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A study on the effect of sub-maximal and maximal load of bicycle training on selected haematological variables among college men players

Sandeep Singh

M.Phil Department of Physical Education, Tamil Nadu Physical Education and Sports University, Chennai, Tamil Nadu, India

Abstract

The purpose of this study was to find out the effect of sub maximal and maximal intensities of bicycle training on selected haematological variables among college men players. To achieve the purpose of the study 30 male college players from the different colleges were randomly selected as subjects and their age were 20-25 years. They were assigned into three groups namely, experimental group I, experimental group II and control group. Experimental group I served as bicycle sub maximal training group-I, second group served as bicycle maximal training group-II and third group served as control group. The selected haematological variables are haemoglobin and red blood cell.

The study was true formulated as a true random group design consisting of pre-test and post-test. The subjects (N=30) were randomly assigned to three equal group of ten male adults each. The groups were assigned as experimental group-I (sub maximal bicycle training), experimental group-II (maximal bicycle training) and control group respectively. Pre-test were conducted for all the selected subjects on selected haematological variables. After the experimental period of six weeks post-test were conducted and the scores were recorded. The difference between initial and final scores in selected haematological variables were subjected to statistical treatment using Analysis of Covariance to find out whether the mean differences were significant or not.

The result showed that there was significant difference due to sub maximal intensity bicycle training and maximal bicycle training among selected haematological variables i.e. sub maximal intensity bicycle training significantly increased red blood cell than maximal and control group and sub maximal intensity bicycle training significantly increased haemoglobin than maximal and control group.

Keywords: Effect, maximal load of bicycle, haematological

1. Introduction

In the words of Csamadi (1966) "training is a pedagogical process which makes possible the achievement of high standard performances without any physical or mental damage, through the planned systematic development of certain specific skills, physical capabilities and the adaptation of the organism".

In maximal load the enhancement of capacity is greater when load of 90 to 100 % of the individual capacity are imposed. Maximal load are potentially injuries and painful and re utilized mainly by athletes in their final training for championship performance.

For optimal stability and posture, it is better to use sub maximal or low load, or minimal, which is less than 25% of IRM (I Repetition Maximum).

Haemoglobin and red blood cells and its importance: The major function of blood is the transport of the tissues to the lungs. The transport of oxygen is accomplished by haemoglobin, the iron- protein molecule carried by the red blood cells. The red blood cells also contain a large quantity of carbonic anhydrites, which catalyses the reaction between carbon dioxide and water to facilitate the removal of carbon dioxide. The regular exercise results in increase in the number of red blood cells circulating in the blood. The improved oxygen carrying and waste removal capacity further increases work load capacity. (Lee, 1989)

The amount of haemoglobin, and the volume percentage of the red blood cell are critical factors in oxygen association. Both haemoglobin and haemotocrit levels increase with maximum exercise, largely because of increased haemo concentration, due to slight decrease of blood plasma volume. During exercise blood plasma shifts to the tissues, where it is needed to maintain water balance (McArdle *et al.* 1986).

1.1 Selection of Subjects

To facilitate the study, 30 male college players from the different colleges were randomly selected as subjects and their age were 20-25 years. They were assigned into three groups, namely, experimental group I, experimental group II and control group. Experimental group I served as bicycle sub maximal training group I, second group served bicycle maximal training group II and third group served as control group.

1.2 Selection of Variables

The research scholar reviewed the various scientific literatures pertaining to bicycle training on selected health related fitness variables from books, journals and research papers, taking into consideration the feasibility of criteria, availability of instruments and the relevance of the present study, the following variables were selected.

1.3 Dependent variables

The following health related fitness variables were selected as dependent variables.

1.4 Haematological Variables: (a) Red blood cell
(b) Haemoglobin

1.5 Independent Variables
(a) Six weeks of sub maximal bicycle training
(b) Six weeks of maximal bicycle training

1.6 Experimental Design
The study was formulated as a true random group design consisting of a pre-test and post-test. The subjects (N=30) were randomly assigned to three equal groups of ten male adults each. The groups were assigned as experimental group I (sub maximal bicycle training), experimental group II (maximal bicycle training) and control group respectively. Pre tests were conducted for all the 30 subjects on selected haematological variables. After experimental period of six weeks post-test were conducted and the scores were recorded.
The post tests were conducted on the above said dependent variables after a period of six weeks training on varied bicycle packages. The training programme was scheduled at 7:30 a.m. to 10:30 a.m., five days a week.

1.7 Criterion Measures
By glancing the literature in consultation with professionals and experts the following variables were selected as the criterion measures in the study.
1. Haemoglobin was estimated by the acid haematin method using Sahle's Haemocytometer in a laboratory
2. The number red blood cell (RBC) were determined by suitable dilution and enumerated over a definite area in a laboratory condition.

1.8 Reliability of Data
The reliability of data was ensured by establishing the instrument reliability, tester's competency and subject reliability.

1.9 Instrument Reliability
Japan made stop watches calibrated to 1/100th of a second were used in this study for recording timings and this stop watches times were compared with other watches in different situations and they were considered reliable. A standard steel tape was used to measuring the tests, all the instruments used were standard and therefore their calibration were accepted accurate enough for the purpose of the study.

1.10 Tester's Competency
Reliability was established by the test re-test processes. Subjects from all the three groups were tested on selected Variables. The repeated measurement of individuals on the same test is done to determine reliability. It is a univariate not a bivariate situation, it makes sense then to use a univariate statistics like correlation coefficient (Baumgartner and Jackson, 1975)
The inter class correlation coefficient obtained for test-retest data are presented in table I

Table 1: Inter Class Correlation Coefficient of Test-Retest Scores

S. No.	Variables	Coefficient of Correlation
1	Haemoglobin	0.88*
2	Red blood cell	0.87*

*Significant at 0.05 level

1.11 Subjects Reliability
The inter class correlation value of the above test and retest also indicated subject reliability as the same testers. The co-efficient of reliability were significant at 0.05 level, for the above test under investigation.

1.12 Training Programme
It was most essential to warm up before every session. The methods of doing sub-maximal and maximal bicycle training were explained to the experimental groups before starting the training. The researcher himself demonstrated the exercises to the subjects. The following were the two different trainings given to experimental group I and experimental group II respectively.

1.13 Description of the Sub Maximal Bicycle Training
The sub maximal bicycle training for the purpose of this study was fixed at 40 RPM. At 40 RPM the delay level was fixed at 66, pedal forward on for 2101 ms and pedal forward off for 1061 ms. The workout was scheduled to take for ten minutes in a day. Five days in a week and the treatment was given for six weeks.

1.14 Description of the Maximal Bicycle Training
The maximal bicycle training for training for the purpose of this study was fixed at 75 RPM. At 75 RPM the delay level was fixed at 100, maximum on/off ratio 5 and press the relevant button to select 75 RPM for two seconds the workout was scheduled to take for ten minutes in a day. Five days in a week and the treatment was given for six weeks.
The difference between sub-maximal and maximal bicycle training was in maximal bicycle training was, in maximal bicycle training, based on the maximum level the subject could perform.
Thus, the experimental group I was sub-maximal and experimental group II was given maximal bicycle training for a period of six weeks.

1.15 Measurement of Haematological Variables
Haemoglobin
Haemoglobin was estimated by the acid haematin method using Sahle's Haemocytometer in a laboratory
Principle: The haemoglobin was converted into acid haematin by reacting with dilute hydrochloric acid. The resulting brownish mixture was matched with a standard in a calorimeter.
Procedure: Upto two marks of the square tube, the 0.1 N hydrochloric acid was taken. To this 20 micro litre of blood was added and then mixture was allowed to stand until acid haematin was developed. Distilled water was added drop by drop till the colour matched with standard colour of the haemometer. Once the colour matched, the readings were recorded directly.

2. Results: The results were expressed in gram percentage.

2.1 Red blood cell
The number red blood cell (RBC) were determined by suitable dilution and enumerated over a definite area in a laboratory condition.

2.2 Procedure
Blood was drawn upto 0.5 mark of red blood cells pipette. The blood on the sides of the pipette was wiped off. Hayem's fluid was drawn into red blood cells pipette upto 101 mark carefully avoiding haemilysis. First few drops were discarded and then a small drop of mixture was placed at the edge of the cover slip, placed on the haemocytometer, which was focused under the microscope.
It was allowed undisturbed for five minutes so that the cells could settle on the haemocytometer. The number of cells in five small squares were counted.

2.3 Calculation
Number of cells in five small squares = X
Number of cells in a Square millimetre area (25 small squares) = X × 5
Depth (height between the cover slip and counting chamber = 0.1 mm
Dilution factor = 200
Number of cell in 1 cu.mm = X × 5 × 10 × 200
X × 10000
Result were expressed in million / cu. mm of blood.

2.4 Statistical Procedure
The following statistical techniques were used to find the effects of sub-maximal and maximal bicycle training on selected haematological variables among college men players.
Analysis of co-variance statistical technique was used to test the adjusted post-test mean differences among the experimental groups. If the adjusted post test result was significant, the Scheffe's post hoc test was used to determine the significance of the paired mean differences (Thirumalaisamy, 1997)

2.5 Computation of Analysis of Covariance and Post Hoc Test

3. Results on Haemoglobin

Table 2: Computation of Analysis of Covariance on Haemoglobin (Scores in mg/l)

	Maximal Intensity Training	Sub Maximal Intensity Training	Control	Source of Variance	Sum of Squares	df	Mean Squares	Obtained F Ratio
Pre Test Mean	14.73	15.12	15.10	Between	1.23	2	0.61	0.97*
				Within	17.14	27	0.63	
Post Test Mean	15.61	16.70	14.81	Between	18.00	2	9.00	15.58*
				Within	15.60	27	0.58	
Adjusted Post Test Mean	15.71	16.44	14.97	Between	10.16	2	5.08	111.96*
				Within	1.18	26	0.05	
Mean Diff.	0.88	1.58	-0.29					

Table F-ratio at 0.05 level of confidence for 2 and 27 (df)=3.35, 2 and 26 (df)=3.37
*Significant

Table 3: Scheffe's Confidence interval scores on Haemoglobin (Scores in Counts)

Means			Mean Difference	Required C.I.
Maximal Intensity Bicycle Training	Sub-maximal intensity bicycle training	Control		
15.71	16.44		0.73	0.24
15.71		14.97	0.74*	0.24
	16.44	14.97	1.47*	0.24

*Significant

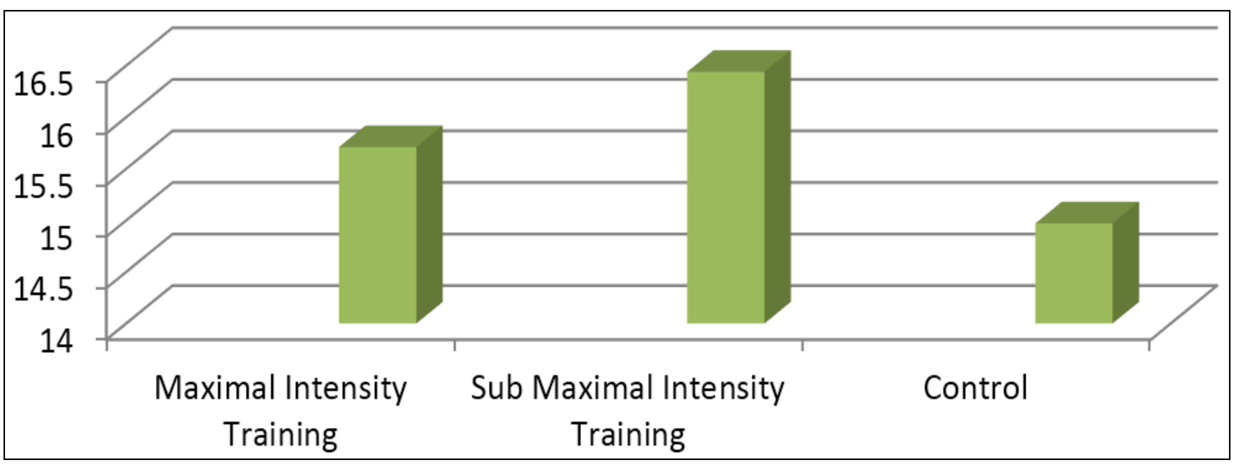

Fig 1: Bar Diagram on ordered Adjusted Means of haemoglobin (Scores in Counts)

Table 4: Computation of Analysis of Covariance on Red blood cell (Scores in mg/l)

	Maximal Intensity Training	Sub Maximal Intensity Training	Control	Source of Variance	Sum of Squares	df	Mean Squares	Obtained F Ratio
Pre Test Mean	5.57	5.21	5.50	Between	0.86	2	0.43	3.23
				Within	3.61	27	0.13	
Post Test Mean	6.28	6.47	5.68	Between	3.40	2	1.70	13.53*
				Within	3.39	27	0.13	
Adjusted Post Test Mean	6.19	6.66	5.59	Between	5.02	2	2.51	57.20*
				Within	1.14	26	0.04	
Mean Diff.	-0.71	1.26	-0.18					

Table F-ratio at 0.05 level of confidence for 2 and 27 (df)=3.35, 2 and 26 (df)=3.37
*Significant

Table 5: Scheffe's Confidence interval scores on Red blood cell (Scores in Numbers)

Means			Mean Difference	Required C.I.
Maximal Intensity Bicycle Training	Sub-maximal intensity bicycle training	Control		
6.19	6.66		-0.47	0.23
6.19		5.59	0.60	0.23
	6.66	5,59	1.07	0.23

*Significant

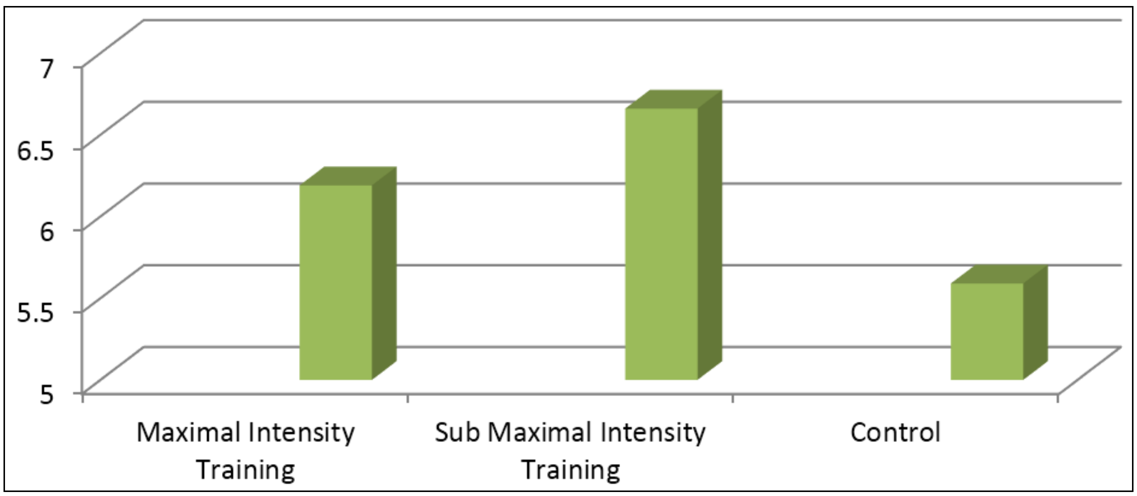

Fig 1: Bar Diagram on Ordered Adjusted Means of Red blood cell (Scores in mg/l)

3.1 Discussions on the Findings of Haemoglobin

The obtained F values on post-test means and the adjusted means on haemoglobin were 15.58 and 111.96 respectively, which were significant at 0.05 level of confidence ass these were greater than the required F value. The post hoc analysis of obtained ordered adjusted means proved that there was significant differences existed between control group and maximal intensity bicycle training group; and sub maximal intensity bicycle training group and control group. This proved that due to six weeks maximal intensity bicycle training and sub maximal intensity bicycle training increased haemoglobin significantly among college players. While considering the two training methods, from the results presented in table III it was found that sub maximal intensity bicycle training groups was better than maximal intensity bicycle training group as there was significant difference among them in haemoglobin.

3.2 Discussions on the findings of Red Blood Cells

The obtained F values on post-test means and the adjusted means on red blood cells were 13.53 and 57.20 respectively, which were significant at 0.05 level of confidence ass these were greater than the required F value. The post hoc analysis of obtained ordered adjusted means proved that there was significant differences existed between control group and maximal intensity bicycle training group; and sub maximal intensity bicycle training group and control group. This proved that due to six weeks maximal intensity bicycle training and sub maximal intensity bicycle training increased haemoglobin significantly among college players. While considering the two training methods, from the results presented in table V it was found that sub maximal intensity bicycle training groups was better than maximal intensity bicycle training group as there was significant difference among them in red blood cells.

4. Results

Results presented in tables II and IV proved that there was significant difference due to sub maximal intensity bicycle training and maximal bicycle training among selected haematological variables i.e. sub maximal intensity bicycle training significantly increased red blood cell than maximal and control group and sub maximal intensity bicycle training significantly increased haemoglobin than maximal and control group. Haematological variable blood sugar was significantly reduced due to maximal intensity training and sub maximal intensity training.

5. Conclusions

(a) It was concluded that sub maximal intensity bicycle training significantly increased haemoglobin than maximal and control group.
(b) It was concluded that sub maximal intensity bicycle training significantly increased total cholesterol than maximal and control group.

6. References

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