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J S M T JOURNAL OF SPORTS MEDICINE AND THERAPY
ISSN 2573-1726

Research Article

Acute Effect of Resistance Exercise on Hemoglobin Level (HBG) Among Physically Trained Boys

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Abstract

Introduction: In this research, the examination of the acute effect of resistance exercise on hemoglobin level of physically trained boys has been aimed.

Methods: Ten (10) physical education male students with an average age of 23.16 ± 1.85 years participated in this study on voluntary basis. Hemoglobin level (HBG) of the students were analyzed Before Exercise (BE) and just after 35 minutes of resistance exercise (AE).

In order to determine Hemoglobin level, blood samples with 5 ml EDTA were taken from the forearm ante-cubical area before and after resistance exercise, and analyzed in laboratory with using auto-analyzer (Sysmex XP- 100).

Results: Measurement results were presented as average and standard deviation. Student's t-test for dependent samples was used in order to make a comparison between BE and AE values. $p < -0.01$ value was considered to be significant. The result of the study revealed that, the increase in AE than BE values for Hemoglobin level significantly.

Conclusion: Conclusively Hemoglobin level displayed significant increase in relation to acute resistance exercises.

More Information

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Submitted: April 08, 2025
Approved: April 17, 2025
Published: April 18, 2025

How to cite this article: Ghosh A, Mukhopadhyay K. Acute Effect of Resistance Exercise on Hemoglobin Level (HBG) Among Physically Trained Boys. J Sports Med Ther. 2025; 10(2): 027-030. Available from: https://dx.doi.org/10.29328/journal.jsmt.1001093

Keywords: Hemoglobin; Resistance exercise, Acute effect

Introduction

In sports, blood plays a critical role as it transport oxygen, carbon dioxide, and other substances required for normal functioning of tissue [1]. Blood is typically composed of plasma, Red Blood Cells (RBC), white blood cells (WBC) and platelets. Hemoglobin and water are the predominant parts of crimson blood cellsrefers to red blood cells, which are also known as erythrocytes. Red blood cells and hemoglobin, are responsible for moving nutrients and oxygen to active tissues, andremovingmetabolic wastefrom tissues. Again, it's been proven that physical exerciseis able to enhance the cardio-respiratory capabilities.One particularly essential issue is oxygen transportation, which plays an important role for optimal functioning of aerobic capacity. In addition, RBC depend, hemoglobin stage and hematocrit greatly affect the supply of oxygen to tissues and excretion of carbon dioxide [2].

Prolonged periods of normal exercises make high quality contributions into human organism reported by different studies. Researchers have stated thatphysical exercise ispromotes positive quality in physical, physiological, mental and motor functions of an individual. The evaluation of hematology proven that, the effect of regular exercise on hematology is distinctive. It is said that those variations of hematological parameters rely on the intensity, duration and frequency of exercise with physical and physiological conditions of individuals [3]. Furthermore, the severity, period and frequency of exercising should be well-organized to have similar fine influence on blood biochemistry [4].

There is no complete agreement on how exercise impacts hematology. Research on this topic includes remarkable results regarding blood biochemistry that depend on the type of exercise performed. While some studies indicate a decrease [5] in blood biochemistry, others show an increase [4,6] resulting from both acute and chronic physical activities. Additionally, some research indicates that hematological values remain unchanged with exercise [7]. Examining the changes in hematological parameters resulting from regular

physical education in trained athletes could provide valuable insights for the advancement of effective combined sports.

A major mechanism optimizing O_2 transport by hemoglobin is the change in Hb-O_2 affinity. Changes are very fast and actually occur while red blood cells pass through blood capillaries. Effects of altered Hb-O_2 affinity on O_2 transport are independent of Hb concentration and total Hb mass in circulation and thus add to the adjustment by changes in erythropoiesis [8].The biological significance of O_2 transport by Hb is well-illustrated by anemia where decreased Hb also decreases exercise performance despite a compensatory increase in cardiac output [9], and by improved aerobic performance upon increasing total Hb [10].

Strength training can help improvemetabolism, bone density, muscular strength, endurance, Strength training is beneficial for anemia as it can increase muscle mass and red blood cell production, boosting hemoglobin levels and oxygen delivery to tissues. Dumbbells, kettlebells, and resistance bands can be used to increase resistance. To continue challenging one's muscles, gradually increase the weight or resistance over time reported by Emily Cronkleton, 2023 [11].

Very few research has been conducted to evaluate immediate effect of resistance exercise on healthy trained individual. Keeping the view in mind the researcher conducted the present study to investigate the acute effect of resistance exercise on hemoglobin level of physically trained boys.

Materials and methods

Participants

Ten (10) physically trained boys with an average age of 23.16 ± 1.85 years who were studding in bachelor of Physical Education,participated in this study on voluntary basis. These subjects were healthy, nonsmokers, without history of hematological disease and free of infection.

Study design

Blood was taken from every ten subjects before and just after the resistance exercise. The subject was selected randomly following simple random sampling technique. The design of the study was single group experimental study.

Total 35 min exercise season was administrated in the following manner 15 min exercise then 5min rest and again 15 min exercise. Figure 1 represent the experimental protocol.

Data collection

Blood samples were taken in the morning from 7:00 to 8:00 am. Blood samples with 5 ml EDTA (Ethylenediaminetetraacetic acid) were taken from players in the forearm ante cubical area, in line with hygiene rules before and immediate after the resistance exercise. Hemoglobin levels were analyzed by the expert pathologist at standard laboratory with Sixmex auto-hemato analyzer (Table 1).

Statistics analysis

The results were presented as average and standard deviation. Student T-test for dependant samples was used in order to make a comparison between Pre and post exercise values. The level of significant was fixed at 0.01 level of confidence ($p < 0.01$.).

Before T-test the data were assessed for normality using the Shapiro-Wilk test ($\alpha = 0.05$), which indicated no significant deviation from a normal distribution ($p = 0.741$), (Table 2).

Results

The findings of the study indicate that Hemoglobin level of physically trained boys were significantly increase immediate after 35 minutes of resistance exercise. Though pre-exercise and post exercise both values of hemoglobin level are in between the normal pathological range. Student t test of the subjects indicated significant improvement after resistance exercise (Table 3).

Interpretation of Table:

Significant change in Hemoglobin was evident in pre and postresistance exercise ($t = 12.0933$, $p < 0.01$).

Cohen's d = (14.78 - 13.48) / 1.362711 = 0.953981 [12].

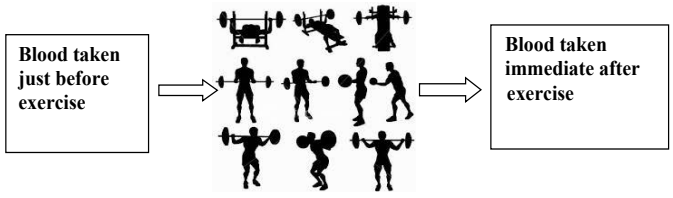

Figure 1: Experimental Protocol of the study.

Table 1: represents the Exercise protocol of the study.

Exercise protocol			
	15 minute	5 minute interval	15 minute
Type of exercise	Push-Up & Squat		Overhead press & Leg press
Repetition	12 x 3		10 x 3
Intensity	Sub maximal (75%)		Sub maximal (75%)

Table 2: Results of Shapiro-Wilk test [25].

Normality p - value	0.741
A priori power	0.2932
Post hoc power	0.181
Skewness	-0.701
Skewness Shape	Potentially Symmetrical (p - value = 0.308)
Excess kurtosis	1.4517
Kurtosis Shape	Potentially Mesokurtic, normal like tails (p - value = 0.277)

Table 3: T Test of hemoglobin level of the sample of the study.

Status of Haemoglobin level (gm/dL)					
		Mean	SD	t - value	p - value
HBG	Pre exercise	13.48	1.406	12.0933	0.000001*
	Post exercise	14.78	1.318		
$p < 0.01$*		or gm/dl			

The *d* - value of 0.953981 falls well into the "large" effect size category, indicating a substantial difference between the groups.

Discussion

In this present study it is found that the mean hemoglobin level of the students was increased significantly after exercise. This finding is support the outcomes of [13] but it is contradict with the findings of [14]. The increase in hemoglobin attention due to acute exercising is on the whole due to motion of fluid among vascular and interstitial cubicles [15]. [16] shows the importance of normal workout in enhancing sustained ability to supply oxygen to the tissues at raised stage on demand and through increasing cardiac output through diverting iron stores in the direction of synthesis hemoglobin. Upward push in hemoglobin may be due to lower in plasma extent is main to increase in hemoglobin [17]. Figure 2. Represents the hemoglobin level of the subject of the study before and immediate after the exercise protocol.

Hemoglobin has a crucial position in the human body that is carrying oxygen to tissues along with red blood cells [18]. The ability of the coronary heart, lungs and blood to do bodily activity is strongly stimulated by means of VO2max [19]. Therefore, the extended capability of blood to bind oxygen level inside the blood also cans growth VO2max positively. Hemoglobin and ordinary bodily activity carried out via a person are matters which might be interconnected [20,21]. The relationship among physical activity performed by a person in opposition to a person's hemoglobin stage while doing physical exercise, including workout, there is a excessive growth in metabolic interest resulting in a decrease in pH. This reasons hemoglobin to launch more oxygen, then it increases oxygen transport to the muscular tissues. Exercising or involvement in physical activity can increase hemoglobin ranges within the blood. This is in accordance and is the reason that, workoutcan boom overall Hemoglobin and red cell mass, which enhances oxygen-carrying potential [22]. Exercisingcan increase the HBG and red blood cell mass, whichwill increase oxygen wearing ability in order that with dependent exercising the hemoglobin level within the blood which functions to bind oxygen within the blood and loosen up it for the duration of the frame can even growth. For the duration of workout, thebody wishes more oxygen than ordinary every day work. All the demand for oxygen is obtained from the bloodstream inside the muscular tissues. This is according which explainsthat, at some stage in exercisingtheextended demand for oxygen is met with the aid of active muscle blood flow [8,23]. Moreover, provideexplanations for that Hb-mass are therefore different physiological parameters, which might also exert exceptional outcomes on endurance performance [24]. This means that the hemoglobin level may have a special impact on someone's endurance.

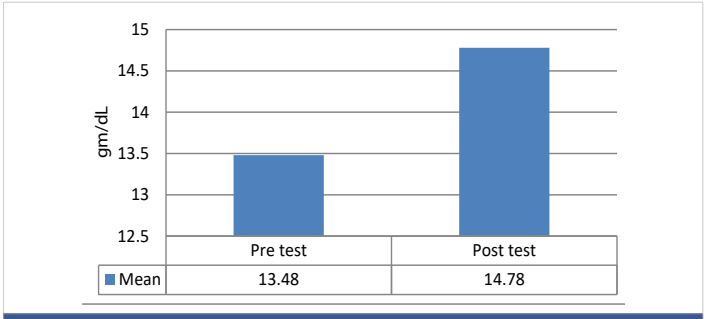

Figure 2: Haemoglobin status of pre and post resistance exercise.

Conclusion

From the results of the present study, it can be concluded that Hemoglobin level displayed significant incensement in relation to acute resistance exercises. Though there is some controversy with the other studies, researcher thought that experiment with more number of subjects and various duration of exercise may throw more light on this problem. However, from the above study it can be conclude that, hemoglobin level significantly increased following resistance exercise among trained male students.

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