EFFECT OF HIGH INTENSITY INTERVAL TRAINING AND FUNCTIONAL TRAINING ON BASAL HEART RATE AND MOTOR FITNESS VARIABLES OF SPRINTERS

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Abstract

The purpose of the study was to find out the effect of high intensity interval training and functional training on basal heart rate and selected motor fitness variables of sprinters. To achieve the purpose, 45 sprinters were randomly selected as subjects from Regional College of Physical Education, North Tiripura, India using a simple random method. Their age was 19-23 years respectively. They were randomly divided into three equal groups, and each group consisted of fifteen (n=15) subjects, in which, group I underwent high intensity interval training, group II underwent functional training and group III acted as control. All the subjects in the experimental groups (I & II) were given their respective training programme was performed three days/wk training for eight weeks duration. The study was restricted to the following selected dependent variables namely basal heart rate, explosive power and speed; they were tested by standardized test items such as sarjent vertical jump test and 50-mts dash. The participants were trained for eight weeks of three days a week (alternate days). A pre and post test randomized design was employed for this investigation. The collected data were statistically analyzed by using dependent-'t' test and ANCOVA. The scheffe's test was used as post-hoc test to determine which of the paired means differed significantly where the differences in adjusted post-test means resided in univariate Ancova of three groups. All the above statistical analysis tests were computed at 0.05 level of significance ($p<0.05$). It was concluded that, the high intensity interval training and functional training groups had significantly improved the participant's dependent variables namely basal heart rate, explosive power and speed when compared than the control group and also made significant differences among both experimental and control groups. The high intensity interval training group had significantly out-performed than the functional training group on participant's selected variables. However, the control group had not shown any significant improvement on selected variables.

***Keywords**: High Intensity Interval Training, Functional Training, Basal Heart Rate, Explosive Power, Speed*

Introduction

High-intensity interval training (HIIT) refers to a training protocol involving multiple bouts of high-intensity exercise or all-out sprints that are interspersed with recovery periods (**Weston, 2014).** Various high-intensity interval training (HIIT) protocols are frequently used in modern training programs and especially in intermittent sports, such as team or racket sports, to enhance the fitness of the athletes **(Iaia et al., 2009**). The physiological adaptations associated with HIIT are based on complex molecular and cellular mechanisms in response to different metabolic and mechanical stimuli **(Wahl et al.,2010).** High-intensity interval

training has been a complementary component of athletic performance development programs since the early nineteenth century. It is an exercise system based on consecutively repeated very high-intensity anaerobic periods and shorter periods of rest for effective, short-duration training. It is described as short and intermittently performed physical exercises in which short rests or low-intensity exercises are added together with explosive movements **(Buchheit, 2013).** It is a training method that enables more metabolic adaptation compared to normal endurance training and that increases strength, anaerobic power, motor skill performance and fat burning **(McKay, 2009; Laursen, 2005).**

Specifically, the addition of a short-term, high-intensity interval training (HIIT) program performed for 3 to 6 weeks is able to promote significant improvements in RE, PTS, and OBLA in trained participants **(Billat, 2006).** For instance, Smith et al. applied a 4-week HIIT program to well-trained runners and observed a significant increase in PTS. In addition, Smith et al. reported significant improvements in VO_2max and RE in a group of well-trained runners after a 4-week HIIT **(Smith, 1999).** During high-intensity exercise, the intramuscular accumulation of lactic acid has long been considered one of the most important factors in fatigue. In 1907, Fletcher and Hopkins were the first to demonstrate that lactate was produced in amphibian muscle electrically stimulated under anaerobic conditions. The concept that this metabolite is a major player in fatigue was then evolved through their student, AV Hill, with on isolated frog muscle and with plasma lactate measurements in exercising humans. It should be noted that virtually no lactic acid exists in the body in this neutral form; instead it is represented by two ionic species: lactate ions and hydrogen (H+) ions **(Cairns, 2006).**

Functional training, a type of resistance training which has been heavily implemented in recent years, provides several benefits with the purpose of adapting training to be more specific for certain movement patterns or actions in the daily activities of athletes and non-athletes **(Chaves, 2017).**

Functional training is becoming increasingly popular within the fitness industry and has been considered to be a better alternative than traditional resistance training for improving various measures of muscular fitness including strength, endurance, coordination and balance. Definitions describing what functional training is or what a functional exercise program should entail vary considerably in the literature **(Weiss, 2010).**

The basal heart rate is defined as the heart rate when a person is awake, in a neutrally temperate environment, and has not been subject to any recent exertion or stimulation, such as stress or surprise. Explosive power can be increased, either by increasing the amount of work or by decreasing the amount of time. In throwing and jumping events, serving in tennis are some of the sticking examples for power **(Arumugam & Suriya & Kumar, 2019).** Speed which provides movements, the speed and coordination is an elementary technical demand for sportive performance in tennis **(Arumugam & Suriya, 2018).**

Purpose of the Study

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Methodology

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consisted of fifteen (n=15) subjects, in which, group I underwent high intensity interval training, group II underwent functional training and group III acted as control. All the subjects in the experimental groups (I & II) were given their respective training programme was performed three days/wk training for eight weeks duration. The study was restricted to the following selected dependent variables namely basal heart rate, explosive power and speed; they were tested by standardized test items such as sarjent vertical jump test and 50-mts dash. The participants were trained for eight weeks of three days a week (alternate days). A pre and post test randomized design was employed for this investigation. The collected data were statistically analyzed by using dependent-'t' test and ANCOVA. The scheffe's test was used as post-hoc test to determine which of the paired means differed significantly where the differences in adjusted post-test means resided in univariate Ancova of three groups. All the above statistical analysis tests were computed at 0.05 level of significance ($p<0.05$).

Results and Discussion

Table I

Means, standard deviation and dependent-'t' test values on basal heart rate and selected motor fitness variables of experimental and control groups

Variable Name	Test	High Intensity Interval Training Group	Functional Training Group	Control Group
Basal Heart Rate	Pre Test	70.09	70.10	70.14
	Post Test	67.51	68.93	70.11
	t- test	**11.34***	**8.29***	1.02
Explosive Power	Pre Test	47.61	48.38	49.33
	Post Test	57.98	54.02	50.42
	t- test	**6.99***	**3.92***	1.12
Speed	Pre Test	7.78	7.78	7.79
	Post Test	7.48	7.62	7.78
	t- test	**7.08***	**3.48***	0.21

**Significant at. 05 level. The Table Value required at. 05 levels with df 14 is 2.15.*

From the table-I, the high intensity interval training and functional training groups had significantly improved on basal heart rate and selected motor fitness variables while compared than the control group.

Table II

Analysis of covariance on basal heart rate and selected motor fitness variables of experimental & control groups

Test	High Intensity Interval Training Group	Functional Training Group	Control Group	SOV	SS	Df	MS	F-ratio
Adjusted Post-Test Mean								
Basal Heart Rate	67.46	68.92	70.09	**B.M**	136.22	2	68.11	36.42*
				W.G	76.67	41	1.87	
Explosive Power	58.34	54.05	49.65	**B.M**	555.65	2	277.86	19.20*
				W.G	593.27	41	14.47	

Speed	7.49	7.62	7.78	**B.M**	0.64	2	0.32	16.00*
				W.G	0.82	41	0.02	

** Significant at 0.05 level. Table value for df 2, 41 was 3.23.*

From the table-II shows that the adjusted post-test means values on basal heart rate and selected motor fitness variables such as explosive power and speed. The obtained f- ratio for selected motor fitness variables was 36.42, 19.20 and 16.00 but the required table value of df 2 and 41 was 3.23. It shows that both training groups of obtained value were greater than the required table value at 0.05 level of confidence. This results of the study indicated that there was a significant mean difference exist between the high intensity interval training, functional training and control groups on basal heart rate and selected motor fitness variables. To find out which of the paired means had a significant difference, the Scheffe's post-hoc test was applied and the results are presented in Table III.

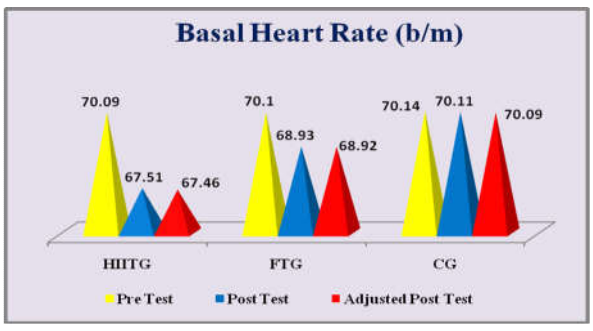
Table III

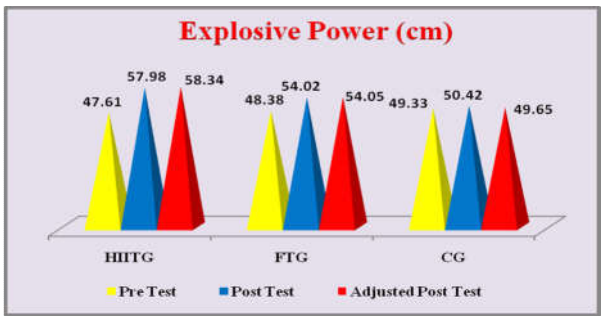
The scheffe's test for differences on basal heart rate and selected motor fitness variables between the adjusted post-test paired means

Variable	High Intensity Interval Training Group	Functional Training Group	Control Group	Mean Difference	CI
Basal Heart Rate	67.46	68.82	*	1.36*	**1.27**
	67.46	*	70.09	2.63*	
	*	68.82	70.09	1.27*	
Explosive Power	58.34	54.05	*	4.29*	3.53
	58.34	*	49.65	8.69*	
	*	54.05	49.65	4.40*	
Speed	7.49	7.62	*	0.13*	**0.13**
	7.49	*	7.78	0.29*	
	*	7.62	7.78	0.17*	

**Significant at 0.05 level of confidence*

From the table III shows that, there was a significant difference on basal heart rate and selected motor fitness variables between three groups. it was concluded that the high intensity interval training group was better than functional training group and also the functional training group had improving their selected motor fitness variables of sprinters while compared than the control group.





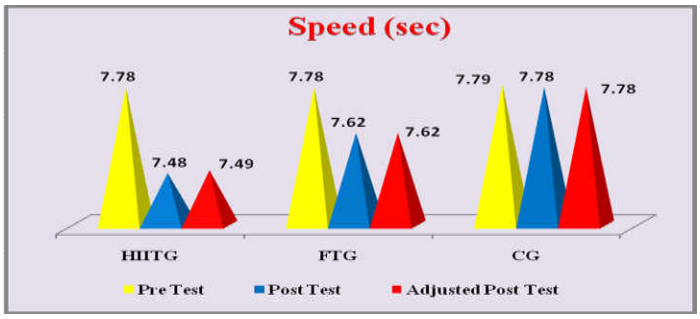


Figure 1: Mean value of high intensity interval training group (HIITG), functional training group (FTG) and control group (CG) on basal heart rate, explosive power and speed of sprinters.

Discussion on Findings

The result of study indicates that there were significant differences on basal heart rate, explosive power and speed on high intensity interval training, functional training and control groups of sprinters. The following studies are supported to the result of this investigation from Arumugam, S., & Suriya, P. (2018); Arumugam, S., & Kumar, V. (2019); Arumugam, S., Suriya, P. & Kumar, V. (2019); Arumugam, S., Kumar, V. & Suriya, P. (2019); Arumugam, S., & Vimal Kumar, V. (April 2019); Vigneshwaran, G., & Suriya. P, (2019) & Gururaj, S., & Arumugam, S. (2018)

Conclusions

On the basis of findings of the study, the following conclusions may be drawn:

The present study was exposed that significant difference was found in the mean of basal heart rate, explosive power and speed of high intensity interval training and functional training and control groups. The high intensity interval training group had significantly outperformed than the functional training group on the participant's basal rate and selected motor fitness variables. However the control group had not shown any significant improvement on selected dependent variables.

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