International Journal of Physical Education, Exercise and Sports
www.physicaleducationjournal.com
Online ISSN: 2664-9896, Print ISSN: 2664-9888
Received: 28-03-2022, Accepted: 13-04-2022, Published: 29-04-2022
Volume 4, Issue 1, 2022, Page No. 12-16

Effect of circuit training on selected physical fitness variables among college level women kho-kho players

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Abstract
The aim of the study was to find out the effect of circuit training on selected physical fitness variables among college level women Kho-kho players. To achieve the purpose of the study thirty women Kho-kho players were selected from various departments of Bharathidasan University, Tiruchirappalli. The selected subjects age range between 21 to 23 years. The selected subjects randomly divided in to two equal groups, group I experimental group, group II control group. Each group consists of 15 subjects. Experimental Group I undergone to circuit training for 6 weeks, 6 days per week under training in the morning secessions only. Group II (control group) does not have any specific training other than the regular routine activities. The physical fitness variables such as speed, agility and endurance have been selected as depended variables. The data collected from the two groups prior to and post experimentation were statistically analyzed by analysis of covariance (ANCOVA). The level of significance was fixed at 0.05 of confidence for all the cases. The experimental groups had significant improvement on all the selected physical fitness variables when comparing to the control group.

Keywords: circuit training, speed, agility and endurance

Introduction
The game of Kho-Kho is stand on the natural principal of physical development. It is extremely enjoyable thrilling game, speed is heart of the game and to play four innings with same speed the players need a large amount endurance and stamina to controlled sprint, dodging, diving is the skill throughout the game. The defender performs such skill in the game like swift, zigzag running, circle running, faking stopping, twisting upper body, bending etc. The Kho-Kho players performance depends high level of motor finest factor like speed, endurance, agility, power, flexibility, balance, reaction time, neuromuscular co-ordination, explosive strength, speed of movement and match practices are the principal qualities which should go with the Kho-Kho players (Dyavanoor 2020) [1].

Circuit Training
Circuit training is the combination of many anaerobic exercises performed consecutively, with very short or no rest in between, to achieve a cardiovascular training effect. Circuit training has become a common mode of exercise, in part because of time efficiency and because lighter loads typically are implemented in such a program. Free weight circuit weight training classes are popular group exercise classes designed to improve aerobic capacity, body composition, muscular strength and endurance.
Circuit training does not provide an effective aerobic workout. Studies evaluating circuit weight training showed an average improvement of only 6% in cardiovascular fitness as measured by vo_2 max over a six week period. Circuit training was described as continuous exercises with moderate weights using 10-15 repetition with 15-30 second rest periods. (Sushil Chauhan, 2013) [3]. Endurance training elicits improvement in maximal oxygen uptake, vital capacity, total lungs capacity and increase in blood hemoglobin contents (Arun Kumar Uppal et. al., 1980). Flexibility is developed through slow stretching and hold method, post isometric stretching and ballistic method. Agility is also much important variable which depend upon body movements with change of velocity or direction in response to a stimulus (Sheppard, J.M and Young, W.B et. al., 2006) [6].

Methodology
The purpose of the study was to find out the effect of circuit training on selected physical fitness variables among college level women Kho-kho players. To achieve the purpose of the study thirty women Kho-kho players were selected from various departments of Bharathidasan University, Tiruchirappalli. The selected subjects age range between 21 to 23 years. The selected subjects randomly divided in to two equal groups, group I as experimental group, group II as control group. Each group consists of 15 subjects. Experimental Group I undergone to circuit training for 6 weeks, 6 days per week under training in the morning secessions only. Group

II (Control Group) does not have any specific training other than the regular routine activities. The following physical fitness variables such as speed, agility and endurance have been selected.

Table 1: Criterion Variables and Tests

S.No.	Criterion Variables	Test Items	Unit of Measurements
1	Speed	50 mts run	In seconds
2	Agility	Shuttle run (4x10meters)	In seconds
3	Endurance	Cooper's 12min run/walk test	In minutes

The data collected from the two groups prior to and post experimentation were statistically analyzed by analysis of covariance (ANCOVA). The level of significance was fixed at 0.05 of confidence for all the cases was represented in Table II.

Table 2: Computation of Analysis of Covariance of Speed on Experimental and Control Group among Women Kho-Kho Players

Test	Experimental Group	Control Group	Sources of Variables	Sum of Square	Df	Mean Square	'F'-Ratio
Pre Test	7.72	7.70	Between	0.294	1	0.294	2.963
			Within	2.778	28	0.099	
Post Test	7.40	7.52	Between	0.678	1	0.678	7.541*
			Within	2.518	28	0.090	
Adjusted Post Test	7.40	7.70	Between	0.150	1	0.150	4.592*
			Within	0.883	27	0.033	

*Significant at 0.05 level, Table value for df 1 and 28 was 3.21Table value for df 1and 27 was 3.22.

Table -II shows that the pretest mean values of speed on experimental groups control group were 7.72 and 7.70. The obtained F ratio was 2.963, which was lesser then the table value of 3.22. Hence it was proved that the randomization of the subjects was successful.

The posttest mean values of speed on experimental groups and control group were 7.40 and 7.52. The obtained F ratio was 7.541, which was greater than the table value of 3.22. Hence it was proved that there was a significant improvement on speed among women kho-kho players.

The adjusted posttest mean values of experimental groups and control group were 7.40 and 7.70. The obtained F ratio 4.592 which was greater than the table value of 3.22. Hence it was proved that there was a significant improvement on speed among women kho-kho players.

For the better understanding of the results mean values of speed were graphically presented in the figure 1.

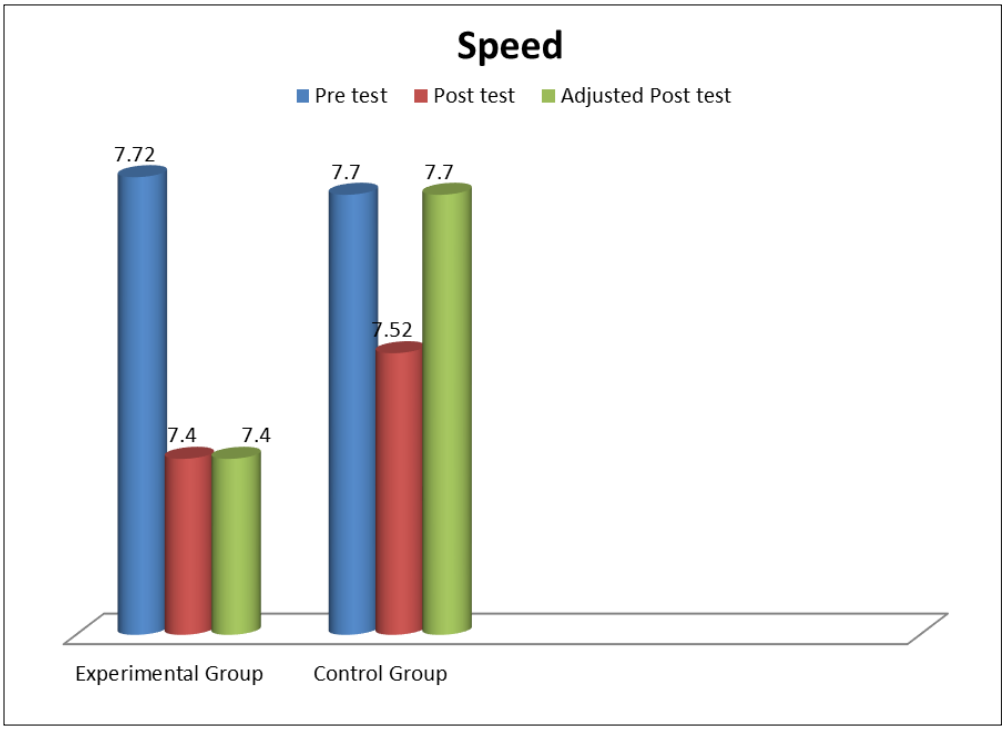

Fig 1: The Graphical Representation of the Pre, Post and Adjusted Mean Values of Speed on Experimental and Control Group

Table 3: Computation of Analysis of Covariance of Agility on Experimental and Control Group among Women Kho-Kho Players

Test	Experimental Group	Control Group	Sources of Variables	Sum of Square	Df	Mean Square	'F'-Ratio
Pre Test	8.17	7.79	Between	1.121	1	1.121	2.79
			Within	11.267	28	0.402	
Post Test	6.60	7.87	Between	12.033	1	12.033	44.49*
			Within	7.573	28	0.270	
Adjusted Post Test	6.52	7.94	Between	13.744	1	13.744	63.84*
			Within	5.813	27	0.215	

*Significant at 0.05 level, Table value with df 2 and 28 and 2 and 27 were 3.34 and 3.35

Table -III shows that the pretest mean values of agility on experimental groups control group were 8.17 and 7.79. The obtained F ratio was 2.79 which was lesser then the table value of 3.34. Hence it was proved that the randomization of the subjects was successful.

The posttest mean values of agility on experimental groups and control group were 6.60 and 7.87. The obtained F ratio was 44.49 which was greater than the table value of 3.34. Hence it was proved that there was a significant improvement on agility among women kho-kho players.

The adjusted posttest mean values of agility on experimental groups and control group were 6.52 and 7.94. The obtained F ratio was 63.84 which was greater than the table value of 3.34. Hence it was proved that there was a significant improvement on agility among women kho-kho players.

For the better understanding of the results mean values of agility were graphically presented in the figure 2.

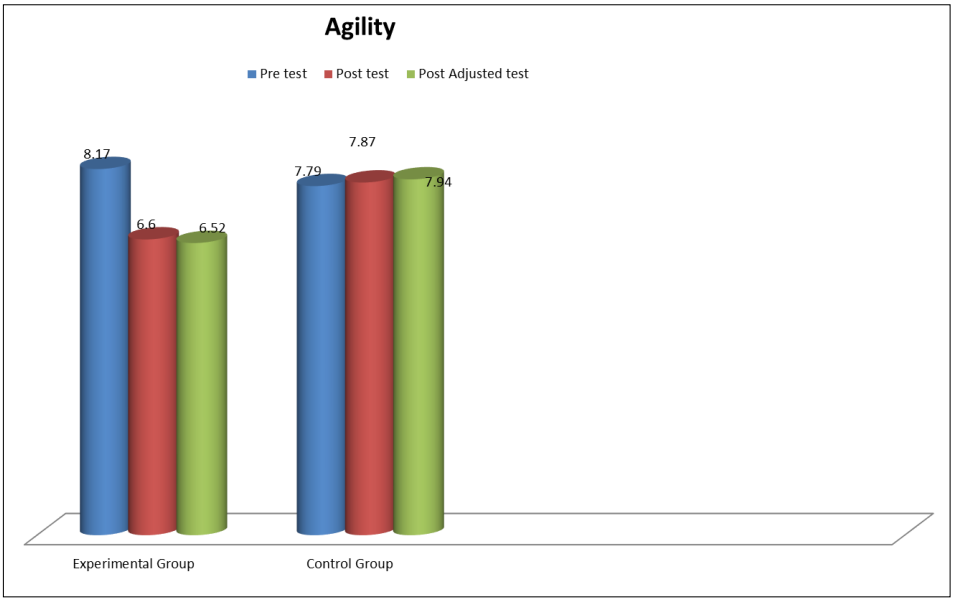

Fig 2: The Graphical Representation of the Pre, Post and Adjusted Mean Value of Agility on Experimental and Control Groups.

Table 4: Computation of Analysis of Covariance of Endurance on Experimental and Control Group among Women Kho-Kho Players

Test	Experimental Group	Control Group	Sources of Variables	Sum of Square	Df	Mean Square	'F'-Ratio
Pre Test	2193.33	2505.33	Between	730080.000	1	730080.000	1.60
			Within	12800306.667	28	457153.810	
Post Test	4118.67	2227.33	Between	26828563.333	1	26828563.333	27.70*
			Within	27123066.667	28	968680.952	
Adjusted Post Test	4193.38	2152.62	Between	29549645.206	1	29549645.206	32.99*
			Within	24187269.282	27	895824.788	

* Significant at 0.05 level, Table value with df 2 and 28 and 2 and 27 were 3.34 and 3.35

Table -IV shows that the pretest mean values of endurance on experimental groups control group were 2193.33 and 2505.33. The obtained F ratio 1.60 which was lesser then the table value of 3.34. Hence it was proved that the randomization of the subjects was successful.

The posttest mean values of endurance on experimental groups and control group were 4118.67 and 2227.33. The obtained F ratio was 27.70 which was greater than the table value of 32.99. Hence it was proved that there was a significant improvement on endurance among women kho-kho players.
The adjusted posttest mean values of endurance on experimental groups and control group were 4193.38 and 2152.62. The obtained F ratio was 32.99 which was greater than the table value of 3.34. Hence it was proved that there was a significant improvement on endurance among women kho-kho players.
For the better understanding of the results mean values of endurance were graphically presented in the figure 3.

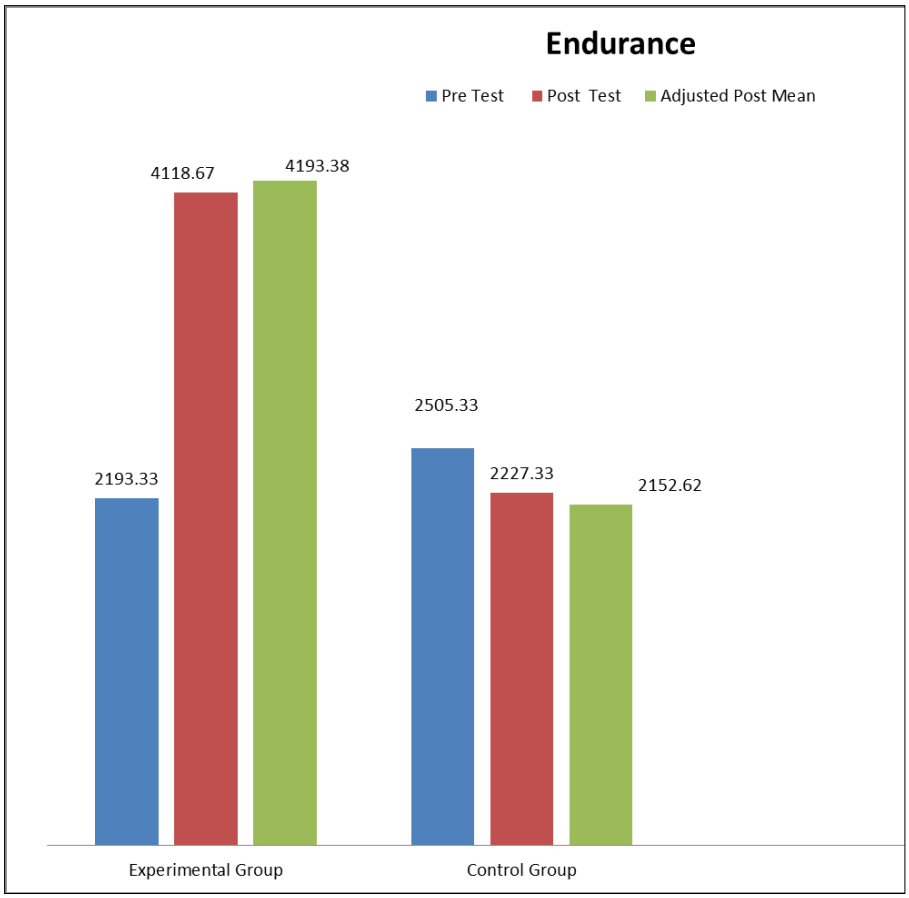

Fig 3: The Graphical Representation of the Pre, Post and Adjusted Mean Values of Endurance on Experimental and Control Groups

Discussions on Findings
The result of the study reveals that significant improvement on all the selected physical fitness variables such as speed, agility and endurance among women kho-kho players due to six weeks of circuit training. The results of the studies are in corroboration with the studies of Kumar, (2016) and Kim, (2018).

Conclusions
It was concluded that significant improvement in all the selected physical fitness variables such as speed, agility and endurance among women kho-kho players.
Six weeks of circuit training produced significant improvement on all the selected physical fitness variables.
The Control group does not shown any specific improvement on the selected variables.

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