EFFECT OF HIGH AND MODERATE INTENSITY INTERVAL SPRINT TRAINING AND DETRAINING IMPACT ON ANAEROBIC POWER

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ABSTRACT

The purpose of this investigation was to examine the effect of high and moderate intensity interval sprint training and detraining impact on anaerobic power. To achieve the purpose of the study, forty five male students were selected as subjects at random. The age of the subjects ranged from 19 to 21 years. The selected subjects were randomly assigned to one of the three groups. The experimental group-I underwent high intensity interval sprint training and experimental group-II underwent moderate intensity interval sprint training and group-III acted as control. All the subjects were tested on anaerobic capacity by using Margariya Kalaman anaerobic power test. Pretest data were collected prior to the training programme and posttest data were collected immediately after the twelve-weeks of interval sprint training programme for both the experimental groups and control group. During the detraining period the data were collected for all the selected criterion variables once in ten days for 40 days from both experimental groups and control group. The data collected from the three groups prior to and post experimentation on anaerobic power was statistically analyzed by applying the analysis of covariance (ANCOVA). The data collected on post experimentation and during detraining periods were statistically analyzed by using two way (3 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. Both experimental groups have significantly increased the anaerobic power as compared to control group. However, the improvement on anaerobic power was significantly higher for high intensity than moderate intensity group. During the detraining periods, significant decline on anaerobic power was found at second cessation, of which, the rate of decline was higher for high intensity than moderate intensity group.

Key words: *High and moderate intensity interval sprint training, Detraining and Anaerobic power*

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. An early form of interval training, "Fartlek" was casual and unstructured. A runner would simply increase and decrease his pace at will. Fartlek training, named and developed by Swedes, is intermediate between true interval training and regular distance training. The name means 'speed play', and consists of distance running "anywhere," with bursts of harder running at more irregular points, lengths and speeds compared with interval training. Supporters of

this discipline state that fartlek is an efficient training method, helping a person to avoid injuries that often accompany non-stop, repetitive activity, stating also that it provides the opportunity to increase a person's intensity without extenuating in a matter of minutes.

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. The aerobic threshold is the intensity where our body switches from burning a greater percentage of fat to a greater percentage of carbohydrate and is generally 85% of maximum heart rate. Interval training can refer to organization of any cardiovascular workout (e.g., cycling, running, rowing, etc.), and is prominent in training routines for many sports. 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, but the basics are still the same as the original fartlek training.

If our goal is to burn fat, intervals better be part of our program. Besides being a quick method to getting in a great workout, intervals are extremely effective for transforming our physique. By incorporating intense periods of work with short recovery segments, intervals allow us to keep the workout intensity high while still maintaining form. The magic of high intensity interval training lies its ability to keep burning fat even after leave the gym. In short, our body isn't able to bring in enough oxygen during periods of hard work. Therefore, accumulate a "debt" of oxygen that must be repaid post-workout in order to get back to normal. As a result our metabolism is revved for hours after leave the gym. Trainers refer to these phenomena as excess post-exercise oxygen consumption. The biggest way to use it to advantage is to make short, intense exercise bouts a regular piece of workout regimen.

Detraining refers to the bodily effect experienced when one takes an extended break from regular, vigorous fitness training. Detraining may occur due to unforeseen circumstances, such as Illness, injury, holidays, work, travel and social commitments often interfere with training routines. Physical activity may need to be postponed for several weeks or months, and the effects on the body may be noticed fairly quickly. How quickly we lose it depends on several

factors, including how fit we are, how long we have been exercising and how long we stop. Losing fitness when we stop working out, also called detraining or deconditioning, is one of the key principles of conditioning. The principle of use/disuse simply means that when we stop exercising, we generally begin to decondition, and lose both strength and aerobic fitness.

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 row (typically only 1 or 2 days). 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 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).

The aim of the present study was to compare the two intensities from the moderate to higher range for differences in their effectiveness and detraining impact on anaerobic power. The primary research objectives were the following: (i) to analyze the changes on anaerobic power due to the effect of high intensity and moderate intensity interval sprint training. (ii) to investigate how long the training effect shall last or be maintained after the cessation of training and the rate of decrease.

METHODOLOGY

Subjects and Variable

To achieve the purpose of the study, forty five male students studying bachelor's degree in physical education, from the Sree Vivekananda College, Kunnamkulam, Thrisssur District, Kerala, were selected as subjects at random. The age of the subjects ranged from 19 to 21 years. The selected subjects were randomly assigned to one of the three groups. The experimental group-I underwent high intensity interval sprint training and experimental group-II underwent moderate

intensity interval sprint training and group-III acted as control. All the subjects were tested on anaerobic capacity by using Margariya Kalaman anaerobic power test. Pretest data were collected prior to the training programme and posttest data were collected immediately after the twelve-weeks of interval sprint training programme for both the experimental groups and control group. During the detraining period the data were collected for all the selected criterion variables once in ten days for 40 days from both experimental groups and control group.

Training Programme

During the training period the experimental groups underwent their respective training programme three days a week on alternate days for twelve weeks. The training intensity for the moderate intensity group was fixed at 65% to 80% and for the high intensity group the intensity was fixed at 80% to 95%. The training distance varied between 40 to 80metres. The subjects were placed under active rest in between repetitions. The training intensity was increased once in three weeks. After the completion of twelve-weeks training period the subjects of group I and II were physically detrained for forty days, and they were instructed not to participate in any strenuous physical exercise and specific training throughout the detraining period.

Statistical Technique

The data collected from the three groups prior to and post experimentation on anaerobic power was statistically analyzed to find out the significant difference if any, by applying the analysis of covariance (ANCOVA). Whenever the obtained F ratio value was found to be significant for adjusted posttest means, the Scheffe's test was applied as post hoc test. The data collected on post experimentation and during detraining periods were statistically analyzed by using two way (3 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.

RESULTS

The analysis of data on anaerobic power of experimental and control groups is presented in table-I to IV.

Table-I: Analysis of Covariance on Anaerobic Power

	High Intensity	Moderate Intensity	Control Group	SoV	SS	df	MS	'F' ratio
Adjusted Post test Mean	107.398	105.254	97.417	B	755.748	2	377.874	28.867*
				W	536.679	41	13.090	

The required table value for significance at 0.05 level of confidence with df 2 & 41 is 3.226.

The result of the study shows that, significant differences exist among the adjusted post-test means of experimental and control groups on anaerobic power. Since the 'F' ratio is found to be significant, the Scheffe's post hoc test was applied, which shows that both the experimental groups contributed to the significant improvement on anaerobic power. However, high intensity group was better than the moderate intensity group in improving anaerobic power since, the mean differences were greater than the confidence interval value 3.356 at .05 level of significance.

To determine the detraining impact on anaerobic power two-way factorial ANOVA (3x5) with repeated measures on last factor was applied. The obtained 'F' ratio value of Interaction (Groups x Different Tests) is 12.991, which is greater than the table value of 1.993 with df 8 and 168 required for significance at .05 level of confidence. Since, the interaction effect was found significant simple effect test was used as a follow up test.

Table – II: Simple Effect Scores of Groups at Five Different Stages of Tests on Anaerobic Power

Source of Variance	Sum of Squares	df	Mean Squares	Obtained "F" ratio
Groups at Post test	1101.187	2	550.594	84.603*
Groups at First Cessation	721.348	2	360.674	55.420*
Groups at Second Cessation	151.675	2	75.838	11.653*
Groups at Third Cessation	34.963	2	17.482	2.686
Groups at Fourth Cessation	13.588	2	6.794	1.044
Tests and Group I	990.71	4	247.678	38.057*
Tests and Group II	567.6648	4	141.916	21.806*
Tests and Group III	17.8002	4	4.450	0.684
Error	1093.34	168	6.508	

**Significant at .05 level of confidence*
(Table values required for significance at .05 level with df 2 &168, & 4 &168 are 3.053 and 2.423)

The result of the study indicates that significant difference exists between groups at posttest, first cessation and second cessation on anaerobic power. The result

of the study also indicates that significant difference exists among tests and group-I and tests and group-II on anaerobic power. Since, 'F' ratio is found to be significant, the Scheffe's post hoc test was applied.

Table - III: **Scheffe's Test for the Differences between the Paired Means of Post Test and Cessation Periods for Different Groups on Anaerobic Power**

Testing periods	High intensity	Moderate intensity	Control group	Mean differences
Post test	108.059	105.795		2.264
	108.059		96.515	11.544*
		105.795	96.515	8.680*
First cessation	105.992	103.914		2.078
	105.992		96.649	9.343*
		103.914	96.649	7.265*
Second cessation	101.137	100.691		0.446
	101.137		97.042	4.095*
		100.691	97.042	3.649*

** Significant at 0.05 level.*
The confidence interval required for significance at 0.05 level is 2.33.

Table - III shows that significant differences exist between experimental and control groups during posttest, first cessation and second cessation periods however, no significant difference exists between experimental groups. During third and fourth cessation period, no significant differences exist among all the three groups.

Table – IV: **Scheffe's Test Result of High and Moderate Intensity Group at Different Stages of Testing on Anaerobic Power**

Training	Test	First cessation	Second cessation	Third cessation	Fourth cessation
High intensity	Post test	2.067	6.922*	8.042*	9.466*
	First cessation		4.855*	5.975*	7.399*
	Second cessation			1.120	2.544
	Third cessation				1.424
Moderate intensity	Post test	1.581	4.804*	6.374*	7.126*
	First cessation		3.223*	4.793*	5.545*
	Second cessation			1.570	2.322
	Third cessation				0.752

**Significant at .05 level of confidence*
The confidence interval required for significance at 0.05 level is 2.90.

From the above table, it is inferred that the anaerobic power of high and moderate intensity group deteriorated significantly during second cessation. When comparing both the experimental groups, the rate of decline was higher for high intensity group than moderate intensity group.

Discussion

Interval training leads to many physiological changes including an increase in cardiovascular efficiency as well as increased tolerance to the build-up of lactic acid. Lactate threshold has been shown to be a significant factor determining performance for long distance running events. Interval training increases maximal oxygen uptake by increasing cardiac stroke-volume, increasing the size and number of energy-producing mitochondria in working muscles and improving the oxidative capacity of fast-twitch muscle fibers. It also tends to improve lactate tolerance as well as promoting mental toughness. Studies show that sprint interval training is far more effective in creating post exercise caloric expenditure than aerobic exercise.

Most of the former studies also show a substantial increase in anaerobic power following short bouts of intense exercises. These results are support the observation by Laursen and others (2005) that, peripheral adaptation rather than central adaptation are likely responsible for the improved anaerobic capacity following various forms of high intensity interval training. MacDougall and others (1996) found that, relatively brief period of sprint training increased aerobic and anaerobic capacities in initially untrained individuals. 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.

Following detraining, a loss in anaerobic power performance was evident in both the experimental groups. These results are in conformity with the earlier studies undertaken by Ready & Quinney (1982) and Linossier and others (1997) in which they found substantial decline in anaerobic power due to the long interruption in training. Ross & Leveritt (2001) stated that, enzymes of all three energy systems showing signs of adaptation to training and due to the impact of detraining it return to base line levels. Since partial or complete loss of training induced adaptations on anaerobic power within two weeks of detraining were found, it is suggested that the athlete must resume training within ten days.

CONCLUSIONS

Both experimental groups have significantly increased the anaerobic power as compared to control group. However, the improvement on anaerobic power was significantly higher for high intensity than moderate intensity group. During the detraining periods, significant decline on anaerobic power was found at second cessation, of which, the rate of decline was higher for high intensity than moderate intensity group.

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