of co-variance the significant difference in resting diastolic blood pressure in adjusted post-test means among aerobic training, hatha yoga training, combination of hatha yoga and aerobic training and one control group were found, further in order to find out the existence of significant differences between paired adjusted final means, the post-hoc test was computed, which is presented in table 6.

Table 5 and Figure 3, revealed insignificant differences in resting diastolic blood pressure in pre and post-test phases among three experimental training groups namely (aerobic training, hatha yoga training, combination of hatha yoga and aerobic training groups) and one control group. The obtained 'F' value 0.50 and 1.09 were found to be lesser than that of required 'F' value 2.72 to be significant at 0.05 level of confidence with 3, 96 degree of freedom.

However, the 'F' ratio value 4.35 for adjusted post-test mean was found to be significant for being greater than the required 'F' value 2.71 to be significant at 0.05 level of confidence.

As in analysis of co-variance the significant difference in resting diastolic blood pressure in adjusted post-test means among aerobic training, hatha yoga training, combination of hatha yoga and aerobic training and one control group were found, further in order to find out the existence of significant differences between paired adjusted final means, the post-hoc test was computed, which is presented in table 6.

**Table-6**  
**Paired adjusted final means and difference between means of four different groups related to resting diastolic blood pressure**

Aerobic Gr. (A)	Hatha Yoga Gr. (B)	Combination of both (C)	Control Gr. (D)	Mean Df.	Critical Df.
74.67	75.75			1.08*	0.81
74.67		73.44		1.23*	0.81
74.67			73.79	0.88*	0.81
	118.89	117.88		2.31*	0.81
	118.89		116.49	1.96*	0.81
		117.88	116.49	0.35	0.81

\*Significant at 0.05 level of confidence.

The Table 6, (post-hoc test) in respect to the paired adjusted final means differences in resting diastolic blood pressure clearly indicates significant differences between aerobic training and hatha yoga training groups (1.08), aerobic training and combination of hatha yoga and aerobic training groups (1.23), aerobic training and control groups (0.88), hatha yoga training and combination of hatha yoga and aerobic training groups (2.31) and between hatha yoga and control group (1.96) in resting diastolic blood pressure of college male students. Which were found to be greater than that of critical values (0.81). However, no significant difference between other paired group mean difference namely combination of hatha yoga and aerobic training and control group (0.35) was noticed. Where the observed mean difference value was found to be (lesser than) that of critical value 0.81.

#### **Conclusion:**

**On the basis of finding of the study, the following conclusions are drawn:**

The effect of ten weeks' hatha yoga training, aerobic training and combination of hatha yoga and aerobic training programmes shows significant differences on physiological variables i.e. resting heart rate and systolic and diastolic blood pressure.

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