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## Effect of Isolated and Combined Training of Aerobic and Yoga on Leukocytes 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 leukocytes 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 erythrocytes prior to and immediately after the training period. The selected criterion variable such as erythrocytes 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 erythrocytes.*

**Keywords:** *erythrocytes, aerobic training, yogic training, combined training, school students*

### 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). White blood cells (WBCs), also called leukocytes or leucocytes, are the cells of the immune system that are involved in defending the body against both infectious disease and foreign invaders. All leukocytes are produced and derived from a multipotent cell in the bone marrow known as a hematopoietic stem cell. Leukocytes are found throughout the body, including the blood and lymphatic system (6).

#### **A. Objectives of the study**

The main objective of the study was to assess the effect of aerobic training, yoga training and combined training on leukocytes which would help to enhance physical fitness of school students. The present study was designed to obtain the data on the school students from INDUS International School, Bangalore.

#### **B. Statement of the problem**

The purpose of the study was to determine the effect of isolated and combined training of aerobic and yoga on leukocytes among school students.

#### **C. Delimitations**

1. The study was delimited to INDUS International School, Bangalore.
2. The study was delimited to 60 school girls, their age was 15 to 18 years.
3. The study was restricted to the dependent variable is leukocytes and independent variables are aerobic training, yoga training and combined training.

#### **D. Significance of the Study**

1. The findings of the study may be helpful for school students to apply aerobic, yoga and combined training which will help in better health and fitness.
2. The findings of the study would be helpful for the exercise physiologist to know the role of erythrocytes influence their physical fitness.
3. The results of the study may be helpful to fitness trainers, coaches, physical educationist and exercise physiologists to design proper training protocol for other populations.

### **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 leukocytes.

### A. Test Administration – Estimation of Leukocytes

A1 in 20 dilution of blood was made of adding 20 ml of blood in to 0.38 ml of diluting fluid in a 75 × 10 mm glass tube. After tightly corking the tube, the suspension was mixed by rotating the tube at least one minute. The improved neubeaus counting chamber with its cover glass already in position was filled by means of a past our pipette. The red cells were analysed by the diluting the fluid but the leukocytes remained in fact, their nuclei staining deep violet blank. The cells were counted width 16 mm objective and × 10 eye pieces. The counting was done from all the smaller squares of the four corner white blood corpuscles counting areas. Thus the total area counted was 4 sq mm (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 statistical analysis comparing the initial and final means of blood parameter, leukocytes due to aerobic, yoga and combined training have been presented in Table 1.

**TABLE 1. COMPUTATION OF ANALYSIS OF COVARIANCE ON ERYTHROCYTES**

Test	Aerobic Training	Yoga Training	Combined Training	Control Group	Source of Variance	Sum of Squares	df	Mean Squares	Obtained 'F' Ratio
Pre-Test									
Mean	4.78	4.82	4.73	4.75	<b>B:</b>	5.64	3	1.88	0.18
S.D.	1.22	1.14	1.32	1.42	<b>W:</b>	586.88	56	10.48	
Post-test									
Mean	6.42	6.22	6.50	4.88	<b>B:</b>	8.82	3	2.94	16.33*
S.D.	1.14	1.16	1.25	1.32	<b>W:</b>	10.08	56	0.18	
Adjusted Post-test									
Mean	6.34	6.12	6.52	4.86	<b>B:</b>	9.28	3	3.10	20.67*
					<b>W:</b>	8.25	55	0.15	

\*Significant at 0.05 level of confidence.

The table value for significance at 0.05 level with df 3 and 56 and 3 and 55 are 3.16 and 3.03 respectively.

The table 1 shows that the pre-test means of aerobic, yoga, combined training groups and control group are 4.78, 4.82, 4.73 and 4.75 respectively. The obtained 'F' ratio of 0.18 for pre-test means is less than the table value of 3.16 for df 3 and 56 required for significance at 0.05 level. The post-test means of aerobic, yoga, combined training groups and control group are 6.42, 6.22, 6.50 and 4.88 respectively. The obtained 'F' ratio of 16.33 for post-test mean is more than the table value 3.16 for df 3 and 56 required for significance at 0.05 level.

The adjusted post-test means of aerobic, yoga, combined training groups and control group are 6.34, 6.12, 6.52 and 4.86 respectively. The obtained 'F' ratio of 20.67 for adjusted post-test means is more than the table value of 3.03 for df 3 and 55 required for significance at 0.05 level.

The result of the study indicates that there is a significant difference among adjusted post-test means of aerobic, yoga, combined training groups and control group. To determine the significant difference among the four paired means, Scheffe’S post-hoc test was applied and the results are presented in Table 2.

**Table 2. SCHEFFE’S TEST FOR THE DIFFERENCE BETWEEN THE ADJUSTED POST-TEST PAIRED MEANS OF LEUKOCYTES**

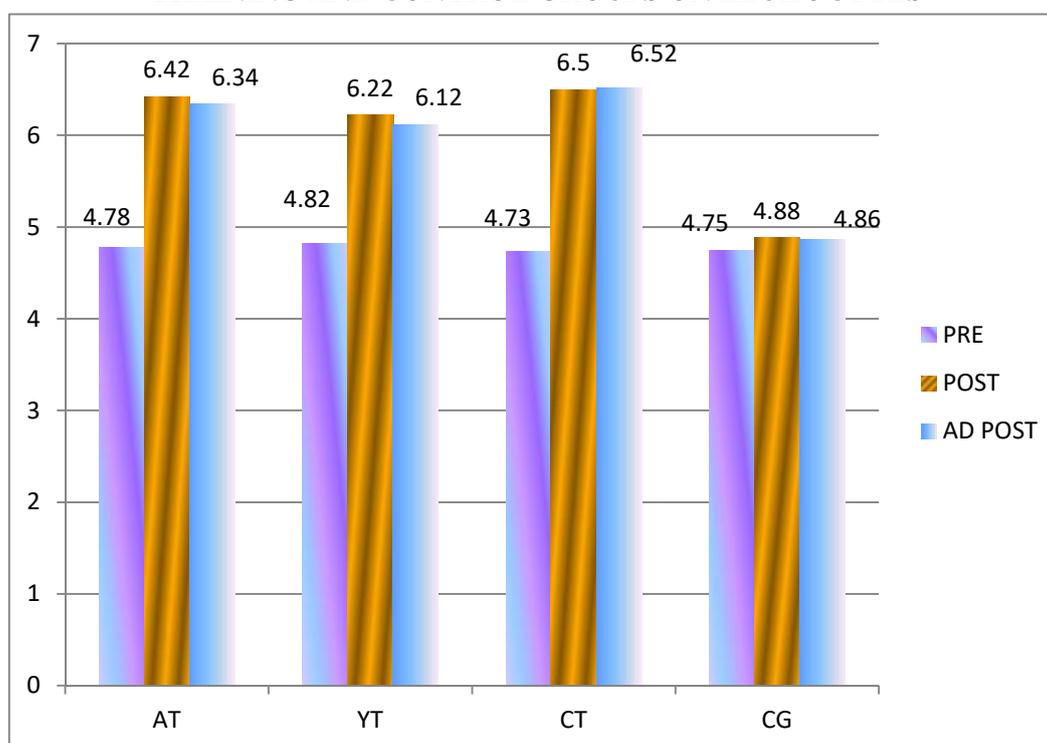
Adjusted Post-test Means				Mean Differences	Confidence Interval
Aerobic Training	Yoga Training	Combined Training	Control group		
6.34	6.12			0.22	1.18
6.34		6.52		0.18	1.18
6.34			4.86	1.48*	1.18
	6.12	6.52		0.40	1.18
	6.12		4.86	1.26*	1.18
		6.52	4.86	1.66*	1.18

\*Significant at 0.05 level of confidence.

Table 2 shows that the adjusted post-test mean difference in leukocytes between aerobic training and control, yoga training and control and combined training and control groups are 1.48, 1.26 and 1.66 respectively, which are higher than the confidence interval value of 1.18. But aerobic and yoga training, aerobic and combined training and yoga and combined training mean difference are 0.22, 0.18 and 0.40 respectively, which are lesser than the confidence interval value of 1.18.

The adjusted post-test mean values of aerobic, yoga, combined training groups and control group on leukocytes were graphically represented in Figure 1.

**FIGURE 1. MEAN VALUES OF AEROBIC TRAINING, YOGA TRAINING, COMBINED TRAINING AND CONTROL GROUPS ON LEUKOCYTES**



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## DISCUSSION/CONCLUSIONS

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 leukocytes content in school girls. However, there was no significant difference between experimental groups. The above results are supported by Lamina and Okoye (9), Defence and Civil Institute of Environmental Medicine (10), Deilami, Sangari and Taghi Shojaeimehr (11) and Gamit (12).

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