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Comparative effect of SAQ and circuit training programme on selected physical fitness variables of school level basketball players

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Abstract
The present study was undertaken to study the comparative effect of SAQ and circuit training program on selected physical fitness variables of school level basketball players. Thirty (30) school level basketball players aged between 14-17 years will randomly be selected from Simpkins School Agra U.P. The subjects were randomly divided in three groups as group A (SAQ training group), group B (circuit training group) and group C (control group). After the pre-test with Physical fitness test Experiment Group-A underwent a training SAQ programme of selected exercise. Experiment Group-B received a Circuit training program of selected exercises, whereas the Control group did not participate in any training program. Group A has gone under SAQ training program and Group has gone under circuit training for 60 minutes three times a week except Sunday for duration of 12 weeks. Post data was collected after 12 weeks of experimental period. Analysis of Variance (ANOCOVA) was applied at 0.05 level of significance and Post hoc mean comparison was done by using LSD test. It may be concluded that SAQ training program was significantly better than circuit training program for speed and agility whereas circuit training program was better than SAQ training program for abdominal, arms & shoulder endurance being studied by the researcher. In case of explosive strength no significant difference was found between both the training programs.

Keywords: SAQ training, circuit training, physical fitness

1. Introduction
Basketball is becoming a game that revolves around athleticism, and if athletes of a team are not fit it is going to be difficult to get on the floor. Therefor athletes need to dedicate time and add speed and quickness workouts to basketball training. Basketball requires tremendous endurance, speed, agility, and power (Siegler *et al.,* 2003) [12]. Basketball is an extremely dynamic sport that requires movements in multiple planes of motion as well as rapid transitions from jogging to sprinting to jumping. The ability to quickly elude defenders, rapidly decelerate to take a jump shot, or explosively jump up to grab a rebound are all skills required to effectively play the sport. It is equally important for the athlete to be able to perform these skills in a variety of directions and in a controlled manner to ensure injuries do not ensue (Young WB, 2001) [15]. The importance of developing good conditioning programs based on the specific physiological demands of each sport is considered a key factor to success (Gillam, 1985; Taylor, 2003) [6, 14]. Speed, agility, and quickness (S.A.Q.) training has become a popular way to train athletes. Whether they are school children on a basketball field or professional in a training camp, they can all benefit from speed, agility, and quickness training. The basketball agility drills will improve the speed around the court, quickness, co-ordination and most importantly r ability to change direction with minimal deceleration**.** The circuit is completed the exercises performed after over at all stations. Moreover, the high intensity movements of basketball players are closely related to the development of strength, speed and agility (Hedrick, 1993; Castagna *et al.,* 2007) [7, 3]. Explosive strength, take-off power, speed, and agility are abilities that make an important contribution to efficient movement with and without the ball, thus play an important role in basketball technique and tactics (Erculj *et al.,* 2010) [5]. The basketball player needs to train multiple components of fitness. Thus, the athlete will concurrently perform various modes of training (e.g., strength, anaerobic, endurance).

The purpose of the study was to compare effect of SAQ and circuit training program on selected physical fitness variables of school level basketball players.

2. Methodology

Thirty (30) school level basketball players aged between 14-17 years will randomly be selected from Simpkins School Agra U.P. The subjects were randomly divided in three groups as group A (SAQ training group), group B (circuit training group) and group C (control group). After the pre-test with Physical fitness test Experiment Group-A underwent a training SAQ program of selected exercise. Experiment Group-B received a Circuit training program of selected exercises, whereas the Control group did not participate in any training program. Group A has gone under SAQ training program and Group has gone under circuit training for 60 minutes three times a week except Sunday for duration of 12 weeks. Post data was collected after 12 weeks of experimental period. The following criterion measures were chosen for testing hypothesis. Illinois Agility Test was used for measuring agility of subjects and performance was recorded in seconds, speed was measured by using 50 yards run the unit of measurement was in 1/100 seconds. The leg explosive strength was measured by sargent jump test and performance was recorded in centimeters. The muscular strength endurance of abdominal and arms & shoulder was measured by bent knee set-ups and chin-ups test respectively and performance was recorded in numbers.

To analyze data descriptive statistics and the analysis of co-variance (ANCOVA) at 0.05 level of significance was applied. In case of F- value significant LSD (Least Significant Difference) post hoc means comparison was used for on selected physical fitness variables of school level basketball players. Selected physical fitness variables was measured by following test given below - Speed (50 yard run), explosive leg strength (standing broad jump), muscular strength endurance of abdominal (Bent knee sit up), power endurance of arms and shoulder (Push- up) and agility (Shuttle run test).

3. Results

The data collected was analyzed by using descriptive statistics and scores of adjusted post mean of fitness variables is presented in table-1.

Table 1: Descriptive Statistics of Adjusted Post Mean For Fitness Variables of Experimental Groups

Variable	Group	Mean	Std. Error	95% Conf. Int.	
				Lower Bound	Upper Bound
Speed	SAQ Training Group	10.740a	.074	10.589	10.892
	Circuit Training Group	11.490a	.073	11.339	11.641
	Control group	11.838a	.073	11.687	11.988
Agility	SAQ Training Group	9.292a	.067	9.154	9.429
	Circuit Training Group	9.932a	.064	9.800	10.064
	Control group	10.419a	.067	10.280	10.558
Explosive	SAQ Training Group	2.268a	.019	2.229	2.307
	Circuit Training Group	2.255a	.018	2.218	2.293
Strength	Control group	2.087a	.018	2.049	2.124
Abdominal Endurance	SAQ Training Group	43.154a	.314	42.509	43.798
	Circuit Training Group	45.594a	.316	44.945	46.242
	Control group	40.190a	.329	39.476	40.829
Arms& Shoulder Endurance	SAQ Training Group	42.257a	.318	41.603	42.910
	Circuit Training Group	46.554a	.376	45.781	47.326
	Control group	40.190a	.314	39.544	40.836

It is evident from Table 1 that the adjusted mean scores of speed 10.74with standard deviation values of. 74 and the adjusted mean scores of agility9.29with standard deviation values of. 67 of SAQ training group was found lowest among all the groups. In case of explosive strength SAQ training group mean scores 2.26 with standard deviation values. 019 was found highest among all the groups. In case of abdominal endurance circuit training group mean scores 45.59 with standard deviation values. 316was found highest among all the groups. Similarly mean scores 46.55 with standard deviation values. 376of circuit training group was found highest among all the groups in case of arms & shoulder endurance.

The analysis of covariance (ANCOVA) was used to find out the significant difference between experimental groups & control group after eliminating the effects of covariate is presented in table-2.

Table 2: Analysis of Covariance for Between Subject Effects among Experimental Groups of Fitness Variables

Variables	Source	Sum of Squares	df	Mean Square	F	Sig. (p-value)
Speed	Pre Speed	9.929	1	9.929	184.604	.000
	Treatment Group	6.235	2	3.118	57.967	.000
	Error	1.398	26	.054		
	Corrected Total	19.254	29			
Agility	Pre Agility	11.543	1	11.543	280.276	.000
	Treatment Group	5.400	2	2.700	65.556	.000
	Error	1.071	26	0.41		
	Corrected Total	28.602	29			
Explosive Strength	Pre Strength	.650	1	.650	203.136	.000
	Treatment Group	.196	2	.098	30.632	.000
	Error	.083	26	.003		
	Corrected Total	.875	29			
Abdominal Strength Endurance	Pre Endurance	208.992	1	208.992	218.155	.000

	Treatment Group	127.960	2	63.980	66.785	.000
	Error	.083	26	.003		
	Corrected Total	.875	29			
Arms & Shoulder Endurance	Pre Endurance	243.792	1	243.792	282.868	.000
	Treatment Group	119.621	2	59.811	69.397	.000
	Error	22.408	26	.862		
	Corrected Total	1128.000	29			

* Significant at 0.05 level of significance

Table-3 clearly revealed that there was a statistically significant difference among experimental groups (SAQ training group &Circuit training group) and control group in all the fitness variables. Since p-value for the F-statistics is. 000 for all the fitness variables which is less than 0.05, it is significant. Thus, the null hypothesis of no difference among the adjusted post means for the data on all the fitness variables among experimental groups and control group may be rejected at 5% level.

As the calculated 'F' value was found to be significant at 5% level a post hoc comparison test was applied by using LSD test. The result of the post hoc test is shown in table-3.

Table 3: Post Hoc Comparison of Adjusted Post Test Means In 50 Meter Sprint Among Different Tribes

Variable	SAQ Group	Circuit Training Group	Control Group	Mean Diff.	Std. Error	Sig. Diff.
Speed	10.740	11.490		.750*	.104	.000
	10.740		11.838	1.097*	.104	.000
		11.490	11.838	.348*	.104	.002
Agility	9.292	9.932		.641*	.092	.000
	9.292		10.419	1.127*	.099	.000
		9.932	10.419	.487*	.094	.000
Explosive Strength	2.268	2.255		.013	.027	.636
	2.268		2.087	.182*	.027	.000
		2.255	2.087	.169*	.025	.000
Abdominal Endurance	43.154	45.594		2.440*	.438	.000
	43.154		40.153	3.001*	.467	.000
		45.594	40.153	5.441*	.471	.000
Arms & Shoulder Endurance	42.257	46.554		4.297*	.548	.000
	42.257		40.190	2.067*	.415	.000
		46.554	40.190	6.364*	.541	.000

* Significant at 0.05 level of significance

The table 3 shows the pair wise comparison of means between experimental groups and control group. It is very much clear that comparison of mean difference between SAQ training group and circuit training group was found significant at 0.05 level of significance as p-value (0.000) was less than 0.05 in case of all the fitness variables except explosive strength. It is also clearly seen that comparison of mean difference between SAQ training group and control group was found significant at 0.05 level of significance as p-value (0.000) was less than 0.05 in case of all the fitness variables. Similarly it is also seen very clearly that comparison of mean difference between circuit training group and control group was found significant at 0.05 level of significance as p-value (0.000) was less than 0.05 in case of all the fitness variables.

In order to find out which training program was the best, it can easily seen in adjusted mean scores of different groups. Hence it may be concluded that SAQ training program was significantly better than circuit training program for speed, agility and explosive strength whereas circuit training program was better than SAQ training program for abdominal, arms & shoulder endurance being studied by the researcher.

The graphical representation of adjusted post-group means of experimental groups and control group for fitness variables are presented in Figure-1.

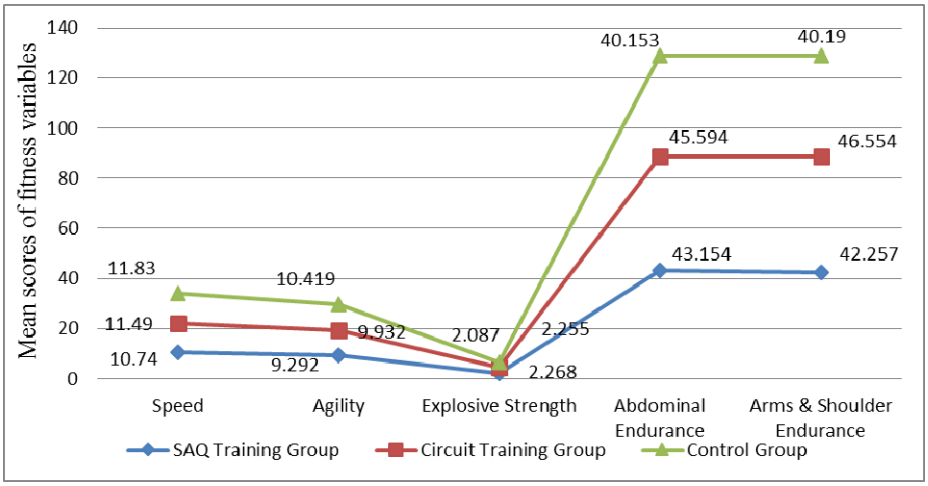

Fig 1: Graphical Comparison of the Adjusted Mean in fitness variables of Experimental Groups& control group

4. Discussion

This study investigated the comparative effect of two types of training program on selected physical fitness variables of school level basketball players. It may be concluded that SAQ training program was significantly better than circuit training program for speed and agility whereas circuit training program was better than SAQ training program for abdominal, arms & shoulder endurance being studied by the researcher.

SAQ training encompasses multi directional movement, hand eye coordination, balance, perception, acceleration and velocity training which directly related to speed and agility. SAQ training will help to improve straight ahead speed and deceleration capabilities required during transition periods and fast breaks that are performed in basketball. A basketball player required a very agile movement at basketball court, rapidly decelerate to take a jump shot, or explosively jump up to grab a rebound are all skills required to effectively play the sport. It is equally important for the athlete to be able to perform these skills in a variety of directions. Due to the myriad of physical demands that come with the sport makes speed and agility training a crucial component to incorporate into a basketball training program. Although it is considered that the best period for the development of agility is at the age of 16 (Markovic *et al.,* 2007) [10], this study has shown that agility can also be improved in later years using an appropriate training programme. This confirms previous findings by (Sporis, 2010) [13] where a poly-structural complex training programme produced improved performance in young soccer players. Whilst recent studies (Bloomfield *et al.,* 2007; Jovanovic *et al.,* 2011; Polman *et al.,* 2004) [2, 9, 11] have tended to show that SAQ training methods have a positive impact on power, speed and quickness these did not consider agility with and without the ball.

The circuit training comprises of six to eight strength exercises that are completed one exercise after another. Circuit training increased muscular endurance and strength of athlete as each exercise on circuit training is performed for a specified number of repetitions or for a set time before moving on to the next exercise. Basketball players are expected to repeat multiple high-intensity activities with minimal rest periods which are directly related to circuit training. A basketball player need muscular endurance and strength to perform explosive bursts of energy while on court and their skill levels must remain high if they are to make those 'three-pointers' and blocks. So during playing in basketball a good player has to jump as early as possible for fruitful playing. Therefore power is the performance prerequisite for a good basketball player. Previous studies in which children performed an extra-curricular circuit training program confirmed a significant improvement on both muscular and cardiorespiratory fitness (Annesi *et al.,* 2005; Ignico and Mahon, 1995; Wong *et al.,* 2008) [1, 8, 16]. In this line, Dorgo et al. (2009) [4] carried out a circuit training program with adolescents in the PE setting. These authors found a statistically significant improvement for both muscular strength and cardiovascular endurance when the circuit training was complemented with endurance training.

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