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## Effects of a low intensity circuit resistance exercise session on selected hematological parameters of male college students

**Pukhraj Singh****Abstract**

The purpose of the study was to find the effects of a circuit resistance training session with a light intensity on some hematological parameters of male students of Physical Education. The present study was conducted on a sample of twenty (N=20), of age ranging from 18 to 28 years. Firstly, blood samples were collected from the samples before performed the exercise then subjects in the group were asked to perform 10-step circuit exercise for three non-stop alternating rounds with a rest period at each round. Hematological parameters measured included white blood cells, platelet variables, and red blood cells. Data was analyzed using SPSS software, To compare the means before and after the exercise, the 't'-test was used. There was significant difference was found between pre and post test, on the account of red blood cell count, platelet, hemoglobin and hematocrit. However, in respect to White blood cell count data shows insignificant differences between pre and post test.

**Keywords:** Red blood cells, exercise, college students

**Introduction**

Hematology is a branch of medicine concerning the study of blood, the blood-forming organs, and blood diseases. The word "heme" comes from the Greek for blood. Hematology, also spelled haematology (from the Greek *αἷμα*, *haima* "blood," and *-λογία*), is the branch of medicine concerned with the study, diagnosis, treatment, and prevention of diseases related to the blood. Hematology includes the study of etiology. It involves treating diseases that affect the production of blood and its components, such as blood cells, hemoglobin, blood proteins, bone marrow, platelets, blood vessels, spleen, and the mechanism of coagulation. The laboratory work that goes into the study of blood is frequently performed by a medical technologist or medical laboratory scientist.

Blood is a bodily fluid in humans and other animals that delivers necessary substances such as nutrients and oxygen to the cells and transports metabolic waste products away from those same cells. [1] When it reaches the lungs, gas exchange occurs when carbon dioxide is diffused out of the blood into the pulmonary alveoli and oxygen is diffused into the blood. This oxygenated blood is pumped to the left hand side of the heart in the pulmonary vein and enters the left atrium. From here it passes through the mitral valve, through the ventricle and taken all around the body by the aorta. Blood contains antibodies, nutrients, oxygen and much more to help the body work. The main function of red blood cells in exercise is the transport of O<sub>2</sub> from the lungs to the tissues and the delivery of metabolically produced CO<sub>2</sub> to the lungs for expiration. Hemoglobin also contributes to the blood's buffering capacity.

**Methodology**

The study was conducted on 20 male students of Physical Education of Chaudhary Devil al University, Sirsa (Haryana) India. The age range of students was 18 to 28 years. Conditions for selection of subjects included non-use of drugs and supplements and also medication, personal health, and not having the history of blood diseases or diseases affecting platelet variables. All the participants were informed about the aim and methodology of the study and they volunteered to participate in this study. The purposive sampling technique was used to select the subjects.

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### Exercise protocol

On study day, the subjects were asked to do an exercise with weight including 10 motions (Biceps with barbell, sit-up, triceps with barbell, trunk extension, ninety-degree Scott, supine bench press, knee flexion, standing shoulder press, dead lift, and sitting paddle lift with device) with 35% of a maximum repetition in 3 rounds. In this exercise which lasted 21 minutes, a 5-minute gentle warm-up was done at first, each station (motion) took 20 seconds (8-10 repetitions on average) with no rest period, and there was one minute of active rest after each round.

### Blood samples and Measurements

10cc bloods were taken from brachial vein of the subjects using venoject needles before and immediately after the exercise session while they were sitting. In order to equalize the dietary conditions of subjects before the training session, they were asked to fast for at least 12 hours. Blood samples were taken immediately to the laboratory and centrifuged with

1500 rounds for 10-15 minutes. Then, the supernatant fluid (blood plasma) was taken immediately and used for measurement of white blood cells (WBC), platelet (PLT), and red blood cells (RBC). Plasma volume was calculated using the formula based on hemoglobin and hematocrit (6). All above-mentioned variables were measured by the automated system of hematology analyzer of Sysmex (kx-21). Weight and height of were measured by digital scale BEURER (model ps06m42, made in Germany) and scaled wall and BMI was calculated by the following formula  $\text{Weight/Height}^2$ .

### Statistical Analysis

The Statistical Package for the Social Sciences (SPSS) version 16.0 was used in data analyses. The data pertaining to two groups was analyzed with the help of t-test. The level of significance was set at 0.05.

### Results

**Table 1:** Physical Characteristics of Physical Education Students before Test and after Test

Variables	Mean		SD		't' Value
	Pre-Test	Post-Test	Pre-Test	Post-Test	
Age (Year)	23.09	23.09	1.89	1.89	-
Height (cm)	182.27	182.27	5.29	5.29	-
Body Weight (kg)	83.66	82.91	11.87	12.05	0.198
Body Mass Index {Kg/(m) <sup>2</sup> }	25.2	25	3.11	3.17	0.020
Body Fat Percentage (%)	12.22	11.74	2.81	2.33	0.588

Table 1 shows the mean, SD and 't' value between pre-test and post-test of student of physical education. The mean of age was 23.09 and 23.09 respectively of pre-test and post-test. The mean of height was 182.27 and 182.27 respectively of pre-test and post-test. The mean of Body weight was 23.09 and 23.09 respectively of pre-test and post-test and the 't'

value was 0.198. The mean of Body mass index was 25.02 and 25 respectively of pre-test and post-test and the 't' value was 0.020. The mean of Body fat percentage was 12.22 and 11.74 respectively of pre-test and post-test and the 't' value was 0.588.

**Table 2:** Comparison of Hematological Variables between Pre-Test and Post-Test

Variables	Mean		SD		't' Value
	Pre-Test	Post-Test	Pre-Test	Post-Test	
White Blood Cell Count ( $\times 10^3/\mu\text{L}$ )	6.68	6.80	1.80	1.12	0.304
Red Blood Cell Count ( $\times 10^6/\mu\text{L}$ )	4.87	5.29	0.38	0.47	3.107*
Platelet count ( $\times 10^3/\mu\text{L}$ )	231.83	294.47	72.10	86.09	2.494*
Hemoglobin (g/L)	14.10	14.96	0.81	1.03	2.930*
Hematocrit (%)	43.56	45.44	2.23	2.48	2.52*

Table 2 shows the mean, SD and 't' value of selected hematological variables between pre-test and post-test of student of physical education. The mean of white blood cell count was 6.68 and 6.80 respectively of pre-test and post-test and the 't' value was 0.304, which was not significant at the level of 0.05 on tabulated value. The mean of red blood cell count was 4.87 and 5.29 respectively of pre-test and post-test and the 't' value was 3.107, which was significant at the level of 0.05 on tabulated value. The mean of platelet count was 231.83 and 294.47 respectively of pre-test and post-test and the 't' value was 2.494, which was significant at the level of 0.05 on tabulated value. The mean of hemoglobin was 14.10 and 14.96 respectively of pre-test and post-test and the 't' value was 2.930, which was significant at the level of 0.05 on tabulated value. The mean of hematocrit was 43.56 and 45.44 respectively of pre-test and post-test and the 't' value was 2.52, which was significant at the level of 0.05 on tabulated value.

### Discussion

The present study examined the effect of a circuit resistance

training session on some hematological parameters such as white blood cell count, red blood cell count, platelet, hemoglobin and hematocrit. All variables were significant at the table value except the white blood cell count. Results firstly show that the selected activity of the present study did not induce any significant change in parameter related white blood cells. Tayebi *et al* (2005) <sup>[1, 2]</sup> observed a significant increase in WBC, PLT, and MPV in the blood of 10 students of Physical Education after a session of continuative-periodic circuit resistance training (No rest at the stations). Ghanbari *et al* (2005) <sup>[1, 2]</sup> also found a significant increase in PLT, MPV, P-LCR, and WBC after a session of circuit resistance training in 14 students of Physical Education. Karakoc *et al* (2005) <sup>[5]</sup> found a significant decrease in HGB and MCV and no significant change in RDW and RBC. He attributes the significant decrease in HGB and MCV to haemodilution caused by shear rate occurring at the end of training session and also increased content of Na<sup>+</sup> of plasma which facilitates the fluid entry into the plasma space. Wu HJ *et al* (2004) <sup>[4]</sup> observed no significant change in RBC, MCV, MCH, MCHC,

RDW, HGB, and HCT. Tayebi *et al* (2005) <sup>[1, 2]</sup> reported a significant decrease in RDW and a significant increase in MVC in 10 students of Physical Education after a session of circuit resistance training.

### Conclusion

There was significant difference was found between pre and post test, on the account of red blood cell count, platelet, hemoglobin and hematocrit. However, in respect to White blood cell count data shows insignificant differences between pre and post test. Despite the available information, the point that is not exactly answered is that what volume of exercise intensity can have the best impact on hematological parameters and how possible changes in blood parameters can be optimally used to increase physical work and exercise capacity. Given that few papers have been published on the effects of exercises and especially resistances exercise on hematological parameters, the importance of conducting studies on this topic becomes doubled.

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