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Effect of circuit strength training on aerobic and anaerobic capacity on junior basketball players

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Abstract

Basketball is a high intensity running game highly demand aerobic and anaerobic energy pathway. The purpose of the study was to find out the effect of the circuit strength training on aerobic and anaerobic capacity on junior basketball players. Fifteen (n15) basketball players have been recruited from Jaffna central college as experimental group(EG) and fifteen (n=15) basketball players have been recruited from Jaffna Hindu college as control group(CG). EG has undergone 12 weeks of circuit strength training. Pre test data was collected from both group before commencing the study in selected variables such as aerobic and anaerobic capacity. Aerobic capacity was measured from 1.5KM run test and anaerobic capacity was measured from 300m running. After completion of experimental study post test data was collected from EG and CG. t statically test was administered to find out significant level. Significant level fixed at 0.05 level. Result revealed that anaerobic capacity has shown significant level of improvement of EG and aerobic capacity has not shown improvement. Control group had any more improvements in certain variables. Result concluded that 12 weeks circuit strength training had significant level of improvement on anaerobic capacity but CG had no more improvement in certain variables.

Keywords: Aerobic, anaerobic, strength training.

Introduction

Basketball game is aerobic base anaerobic sports demand fast glycosis energy system as dominants[1]. Basketball is considered an intermittent high-intensity sport that requires mainly anaerobic metabolism[2]. However slow a glycosis energy system contributes for quick recovery and prolongs minutes of running. ATP-PC system contributes sudden attack of movement during ball shooting. However, the duration of a basketball game (40–48 min) 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[3]. It seems clear that the physical fitness of basketball players and game performance can be influenced by both aerobic and anaerobic metabolism[4]. This aerobic and anaerobic capacity may be improved by strength training. This circuit base strength training develops the aerobic capacity through performing many repetition and sets. Aerobic capacity is base to build anaerobic capacity of players. Basketball players should have excellent anaerobic capacity to do high intensity running and ideal quick movement. However anaerobic capacity is also highly depend on aerobic capacity.

Aerobic capacity is highly depend on major three factors such as VO_2max, running economy, and lactate threshold. VO_2max play major contribution in the development of aerobic capacity that determine amount of oxygen utilized by body during running. Low VO_2max level affect the basketball performance and the recovery of basketball players. Endurance athletes have high VO_2max it is about 85ml however basketball players should have slightly less than endurance athletes as playing anaerobic sports. When adopt circuit base strength training which has no negative impact on aerobic capacity[2]. This strength training boosts muscular endurance that reduces to muscles fatigue and improves myoglobin. Muscles strength develop anaerobic capacity through improving fast twist muscles fiber, 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. Previous review literature found that strength has been correlated with basketball performance. Thus basketball players should have adequate strength to produce better performance in competition. Strength is correlated with anaerobic performance. 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 peak testerione which lead to peak performance and strength.

Circuit based strength training is a important to basketball players as it is developing muscular characters such as muscles fibers some previous research has marked that strength training limited aerobic capacity of basketball players and it is important for quick recovery and continue to tolerate game

pressure in competitive situation. Therefore there are unclear result produced in previous study thus present study is to be revealed that effect of circuit based strength training on aerobic and anaerobic capacity of basketball players.

Methodology

Study design: Fifteen basketball (n=15) players have been recruited from Jaffna central college as experimental group and fifteen (n=15) control group participant has been selected from Jaffna Hindu college. Participant age range was17 years old, they have represented national school basketball championship with more 3years experience in basketball game. Experimental group has followed weekly 3days training consistently for 12 weeks. Before commencing the intervention aerobic and anaerobic pre test data was collected from participants. 1.5km run test was administered to measure aerobic capacity, completed timing recorded in minutes, anaerobic capacity was measured by 300m run test best timing was recorded in second. Before conducting intervention sufficient explanation was given to participant to understand objective of study. Thereafter consent was collected from participants and parents.

Results and discussion

Result of the study revealed that circuit strength training had significant improvement on anaerobic capacity of experimental group (0.000<0.05) conversely that control group has not shown any improvement on anaerobic capacity. Moreover aerobic capacity of experimental group did not improve in aerobic capacity (0.05<0.174) as well as aerobic capacity of control group did not improve in their aerobic capacity (0.05<0.374).

Table-1: Training protocol.

	Weekly training					
Type of exercise	1 and 2 70%	3 and 4 75%	5 and 6 80%	7 and 8 85%	9 and 10 90%	11 and 12 95%
Snatch	10R×2S	8R×3S	6R×2S	3R×4S	2R ×4S	2R ×4S
Squat	12R×1S	12R×2S	8R×2S	7R×3S	6R×2S	3R×3S
Bench press	15R×1S	12R×2S	9R×2S	7R×2S	6R×2S	3R×3S
Lunges	13R×1S	12×2S	10R×1S	8R×2S	5R×2S	2R×4S
Step up	14R×1S	12×2S	9R×2S	7R×2S	5R×2S	3R×3S
Dead lift	12R×1S	12R×2S	8R×2S	7R×3S	6R×2S	3R×3S

R= repetition, S =sets, %= percentage of intensity.

Table-2: A result shows that effect of circuit strength training on aerobic and anaerobic capacity of basketball players.

	Test type	Mean	St-Deviation	P – value
Aerobic capacity	Pre- test-EG	8.670	0.717	0.174
	Post- test-EG	8.519	0.954	
	Pre test-CG	8.561	0.971	0.374
	Post test-CG	8.374	1.009	
Anaerobic capacity	Pre- test-EG	45.948	2.418	0.000**
	Post- test-EG	43.859	3.010	
	Pre test-CG	45.791	2.098	0.560
	Posttest-CG	45.897	1.839	

** Significant level <0.05.

Discussion: Basketball players should have adequate muscular charters to do rapid movements, shooting accuracy, preventing from sports injury, delay lactic acid accumulation, quick recovery. Therefore strength training need to be adopted to the players with appropriate load. Aerobic endurance training in conjunction with muscle strengthening provides peak performance for short and long energy demands[6]. In this connection that circuit base strength training insists the body for greater physiological adaptation, it may be neurological or morphological. These motor tasks are movements that make agility an imperative skill for basketball 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 production[8]. Basketball players should have required amount of neurological adaptation, which helps to successful movement's pattern. In basketball speed voluntary occur during basketball attempt in side D circle thus circuit base strength training should be adopted. Improving all those variables enhance anaerobic capacity of basketball players it is confirmed in present study.

Circuit base strength training improve type II muscles fiber, this improvement contribute 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. Which sports demand anaerobic capacity as dominant energy that sports should follow strength training. Advantage of circuit base strength 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. Circuit base strength training increasing hypertrophy of muscles cells it increase muscles contractile unit and hypertrophy which helps to force production. Increasing number of contractile unit may be associated with perfect shooting in basketball game[6].

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 basketball players for rapid recovery as it is demanding high intensity of repetition up and down suppose if players don't have adequate 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 recover between station which will enhance aerobic capacity however previous research has highlighted strength training might improve aerobic capacity and some studies revealed it is unclear[14] therefore present study found strength training had no negative impact endurance capacity without controversial as found major physiological changes in muscles. Strength training affect your type I muscles fiber which is directly related with volume of oxygen uptake and mitochondria it is power house during aerobic running[15]. Moreover resistance training affects the number of connective tissue, capillary density. These both are important for enhancing aerobic capacity as well as strength training contribute in the development of cross sectional area of muscles fiber. Thus present study found circuit based strength training has no negative impact on aerobic capacity.

Conclusion

Basketball is short sprint sports; it contains much high intensity repetition and low intensity running. Circuit base strength training has been adopted to improve aerobic and anaerobic. Many numbers of repetitions, station of exercise and set improve aerobic and anaerobic. Particularly circuit base training contains low level of recovery between stations that develop the anaerobic endurance. However strength training has no negative impact on aerobic capacity as it is developing anaerobic variables such as myofibriller, ATP-PC system, and type II muscles fiber. Therefore present study concluded that circuit training improved anaerobic capacity of basketball players.

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