EFFECT OF CIRCUIT RESISTANCE TRAINING ON CARDIORESPIRATORY ENDURANCE OF BADMINTON PLAYERS

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Abstract

The purpose of this study was to find out the effect of circuit resistance training on cardiorespiratory endurance of badminton players. Forty male badminton players (n = 40) were randomly selected as subjects and their age ranged between 14 and 17 years. They were randomly divided into two equal groups such as experimental group (*EG*) and control group (*CG*) with twenty subjects each (n = 20). The experimental group underwent circuit resistance training for 10 weeks three days per week and a session on each day. Control group was not exposed to any specific training apart from their curriculum. Cardiorespiratory endurance was selected as criterion variable for this study and it was measured by using coopers 12 minute run or walk test and the distance covered in meters was recorded. Analysis of covariance (*ANCOVA*) was applied as statistical tool. In all cases 0.05 level of confidence was fixed to test the significance, which was considered as an appropriate. It was concluded from the result of the study that there was a significant improvement ($p \leq 0.05$) due to circuit resistance training on cardiorespiratory endurance among badminton players as compared to control group.

Keywords: Resistance training, circuit training, cardio respiratory endurance, badminton players

Introduction

Badminton is an explosive sport that requires the athlete to be able to move in multiple directions while smashing and receiving a shuttlecock with speeds of up to 332 km/h[1.] Badminton is aerobic base anaerobic sports which demand fast glycosis energy system as dominants. Repeated jump smashes, lunges, fast changes of direction; all require the entire body to generate maximum power.

Badminton is considered an intermittent high-intensity sport that requires mainly anaerobic metabolism However slow a glycosis energy system contributes for quick recovery and prolongs minutes of running. ATP-PC system contributes sudden attack of movement during smashing, lunching. The duration of a high intensity badminton game requires a high level of aerobic metabolism to enhance the resynthesis of creatine phosphate, lactate clearance from active muscle and removal of accumulated intracellular inorganic phosphate [2].

It seems clear that the physical fitness of players and game performance can be influenced by both aerobic and anaerobic metabolism [3]. Anaerobic capacity may be improved by strength training. The strength training develops the aerobic capacity through performing many repetition and sets. Aerobic capacity is base to build anaerobic capacity of players. Badminton players should have excellent anaerobic capacity to do high intensity quick movement. Aerobic capacity is highly depend on major three factors such as VO2max, running economy, and lactate threshold. VO2 play major contribution in the development of aerobic capacity that determine amount of oxygen utilized by body during running. Low VO2max level affect the badminton performance and the recovery of players.

Resistance training is used by the majority of elite athletes as a method to enhance on court athleticism. A combination of weight-bearing endurance training and resistance training in particular, could help enhance the positive effects is far from unlikely. Beyond the muscular and performance-enhancing benefits, resistance training also offers young individuals psychological benefits like improved self-confidence and body image.[4]

Circuit training is a form of conditioning combining resistance training and high intensity aerobics. It is designed to be easy to follow and target strength building as well as muscular endurance. Traditionally, the time between exercises in circuit training is short, often with rapid movement to the next exercise. A well rounded programme of physical activity includes strength training, to improve bone, joint function, muscle, tendon and ligament strength, as well as improve our heart and lungs fitness[5].

The term circuit training describes the way a workout is structured rather than the type of exercise performed. It typically consists of a series of exercises or stations completed in succession with minimal rest in between. Circuit routines allow the athlete or coach to create an endless number of workouts and add variety to routine training programs. Through circuit training the athletes may increasing their strength and endurance by increasing the repetitions of exercise at each station or by doing the required frequencies of exercise in a shorter length

of form. If the work load is kept constant, the athletes can develop strength and endurance by gradually decreasing the time taken to go through the circuit. Circuit training is a program in an athlete moves from one exercise station to another planned sequence and in the shortest possible form.

When adopt combined training with strength and circuit training which has no negative impact on aerobic capacity, strength training boosts muscular endurance that reduces to muscles fatigue and improves myoglobin. Muscles s develop anaerobic capacity through improving fast twist muscles fibre, ATP – PC energy system, fast glycolic system, increase stroke volume and cardiac output. Enhancing this variables contribute in the development of aerobic and anaerobic capacity. Circuit based training increase certain amount of strength and muscular hypertrophy. It helps to produce external force against resistance. Strength training contributes in the development of energy contribution to increase glycogen storage [5]. Circuit based strength training play key role in the adaptation of athletes to sports as well as produce endurance which lead to peak performance and strength. Circuit training is an important to players as it is developing aerobic capacity of players and it is important for quick recovery and continues to tolerate lactic acid. The purpose of the study was to find out the effect of combined resistance training and circuit training programme on selected cardio respiratory endurance of badminton players.

Materials and Methods

Random group design was used in this study. The subjects of the study were 40 badminton players with in the age group of 14 to 17 years were selected from Calicut. The subjects were randomly assigned to two groups that is an experimental group (*EG*) and one control (*CG*) (n = 20). The experimental group participated in circuit resistance training programme for a period of 10 weeks. The control group did not participate in any specialized physical activity training programme during the same period. All the subjects were tested in the selected cardiorespiratory endurance using coopers 12 min run or walk test after 10 weeks of combined resistance training and circuit training programme. The training programme included warm up (10 mins), work out (40 minutes) and cool down (10 mins) sessions for duration of 60 min. The intensity of training was increased after every 2 weeks. The data pertaining to selected variables were analysed by ANCOVA to determine the difference between initial and final mean for experimental and control group at 0.05 `level of significance.

Results

The statistical analysis of data collected on selected physical variables has been presented in the below table. The data pertaining to cardiorespiratory endurance for both experimental and control group were tested using ANOVA. The level of significant chosen was 0.05 level. The mean difference of the criterion measures for the control and experimental group is presented in tables I.

Table-I

Computation of Analysis of Covariance on Cardiorespiratory Endurance of Experimental group and Control Group

	EG	CG	SOV	SS	df	MS	*F*
Pre Test Mean	2041.0	2036.5	BG	202.500	1	202.500	.952
			WG	2061835	38	54258.81	
Post Test Mean	2405.0	2064.0	BG	1162810.0	1	1162810.0	27.7*
			WG	1594780.0	38	41967.8	
Adjusted Mean	2403.31	2065.68	BG	1139781.1	1	1139781.1	99.14*
			WG	433641.7	37	11720.04	

* P < 0.05 Table F, df (1, 38) (0.05) = 4.09; (1, 37) (0.05) = 4.10

Table I indicated that the obtained pre-test F-ratio for Cardiorespiratory endurance was 0.952. As the calculated value was below the table value the pre-test means of all cardiorespiratory variables was insignificant at 0.05 level of confidence for the degree of freedom 1 and 38. The obtained post-test F-ratio for cardiorespiratory endurance was 27.7*. The table value of F-ratio was 4.09; as the calculated value was higher than the required table value the post-test means of all cardio respiratory variables was significant at 0.05 level of confidence for the degree of freedom 1 and 38. The obtained adjusted post-test F-ratio for cardiorespiratory endurance was 99.14. The table F-ratio was 4.10; as the calculated value was higher than the required table value hence the post-test adjusted means of cardio respiratory variables was significant at 0.05 level of confidence for the degree of freedom 1 and 37.

The result of the study indicated that there was a significant difference between the adjusted post-test mean of the circuit resistance training group with respect to the control group on cardiorespiratory endurance at 0.05 levels. The pre, post and adjusted post-test mean values

of the circuit resistance training group and the control group on cardiorespiratory endurance is graphically represented in the figure l.

Figure -1

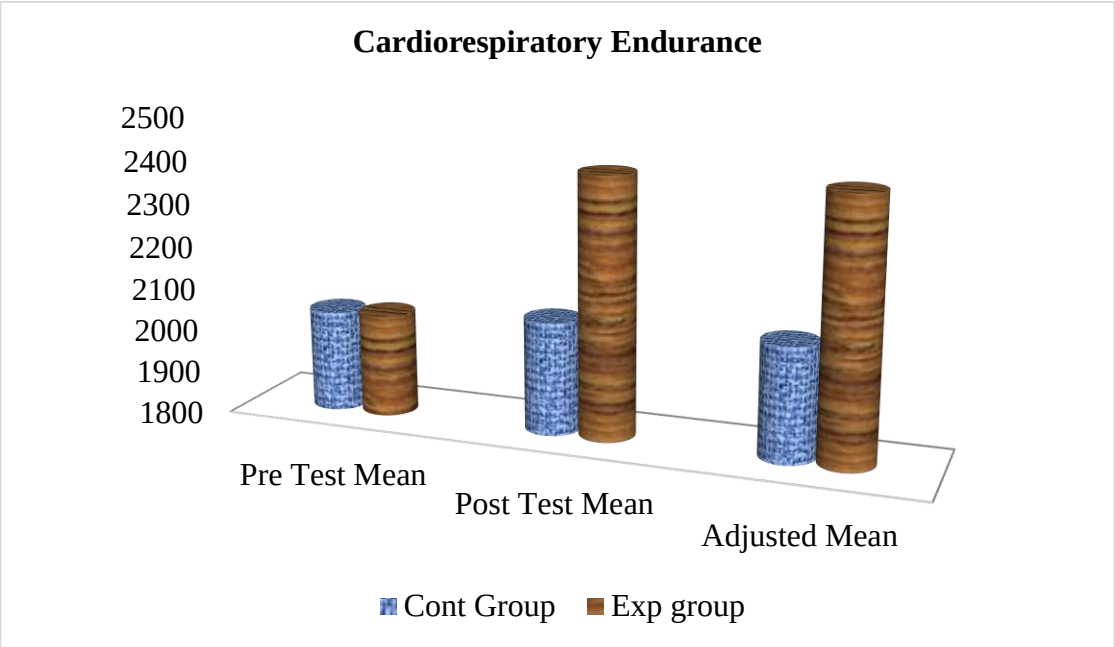

Figure1: The pre, post and adjusted post-test mean values of Circuit Resistance Training Group and Control Group on Cardiorespiratory Endurance.

Discussion

Badminton players should have adequate muscular strength to do rapid movements, preventing from sports injury, delay lactic acid accumulation, quick recovery. Therefore strength training needs to be adapted to the players with appropriate load. Aerobic endurance training in conjunction with muscle strengthening provides peak performance for short and long energy demands[6]. The resistance training and circuit training insists the body for greater physiological adaptation, it may be neurological or morphological. These motor tasks are movements that make strength and fitness and an imperative skill for athletes[7]. Neurological adaptation is important for motor unit recruitment, increasing the number of motor unit produce greater force production without controversial conversely reducing number of motor unit produce low force production8. Combined strength and circuit training improve type II muscles fibre, this improvement contributes in the development of maximum strength and power[9] which helps develop significant level of anaerobic capacity without controversial. Conversely who follow regular endurance sports have higher type I muscles fiber[10] which has

contributed in the development of volume of oxygen uptake. Advantage of resistance and circuit training improves aerobic capacity and anaerobic capacity but based on present study protocol that have developed significant level of anaerobic capacity no negative changes in aerobic capacity. Resistance and Circuit base training increasing hypertrophy of muscles cells it increases muscles contractile unit and hypertrophy which helps to force production. The activation status of both aerobic and anaerobic energy systems require energy to do during the game is required[11]. Aerobic capacity is important for players for rapid recovery as it is demanding high intensity of repetition if players don't have adequate endurance and recovery it will affect their sporting performance[12]. This game demand 60% of anaerobic and dominant energy system for game 40% aerobic capacity. Phosphagen energy system and anaerobic glycolysis which produces two routes of anaerobic metabolism is adenosine triphosphate[13]. Circuit based training has low level of recovery between station which will enhance aerobic capacity however previous researches has highlighted strength training might improve aerobic capacity therefore present study found that combined strength and circuit training had positive impact on endurance capacity without controversial as found major physiological changes in muscles.

Conclusion

Circuit resistance training has a great impact on the physical performance of the sportsman; training helps to improve the cardiorespiratory endurance of the athlete. The training for 10 weeks showed positive significance on cardio respiratory endurance of badminton players. So it is accessed that 10 weeks of circuit resistance training programme is very useful to improve the player's respiratory endurance and performance as well.

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