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Influence of series and parallel methods of circuit training and interval training on muscular endurance of college men

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Abstract

The purpose of this investigation was to find out the influence of series and parallel methods of circuit training and interval training on the muscular endurance of college men. To achieve this purpose, forty five (N= 45) men students studying in Government Degree College Kulgam, Jammu and Kashmir, were selected as subjects. The age ranged between 18 to 23 years. The selected subjects were randomly assigned into three equal groups of fifteen (n=15) subjects each such as series training group, parallel training group and control group. The Group I underwent series method of circuit training and interval training programme three days per week for twelve weeks. Group II underwent parallel method of circuit training and interval training programme for three days per week for twelve weeks and Group III acted as control group which did not participate in any special training programme apart from their regular activities. The muscular endurance was taken as criterion variable for the present study and it was measured by bent knee sit ups. All the subjects of the three group's were tested on the selected dependable variable at prior to and after the training programme. The analysis of covariance (ANCOVA) was used to analyse the significant difference, if any, between the groups. Level of confidence was fixed at .05 to find out the level of significance which was considered as an appropriate. The results revealed that there was a significant difference between series training group, parallel training group and control group (28.60 ± 3.22 , 30.80 ± 2.45 and 22.53 ± 1.55) on muscular endurance and also the result of the study shows that the improvement of (2.15) on the muscular endurance was significantly higher for parallel training group than series training group.

Keywords: Series training, parallel training, muscular endurance, ANCOVA

Introduction

Physical exercise is any bodily activity that helps to maintain physical fitness and overall wellbeing of an individual. By the proper use of exercises we can make our muscles and cardio-vascular system strong. Exercises also help to achieve athletic skills, weight loss or maintenance, as well as for the purpose of enjoyment (Stampfer *et al.*, 2000) [1].

Circuit training is most likely the most common training programme used by athletes to improve their performance. A circuit consists of a number of different stations at which the athlete performs a given exercise as many times as possible within a given time period. After completing exercise in one station the individual moves on to next station & performs a different exercise for a similar period of time and so on around the various stations. Circuit training is designed to develop cardio-respiratory endurance, flexibility, strength and muscular endurance in essential muscle groups. It is an efficient training method in terms of gain made in a short time (Reddy 2012) [2]. Studies show that circuit training is the most efficient way to cardio-vascular fitness and muscular endurance and that helps to achieve their goals and maintain longer than other form of exercises (Buncher and prentice 1985) [3].

Interval training includes heavy exercises for a given distance or a particular time, alternate with lighter exercise and recovery. As tolerance permits greater speed of the exercise, the distance covered is also increased in succeeding workouts. The exercise bouts are at near maximum level of intensity and hence it differs from cardio respiratory fitness. In other words the heart rate and energy requirements are greater in the interval training. Physical training will be more in this type of training as maximal efforts is required for endurance training (singh).

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Interval method is the most essential method of improving endurance. Many coaches believe that the athletes have improved their endurance with the help of interval training.

Muscular endurance is the ability/capacity of a muscle or a group of muscle to do repeated contractions against a resistance or to maintain contraction for an extended period of time. Muscular endurance can be developed by the exercises such as push ups, pull ups and set ups and by doing these exercises we can also measure muscular endurance (sing *et al.* 2008) [6].

Materials and Methods

The aim of this study was to find out the influence of series and parallel methods of circuit training and interval training on the muscular endurance of college men. To achieve the purpose of forty five men students studying bachelor's degree in Government Degree College Kulgam, Jammu And Kashmir State were selected as subjects during the academic year 2018-19 were randomly selected. The age of the subjects were ranged from 18-23 years. The selected subjects were divided into three equal groups of fifteen (n=15) subjects each at random. Group I (series training group) underwent circuit training for three days per week for first six weeks and interval training for three days per week for remaining six weeks. Group II (parallel training group) underwent circuit training and interval training for three days per week for twelve weeks in alternative sessions. Every day the work out is conducted about 45 to 60 minutes including warming up and cooling down exercises. Group III (control group) did not participate in any specific activity The subjects underwent

their respective training programme under the strict supervision of the convenor of sports and assistant physical instructor of the Government Degree College Kulgam, Jammu and Kashmir state. The data on muscular strength was collected by administering bent knee sit ups. Pre-test data were collected prior to the training programme and post-test data were collected immediately after the twelve-weeks of training programme from both the experimental groups and control group

Statistical procedure

The collected data from circuit training and interval training in series, circuit training and interval training in parallel and control groups during pre and post-test on selected criterion variable such as , muscular endurance, used for statistical treatment to find out the significant difference between the adjusted post means by computing the analysis of covariance (ANCOVA). The 0.05 level of confidence was fixed to test the significance which was considered to be appropriate measures. Since, three groups were compared, whenever obtained "F" ratio for the adjusted post-test was found to be significant the Scheffe's test was applied as post hoc test to find out paired mean differences if any.

Results and Discussion

Analysis of covariance for the pre-test, post-test and adjusted post-test mean values for Series and Parallel methods of circuit and interval trainings and control groups on muscular endurance.

Table 1: Analysis of covariance of circuit training and interval training in series, parallel and control groups on muscular endurance

Tests	Series group	Parallel group	Control group	SoV	SS	DF	MS	F
Pre-test Mean	22.60	22.66	22.80	BG	0.31	2	0.15	0.04
SD (\pm)	1.91	1.87	1.82	WG	147.33	42	3.50	
Post-test Mean	28.60	30.80	22.53	BG	549.91	2	274.95	43.78*
SD (\pm)	3.22	2.45	1.55	WG	263.73	42	6.27	
Adjusted Post-test Mean	28.66	30.81	22.45	BG	564.87	2	282.43	61.86*
				WG	187.18	41	4.56	

*Significant at 0.05 level of confidence

(The required table value for significance at 0.05 level of confidence with degrees of freedom 2 and 42 is 3.22 and degree of freedom 2 and 41 is 3.23).

The above table shows that the pre-test means and Standard deviation on muscular endurance of Series training, Parallel training and control groups are 22.60 \pm 1.91, 22.66 \pm 1.87 and 22.80 \pm 1.82 respectively. The obtained F ratio value 0.04 of muscular endurance is less than the required table value of 3.22 for the degree of freedom 2 and 42 at 0.05 level of confidence, which proved that the scores in muscular endurance before the training were equal and there was no significant differences. The post-test means and standard deviation on muscular endurance of Series training, parallel training and control groups are 28.60 \pm 3.22, 30.80 \pm 2.45 and 22.53 \pm 1.55 respectively. The obtained 'F' ratio value 43.78 of muscular endurance is greater than the required table value of 3.22 for the degree of freedom of 2 and 42 at 0.05 level of confidence. It implies that the significant differences existed between three groups during the post test period on muscular endurance. The Adjusted post- test means on muscular endurance of Series training, parallel training and control groups are 28.66, 30.81 and 22.45 respectively. The obtained F ratio value 61.86 of muscular endurance is greater than the required table value of 3.23 for the degree of freedom 2 and

41 at 0.05 level of confidence. Hence, it is concluded that significant differences exist between the adjusted post-test means of Series training, Parallel training and control groups on muscular endurance. Since, the obtained F ratio value in the adjusted post- test means is found to be significant, the Scheffe's test is applied as post hoc test to find out the paired mean differences, and it is presented below.

Table 2: Scheffe's Post Hoc Test for the Differences among Paired Means of Experimental and Control Groups on muscular endurance

Series Group	Parallel Group	Control Group	Mean Difference	CI
28.66	30.81		2.15*	1.96
28.66		22.45	6.21*	
	30.81	22.45	8.36*	

From the above table the Scheffe's post hoc analysis proved that significant mean differences exist between Series training, Parallel training and control groups on muscular endurance. Since the mean differences 6.21 and 8.36 are higher than the confidence interval value of 1.96 at 0.05 level of significance. However, significant difference exists between Series and Parallel methods of circuit and interval training groups, since mean difference is 2.15 greater than the

confident interval value of 1.96 at 0.05 level of confidence. The result of the study shows that significant difference exists between series training group and parallel training group, series training group and control group and parallel training group and control group on muscular endurance. However, the improvement of muscular endurance was significantly

higher for the parallel training group than series training group. It may be conclude that parallel training is more beneficial than series training in improving muscular endurance. The pre-test, post-test and adjusted post mean values of series training group, parallel training group, and control group are graphically represented in figure 1

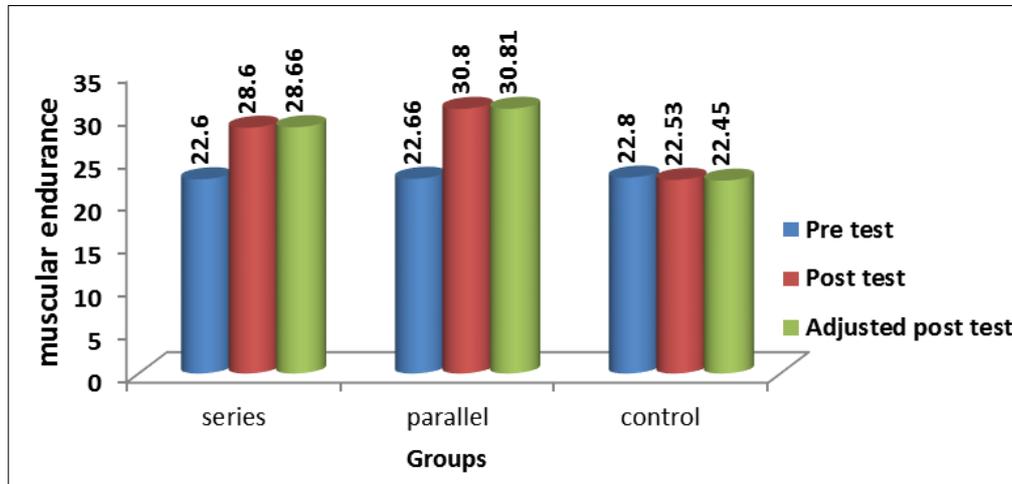


Fig 1: The pre-test, post-test and adjusted post mean values of series training group, parallel training group, and control group on muscular endurance

Discussion

The result of the present study points out that the muscular endurance of the subjects significantly improved due to series and parallel methods of circuit training and interval training. The findings are agreed with the findings of Yadav (2017) ^[4] that circuit training and fartlek training improved muscular endurance. It is also similar with the findings of Kumar and Maniazhagu (2014) ^[5] that significant improvement has been shown by muscular endurance due to the circuit resistance training. Kumar (2016) ^[7] conducted a study to find out the effect of interval training on endurance components among college Kabaddi players. The result indicates that interval training group had shown significant improvement in all the selected endurance components

Conclusion

The result of the study revealed that the training group has significant improvement in muscular endurance among college men after the series and parallel methods of circuit and interval trainings protocol. However, the improvement of muscular endurance was significantly higher for the parallel training group than series training group. It is also concluded that these methods of training is one of the best methods for increasing the muscular endurance and as well as the physical fitness of college men.

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