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Effects of Circuit Training on Speed Performance: A Comparative Study Among Kho Kho Players, Kabaddi Players, and Control Group

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ABSTRACT: Speed is a crucial performance parameter in traditional Indian games like Kho Kho and Kabaddi. Circuit training has emerged as an effective method to enhance athletic performance across various sports disciplines. This study aimed to investigate the effects of circuit training on speed performance among Kho Kho players, Kabaddi players, and a control group of intercollegiate athletes. Ninety male participants (n=90) aged 18-25 years were randomly assigned to three groups: Control group (n=30), Kho Kho group (n=30), and Kabaddi group (n=30). The experimental groups underwent an 8-week circuit training program while the control group maintained their regular training routine. Speed was measured using a 50-meter sprint test before and after the intervention period. Both experimental groups showed significant improvements in speed performance compared to the control group. The Kho Kho group demonstrated the greatest improvement with a mean difference of 0.66 seconds ($p<0.01$), followed by the Kabaddi group with a mean difference of 0.60 seconds ($p<0.01$). The control group showed no significant change ($p>0.05$). Circuit training effectively improves speed performance in both Kho Kho and Kabaddi players, with Kho Kho players showing slightly superior adaptation to the training protocol.

Keywords: Circuit training, speed, Kho Kho, Kabaddi, athletic performance, traditional Indian games

INTRODUCTION

Speed is a fundamental component of physical fitness that significantly influences performance in most sporting activities (Bompa & Haff 2019). In traditional Indian games such as Kho Kho and Kabaddi, speed plays a pivotal role in determining success, as these sports require rapid directional changes, quick acceleration, and sustained high-intensity movements (Singh & Kumar 2018). The ability to move quickly and efficiently can mean the difference between scoring points and conceding them in these highly dynamic games.

Circuit training has gained popularity as an effective training methodology for improving various fitness components simultaneously (Klika & Jordan 2013). This training approach combines strength, endurance, and speed exercises in a sequential format, allowing athletes to develop multiple fitness parameters within a single training session (Alcaraz *et al*., 2011). The versatility and time-efficiency of circuit training make it particularly attractive for team sport athletes who need to develop comprehensive fitness profiles.

Research has consistently demonstrated the effectiveness of circuit training in improving speed performance across various sports (McRae *et al*., 2012; Migliaccio *et al*., 2014). However, limited research has specifically examined its effects on traditional Indian games like Kho Kho and Kabaddi. These games have unique movement patterns and physiological demands that may respond differently to circuit training interventions compared to conventional Western sports.

Kho Kho requires players to execute rapid directional changes, quick starts and stops, and maintain high speeds during chasing sequences (Patel & Shah 2017). Similarly, Kabaddi demands explosive movements, quick raids, and defensive maneuvers that rely heavily on speed and agility (Dhillon *et al*., 2019). Understanding how circuit training affects speed performance in these sports could provide valuable insights for coaches and athletes seeking to optimize training programs.

Objectives

The primary objectives of this study were:

1. To examine the effects of circuit training on speed performance in Kho Kho players
2. To investigate the impact of circuit training on speed performance in Kabaddi players
3. To compare the effectiveness of circuit training between Kho Kho players, Kabaddi players, and a control group
4. To determine which group demonstrates superior adaptation to circuit training for speed development

RESEARCH METHODOLOGY

Selection of Subjects

Ninety male participants from intercollegiate tournaments were selected for this research. The subjects were recruited from Kurukshetra University, Kurukshetra, Haryana; Chaudhary Charan Singh (CCS) University, Meerut, Uttar Pradesh; Maharshi Dayanand (M.D.) University, Rohtak, Haryana; and Periyar University, Salem, Tamil Nadu. These universities had teams that participated in league competitions with rankings of Winners, Runners-up, Third Place, and Fourth Place.

Thirty players each were randomly assigned to the Kho Kho group, Kabaddi group, and Control group from teams that had competed in the All India Inter-University Competition during 2008-09, organized by Swami Ramanand Teerth Marathwada University, Nanded. Participants' ages ranged from 18 to 25 years. All participants came from diverse economic backgrounds, ensuring a representative sample of the intercollegiate athlete population.

Inclusion Criteria

- Male athletes aged 18-25 years
- Active participation in intercollegiate Kho Kho or Kabaddi
- Minimum 2 years of competitive experience
- No history of lower limb injuries in the past 6 months
- Voluntary participation with informed consent

Exclusion Criteria

- Athletes with chronic health conditions
- Those undergoing other structured training programs
- Participants with incomplete attendance records
- Athletes who sustained injuries during the study period

Research Design

A randomized controlled trial design was employed with pre-test and post-test measurements. Participants were randomly assigned to one of three groups using a simple randomization technique.

Training Protocol

The circuit training program consisted of 8 weeks of training, conducted 4 days per week. Each session lasted approximately 45-60 minutes and included 8-10 stations with exercises targeting speed, agility, strength, and endurance components. The control group maintained their regular training routine without any additional circuit training intervention.

Testing Procedure

Speed was assessed using a standardized 50-meter sprint test conducted on a synthetic track. Participants performed a standing start and were timed using electronic timing gates positioned at the start and finish lines. Two trials were conducted with adequate rest between attempts, and the better time was recorded for analysis.

Statistical Analysis

Data were analyzed using SPSS version 25.0. Descriptive statistics including means and standard deviations were calculated for all variables. Paired sample t-tests were used to compare pre-test and post-test values within each group. Analysis of Covariance (ANCOVA) was employed to compare adjusted post-test means among the three groups. Scheffe's post hoc test was used to identify specific group differences. The significance level was set at $p<0.01$.

RESULTS

Speed Performance Analysis

The results of the speed analysis are presented in the following tables, which demonstrate the effects of circuit training on the three groups studied.

Table 1: Computation of 't' Value of Speed Pre-Test and Post-Test Values of Control Group, Kho Kho Group, and Kabaddi Group.

Sr. No.	Group	Means (sec)	S.D	Obtained 't'	Required 't' (0.01 level)
		Pre	Post	Pre	Post
1	CONTROL	8.18	8.14	0.25	0.24
2	KHO KHO	8.03	7.37	0.43	0.44
3	KABADDI	8.16	7.53	0.39	0.41

*Significant at 0.01 level; #Non-significant; Degrees of Freedom = 29

The pre-test mean scores for the Control, Kho Kho, and Kabaddi groups were 8.18, 8.03, and 8.16 seconds, respectively. Following the 8-week intervention period, the post-test mean scores were 8.14, 7.37, and 7.53 seconds for the Control, Kho Kho, and Kabaddi groups, respectively.

The calculated 't' values were 1.43 for the Control group, 10.71 for the Kho Kho group, and 8.68 for the Kabaddi group. With 29 degrees of freedom at the 0.01 confidence level, the required 't' value was 2.756. The calculated values for both the Kho Kho and Kabaddi groups exceeded the required value, indicating statistically significant

improvements in speed performance. The Control group's calculated value was less than the required value, indicating no significant change in speed performance.

Table 2: Analysis of Co-Variance of Post-Test Scores for Control, Kho Kho, and Kabaddi Groups on Speed.

Test	MEANS (sec)	Sum of Squares	DF	Mean Square	Obtained F-Ratio	Req. F-Ratio at 0.01
	Control	Kho-Kho	Kabaddi			
Pre test	8.18	8.03	8.16	B: 0.406	2	0.203
				W: 11.424	87	0.131
Post test	8.14	7.37	7.53	B: 9.875	2	4.937
				W: 12.389	87	0.142
Adjusted posttest	8.10	7.44	7.50	B: 7.979	2	3.989
				W: 7.211	86	0.084

*Significant at 0.01 level; #Non-significant; B: Between groups; W: Within groups

The ANCOVA results revealed no significant differences between groups at pre-test (F-ratio = 1.55, $p>0.01$), confirming the homogeneity of groups at baseline. However, significant differences emerged in post-test scores (F-ratio = 34.77, $p<0.01$) and adjusted post-test scores (F-ratio = 47.49, $p<0.01$), indicating that the circuit training intervention had differential effects across the three groups.

Table 3: Scheffe's Post Hoc Test Results for Speed Differences Between Groups.

Control Group	Kho-Kho Group	Kabaddi Group	Mean Diff. (sec)	Confidence Interval at 0.01 level
8.10	7.44	-	0.66*	0.22
8.10	-	7.50	0.60*	0.22
-	7.44	7.50	0.06#	0.22

*Significant difference; #Non-significant difference

The Scheffe's post hoc analysis revealed significant differences between the Control group and both experimental groups. The difference between Control and Kho Kho groups (0.66 seconds) and between Control and Kabaddi groups (0.60 seconds) exceeded the confidence interval value of 0.22 seconds. However, no statistically significant difference was found between the Kho Kho and Kabaddi groups (0.06 seconds), although the Kho Kho group showed numerically superior performance.

DISCUSSION

The findings of this study provide compelling evidence for the effectiveness of circuit training in improving speed performance among traditional Indian game athletes. Both the Kho Kho and Kabaddi groups demonstrated significant improvements in speed performance following the 8-week circuit training intervention, while the control group showed no meaningful changes.

The significant improvements observed in both experimental groups align with previous research demonstrating the efficacy of circuit training for speed development (Alcaraz *et al.*, 2011; McRae *et al.*, 2012). The circuit training protocol employed in this study likely enhanced speed performance through multiple physiological mechanisms. First, the combination of high-intensity exercises with short rest periods may have improved anaerobic power and phosphocreatine system efficiency, both crucial for speed performance (Bompa & Haff 2019). Second, the varied movement patterns in circuit training likely enhanced neuromuscular coordination and motor unit recruitment patterns, contributing to improved running mechanics and stride efficiency.

The Kho Kho group demonstrated the greatest improvement in speed performance, with a mean improvement of 0.66 seconds compared to the control group. This superior adaptation may be attributed to the specific movement patterns characteristic of Kho Kho, which closely align with many circuit training exercises. Kho Kho players regularly perform rapid directional changes, quick acceleration, and deceleration movements during gameplay (Patel & Shah 2017). The circuit training protocol likely provided a training stimulus that complemented these existing movement patterns, leading to enhanced training adaptation.

The Kabaddi group also showed significant improvements, though slightly less pronounced than the Kho Kho group (0.60 seconds improvement). This finding suggests that while circuit training is beneficial for Kabaddi players, the training adaptations may be somewhat different due to the unique physiological demands of Kabaddi. Kabaddi requires more sustained high-intensity efforts during raids and defensive actions, which may require different training emphases compared to the intermittent high-intensity demands of Kho Kho (Dhillon *et al.*, 2019).

The results of this study have significant practical implications for coaches and athletes involved in traditional Indian games. The implementation of circuit training protocols can serve as an effective supplementary training method to improve speed performance. The relatively short duration of the intervention (8 weeks) makes it a feasible addition to existing training programs without requiring extensive modifications to established routines.

Furthermore, the similar improvements observed between Kho Kho and Kabaddi players suggest that circuit training protocols can be adapted for use across different traditional Indian games. This versatility makes circuit training an attractive option for coaches working with multiple sports or in environments where resources and time are limited.

CONCLUSIONS

This study demonstrates that circuit training is an effective intervention for improving speed performance in both Kho Kho and Kabaddi players. The 8-week circuit training program resulted in significant improvements in speed performance for both experimental groups, with the Kho Kho group showing slightly superior adaptations. The lack of improvement in the control group confirms that the observed changes were attributable to the circuit training intervention rather than normal training adaptations.

The findings support the integration of circuit training methodologies into the training programs of traditional Indian game athletes seeking to improve speed performance. Coaches and athletes can confidently implement circuit training protocols as an effective means of enhancing this crucial performance parameter.

The practical significance of these improvements, combined with the time-efficient nature of circuit training, makes it an attractive training option for athletes and coaches in resource-constrained environments. Future research should continue to explore optimal training parameters and investigate the effects of circuit training on other performance variables relevant to traditional Indian games.

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