International Journal of Physical Education, Fitness and Sports

ISSN: 2277: 5447 | Vol.3. No.1 | March"2014

INVESTIGATION OF VARIED INTENSITY INTERVAL SPRINT TRAINING AND DETRAINING IMPACT ON SELECTED SPEED PARAMETERS

Y. Wise Blessed Singh[a,*]

[a]Department of Physical Education and Sports Sciences, Annamalai University, Chidambaram-608002, Tamilnadu, India

**Corresponding Author Ph: +91-9865317567; Email:* drywbs@gmail.com

DOI: 10.26524/1416

ABSTRACT

The objective of this study is to determine the effect of varied intensity interval sprint training and detraining impact on selected speed parameters. To achieve the purpose of the study 45 male students were selected and randomly assigned into three groups of 15 each. Group-I (n=15) underwent high intensity interval sprint training, group-II (n=15) underwent moderate intensity interval sprint training and group-III (n=15) acted as control. The duration of the training programme was 12 weeks with three sessions per week on alternative days. Speed, speed endurance and anaerobic power were assessed prior to and immediately after 12 weeks of training and also during the period of cessation of experimental treatment for 40 days at an interval of every 10 days, from high and moderate intensity interval sprint training groups and control group. The obtained data was analyzed statistically by analysis of covariance and 3 x 5 factorial ANOVA with repeated measures on last factor. Findings of the study revealed significant improvement on selected speed parameters whereas significant decrease during the detraining period.

Key words: Interval sprint training, detraining and speed parameters

Introduction

Interval training for running is a method of practice in which a runner runs at specified paces for specified periods of time, followed by a rest breaks in which a runner walk or jogs. This method of training is named for rest interval between repeated runs. Even experienced runners mistakenly refer to the repeated distance run as the interval, but the rest in between repeats is the interval. The rest interval, repeat distance run, number of repeats, running speed and total distance run can all be quantified; these variables can be changed to achieve certain desired training effects.

Interval training is based on the concept that more work can be performed at higher exercise intensities with the same or less fatigue compared to continuous running. The theoretical metabolic profile for exercise and rest intervals stressing anaerobic metabolism, fast glycolysis and phosphogen system is based on the knowledge of which energy systems predominate during exercise and time of substrate recovery. By choosing appropriate exercise intensities, exercise duration and rest interval, the appropriate energy systems can be trained [1].

To bring about positive changes in an athlete"s state and exercise overload must be applied. The training adaptation takes place only if the magnitude of the training load is above the habitual level. If an athlete uses a standard exercise with the same training load over a very long period, there will be no additional adaptations and the level of physical fitness will not substantially change. If the training load is too low, detraining occurs. In elite athletes, 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 [2].

It has been scientifically accepted that any systemic training over a continuous period of time would lead to produce changes on athletic qualities. These improvements decline towards the base line when the athlete becomes physically inactive. An area that is equally important but that has been given considerably less attention by both the athletes and the coaches and has practically been ignored by the research scholars in the exercise and sports sciences is the area of detraining. Hence, to know how speed parameters are altered due to the impact of varied intensity interval sprint training and detraining, it was decided to take up this study.

METHODOLOGY

Participants

Forty-five male students (age 20 ± 1.4 years, height 1.70 ± 4 cm and weight 65 ± 2 kg) from the Department of Physical Education, Annamalai University were recruited for this study. The selected subjects were randomly assigned into three groups of 15 each. After being fully informed of the risk associated with the study, the subjects gave their written consent to participate. The qualified medical officer examined the subjects and certified that they were fit enough to undergo the experimental protocol.

Training Regimen

The duration of the training programme was restricted to 12 weeks with three sessions per week on alternative days. The experimental group-I performed high intensity interval sprint training, group-II performed moderate intensity interval sprint training and group-III acted as control. The training load for moderate and high intensity interval sprint training groups were 65-80% and 80-95% of their maximum heart rate. After 10 to 15 minutes of warm up at self selected workload, the subjects performed the interval sprint training. The subjects performed short sprints training two session and speed endurance training once in a week. Distance sprinted were 40-80 m for short sprints and 120-150m for speed endurance training. An active recovery of 1:1 work rest ratio between repetitions and 5 minutes between sets was given to high and moderate intensity interval sprint training groups. After the completion of twelve week of interval sprint training the subjects of experimental and control groups were physically detrained for 40 days. During this period the subjects were instructed not to participate in any strenuous physical activity.

Testing Regimen

The selected dependent variables such as speed, speed endurance and anaerobic power were assessed prior to and immediately after the training period and also during the cessation of training for forty days at an interval of every 10 days. The data on speed, speed endurance and anaerobic power were collected by administering 50m, 150m run and Margaria Kalamen anaerobic power test respectively.

Statistical Technique

The data pertaining to the variables confined to this study was statistically examined by ANCOVA to determine the difference between the groups at pretest and posttest periods. The data collected from the three groups during post test and four cessation periods were statistically analyzed by using 3 x 5 factorial ANOVA with last factor repeated measure. Whenever the obtained F-ratio for interaction effect was found to be significant, the simple effect test was used as a follow up test. Since, three groups and five different stages of test were compared, whenever the obtained f-ratio value in the simple effect was significant the Scheffe"s test was applied as post hoc test to determine the paired mean differences, if any. The level of significance was accepted at $P < 0.05$.

RESULTS

Table-1: Analysis of Covariance Results on Selected Speed Parameters of Experimental and Control Groups.

Variable	High Intensity Interval Sprint Training	Moderate Intensity Interval Sprint Training	Control Group	S o V	Sum of Squares	df	Mean squares	Obtained „F" ratio
Speed	7.19	7.51	7.85	B	3.25	2	1.63	147.82*
				W	0.44	41	0.01	
Speed Endurance	17.79	17.05	18.52	B	16.04	2	8.02	67.97*
				W	4.83	41	0.12	
Anaerobic Power	107.40	105.25	97.42	B	755.75	2	377.87	28.87*
				W	536.68	41	13.09	

The required table value for significance at 0.05 level of confidence with degrees of freedom 2 and 41 is 3.23.

**Significant at 0.05 level*

The result of this study shows that significant differences existing between experimental and control groups, since the obtained „F‟ ratio value of adjusted posttest means 147.82, 67.97 and 28.87 on speed, speed endurance and anaerobic power were greater than the required table value of 3.23 for given degrees of freedom at 0.05 level of confidence. Since, the adjusted posttest „F‟ ratio value was found to be significant, Scheffe‟s post hoc test was applied to find out the paired mean differences.

Table 2: Scheffe's Post Hoc Test for Paired Mean difference on Speed, Speed Endurance and Anaerobic Power

Variables	Adjusted Post Test Mean			Mean Differences	Confidence Interval
	High Intensity Interval Sprint Training	Moderate Intensity Interval Sprint Training	Control Group		
Speed	7.19	7.51		0.32*	0.10
	7.19		7.85	0.66*	0.10
		7.51	7.85	0.34*	0.10
Speed Endurance	17.79	17.05		0.74*	0.32
	17.79		18.52	0.73*	0.32
		17.05	18.52	1.47*	0.32
Anaerobic Power	107.40	105.25		2.15	3.36
	107.40		97.42	9.98*	3.36
		105.25	97.42	7.837*	3.36

**Significant at .05 level.*

It was concluded that both the training groups were significantly contributing to the improvement of selected speed parameters, however high intensity interval sprint training has better impact on speed and anaerobic power than the moderate intensity interval sprint training. Whereas moderate intensity interval sprint training has better influence on speed endurance than that of the high intensity interval sprint training.

Table-3: Two Factor ANOVA on selected speed parameters of Experimental and Control Groups at Five Different Stages of Tests

Source of Variance	**df**	**Obtained 'F' ratio** (Speed)	**Obtained 'F' ratio** (Speed endurance)	**Obtained 'F' ratio** (Anaerobic power)
A factor (Groups)	2	8.74*	23.29*	25.26*
Group Error	42			
B factor (Tests)	4	56.30*	14.84*	33.69*

AB factor (Interaction) (Groups and Tests)	8	26.20*	4.26*	12.99*
Error	168			

**Significant at .05 level of confidence*

(Table values required for significance at .05 level with df 2 and 42, 4 and 168 & 8 and 168 are 3.22, 2.42 and 1.99 respectively.)

Table-3 shows that the obtained „F‟ ratio for Factor A (Groups) on speed, speed endurance and anaerobic power are 8.74, 23.29 and 25.26, which are greater than the table value of 3.22 with df 2 and 42 required for significance at .05 level of confidence. The result of the study indicates that, significant differences exist among experimental and control groups irrespective of different stages of testing on speed, speed endurance and anaerobic power.

The obtained „F‟ ratio for Factor B (Different stages of Tests) on speed, speed endurance and anaerobic power are 56.30, 14.84 and 33.69, which are greater than the table value of 2.42 with df 4 and 168 required for significance at .05 level of confidence. The result of the study indicates that speed, speed endurance and anaerobic power are differs significantly among different stages of testing irrespective of groups.

The obtained „F‟ ratio value of Interaction (Groups x Different Tests) on speed, speed endurance and anaerobic power are 26.20, 4.26 and 12.99, which are greater than the table value of 1.99 with df 8 and 168 required for significance at .05 level of confidence. The result of the study shows that significant difference exists among groups at each test and also significant difference between tests for each group on speed, speed endurance and anaerobic power.

The results of the study indicate that significant difference exists in the interaction effect (between groups and tests) on speed, speed endurance and anaerobic power. Since, the interaction effect is significant, the simple effect test has been applied as follow up test and they are presented in table-4.

Table-4: Simple Effect Scores of Groups (Rows) at Five Different Stages of Tests (Columns) on Anaerobic Power

Source of Variance	**df**	**Obtained ‘F’ ratio** (Speed)	**Obtained ‘F’ ratio** (Speed endurance)	**Obtained ‘F’ ratio** (Anaerobic power)
Groups and Post test	2	146.60*	38.193*	84.603*
Groups and First Cessation	2	120.80*	25.193*	55.420*
Groups and Second Cessation	2	13.70*	18.248*	11.653*
Groups and Third Cessation	2	2.90	2.701	2.686

Groups and Fourth Cessation	2	1.00	1.078	1.044
Tests and Group I	4	80.10*	6.706*	38.057*
Tests and Group II	4	28.20*	20.147*	21.806*
Tests and Group III	4	2.20	0.041	0.684
Error	168			

**Significant at .05 level of confidence*

(Table values required for significance at .05 level with df 2 and 168, & 4 and 168 are 3.05 and 2.42 respectively.)

Table-4 shows that the obtained „F‟ ratio values for groups and post test, groups and first cessation and groups and second cessation on speed, speed endurance and anaerobic power are higher than the table value of 3.05 with df 2 and 168 required for significance at .05 level of confidence. The result of the study indicates that significant difference exists between groups and posttest, groups and first cessation, and groups and second cessation on speed, speed endurance and anaerobic power, however, no significant differences exists between groups during third and fourth cessation periods.

The obtained „F‟ ratio values for tests and group-I, and tests and group-II on speed, speed endurance and anaerobic power are higher than the table value of 2.42 with df 4 and 168 required for significance at .05 level of confidence. The result of the study indicates that significant difference exists among tests and group-I and tests and group-II on speed, speed endurance and anaerobic power, however, no significant differences exists between tests of group-III.

Since, the obtained „F‟ ratio value is found to be significant, the Scheffe‟s post hoc test is applied to find out the paired mean differences. From the result of the study it was found that there was no significant reduction in speed and anaerobic power during the first cessation period of both the experimental groups however, during the second, third and fourth cessation periods significant reduction of performance was noticed. The result of the study also shows that speed endurance was not significantly reduced during the first and second cessation period but there was a reverse of the training impact during third and fourth cessation periods. However the reduction of the speed and anaerobic power are higher for high intensity group. when compared with moderate intensity interval sprint training group The rate of decrease on speed endurance was higher for moderate intensity group than the high intensity interval sprint training group The selected speed parameters were gradually declined towards the base line during the fourth cessation period. The means scores of data obtained on speed, speed endurance and anaerobic power during experimental and detraining periods were presented in figure 1, 2 & 3.

International Journal of Physical Education, Fitness and Sports

ISSN: 2277: 5447 | Vol.3. No.1 | March"2014

Figure-1

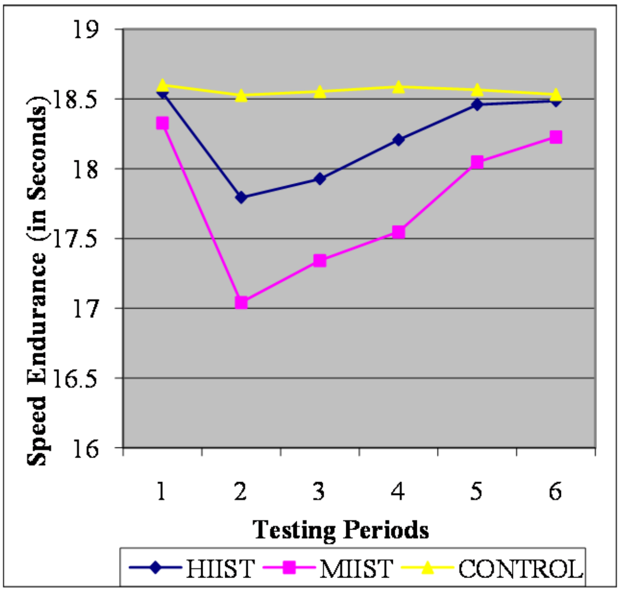


Figure-2

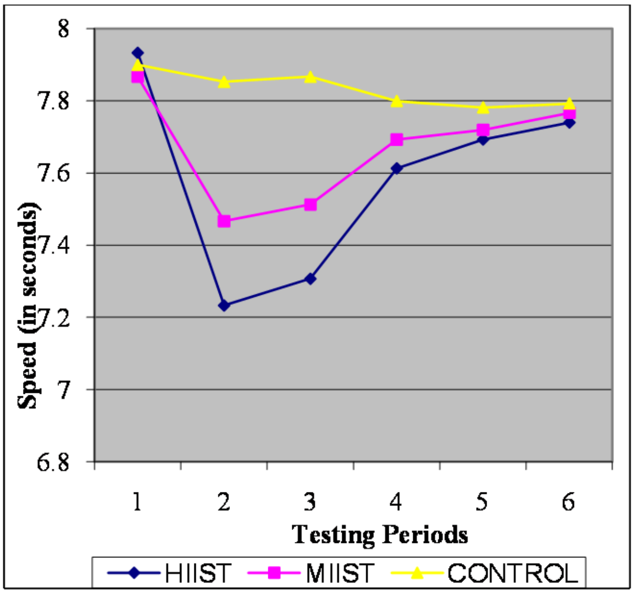
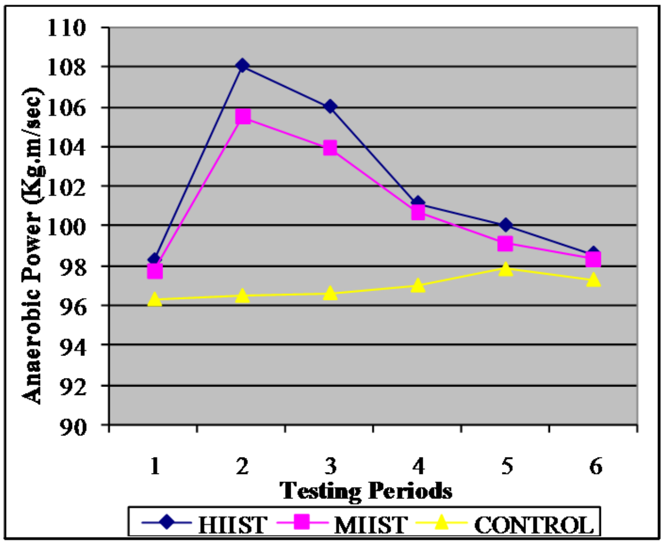


Figure-3



The pretest, post test, first, second, third and fourth cessation mean values on speed, speed endurance and anaerobic power of high intensity interval sprint training group (HIIST), moderate intensity interval sprint training group (MIIST)and control groups (CONTROL) are graphically represented in figure- 1,2 and 3.

DISCUSSION

Substantial and beneficial gains in speed parameters have been reported in most of the studies conducted previously. The results of the present study are also in line with the results observed from the previous studies. To produce best performance, training intensities have to be equal to those, which will be attempted in the competition [3]. High intensity interval training is an effective means to improve sprint performance [4,5]. Four weeks of high intensity sprint interval training combined with endurance training increased motor units activation. Cheetham and Williams (1987) [6] found that 11.1% of improvement in peak running speed following high intensity training. Relatively brief period of sprint training increased anaerobic capacities in initially untrained individuals [7,8]. Sprinters have better anaerobic capacity than endurance athletes due to increase in anaerobic energy release and it can be improved within six weeks of training [9]. Anaerobic capacity can be significantly improved due to high intensity interval training regimen [10].

The result of the present study also reveals that significant reduction of performance on selected speed parameters of experimental groups during the detraining period. The above findings can also be substantiated by observation made by experts in the field of sports training. According to Wilmore and Costill, (1994) [11] the greater the gains during training, the greater the losses during detraining. It was also stated that the period of total inactivity cause sizable losses in speed, power and endurance. According to Baechle (1994) [1] endurance adaptations are most sensitive to periods of inactivity because of their enzymatic basis. Bompa (1999) [12] stated that "speed tends to be the first ability affected by detraining". Speed loss may also be due to the nervous system's sensitivity to detraining.

CONCLUSION

The result of the study reveals that the speed, speed endurance and anaerobic power of high intensity interval sprint training group has been increased by 9%, 4% and 10% respectively from that of the baseline and thereafter during the detraining period the data on selected speed parameters declined to near baseline after fourth cessation period. Similarly, data on speed, speed endurance and anaerobic power of moderate intensity interval sprint training group has been increased by 5%, 7% and 9% respectively and it was observed that selected speed parameters reversed its training impact to near baseline after fourth cessation period. The result of the study also indicates that high intensity interval sprint training group is better in improving speed and anaerobic power and moderate intensity interval sprint training groups is better in improving speed endurance. It was also found that speed and anaerobic power was started declining from the second cessation however speed endurance gradually declined from the third cessation. It is inferred from the results of the present study that systematically designed interval sprint training develops the selected speed parameters. This peak level of performance can be maintained with only by performing limited amount of training during detraining period. Therefore, to prevent or minimize the changes that result from period of physical inactivity, the athletes and players are advised to participate in physical activities during the detraining period.

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