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ESTIMATION OF DIFFERENT INTENSITIES OF INTERVAL TRAINING IMPACT ON ANAEROBIC POWER OF UNTRAINED MEN

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ABSTRACT

The aim of this study was to estimate different intensities of interval training impact on anaerobic power of untrained men. For this purpose forty-five men in the age group of 40 to 45 years, who were not involved in any specific training, were selected as participants. The selected participants were the inhabitants of Ongole town, Prakasam District, in the State of Andhra Pradesh, India. They were randomly divided into three groups of fifteen each. Group-I underwent high intensity interval training, group-II underwent moderate intensity interval training and group- III acted as control. The data on anaerobic power were assessed by conducting Running Based Anaerobic Power Sprint Test (RAST). The pre and post test data collected from the experimental and control groups on anaerobic power have been analyzed by using two way ANOVA with repeated measures on last factor. Whenever the obtained 'F' ratio value for interaction was found to be significant, the simple effect test was used as a follow up test. The Scheffè S test was applied as post hoc test to determine the paired mean differences, if the obtained 'F' ratio value in the simple effect test was found significant. It was concluded that in improving the anaerobic power of the untrained men, high intensity interval training was significantly better than moderate intensity interval training.

Key words: *Interval Training, Anaerobic power and untrained men*

INTRODUCTION

Anaerobic energy is the output of energy when the oxygen supply is insufficient. High speed intense work of short duration requires immediate energy that cannot be attained quickly enough from aerobic sources. In this situation another process termed anaerobic metabolism, is called on for a ready supply of energy. In anaerobic exercise a large portion of the required energy is obtained from the anaerobic energy sources. Anaerobic energy is required in high intensity short-term exercise involving power or speed (Reid & Thomson, 1984). Sharkey (1986) pointed out that power is an essential quality in many sports for it represents the effective combination of strength and speed. Increase in strength or speed will increase power. When power increases, more work can be done in less time.

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Interval training (IT) is a popular form of exercise that combines two of the most effective fat-burning methods. The first is high-intensity training, which pushes the body to maximum effort to achieve muscle fatigue and maximum oxygen use in a quick burst. The second method is interval training, which alternates periods of intense effort with periods of moderate-to-low intensity effort. Interval training boosts metabolism significantly longer than a steady workout of equal or even greater length. High-intensity interval training is an incredibly effective method for improving fitness in a short time, but it is also extremely taxing on the body. It is best to start gradually and incorporate it into training over a period of time.

Intensity, the qualitative component of work an athlete performs in a given time, is also an important component of training. The more work the athlete performs per unit of time, the higher the intensity. Intensity is a function of the strength of the nerve impulses the athlete employs in training. The strength of a stimulus depends upon the load, speed of performance, and the variation of intervals or rest between repetitions. Muscular work and central nervous system involvement through maximum concentration determine the intensity during training or competition. Intensity varies according to the specificity of the sport, because the level of intensity varies in most sports and games. It is important to establish and use varying degrees of intensity in training. Several methods are available to measure the strength of the stimuli and thus the intensity (Bompa**,** 1999**).** During training, athletes experience various levels of intensity. The body adapts by increasing physiological functions to meet the training demand. It has been found in numerous training studies that the great proportion of the physical performance enhancement is due to increase in training intensity. Literature addressing the problem of adequate training intensity is rare and not entirely conclusive. This is reflected in the relatively low number of studies.

Interval training focuses on very different results on the body, it is easy to assume there are many different adaptations the body must make if one were to choose to only exclusively train interval workout. There is a scarcity of research work carried out to identify the impact of different intensities of interval training on anaerobic power. Hence,

the investigator examined to find out whether anaerobic power performance of the untrained men could be significantly influenced by high or moderate intensities of interval training protocols.

METHODOLOGY Subjects and Variable

To achieve this purpose forty-five men in the age group of 40 to 45 years, who were not involved in any specific training, were selected as participants. The selected participants were the inhabitants of Ongole town, Prakasam District, in the State of Andhra Pradesh, India. They were randomly divided into three groups of fifteen each. Group-I underwent high intensity interval training, group-II underwent moderate intensity interval training and group- III acted as control. A qualified physician examined the subjects medically and declared them fit for the study. Anaerobic power was selected as dependent variable and was assessed by conducting Running Based Anaerobic Power Sprint Test (RAST) prior to and after twelve weeks of experimental treatment.

Training Protocol

The training regimen for the three experimental groups lasted for twelve weeks for six days per week in the morning session. Experimental group-I underwent high intensity interval training, experimental group-II underwent moderate intensity interval training and group-III was the control group who did not participate in any specialized training during the period of the study. To fix the training load for the experimental groups the subjects were examined for their exercise heart rate in response to different work bouts, by performing interval 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 and 60%HRmax to 75%HRmax for moderate intensity interval training. The work rest ratio of 1:1 between exercises and 1:3 between sets was given.

Statistical Technique

The pre and post test data collected from the experimental and control groups on anaerobic power have been statistically analyzed by using two way ANOVA with repeated measures on last factor. Whenever the obtained 'F' ratio value for interaction was found to be significant, the simple effect test was used as a follow up test. The

Scheffé S test was applied as post hoc test to determine the paired mean differences, if the obtained 'F' ratio value in the simple effect test was found significant. In all the cases level of confidence was fixed at 0.05 for significance.

RESULTS

The mean and standard deviation values on anaerobic power of high, moderate intensity interval training and control groups during pre and post tests have been analyzed and presented in table-I.

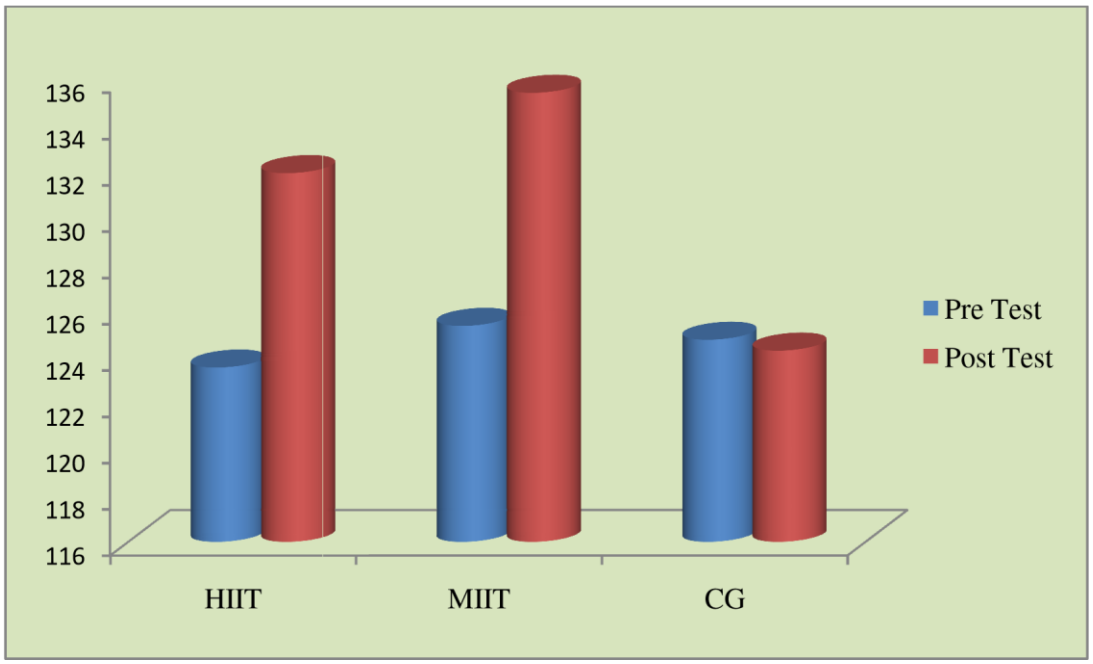
Table – I: Mean and Standard Deviation on Anaerobic Power during Pre and Post Tests of Experimental and Control Groups

Groups		Pre Test	Post Test
HIIT	Mean	123.53	131.93
	SD	1.76	1.88
MIIT	Mean	125.33	135.40
	SD	2.05	1.75
Control	Mean	124.73	124.26
	SD	2.40	2.40

(*Anaerobic power scores are expressed in watts*)

The mean values on anaerobic power during pre and post test of experimental and control groups are graphically shown in figure-I.

Figure- I: Graph Showing the Mean Values on Anaerobic Power during Pre and Post Tests of Experimental and Control Groups



The data on anaerobic power have been analyzed by two way factorial ANOVA (3x2) and the obtained results are presented in table -II

Table – II: Two Way Factorial ANOVA on Anaerobic power of Experimental and Control Groups

Source of Variance	Sum of Squares	df	Mean Squares	Obtained "F" ratio
Groups	424.46	2	212.23	49.87*
Tests	810.00	1	810.00	190.33*
Groups and Tests	574.46	2	287.23	67.49*
Error (Tests)	357.46	84	4.25	

**Significant at .05 level of confidence*

(Table values for df 1 & 84 and 2 & 84 are 3.96 and 3.11 respectively.)

Table –II shows that the obtained 'F' ratio value of groups (49.87), and interaction of groups and test (67.49) are greater than the table value of 3.11 with df 2 and 84 required for significance at 0.05 level of confidence. Also the obtained 'F' value of test (190.33) is higher than the table value of 3.96 with df 1 and 84 required for significance at 0.05 level of confidence.

Findings of the study establish the existences of significant differences in the two way interaction effect on anaerobic power. Since the interaction effect is significant, the simple effect test has been applied as follow up test and the obtained results are presented in table-III.

Table – III: Simple Effect Scores of Groups at Two Different Stages of Tests on Anaerobic Power

Source of Variance	Sum of Squares	df	Mean Squares	"F" ratio
Groups at pre test	2.78	2	1.39	2.01
Groups at post test	812.05	2	406.02	588.43*
Tests and group I	504.30	1	504.30	730.86*
Tests and group II	714.43	1	714.43	1035.40*
Tests and group III	0.003	1	0.003	0.004
Error	29.22	42	0.69	

**Significant at .05 level of confidence*
(Table values for df 1 & 42 and 2 and 42 are 4.07 and 3.23 respectively.)

Table-III exhibits that the obtained 'F' ratio values for groups at pre rest (2.01) is lesser than the table value of 3.23 with df 2 and 42 required for significance at .05 level of confidence. However the 'F' ratio values obtained for groups at post rest (588.43) is higher than the table value of 3.23 with df 2 and 42 required for significance at .05 level of confidence. The result of the study indicates that anaerobic power of the three groups did not differ significantly during pre test period however significant differences were found among the three groups during post test period.

The result of the study also shows that 'F' ratio values obtained for during tests and group-I, and group-II are 730.86 and 1035.40 respectively, which are higher than the table value of 4.07 with df 1 and 42 required for significance at .05 level of confidence. The result of the study indicates that anaerobic power of the two experimental groups elevated significantly in response to high and moderate intensity interval training.

Since the interaction effect is significant, the scheffe's test has been applied as post hoc test to find out the paired mean difference, and it is presented in table-IV.

Table – IV: Scheffè S Test for the Differences between Paired Means on Anaerobic Power of Groups during Post Test

HIIT	MIIT	Control Group	Mean Difference	Confidence Interval
131.93	135.40		3.47*	2.11
131.93		124.26	7.67*	2.11
	135.40	124.26	11.14*	2.11

**Significant at .05 level of confidence*

The above table clearly indicates that the mean differences between high intensity interval training and moderate intensity interval training groups, high intensity interval training and control groups and moderate intensity interval training and control groups are 3.47, 7.67 and 11.14 respectively on anaerobic power which are greater than the confidence interval value of 2.11 at .05 level of confidence.

Findings demonstrate that there is a significant difference among the groups confined to this study on anaerobic power. It is inferred that high and moderate intensity interval training groups are significantly better than control group however when comparing the experimental groups high intensity interval training group is significantly better than moderate intensity interval training group in improving the anaerobic power of the subjects.

DISCUSSION

After 12 weeks of training, both the experimental groups showed significant improvement in anaerobic power, however high intensity interval training was better than moderate intensity interval training. Most of the previous studies also show a substantial increase in anaerobic power following short bouts of intense exercises. These results are in agreement with the previous observation by Wenzel (1992) and Nowberry & flowers (1999) in which they found significant improvement in anaerobic power following speed training. Medbo and Burgers (1990) reported that, six weeks of intense exercise of short duration improved anaerobic capacity. They identified that sprinters have better anaerobic capacity than endurance athletes, due to increase in anaerobic energy release.

It has been observed by Pizza et al., (1994) that, anaerobic capacity was not affected by endurance training. Mahon (2000) postulated that, factors such as motor neurone firing rate and improved coordination were responsible for enhanced anaerobic power performance. These results are support the observation by Laursen et al., (2005) that, peripheral adaptation rather than central adaptation are likely responsible for the improved anaerobic capacity following various forms of high intensity interval training. The mechanisms responsible for anaerobic performance enhancements may relate to greater force generation increase in energy release and neural adaptation.

CONCLUSION

Due to the impact of twelve weeks of high and moderate intensities of interval training both the experimental groups showed significant improvement in anaerobic power performance of the untrained men, however high intensity interval training was better than moderate intensity interval training.

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