

## Effect of isolated and combined training of aerobic and yoga on hemoglobin among school students

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**Abstract:** The purpose of the study was to find out the effect of isolated and combined training of aerobic and yoga on hemoglobin among school students. To achieve this purpose of the study, sixty female students were selected as subjects who were from the INDUS International School, Bangalore. The selected subjects were aged between 15 to 18 years. They were divided into four equal groups of fifteen each, Group I underwent aerobic training, Group II underwent yogic training, Group III underwent combined training and Group IV acted as control that did not participate in any special training apart from their regular curricular activities. The subjects were tested on selected criterion variable such as hemoglobin prior to and immediately after the training period. The selected criterion variable such as hemoglobin was determined through blood samples analyzed through laboratory tests. The analysis of covariance (ANCOVA) was used to find out the significant differences if any, between the experimental group and control group on selected criterion variable. In all the cases, 0.05 level of confidence was fixed to test the significance, which was considered as an appropriate. The result of the present study has revealed that there was a significant difference among the experimental and control group on hemoglobin..

**Key Words:** Hemoglobin, aerobic training, yoga training, combined training, girls.

### Introduction

The primary objective of sports training is to stress various bodily systems to bring about positive adaptation in order to enhance sporting performance. To achieve this objective, coaches and athletes systematically apply a number of training principles including overload, specificity and progression, organized through what is commonly termed periodisation. The application of these principles involves the manipulation of various programme design variables including choice of exercise, order of training activities/exercises, training intensity (load and repetition), rest periods between sets and activities/exercises and training frequency and volume in order to provide periods of stimulus and recovery, with the successful balance of these factors resulting in positive adaptation [1]. Aerobic exercise is vigorous, oxygenated large muscle exercise, which stimulates heart and lungs activity for a specific period of time to bring about beneficial changes in the cardiovascular system. The main objective of aerobic dance, like any others form of aerobics is to increase the maximum amount of oxygen that the body can

process in a given amount of time. The aerobic effect depends on the body's ability to (a) rapidly breathe large amounts of air, (b) forcefully deliver large volumes of blood, and (c) effectively deliver oxygen to all parts of the body. In simplest terms, the aerobic effect is large muscle activity that brings about a reduction in resting heart rate. Aerobic conditioning is synonymous with the first component of health-related fitness: cardiovascular efficiency. Improved cardio respiratory endurance is one of the most important benefits of aerobic training programs [2]. The Sanskrit word "Prana" means "vital force" or "cosmic energy". It also signifies "life" or "breath". "Ayama" means 'control'. Hence, Pranayama means the control of the vital force through concentration and regulated breathing. Prana is not the supply of a particular volume of oxygen-nitrogen mix when we inhale. Nor is prana the volume of carbon dioxide mixed with the residual air that comes out when we exhale. Of course, the physico-chemical actions are there, but the prana sits at the root of the two processes -- exhalation and inhalation. It is the vital invisible force that enables us to breath out or to

breath in. Numerous recreational exercisers complete their cardiovascular and strength training workouts either during the same training session or within hours of each other. This sequential exercise regime is referred to as “concurrent training. The “fatigue hypothesis,” which theorizes that strength performance is reduced due to fatigue caused by the prior cardiovascular work. Muscle fatigue is a multifactorial phenomenon, however, caused by an increase in cellular protons (due to acidosis), a decrease in energy-providing substrates and neural drive, and structural damage to the muscle cells [3]. The physiological response to dynamic aerobic exercise is an increase in oxygen consumption and heart rate that parallels the intensity of the imposed activity and a curvilinear increase in stroke volume. There is a progressive increase in systolic blood pressure, with maintenance of or a slight decrease in the diastolic blood pressure and a concomitant widening of the pulse pressure. Blood is shunted from the viscera to active skeletal muscle, where increased oxygen extraction widens the systematic arteriovenous oxygen difference. Thus aerobic exercise imposes primarily a volume load on the myocardium [4]. Blood is a tissue. The essential act of blood is to maintaining of hemostasis of internal tissues of body. A lot of actions are done in the body which changes the internal environment of chemical component, for example some changes will occur by contraction of muscles [5]. A cell that contains hemoglobin and can carry oxygen to the body. Also called a red blood cell (RBC). The reddish color is due to the hemoglobin. Erythrocytes are biconcave in shape, which increases the cell's surface area and facilitates the diffusion of oxygen and carbon dioxide. This shape is maintained by a cytoskeleton composed of several proteins. Erythrocytes are very flexible and change shape when flowing through capillaries. Immature erythrocytes, called reticulocytes, normally account for 1-2 percent of red cells in the blood. Hemoglobin is a protein of 200 to 300 million nearly spherical molecules in each red blood cell, having a molecular weight of 64,458 based on the chemical structures of its alpha and beta chains [6].

## Methodology

In the present study all the students studying in educational institutions of INDUS International School, Bangalore area were considered as population for the study. A representative sample of 60 school girls in the age of 15-18 years was chosen as sample for the study. The selected participants were divided into four groups. Group I underwent aerobic training, group II underwent yoga training, group III underwent combined training and group IV act as control group. The experimental groups underwent

twelve weeks of training in their particular workout. For this study dependent variable is hemoglobin.

### A. Test Administration – Estimation of Hemoglobin

Hemoglobin concentration was estimated using calorimetric procedure by Cyanmethaemoglobin method. An aliquot of well mixed whole blood was taken and reacted with a solution of potassium cyanide and potassium ferricyanide. The chemical reaction yields a product of stable color, Cyanmethaemoglobin. The intensity of the color is proportional to the hemoglobin concentration at 540 nm. The following reagents were used for the assay.

- (a) Reagent 1: Drabkin's reagent (50 mg potassium cyanide, 200 mg potassium ferricyanide and 1000 ml distilled water).
- (b) Reagent 2: Cyanmethaemoglobin standard.

Three sets of test tubes were taken and marked as blank, Test and standard. In the blank 5.0ml of reagent 1, then 20  $\mu$ l of an aliquot of well mixed EDTA- anticoagulated blood specimen was added, mixed well and stand for 10 minutes. Another tube marked as standard contained 5.0ml of Cyanmethaemoglobin standard. Blank solution was used for setting the spectrophotometer. Absorbance (Abs) of the test and standard was performed using spectrophotometer at 540nm [7].

### B. Analysis of Data

The data obtained were analyzed by analysis of covariance (ANCOVA). Analysis of covariance was computed for any number of experimental groups, the obtained 'F' ratio compared with critical F value for significance. When the F ratio was found to be significant, scheffe's post hoc test was used to find out the paired mean significant difference [8].

## Results

The analysis of covariance on the data obtained for hemoglobin of the pre, post and adjusted post-test of aerobic, yoga, combined training groups and control group have been presented in Table I.

Table I shows the analysed data of hemoglobin. The hemoglobin pre means were  $12.38 \pm 1.27$  for the aerobic training group,  $12.44 \pm 1.12$  for the yoga training group,  $12.42 \pm 1.22$  for combined training group and  $12.36 \pm 1.08$  for the control group. The resultant 'F' ratio of 1.26 was not significant at .05 levels indicating that the three groups were no significant variation. The post test means were  $14.86 \pm 1.32$  for the aerobic training group,  $14.42 \pm 1.08$  for the yoga training group,  $15.14 \pm 1.14$  for combined training group and  $12.68 \pm 1.12$  for the control

group. The resultant 'F' ratio of 10.75 at .05 level indicating that was a significant difference. The difference between the adjusted post-test means of 14.92 for the aerobic training group, 14.46 for the yoga training group, 15.12 for combined training group and 12.72 for the control group yield on 'F' ratio 32.43 which was significant at.05 level.

**Table – I** Analysis of covariance of data on hemoglobin between pre-test, post-test and adjusted post-test of aerobic, yoga, combined training groups and control group

Test	A T	Y T	C T	C G	'F' Ratio
<b>Pre Test</b>					
<b>Mean</b>	12.38	12.44	12.42	12.36	1.26
<b>σ</b>	1.27	1.12	1.22	1.08	
<b>Post Test</b>					
<b>Mean</b>	14.86	14.42	15.14	12.68	10.75*
<b>σ</b>	1.32	1.08	1.14	1.12	
<b>Adjusted Post Test</b>					
<b>Mean</b>	14.92	14.46	15.12	12.72	32.43*

(The table value required for significance at .05 level with df 3 & 56 is 2.77 and 3 & 55 is 2.78).

**Table II** Scheffe's test for the difference between the adjusted post-test paired means of haemoglobin

Adjusted Post-Test Means				Mean Diff.	C I
A T	Y T	C T	Control Group		
14.92	14.46			0.46	1.24
14.92		15.12		0.20	
14.92			12.72	2.20*	
	14.46	15.12		0.66	
	14.46		12.72	1.74*	
		15.12	12.72	2.40*	

The results of the study indicate that there is a significant difference among aerobic training, yoga training, combined training and control groups on the hemoglobin. To determine which of the paired means had a significant difference, Scheffe's post-hoc test was applied and the results are presented in Table II.

The adjusted post test mean difference of hemoglobin between aerobic training and control group (2.20), yoga training and control group (1.74), combined training and control group (2.40) were

greater than the required confidence interval of 1.24. The results of the study indicate that there were significant differences between control group and experimental groups and there was no significant difference between the experimental groups.

**Discussion/ Conclusion**

The results of the study proved that there were significant differences between control group and aerobic training, yoga training and combined training group. The twelve weeks of experimental treatment significantly influence on hemoglobin content in school girls. However, there was no significant difference between experimental groups. The above results are supported by Heimo Mairbaurl [9], Carranque and others [10] and Krishna Sharma, Thirumaleshwara, Udayakumara and Savitha [11].

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