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PHYSICAL EDUCATION

IMPACT OF HIGH INTENSITY INTERVAL TRAINING AND DETRAINING ON CARDIO RESPIRATORY ENDURANCE OF COLLEGE MALE STUDENTS

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Abstract

The purpose of this study was to examine the effect of high intensity interval training and detraining on cardio respiratory endurance. Thirty subjects were selected and they were divided into two equal groups of fifteen each. The experimental group performed high intensity interval training and the second group acted as control. After the completion of twelve-weeks training period the subjects of group I and II were physically detrained for forty days. The pre and posttest data on cardio respiratory endurance was statistically analyzed by applying the analysis of covariance (ANCOVA). The data collected on post experimentation and during detraining were statistically analyzed by using two way (2x5) factorial ANOVA with last factor repeated measures. Statistical analysis found significant improving in cardio respiratory endurance and significant decline during detraining period.

Keywords: Interval training, Detraining, Cardio respiratory endurance.

INTRODUCTION

Interval training has been used by athletes for years to build fitness. Interval training combines, short, high intensity bursts of speed, with slow, recovery phases, repeated during one exercise session. The protocol for interval training is, to push our body past the aerobic threshold for a few moments and then return to aerobic conditioning level with the objective of improving speed, strength, endurance and cardiovascular fitness. It is a technique particularly employed by runners, but athletes in many disciplines use this type of training. Today, athletes use more structured interval training workouts to build speed and endurance. This variation of interval training and speed work can be a simple or sophisticated routine.

Many training improvements are lost within several weeks, even days, if an athlete stops exercising. During the competition period, elite athletes cannot afford complete passive rest for more than three days in a stretch. The reduction or cessation of training brings about substantial losses in adaptation effects. However, athletes to a certain extent can sustain the acquired training benefits over time without extensively training them continually. De-adaptation, as well as adaptation, takes time. If athletes exclude a given group of exercise from training protocols, they gradually lose the adaptation. Four factors mainly determine the time course of detraining, such as the duration of the immediately preceding period of training, training experience of the athletes, targeted motor abilities and amount of specific training loads during detraining (Zatsiorsky, 1995).

METHODOLOGY

To achieve the purpose of the study, thirty college male students studying in Selvam College of Physical Education, Namakal, Tamilnadu, India, during the academic year 2015-2016 were selected as subjects at random. The age of the subjects ranged from 18 to 22 years. The selected subjects were randomly assigned to one of the two groups. The experimental group-I underwent high intensity interval training and group-II acted as control. The data on cardio respiratory endurance was collected by administering Cooper's twelve minutes run or walk test. Pretest data were collected prior to the training programme and posttest data were collected immediately after the twelve-weeks of training programme from both the experimental groups and control group. During the detraining period the data were collected once in ten days for 40 days from both the experimental groups and control group.

TRAINING PROTOCOL

The experimental groups underwent their respective training programme three days per week (alternate days) for twelve weeks. The experimental group performed high intensity interval training. To fix the training load for the experimental group the subjects were examined for their exercise heart rate in response to different work bouts, by performing continuous running of two minutes duration for proposed repetitions and

sets, alternating with active recovery based on work-rest ratio. The subject's training zone was computed using Karvonen formula and it was fixed at 80%HRmax to 95%HRmax for high intensity interval training. The work rest ratio of 1:1 between exercises and 1:3 between sets was given. After the completion of twelve-weeks training period the subjects of group I and II were physically detrained for forty days.

STATISTICAL TECHNIQUE

The data collected from the two groups prior to and post experimentation on cardio respiratory endurance was statistically analyzed to find out the significant difference if any, by applying the analysis of covariance (ANCOVA). The data collected on post experimentation and during detraining were statistically analyzed by using two way (2 x 5) factorial ANOVA with last factor repeated measures. The simple effect and the Scheffe's test were used as follow up and post hoc test. The analysis of data on cardio respiratory endurance was presented in table-I to III.

RESULT

Table-I: Analysis of Covariance on Cardio Respiratory Endurance

	Experimental Group	Control Group	S o V	SS	df	MS	'F' ratio
Adjusted Post test Mean	2384.18	2127.41	B	491835.06	1	491835.06	35.38*
			W	375343.38	27	13901.61	

(The required table value for significance at 0.05 level of confidence with degrees of freedom 1 & 27 is 4.21)
**Significant at .05 level of confidence*

The adjusted posttest means on cardiorespiratory endurance of experimental and control groups are 2384.18 and 2127.41 respectively. The obtained 'F' ratio value of 35.38 for adjusted posttest mean on cardiorespiratory endurance of experimental and control groups is greater than the required table value of 4.21 for the degrees of freedom 1 and 27 at 0.05 level of confidence. Hence, it is concluded that due to the effect of twelve weeks of experimental treatment the cardiorespiratory endurance of the subjects was significantly improved.

In order to find out the detraining impact, the data collected from the two groups during post test and four cessations periods on cardiorespiratory endurance have been analyzed by two-way factorial ANOVA (2x5) with repeated measures on last factor and the obtained results are presented in table II.

Table II: Two Factors ANOVA on Cardio Respiratory Endurance of Groups at Five Different Stages of Tests

Source of Variance	Sum of Squares	df	Mean Squares	Obtained "F" ratio
A factor (Groups)	1319578.40	1	1319578.40	60.01*
Group Error	615744.98	28	21990.89	
B factor (Tests)	105350.22	4	26337.55	3.85*
AB factor (Interaction) (Groups and Tests)	143717.29	4	35929.32	5.25*
Error	765615.28	112	6835.85	

(Table values required for significance at 0.05 level with df 1 and 28, 4 and 112 are 4.20 and 2.45 respectively.)

Table-II shows that the obtained 'F' ratio value for the interaction of factor A x B (Groups x Different Tests) is 5.25, which is greater than the table value of 2.45 with degrees of freedom 4 and 112 required for significance at 0.05 level of confidence. The result of the study shows that significant difference exist between groups at each test and also between tests for each group on cardiorespiratory endurance. Since, the interaction effect is significant, the simple effect test has been applied as follow up test.

It indicates that significant difference exists between the paired means of groups at post test, first, second, third and fourth cessation on cardiorespiratory endurance. It also implies that significant difference exists among five different stages of tests on cardiorespiratory endurance of experimental group; however no significant difference exist among five testing periods of control group on cardiorespiratory endurance.

Since, the obtained 'F' ratio value in the simple effect is found to be significant, the Scheffe'S test is applied as post hoc test to find out the paired mean

difference, and it is presented in table III.

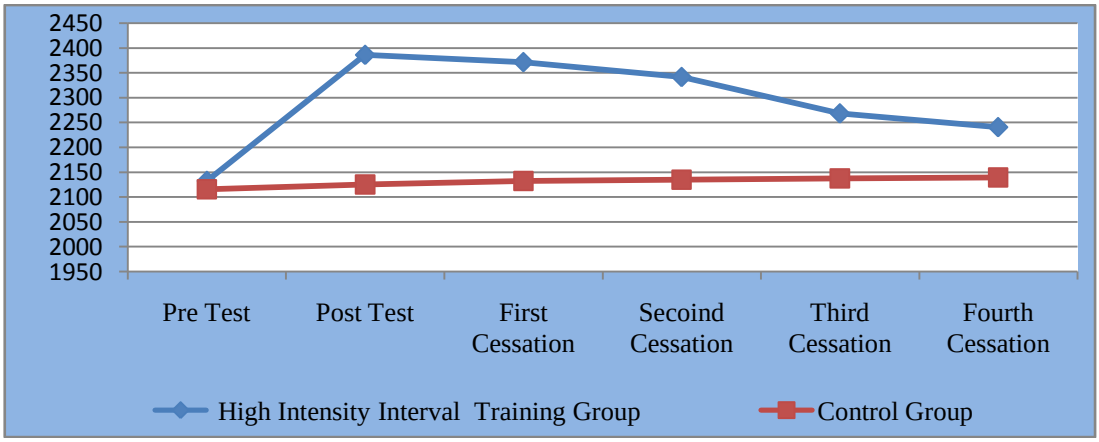
Table III: Scheffe's Test for the Differences among Paired Means of Experimental Group with Different Tests on Cardio Respiratory Endurance

Post test	Cessation				Mean difference	Confidence interval
	I	II	III	IV		
2386.26	2371.66				14.60	47.25
2386.26		2341.67			44.59	47.25
2386.26			2268.33		117.93*	47.25
2386.26				2240.66	145.60*	47.25
	2371.66	2341.67			29.99	47.25
	2371.66		2268.33		103.33*	47.25
	2371.66			2240.66	131.00*	47.25
		2341.67	2268.33		73.34*	47.25
		2341.67		2240.66	101.01*	47.25
			2268.33	2240.66	27.67	47.25

**Significant at .05 level of confidence*

Table-III demonstrated that the cardiorespiratory endurance performance was not significantly decreased during posttest and first cessation, posttest and second cessation, first and second cessation, third and forth cessation periods. Thus it was concluded that the improved cardiorespiratory endurance performance of the participants was maintained only for 20 days during the detraining period, there after it was started declining towards the base line.

Figure-I: Graphical Representation of the Pre, Post and Four Cessation Mean Values on Cardio Respiratory Endurance of Experimental and Control Groups



DISCUSSION

The results of the study showed significant improvement on cardio respiratory endurance due to high intensity interval training. Many elite athletes attribute their success to interval training with the spacing of exercise and rest periods, a tremendous amount of work can be accomplished that would not normally be completed in a workout in which the exercise was performed continuously. One value of interval training is that it permits high intensity and intermittent exercise for a relatively long period (McArdle, Katch and Katch, 1985). To maintain cardio-respiratory endurance, training must be conducted at least three times per week and training intensity should be 70% VO_2max (Wilmore & Costill, 1999). These results are conformity with the following findings. Paton and Hopkins (2005) found that 1- and 4-km time trial performance increased could have also been a result of high intensity interval training. Alcevedo and Goldfarb (1989) suggested that, to produce best performance training intensities have to be equal to those, which will be attempted in the competition. Weltman et al., (1992) arrived at the conclusion that, exercise at lactate threshold, was sufficient for endurance gains within the

first 4 months whereas continuing improvement needed higher intensities.

The results of the study also indicated that the cardio respiratory endurance of high intensity interval training decreased significantly due to detraining. But the significant decrease started after the second cessation toward the base line. The physiological effects of fitness training diminish over time, causing the body to revert back to it's pre-training condition. When we stop exercising, many physiological changes take place. We begin to lose the cardiovascular (aerobic) gains notably the heart's ability to pump blood more efficiently and our muscles' improve the capacity to process oxygen.These results of the study are in conformity with the finding of Nageswaran (1997) and Nugroho (2005) that the detraining losses of cardiorespiratory endurance are much greater than losses of muscle strength and power. Baechle (1994) revealed that, endurance adaptations are most sensitive to period of inactivity, because of their enzymatic basic, when detraining occurs the physiological function goes back to normal.

CONCLUSION

The results of the study showed significant improvement on cardio respiratory endurance due to high intensity interval training. It is also observed that the improved cardiorespiratory endurance performance of the participants was maintained only for 20 days during the detraining period, there after it was started declining towards the base line.

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