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Impact of drill based high intensity interval training on physical fitness variables of volleyball players

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Abstract

The purpose of the study was to find out the impact of drill based high intensity interval training on physical fitness variables of volleyball players. To achieve the purpose of this study forty volleyball players were randomly selected from affiliated colleges of Bharathiar University, Coimbatore and their age ranged between 18 and 25 years. All the subjects were divided into two equal groups with 20 subjects each. Group-I underwent drill based high intensity interval training for a period of sixteen weeks and group-II acted as control who did not participate in any special training other than their regular routine. The fitness variables such as muscular strength and cardiorespiratory endurance were selected as dependent variables. Muscular strength was assessed by modified sit-ups and the unit of measurement in counts, cardio respiratory endurance was assessed by cooper 12min run and walk test and the unit of measurement in meters. Pre and post-test random group design was used for this study. The data were collected before and after the training period of sixteen weeks and the data collected were statically analyzed by 't' test, which was used to find out the significant improvement on selected variables from the base line to post. The result of the study drill based high intensity interval training produced that there was a significant improvement in the muscular strength and cardiorespiratory endurance of volleyball players.

Keywords: Volleyball players, drill based high intensity interval training, muscular strength and cardio respiratory endurance

Introduction

Volleyball is a sport dominated by strength and power. Whereas volleyball players need power in their legs to get high in the air and strength in their upper body to spike, block, and dig balls. Strengthening volleyball-specific muscles ensures that athletes are able to reach their maximum performance potential. A volleyball match will be played for five sets which means a match can last about 90 minutes, during which a player can perform 250-300 actions dominated by the explosive type of strength of the leg muscles. The total number of action as jumps takes up around 50-60% high speed movements and change of direction in space about 30% and as falls about 15% the spike and block action are dominated by the corresponding explosive type of strength which is referred to as a player's vertical jump which is usually the key to winning points (Stojanovic, 2004).

Volleyball players need strength to produce force to block, spike and dig balls during a game. The more force they put into the ground the higher the player will jump. The more force they put into the ball, the faster it will go which increases the chances of a kill shot. Strength in the muscles also helps injury prevention. The force of each landing transfers through the ankles, knees, hips, and back. Strong muscles are better able to absorb the shock than the weaker ones. Also, the shoulders undergo high stress during each overhead spike or serve. As the players decelerate a hit, it places stress on the posterior shoulder, requiring complimentary strength to control this rapid speed. The capacity of the neuromuscular system to produce power is critical to the performance, in sports that need changes in direction, sprints, jumps and throws (Izquierdo M 2002) ^[5]. Specifically, volleyball skills, such as serving, attacking, blocking, setting, digging and receiving the service the players are involved high levels of these functional abilities (Fathi A. 2019) ^[6]. Despite the recognized importance of improving functional abilities to sports performance, their actual contribution to enhancing skill performance is still equivocal.

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In this regard, a few studies have been conducted focusing primarily on the effects of drill based high intensity interval training on sport-specific (Kraemer WJ. 2003) [7], rather than sports performance in real match conditions.

Hence, the health related aspects play a crucial role in the performance of the players. Number of studies suggested HIT that training improves the play fitness for various game. It is also recommended that HIIT training can be adopted for volleyball players for the development and physical fitness components. HIIT exercise sessions generally consist of a warm up period followed by repetitions of high-intensity exercises separated by medium intensity exercises for active recovery, then a cool down period. The high-intensity exercise should be done at near maximum intensity. The medium exercise should be about 50% intensity. The number of repetitions and length of each depends on the exercise, but may be as little as three repetitions with just 20 seconds of intense exercise. The specific exercises performed during the high-intensity portions vary. Most of the research on HIIT has been done using a cycling ergometer, but other exercises like a rowing ergometer, running, stair climbing and uphill walking can also be effective. There is no specific formula to HIIT. Depending on one's level of cardiovascular development, the moderate-level intensity can be as slow as walking. A common formula involves a 2:1 ratio of work to recovery periods, for example, 30–40 seconds of hard sprinting alternated with 15–20 seconds of jogging or walking, repeated to failure. The entire HIIT session may last between four and thirty minutes, meaning that it is considered to be an excellent way to maximize a workout that is limited by time constraints. This can be give its maximum benefit in minimum time. Therefore, the study was made an attempt to find out the effect of drill based high intensity interval training on physical fitness variables among collegiate

volleyball players.

Methodology

To achieve the purpose of this study, 40 male Volleyball players from affiliated colleges of Bharathiar University, Coimbatore were taken as subjects and their age ranged between 18 and 25 years. All the subjects were divided into two equal groups with 20 subjects each. Group-I underwent drill based high intensity interval training for a period of sixteen weeks and group-II acted as control who did not participate in any special training other than their traditional training. Muscular strength and cardio respiratory endurance were selected as criterion variables and assessed with sit ups and cooper 12minutes run and walk test respectively. To determine the improvement from the base line to post test the paired t-ratio was applied. The collected data were analyse and interpreted as follows.

Training Program

The training program was lasted for 45 minutes per session in a day, 3 days in a week for a period of sixteen weeks duration. These 45 minutes included 5 minutes warm up and 5 minutes warm down remaining 35 minutes allotted for drill based high intensity interval training programme. Every two weeks of training 5% of intensity was increased from 65% to 75% of work load. The training load was increased from the maximum working capacity of the subjects during the pilot study.

The collected data on above mentioned parameter due to the effect of drill based high intensity interval training was analysed by using 't' test to find out the significant improvement from the base line to post treatment effect by pre and post-test. In all cases statistical significance was set at 0.05 level of confidence ($P < 0.05$).

Table 1: Computation of 't'-Ratio Between Pre and Post Test Means of Drill Based High Intensity Interval Training Group (DBHIITG) and Control Group(CG) on Muscular Strength and Cardio Respiratory Endurance

Variables	Groups	Test	Mean	Standard deviation	Mean difference	't' ratio
Muscular strength in no N=20	Experimental Group	Pre	32.20	2.80	3.80	14.51*
		Post	36.00	3.02		
	Control Group	Pre	29.66	2.55	0.33	1.78
		Post	29.33	2.46		
Cardio Respiratory endurance in (ml/kg/min) N=20	Experimental Group	Pre	2185.33	275.83	239.33	3.89*
		Post	2424.66	278.85		
	Control Group	Pre	2044.66	354.51	24.00	1.32
		Post	2068.66	368.31		

*Significant at 0.05 level of confidence (2.14) 1, 14

Table reveals that the computed 't' ratio on Muscular strength and cardio respiratory endurance of drill based high intensity interval training group were 14.51 and 3.89 respectively. Since these values were higher than the required table value of 2.14, it was found to be significant at 0.05 level of confidence for degrees of freedom 1 and 14. Whereas the obtained 't' ratio between pre and post-test on Muscular strength and cardio respiratory endurance of the control group was 1.78 and 1.32 respectively, it was lesser than the required table value of 2.14 and it was found to be not significant at 0.05 level of confidence. From the results, it was inferred that the experimental group practiced sixteen weeks drill based high intensity interval training to produced significant improvement on muscular strength and cardio respiratory endurance of volleyball players.

The bar diagram shows the mean values of pre-test and post-test on muscular strength and cardio respiratory endurance of

drill based high intensity interval training group (DBHIITG) and control group (CG) of volleyball players.

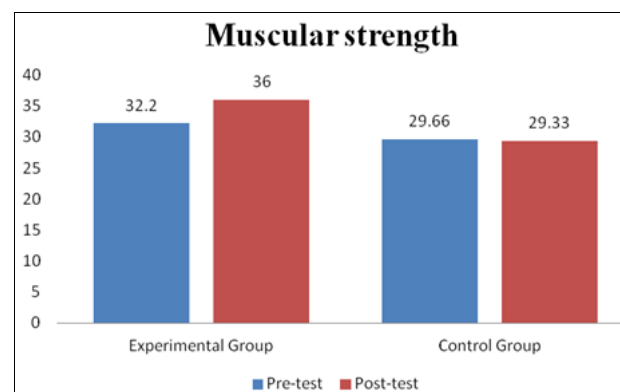


Fig 1: Bar Diagram Showing Means on Muscular strength of Volleyball Players

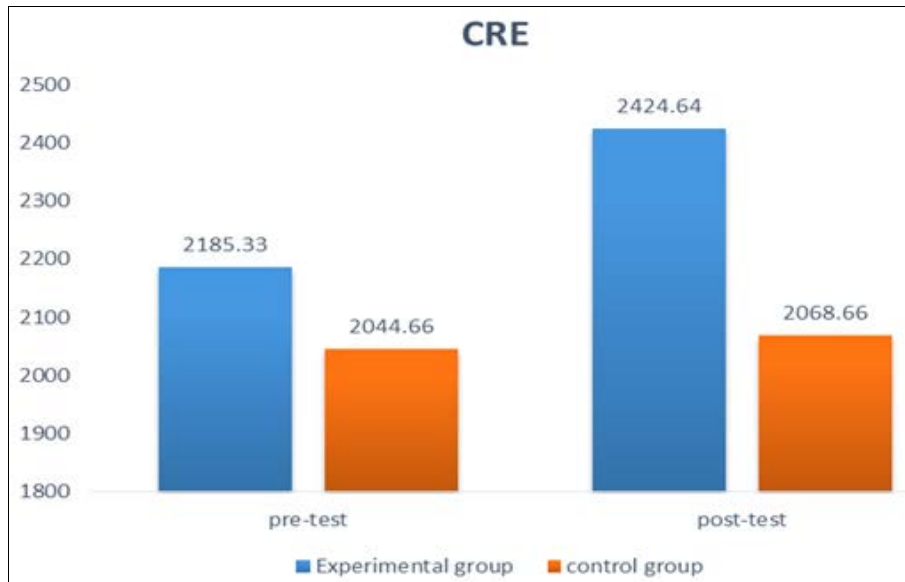


Fig 2: Bar Diagram Showing Means on Cardio respiratory endurance of Volleyball Players

Bar diagram shows the mean values of pre-test and post-test on muscular strength and cardio respiratory endurance of drill based high intensity interval training group (DBHIITG) and control group (CG) of volleyball players.

Discussions on findings

The results clearly indicated that the muscular strength and cardio respiratory endurance of experimental group improved due to the influence of 16 weeks of drill based high intensity interval training programme. Gabbett *et al.*, (2008) suggest that a combination of instructional training and skill-based conditioning games is likely to confer the greatest improvements in fitness and skill in junior elite volleyball players. Trajković *et al.*, (2012) reported that specific volleyball conditioning is necessary in the preseason period for the development of the lower-body strength, agility and speed performance in volleyball players. Griffith *et al.*, (2008) indicated that implementing the skills training program was associated with enhanced service performance. Georgieff *et al.*, (2006) suggested that results demonstrate that skill-based testing offers a reliable method of quantifying development and progress in junior volleyball players. Bobbert, (1990) reported that specific drills of drop jump might trigger improvement of the power output capacity of muscles, whereas the repetition of the counter movement drop jump may help to improve coordination.

Conclusions

Based on the results of the study following conclusion have been arrived.

1. Muscular strength of men volleyball players significantly improved from the base line to posttest due to the effect of drill based high intensity interval training of college level volleyball players.
2. Sixteen weeks of drill based high intensity interval training significantly improved from the base line to posttest due to the effect of drill based high intensity interval training cardio respiratory endurance of college level volleyball players.
3. From the findings of the present study it is postulated that the drill based high intensity interval training is suitable mode to bring out the desirable changes over physical fitness variables of volleyball players.

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