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Effects of circuit training on selected physical and skill performance of kho-kho players

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Abstract
Experimental method has been adopted in the research. The, school level kho-kho players of Satara district have been included as population. There are eleven talukas in Satara district. Also, there are different geographical conditions. It is necessary to select school kho-kho players who represent all in the research, so the researcher for the research study 11 talukas of Satara district (Satara, Karad, Y, Mahabaleshwar, Patan, Mann, Khatav, Koregaon, Phaltan, Javali and Khandala) and the following kho-kho players in the age group of 17 years from each taluk. Kho-Kho players were selected as the population. Eleven talukas of Satara district have been selected as population in the research. To fulfill the research purpose, 5 taluks of rural areas (Phaltan, Mann, Khatav, Koregaon and Khandala) of Satara district were selected as representative samples. Also, a total of 60 players, 12 Kho-Kho players from each taluka, have been selected as a representative sample. In the research, 6 players from each taluka were divided into experimental group of Kho-Kho players from 5 talukas (N=30) and 6 players from each taluka were divided into control group of 6 players from each taluka (N=30). Random sampling method has been adopted while selecting the sample in the research. Also, the Kho-Kho players selected in the experimental group have been given regular circuit training at Sakharwadi Kho-Kho Sports Board. The research used pre-test and post-test design under pure experimental design. Two equal groups of Kho-Kho boy players were selected as samples in the research. One experimental and another control group. The research is established based on pre-test and post-test equivalent group design. In this, both groups were pre-tested before the training. Later the experimental group was given 24 weeks circuit training. After the circuit program period both the groups have been post tested. The six tests have been selected for measurement by selecting physical fitness and skill performance factors in Kho-Kho game after discussing with experts in the field of sports. Three of the six physical fitness-based tests are 12m run and walk, pull ups and bent knee sit ups and three skill level 6 tests are pole vault, pole vault and 10m frog jump. Physical fitness and skill performance tests were used as data collection tools in the research. Independent sample 't' test was used to analyze the collected data obtained from physical fitness and skill performance factor tests. The circuit training program had a significant effect on the test of physical fitness and skill performance component of Kho-Kho players in the experimental group.

Keywords: Satara district, physical fitness, skill performance factors, kho-kho athletes

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Introduction

Kho-Kho is an ancient Indian game. The game consists of 12 players in a team. 09 players each from each team participate in the actual game. One team attack while the other team has three players in one line thus defending in three lines. An inning is 09 minutes long and has a rest period of 05 minutes. The ground is 27 meters long and 16 meters wide and the distance between the two poles is 24 meters. It has a protected area of 1.50 m.

There are two main types of skills in the game of kho-kho, defensive and attacking. Defensive skills include three six nine running, ringing, hurling etc. There are kinds of skills. Attacking skills include poking, pitching, chasing, proper baiting, etc. There are skills.

Physical ability affecting sports performance

Physical capacity is the capacity through which a person can perform his daily tasks very consciously without feeling any fatigue. Also, from this, he accumulates energy to face the income situation in times of happiness and distress. Based on all the above ideas we can explain that the physical ability is fully present in different parts of the body. In this way, physical ability is defined as "tolerance to complete work under stressful and adverse conditions" which is lacking in an ordinary person. While defining physical ability on a common basis, we can say that physical ability is an individual ability that is displayed by different parts of the body. In which muscle involvement is present. Human performance depends on the level of useful physical ability; its main two factors are as follows.

- **Healthy physical capacity:** It consists of different subcomponents; Stamina, strength, body retention, flexibility and endurance are all inherent in us at birth. After objectively assessing them through standardized tests, you can know where you stand in terms of physical ability. To live a healthy and happy life we need to be fit 'Sharir Khalu Dharma Sadhanam' it is the primary duty of

everyone to keep their body in good condition.

- **Causative capacity:** Active ability is an ability that allows the player to perform successfully in any sport and daily movement. It includes the following factors: Orientation, speed, strength, coordination, reaction time. By measuring all these factors, how is the quality of the game and different exercise types can be suggested for different age groups to make corrective changes.

Circuit Training

Such a system is a boon to the sports field. Physical fitness is important for all sports. It can be absorbed by this method. This approach is characterized by progressive resistance exercises that gradually increase all physical abilities to achieve the fitness required for your sport. Circuit training method was introduced by "Morgan and Adamson". Circuit training consists of different types of exercises. With or without tools. The material placed at a particular distance or the sequence and repetitions of a particular exercise at that place are called stations. This arrangement is circular or hexagonal. It is important to do the necessary stimulating exercises before doing circuit exercises. All the different exercises are to be done in the prescribed sequence and maximum number of times in the given time and depends on the strength of the athlete.

In circuit training, there are usually 9 to 12 stations and different exercise types are to be done at each station and the exercise type at each station is to be done 8 to 20 times (repetition) in one set and a rest of up to 30 seconds is given between two sets. Therefore, all the small and large muscles of the body are given exercise in a short period of time. Alternatively, it helps to increase muscle strength, endurance, muscle endurance and joint flexibility. Also, by means of circuit training, all the organs of the body are given exercise and there is a significant change in the body composition.

Materials and Methods

Research Methods

Experimental method has been adopted in the research. Kho-Kho players in the experimental group selected in the research have been given planning in the morning session for three days in a week of circuit training.

Research Samples

In the present research, school level kho-kho players of Satara district have been included as population. There are eleven talukas in Satara district. Also, there are different geographical conditions. It is necessary to select school kho-kho players who represent all in the research, therefore for the research study eleven talukas of Satara district (Satara, Karad, Y, Mahabaleshwar, Patan, Mann, Khatav, Koregaon, Phaltan, Javali and Khandala) and kho-kho players below 17 years of age from each taluk who represented the taluk in the kho-kho team. Kho-Kho players have been selected as a population. Eleven talukas of Satara district were selected as population in the research. 5 talukas (Phaltan, Mann, Khatav, Koregaon and Khandala) of rural areas of Satara district were selected for the purpose of research. Also, a total of 60 players, 12 Kho-Kho players from each taluk, were selected as a representative sample. In the research, 6 players from each taluka were divided into experimental group of Kho-Kho players from 5 talukas (N=30) and 6 players from each taluka were divided into control group of 6 players from each taluka (N=30). Random sampling method has been adopted while selecting the sample in the research. Also, the Kho-Kho players selected in the experimental group have been given regular circuit training in Sakharwadi Kho-Kho Sports Board.

Table 1: Research Design

Group	Pre-test	Treatment	Post-test
Experimental Group	O_1	X	O_2
Control Group	O_3	--	O_4

Research Variables

- **Independent variable:** In this research, a circuit training program has been run independently.
- **Dependent Variable:** Research has focused on physical and skill performance factors.

Research materials and tools

Table 2: Physical fitness and skill performance component test

Sr. No.	Variables	Test	Unit
Physical Fitness			
1	CV Endurance	12-minute run and walk	Meter
2	Muscular Strength	Pull-ups	Number
3	Muscular Endurance	Bent Knee Sit-ups	Number
Skill Performance			
4	Speed	Kho of 6	Second
5	Agility	To take a pole and give it a pole	Second
6	Explosive Strength	10-meter frog jump	Second

Circuit training program schedule

Strength and conditioning training is central to successful athletic performance. It involves developing fitness aspects such as cardiovascular endurance, muscular endurance, and strength.

The 'Parikrama' training program spans 24 weeks, with sessions conducted three days a week Mondays, Wednesdays, and Fridays from November 1, 2023, to April 30, 2024. Each daily session lasts 60 minutes, scheduled from 6:30 to 7:30. During the 'Parikrama' sessions, the exercises including the number of sets and repetitions are structured around a station-based format and determined by the intensity of the movements and the allotted time.

Table 3: Circuit training program

Circuit Training Program of Twelve Weeks					
Warm-Up Exercises					
Exercises			Time Start (Sec.)	Time off (Sec.)	Circuit Number
Monday	Wednesday	Friday			
Jumping Jacks	Half Burpees	Ankle Hops	15	15	2
Mountain climbers	Heel Touches	Sumo squats	15	15	2
Lunges	Side Lunges	Pushup	15	15	2
Squats	High Knees	Glute Bridge	15	15	2
Pushup	Reverse Lunges	Seat Apps	15	15	2
Flutter kicks	Floor Wipers	Beer crawl	15	15	2
High Knees	Crunches	Side plank	15	15	2
Cooling Down Exercises					

Research Methodology

An experimental method has been adopted for this research. Kho-kho players selected for the experimental group were provided with a planned circuit training program during the morning sessions, three days a week. School-level Kho-kho players from Satara district constitute the study population. Satara district comprises eleven talukas and presents diverse geographical conditions. To ensure representative participation, the researcher selected school-level Kho-kho players from all 11 talukas of Satara district (Satara, Karad, Wai, Mahabaleshwar, Patan, Man, Khatav, Koregaon, Phaltan, Jaoli, and Khandala). Specifically, 12 players under the age of 17 representing their respective taluka Kho-kho teams were selected from each taluka, resulting in a total study population of 132 school-level Kho-kho players. For the purpose of the study, five talukas from the rural areas of Satara district (Phaltan, Man, Khatav, Koregaon, and Khandala) were selected. A total of 60 players comprising 12 Kho-kho players from each of these five talukas were chosen as the sample. These players were divided into two groups: An experimental group consisting of 30 players (6 from each of the 5 talukas) and a control group consisting of 30 players (6 from each of the 5 talukas). A random sampling method was employed to select the sample for this research. Furthermore, the Kho-Kho players selected for the experimental group underwent regular circuit training at the Sakharwadi Kho-Kho Sports Club. For this study, groups were formed using a random assignment method within a true experimental design, with the initial assumption that the groups were equivalent. A pre-test and post-test design was employed.

Table 4: Independent 't' test statistical analysis

Group	No	Test	Mean	'T' Value	'P' Value
CV Endurance (12 Minute Run and Walk Test)					
Experimental	30	Pre	1952.20		
		Post	2417.53	12.01	0.003
Control	30	Pre	1938.56		
		Post	1951.73		
Muscular Strength (Pull-Ups Test)					
Experimental	30	Pre	9.53		
		Post	12.23	10.39	0.002
Control	30	Pre	9.52		
		Post	9.60		
Muscular Endurance (Bent Knee Sit-Ups Test)					
Experimental	30	Pre	21.53		
		Post	25.73	19.50	0.003
Control	30	Pre	21.20		
		Post	21.73		
Speed (Kho of 6 Test)					
Experimental	30	Pre	4.80		
		Post	3.62	14.07	0.004
Control	30	Pre	3.62		
		Post	3.60		
Agility (Taking the 'Kho', circling the pole, and passing the 'Kho' Test)					
Experimental	30	Pre	6.36		
		Post	4.72	12.09	0.002
Control	30	Pre	4.29		
		Post	4.26		
Explosive Strength (10-meter frog jumps Test)					
Experimental	30	Pre	18.24		
		Post	14.80	21.13	0.001
Control	30	Pre	18.45		
		Post	18.28		

The selected male Kho-Kho players were divided into two equal groups: An experimental group and a control group. The study was structured around an equivalent-group design involving pre-testing and post-testing. Both groups underwent a pre-test prior to the training. Following the pre-test, the experimental group participated in a 24-week circuit training program. Upon completion of the circuit training period, the researcher administered a post-test to both groups. In this study, the circuit training program serves as the independent variable, while physical and skill-performance components serve as the dependent variables. To select the assessment tools, the researcher consulted with sports experts to identify key physical fitness and skill-performance components of Kho-Kho and chose six specific tests to measure them. These six tests, three assess physical fitness (12-meter run-walk, pull-ups, and bent-knee sit-ups), and three assess skill performance ('6-Kho' drill involving circling the pole and passing the 'Kho', and the 10-meter frog jump). The tests in question were based on key components of physical fitness and skill performance relevant to the sport of Kho-Kho. Their reliability and validity were verified, and as the correlation coefficients for these parameters were found to be excellent, the tests were deemed standardized. Consequently, these physical fitness and skill performance tests were utilized as tools for data collection in the research. A paired-sample t-test was employed to analyze the data obtained through these tests.

Statistical Tools

The 't-test' for independent samples was employed to analyze the data collected through physical fitness and skill performance tests. Based on this, the mean and standard deviation were calculated for all the variables. Subsequently, the variables were compared using the 't-test' to determine if there were significant differences in the data obtained from both groups, and conclusions were drawn accordingly. The level of significance for the research was set at 0.05. SPSS software was used for the statistical analysis.

Analysis and Interpretation

The following table presents the descriptive analysis including the mean, standard error of the mean, and standard deviation and the comparative analysis including the ‘t’ value, degrees of freedom, level of significance, and difference between means based on the pre-test and post-test data obtained from the Kho-Kho players.

Conclusion

It was concluded that circuit training program had a significant effect on the cardiovascular endurance, muscular strength, muscular endurance, speed, agility and explosive strength of the male Kho-Kho players in the experimental group compared to those in the control group. The resulting t-value was 10.39, 19.50, 14.07, 12.09 and 21.13. Therefore, it was concluded that the circuit training program produced a significant effect on the cardiovascular endurance, muscular strength, muscular endurance, speed, agility and explosive strength of the male Kho-Kho players in the experimental group compared to those in the control group.

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