



Effect of extensive and intensive interval training on muscular endurance and resting pulse rate among athletes

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Abstract

The purpose of this study find out effect of extensive and intensive interval training on muscular endurance and resting pulse rate among athletes. pre test-post test randomized group design was used for this study. The randomly selected (N=60) college men athletes were divided into three groups randomly consisting of twenty college men in each. Before the training pre test was taken for all the groups on muscular endurance and resting pulse rate. Experimental group I underwent extensive interval training, experimental group II underwent intensive interval training for twelve weeks. The control group did not undergo any type of training. At the end of twelve weeks the post test was conducted on selected variables. The difference between initial and final test scores was considered as the effect of respective training on selected criterion variables. To test the significance the obtained data were subjected to statistical treatment using ANCOVA. In all cases 0.05 level was fixed to test the hypothesis of this study.

Keywords: muscular endurance and resting pulse rate

Introduction

Life will not be a life without physical activities. Through physical activities alone people were able to survive in earth. The story of evolution throws some light on the nature and type of activities which are an essential part of modern physical activities which are to be fit for day to day existence and to meet the occasional emergencies that arise. Whatever may the emergency that trust itself on individuals the human beings have to readjust and carry on.

Objectives of the Study

The following were the objectives of this study.

1. This study was to assess the present status of college level men athletes' muscular endurance and to find out how far extensive interval training and intensive interval training could be modified through these two experimental treatments.
2. This study was to assess the present status of college level men athletes' resting pulse rate, find out how far extensive interval training and intensive interval training could influence these physiological among college level men athletes.
3. This study would further high light which of the two experimental treatments, namely, extensive interval training or intensive interval training was more beneficial to alter selected Muscule endurance and resting pulse ratr of college men athletes.

Statement of the Problem

The purpose of the study was to find out the effect of extensive and intensive interval training on muscular endurance and resting pulse rate among athletes

Hypothesis

It was hypothesized that:

1. There would be significant improvement due to extensive interval training and intensive interval training on muscular endurance among college men athletes comparing to control group.
2. There would be significant improvement due to extensive interval training and intensive interval training on resting pulse rate among college men athletes comparing to control group.

Significance of the Study

The following are the significance of the study.

1. The study may assess the status of muscular endurance of college men athletes.
2. The study may suggest suitable extensive and intensive interval training as training protocol for college men athletes.
3. This study may provide suitable interval training programmes to help to resting heart rate of college men athletes.

Limitations

This study was limited in the following respects.

1. The study was conducted among college men athletes only.
2. The diet, atmosphere and temperature during training and test period were not taken into consideration.
3. The performance and skills of the subjects and their background experience in the field of sports and games were not taken into consideration.
4. The psychological and nutritional status of the subjects were not measured in the study, and
5. The subjects were allowed to do their routine work of the college throughout the experiment period.

Delimitations

This study was delimited in the following respects.

1. This study was conducted on 60 college men athletes who were from different colleges in Telangana in the age group of 19 to 25 years.
2. The athletes were selected from different events such as, jumpers, throwers, runners etcetera.
3. Only selected resistance exercises were selected for extensive and intensive interval training protocols for this study.
4. The experiment was conducted for a period of twelve weeks

Methodology

Selection of Subjects

The subjects taken for the present study were sixty college men athletes from different colleges in Telangana. The subjects were in the age group of 19 to 25 years with mean age of 21.3 with standard deviation \pm 2.67 years. The subjects were selected on a random basis and were allotted to three groups (experimental group I, experimental group II and control group) by random assignment.

All the subjects were oriented to the purpose of the study and voluntarily involved in the study.

Selection of Variables

Dependent Variables

1. Muscular Endurance
2. Resting Pulse Rate

Independent Variable

1. Twelve weeks extensive interval training
2. Twelve weeks intensive interval raining

Experimental Design

The primary responsibility of the investigator is to adopt the appropriate experimental methodology before proceeding with data collection. (Clarke and Clarke, 1984)

A pre test-post test randomized group design was used for this study. The randomly selected (N=60) college men athletes were divided into three groups randomly consisting of twenty college men in each. Before the training pre-test was taken for all the groups on muscular endurance and resting pulse rate. Experimental group I underwent extensive interval training, experimental group II underwent intensive interval training for twelve weeks. The control group did not undergo any type of training. At the end of twelve weeks the post test was conducted on selected variables. The difference between initial and final test scores was considered as the effect of respective training on selected criterion variables. To test the significance the obtained data were subjected to statistical treatment using ANCOVA. In all cases 0.05 level was fixed to test the hypothesis of this study.

Criterion Measures

By glancing the literature, and in consultation with professional experts, the following variables were selected as the criterion measures in this study.

1. Muscular endurance was measured using sit ups test
2. Resting Pulse Rate was determined through the radial artery beats

The intraclass correlation coefficient obtained for test-retest data are presented in Table 1.

Table 1: Intra Class Correlation Coefficient of Test – Retest Scores

S. No	Variables	Coefficient of Correlation
1	Muscular Endurance	0.93*
2	Resting Pulse Rate	0.89*

* Significant at 0.01 level

Test Administration and Collection of Data

The investigator explained the objectives of the test to the subject before the test. The following tests were conducted to determine the criterion variables.

Muscular Endurance (Sit Ups)

Purpose

To estimate the muscular endurance

Equipment

Gymnastic Mats

Procedure

The subject being tested took supine lying position with bent knees, feet flat about 18 inches from the buttocks, and the hands touching the side of the head. A partner holds the subject feet as the exercises performed. The subject touched the elbow to the alternate knee with each sit up. The subject performs as many sit ups in one minute as possible.

Scoring

The number of correct repetitions was recorded as the score.

Resting Pulse Rate

Objective

The purpose of this test was to record the number of heart beat per minute.

Equipment

A stop watch (1/100 of a second) and a chair.

Procedure and Scoring

The resting heart rate of all the subjects was recorded in sitting position in the morning session. Before taking the resting heart rate, the subjects were asked to sit in a chair inside a room and relax for 20 minutes. To record the heart rate, finger tips were placed on the radial artery at the subjects wrist in such a manner that palpation was clear and the number of palpation was counted for one minute.

Training Schedule of Extensive and Intensive Interval Training

Extensive Interval Training

Extensive interval method, which is also known as intermittent variation of exertion would be 60% to 80% max HR where recovery is less than the exercise period. Thus, the duration of the recovery periods being less than half as long as those of the exertion periods. The range of sinusoidal load schemes during which the intensity is gradually increased until a maximum is reached and subsequently gradually decreased.

Table 2: Showing Training Schedule for Extensive Interval Training for I to III Weeks

Workouts	Monday		Wednesday		Friday	
	Repetition	Rest	Repetition	Rest	Repetition	Rest
60 M run within 14 sec	10	6 sec	10	6 sec	10	6 sec
100 M run within 20 Sec.	8	9 sec	8	9 sec	8	9 sec
140 M run within 32 sec	6	15 sec	6	15 sec	6	15 sec
180 M run within 45 sec	4	22 sec	4	22 sec	4	22 sec

Table 3: Showing Training Schedule for Extensive Interval Training for IV & VI Weeks

Workouts	Monday		Wednesday		Friday	
	Repetition	Rest	Repetition	Rest	Repetition	Rest
60 M run within 12 sec	10	5 sec	10	5 sec	10	5 sec
100 M run within 20 Sec.	8	8 sec	8	8 sec	8	8 sec
140 M run within 30 sec	6	14 sec	6	14 sec	6	14 sec
180 M run within 40 sec	4	20 sec	4	20 sec	4	20 sec

Table 4: Showing Training Schedule for Extensive Interval Training for VII to IX Weeks

Workouts	Monday		Wednesday		Friday	
	Repetition	Rest	Repetition	Rest	Repetition	Rest
60 M run within 12 sec	12	5 sec	12	5 sec	12	5 sec
100 M run within 16 Sec.	10	8 sec	10	8 sec	10	8 sec
140 M run within 30 sec	7	14 sec	7	12 sec	7	12 sec
180 M run within 40 sec	6	20 sec	6	15 sec	6	15 sec

Table 5: Showing Training Schedule for Extensive Interval Training for X to XII Weeks

Workouts	Monday		Wednesday		Friday	
	Repetition	Rest	Repetition	Rest	Repetition	Rest
60 M run within 10 sec	12	4 sec	12	4 sec	12	4 sec
100 M run within 14 Sec.	10	6 sec	10	6 sec	10	6 sec
140 M run within 26 sec	7	11 sec	7	11 sec	7	11 sec
180 M run within 35 sec	6	15 sec	6	15 sec	6	15 sec

Intensive Interval Training

Intensive interval method which is also known as high intensity interval training would have 80% to upto 100% max HR with recovery is more and it can reach the maximum. The high intensity exercise should be done at

near maximum intensity. The number of repetitions and length of each depends on the exercise, but may be as little as three repetitions with just 20 seconds of intense exercise and the entire intensive interval method session may last for thirty minutes

Table 6: Showing Training Schedule for Intensive Interval Training for I to III Weeks

Workouts	Monday		Wednesday		Friday	
	Repetition	Rest	Repetition	Rest	Repetition	Rest
60 M run within 9 sec	12	15 sec	12	15 sec	12	15 sec
100 M run within 14 Sec.	10	25 sec	10	25 sec	10	25 sec
140 M run within 22 sec	8	45 sec	8	45 sec	8	45 sec
180 M run within 32 sec	5	60 sec	5	60 sec	5	60 sec

Table 7: Showing Training Schedule for Intensive Interval Training for IV to VI Weeks

Workouts	Monday		Wednesday		Friday	
	Repetition	Rest	Repetition	Rest	Repetition	Rest
60 M run within 8 sec	12	15 sec	12	15 sec	12	15 sec
100 M run within 12 Sec.	10	25 sec	10	25 sec	10	25 sec
140 M run within 20 sec	8	45 sec	8	45 sec	8	45 sec
180 M run within 30 sec	5	60 sec	5	60 sec	5	60 sec

Table 8: Showing Training Schedule for Intensive Interval Training for VII to IX Weeks

Workouts	Monday		Wednesday		Friday	
	Repetition	Rest	Repetition	Rest	Repetition	Rest
60 M run within 7 sec	12	15 sec	12	15 sec	12	15 sec
100 M run within 12 Sec.	10	25 sec	10	25 sec	10	25 sec
140 M run within 16 sec	8	45 sec	8	45 sec	8	45 sec
180 M run within 25 sec	5	60 sec	5	60 sec	5	60 sec

Table 9: Showing Training Schedule for Intensive Interval Training for X to XII Weeks

Workouts	Monday		Wednesday		Friday	
	Repetition	Rest	Repetition	Rest	Repetition	Rest
60 M run within 7 sec	12	15 sec	12	15 sec	12	15 sec
100 M run within 11 Sec.	10	25 sec	10	25 sec	10	25 sec
140 M run within 16 sec	8	45 sec	8	45 sec	8	45 sec
180 M run within 25 sec	5	60 sec	5	60 sec	5	60 sec

Results on Muscular Endurance

The statistical analysis comparing the initial and final means of Muscular Endurance due to Extensive interval training

and Intensive interval training among athletes is presented in Table 10

Table 10: Ancova Results on Effect of Extensive Interval Training and Intensive Interval Training Compared with Controls on Muscular Endurance

	Extensive Interval Training	Intensive Interval Training	Control Group	Source of Variance	Sum of Squares	df	Mean Squares	Obtained F
Pre Test Mean	25.70	25.10	24.80	Between	8.40	2	4.20	0.18
				Within	1357.20	57	23.81	
Post Test Mean	28.40	28.50	25.50	Between	116.13	2	58.07	3.24*
				Within	1020.80	57	17.91	
Adjusted Post Test Mean	28.02	28.58	25.81	Between	85.65	2	42.83	10.60*
				Within	226.32	56	4.04	
Mean Diff	2.70	3.40	0.70					

Table F-ratio at 0.05 level of confidence for 2 and 57 (df) =3.16, 2 and 56 (df) =3.16.

*Significant

As shown in Table 10, the obtained pre test means on Muscular Endurance on Extensive interval training group was 25.70, Intensive interval training group was 25.10 and control group was 24.80. The obtained pre test F value was 0.18 and the required table F value was 3.16, which proved that there was no significant difference among initial scores of the subjects.

The obtained post test means on Muscular Endurance on Extensive interval training group was 28.40, Intensive interval training group was 28.50 and control group was 25.50. The obtained post test F value was 3.24 and the required table F value was 3.16, which proved that there

was significant difference among post test scores of the subjects.

Taking into consideration of the pre test means and post test means adjusted post test means were determined and analysis of covariance was done and the obtained F value 10.60 was greater than the required value of 3.16 and hence it was accepted that there was significant differences among the treated groups.

Since significant differences were recorded, the results were subjected to post hoc analysis using Scheffe’s Confidence Interval test. The results were presented in Table 11.

Table 11: Multiple Comparisons of Paired Adjusted Means and Scheffe’s Confidence Interval Test Results on Muscular Endurance

Means				Required. C I
Extensive interval training Group	Intensive interval training Group	Control Group	Mean Difference	
28.02	28.58		0.56	1.60
28.02		25.81	2.21*	1.60
	28.58	25.81	2.77*	1.60

* Significant

The post hoc analysis of obtained ordered adjusted means proved that there was significant differences existed between Extensive interval training group and control group (MD: 2.21). There was significant difference between Intensive interval training group and control group (MD: 2.77). There was no significant difference between

treatment groups, namely, Extensive interval training group and Intensive interval training group. (MD: 0.56).

The ordered adjusted means were presented through bar diagram for better understanding of the results of this study in Figure I.

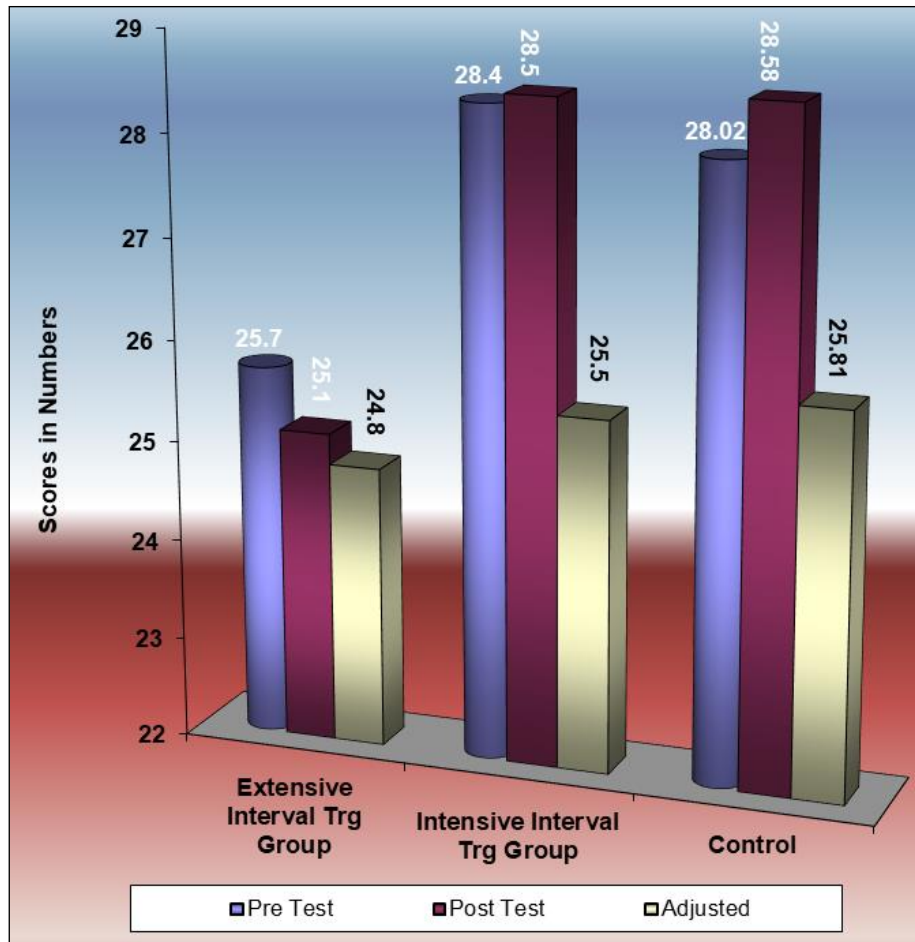


Fig 1: bar diagram showing pre test, post test and ordered adjusted means on muscular endurance

Discussions on Findings on Muscular Endurance

In order to find out the effect of extensive interval training and intensive interval training on physical fitness variable Muscular Endurance the obtained pre and post test means were subjected to ANCOVA and post hoc analysis through Scheffe’s confidence interval test.

The effect of Extensive interval training and Intensive interval training on Muscular Endurance is presented in Table IV. The analysis of covariance proved that there was significant difference between the experimental group and control group as the obtained F value 10.60 was greater than the required table F value to be significant at 0.05 level.

Since significant F value was obtained, the results were further subjected to post hoc analysis and the results presented in Table V proved that there was significant difference between Extensive interval training group and

control group (MD: 2.21) and Intensive interval training group and control group (MD: 2.77). Comparing between the treatment groups, it was found that there was no significant difference between Extensive interval training and Intensive interval training group among athletes.

Thus, it was found that Extensive interval training and Intensive interval training were significantly better than control group in improving Muscular Endurance of the athletes.

Results on Resting Pulse Rate

The statistical analysis comparing the initial and final means of Resting Pulse Rate due to Extensive interval training and Intensive interval training among athletes is presented in Table 12

Table 12: Ancova Results on Effect of Extensive Interval Training and Intensive Interval Training Compared with Controls on Resting Pulse Rate

	Extensive Interval Training	Intensive Interval Training	Control Group	Source of Variance	Sum of Squares	df	Mean Squares	Obtained F
Pre Test Mean	70.40	70.50	69.80	Between	5.73	2	2.87	0.16
				Within	1035.00	57	18.16	
Post Test Mean	67.10	66.10	70.50	Between	212.80	2	106.40	4.83*
				Within	1256.60	57	22.05	
Adjusted Post Test Mean	66.93	65.83	70.95	Between	289.07	2	144.53	51.82*
				Within	156.20	56	2.79	
Mean Diff	-3.30	-4.40	0.70					

Table F-ratio at 0.05 level of confidence for 2 and 57 (df) =3.16, 2 and 56 (df) =3.16.

*Significant

As shown in Table 12, the obtained pre test means on Resting Pulse Rate on Extensive interval training group was 70.40, Intensive interval training group was 70.50 and control group was 69.80. The obtained pre test F value was 0.16 and the required table F value was 3.16, which proved that there was no significant difference among initial scores of the subjects.

The obtained post test means on Resting Pulse Rate on Extensive interval training group was 67.10, Intensive interval training group was 66.10 and control group was 70.50. The obtained post test F value was 4.83 and the required table F value was 3.16, which proved that there

was significant difference among post test scores of the subjects.

Taking into consideration of the pre test means and post test means adjusted post test means were determined and analysis of covariance was done and the obtained F value 51.82 was greater than the required value of 3.16 and hence it was accepted that there was significant differences among the treated groups.

Since significant differences were recorded, the results were subjected to post hoc analysis using Scheffe's Confidence Interval test. The results were presented in Table 13.

Table 13: Multiple Comparisons of Paired Adjusted Means and Scheffe's Confidence Interval Test Results on Resting Pulse Rate

Means				Required. C I
Extensive interval training Group	Intensive interval training Group	Control Group	Mean Difference	
66.93	65.83		1.10	1.33
66.93		70.95	4.02*	1.33
	65.83	70.95	5.12*	1.33

* Significant

The post hoc analysis of obtained ordered adjusted means proved that there was significant differences existed between Extensive interval training group and control group (MD: 4.02). There was significant difference between Intensive interval training group and control group (MD: 5.12). There was no significant difference between treatment groups, namely, Extensive interval training group and Intensive interval training group. (MD: 1.10).

The ordered adjusted means were presented through bar diagram for better understanding of the results of this study in Figure II.

were subjected to ANCOVA and post hoc analysis through Scheffe's confidence interval test.

The effect of Extensive interval training and Intensive interval training on Resting Pulse Rate is presented in Table VI. The analysis of covariance proved that there was significant difference between the experimental group and control group as the obtained F value 51.82 was greater than the required table F value to be significant at 0.05 level.

Since significant F value was obtained, the results were further subjected to post hoc analysis and the results presented in Table VII proved that there was significant difference between Extensive interval training group and control group (MD: 4.02) and Intensive interval training group and control group (MD: 5.12). Comparing between the treatment groups, it was found that there was no significant difference between Extensive interval training and Intensive interval training group among athletes.

Thus, it was found that Extensive interval training and Intensive interval training were significantly better than control group in reducing Resting Pulse Rate of the athletes.

Conclusions

Within the limitations and delimitations of the study, the following conclusions were drawn.

1. It was concluded that 12 weeks extensive interval training and intensive interval training significantly improved muscular endurance compared to control group. It was also found that there was no significant difference between extensive interval training and intensive interval training in altering muscular endurance of college level athletes.
2. It was concluded that 12 weeks extensive interval training and intensive interval training significantly improved resting heart rate compared to control group. It was also found that there was no significant difference between extensive interval training and intensive interval training in altering resting heart rate of college level athletes.

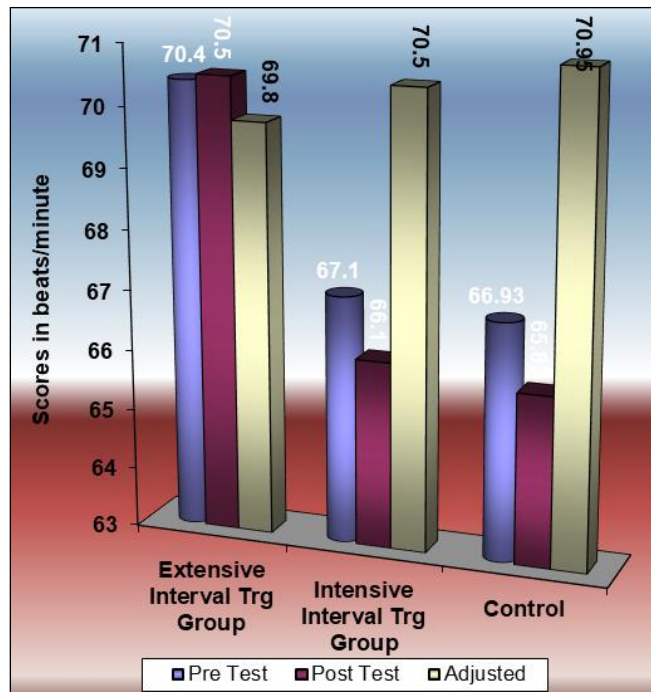


Fig 2: Bar diagram showing pre test, post test and ordered adjusted means on resting pulse rate

Discussions on Findings on Resting Pulse Rate

In order to find out the effect of extensive interval training and intensive interval training on physical fitness variable Resting Pulse Rate the obtained pre and post test means

Recommendations

The findings of this study proved that athletes' muscular endurance, and resting heart rate, could be significantly altered by extensive interval training and intensive interval

training In the light of the above findings, the following recommendations are made.

1. Efforts may be taken by coaches, sports scientists and educational authorities to include protocol of the suggested on extensive and intensive interval training schedules for athletes.
2. In the light of the findings of the study, efforts may be taken to popularize the importance of extensive and intensive interval training among athletes.

Suggestions for Further Research

1. The effect of extensive and intensive interval training on selected variables, not covered by this research may be under taken.
2. A similar study may be conducted among different levels of athletes to find out the effect of training, and detraining on specific skills of the games.
3. Since this study covered the college level men athletes only, a similar research may be undertaken among women athletes to find out the effect of extensive and intensive interval training.

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