



---

## **EFFECT OF CROSS TRAINING AND FERTLEK TRAINING ON SELECTED PHYSICAL FITNESS COMPONENTS OF KABADDI PLAYERS**

Mr. Madhav Bapurao Gavande<sup>1</sup> (Research Scholar)

Dr. Pandurang Srirang Ranmal<sup>2</sup> (Professor)

<sup>1,2</sup>Department of Physical Education, Swami Vivekanand University, Sagar, MP

### **ABSTRACT**

*The main aim of this paper is to find out the effect of cross training and fertlek training on selected physical fitness components of Kabaddi players. To accomplish these goals, 45 kabaddi players were chosen at random from the Mumbai region. The individuals' ages ranged between 18 and 23 years. They were divided into three categories. Each group consists of 15 players who were deemed to be suitable for the study's purposes. The study concluded that the physical factors such as speed, agility, muscular endurance, and cardiopulmonary endurance were shown to differ substantially between the two experimental groups and the control group. There was no statistically significant difference between the two experimental groups.*

*Keywords: Kabaddi players, physical fitness, speed, agility, muscular endurance, cardiopulmonary endurance*

### **INTRODUCTION**

Kabaddi is essentially an Indian game that mixes the individualism of wrestling and rugby by requiring equal skill and force. Kabaddi is properly known as the "GAME OF THE MASSES" because of its appeal, simple, easy-to-understand rules, and widespread demand. The game requires no technical instruments, making it a particularly popular pastime in impoverished nations. However, it is primarily an outdoor game played on clay courts, but it is currently being played on synthetic surfaces (indoors) with great success. The game lasts 45 minutes for men and junior boys, with a 5-minute break in between for teams to switch sides. The duration for ladies and sub junior boys is 35 minutes, with a 5-minute break in between.

Kabaddi is a fast-paced team sport played with minimal equipment on a rectangular court, either outdoors or inside, with seven players on the ground on each side. Every team alternates between offensive and defense. The basic concept of the game is to get points by raiding into the opponent's court and touching as many defensive players as possible without becoming stuck on a single breath. During play, the defensive players are referred to as "Antis," while the offensive players are referred to as "Raiders." Kabaddi is maybe the only violent sport in which the assault is an individual effort and the defense is a group effort.

The game calls for agility, high-quality lung capacity, muscular coordinates, & presence of mind and fast responses. For a single player to take on seven opponents is no mean task, requires challenge as well as a skill to focus and look forward to the opponent's moves (Prasad, 2002).

Kabaddi deserves a most well know place in Indian national field game and is becoming very popular with the scientific techniques. It gives very good exercise to all the players at a same time and requires no special material as such Kabaddi players are different in their accumulation skeleton formations, leverages and flexibilities. The extent direction usefulness of



the various body forces is often hard or impossible to decide accurately and sometimes to be sacrificed in order to reduce the irregular human shape to more suitable numerical forms. Even so much deductions and estimates can be of enough accurateness to the real practice value for the kabaddi coach or teachers. However they must be there self of careful surveillance and impartial interpretations and allowance must be made for laws other than mechanical ones which also acting an essential part.

In recent years countries well developed in sports have broken previous international records and created amazing new records by successfully combining rigorous sports training with the positive results of their intensive research in the area of applied sports like sports physiology, sports psychology and sports medicine, etc. They have undertaken innovative research to analyse the ancient traditional methods and the alternative technologically-aided modern methods for determining their relative merits towards improvement upon the existing sports methods and techniques.

Basically, sports achievements are conditioned by physiological limits. But researchers have been trying to explore all possible ways, to induce achievers to excel in the sports arena in order to reach hitherto unseen heights of excellence. Sport conditioning should involve more than simply lining up and running sprints until total fatigue sets in. when endurance training for conditioning, most team-sport athletes obtain energy from all three energy sources (systems); i) stored energy for brief and explosive movements, ii) recycled lactic acid for periods of intermediate length and iii) oxygen over the long term. To build an effective conditioning plan, Kabaddi players should evaluate fitness demands in the context of what the sport requires, its time parameters, and the specific position's energy needs. Not all positions require a high percentage of aerobic conditioning. The objective is to condition for the way of play.

## **PHYSICAL FITNESS OF KABADDI PLAYERS**

At present the idea of physical fitness can be divided into 2 categories, the health related physical fitness & skill performance related physical fitness. Health related physical fitness components are strength, muscular endurance cardio respiratory endurance, body composition, flexibility and free from obesity. Skill linked physical fitness components include speed, strength, endurance, agility, explosive power, coordination & balance etc. Physical fitness is an essential observable fact for any human being to go ahead a simple & comfort life. Physical fitness develops organic fitness; it means capable of organic system of human body circulatory and respiratory system etc. The meaning of physical fitness is now defined as the body's ability to function professionally and successfully in work & leisure activities, not only at a set point in time, but a various ages and stages within a person's life cycle.

Physical situation is quite important in performance and high presentation sports. It is, in reality, concern for the adaptation of the athlete's body to rising physical and mental hard labor in which all sections of the human body participate. The current Kabaddi game, defined by high-intensity motor activity, exerts a wide variety of demands on players' talents. There are few aptitudes or characteristics that do not play a role in the performance of Kabaddi players. In addition to agility and speed, which are required for effective game situation resolution, a high level of aerobic capacity enables a slower onset of exhaustion and a quick recovery, whereas anaerobic capacity is responsible for endurance in high intensity rhythmic exercises. Kabaddi is a



complicated intermittent sport that needs players to have strong aerobic and anaerobic capabilities. Motor ability, running, leaping, flexibility, and throwing velocity are examples of physical activities that are significant parts of game & contribute to team's excellent performance. Successful performance necessitates explosive leg and arm strength, as well as sprint velocity.

The specific quality of Kabaddi demands from players an effective participation in activities that need a good aerobic and anaerobic response. On the other hand, some authors report that Kabaddi is a sport that demands mostly the motor capacities that depend on the anaerobic metabolism. Therefore, it seems reasonable to assert that the motor capacities strength, velocity and their ways of demonstration are crucial, since the technical and planned capacities can be consistently superior when the Kabaddi players present high levels of adaptation of the anaerobic metabolism. Kabaddi is an endurance game, Without endurance the player cannot carry out well, in the same time the player's need all the individuality i.e. speed, agility, flexibility and so on. These days most of the players having good height can perform well in the game situation. Without physical individuality players cannot attain the aim of the game, so physical characteristics is very necessary for the superior performance of Kabaddi. The physical fitness variables which was investigated in the study are very important for kabaddi players, because without physical fitness the results which a player and coach accept can never achieved.

### **OBJECTIVES OF THE STUDY**

To examine effect of cross training & fartlek training on selected physical variables of Kabaddi players of Mumbai region

### **REVIEW OF RELATED LITERATURE**

Borremans, Rintala, and McCubbin (2010) investigated motor fitness, physical health, and physical activity levels in teenagers with and without Asperger syndrome. The study included thirty teenagers with AS and thirty neurotypical classmates who were age and gender matched. The EUROFIT exam was used to assess physical fitness. A questionnaire was also given to each participant to assess their physical activity during their spare time. A 2\*2 multivariate analysis of variance was used to determine existence of differences between AS vs. control groups and gender on fitness, and the differences among the groups average scores from the administered Baccke questionnaire were analysed using the test of the independent groups. The results showed that AS teenagers scored considerably lower than the comparison group on the subgroups based on motor ability; health-based physical fitness in the EUROFIT.

Kamalavathi and Shunmuganathan (2011) studied effect of physical activity on muscle endurance in sedentary males. The study used physical activities as the independent factors & muscle endurance as dependent variable, which was assessed via sit-ups. The study found that six weeks of physical exercise training resulted in a considerable improvement in muscle endurance. The study strongly indicated that disorders such as asthma, heart difficulties, cholesterol management, and so on, might be avoided by physical activity for maintaining good body posture, muscular mass, and bone density.

Vaczi (2013) looked examined how a short-term in-season plyometric training programme affected power, agility, & knee extensor strength. Male soccer players from a third-



leaguesquad were divided into two groups: experimental & control. For six weeks, experimental group underwent a periodized plyometric training programme in addition to its usual soccer training sessions. The study's findings show that plyometric training using high-impact unilateral and bilateral exercises resulted in significant gains in lower limb power & maximum knee extensor strength, but not in soccer-specific agility. As a result, it is recommended that short-term plyometric training should be included in the in-season preparation of lower level soccer players in order to improve particular performance.

Devaraju (2014) investigated impact of plyometric exercise on explosive strength in Kabaddi players. For current study, 30 male Kabaddi players were chosen at random from Dr. Sivanthi Aditanar College of Physical Education in Tiruchendur, Tamilnadu, ranging in age from 18 to 25 years. The individuals were randomly allocated to control & experimental groups of fifteen each, dubbed Groups 'A' and 'B'. Group 'A' received plyometric training, whereas Group 'B' received no training. To determine the efficacy of the plyometric training programme, data was gathered before & after six weeks of training & analysed using Analysis of Covariance (ANCOVA). The significance threshold was set at 0.05. The study's findings strongly showed that six weeks of plyometric training had a substantial influence on the explosive strength of Kabaddi players. As a result, hypothesis that a plyometric training programme would have had a considerable influence on explosive strength is accepted. Plyometric training had a significant influence on explosive strength.

Nageswaran (2014) investigated the effects of band training on collegiate the game players' strength, speed, and balance. Twenty-four male intercollegiate Kabaddi players from Sivanthi Aditanar College of Physical Education in Tiruchendur were chosen at random as subjects. The individuals' ages varied from 21 to 28 years. The subjects chosen were separated into two categories. Group I received resistance band training, while Group II served as a control. For six weeks, the experimental group was treated to resistance band exercise on alternating three days each week. Resistance band training was chosen as the independent variable, whereas criteria factors such as strength, speed, and balance were chosen as the dependent variables. The strength test consisted of one repeat, the speed test consisted of a 50m run, and the balance test consisted of a stork stand. This study's experimental design was a before and post test randomized design. Before and after the training session, data were gathered from all individuals and statistically evaluated using the dependent 't' test and analysis of covariance (ANCOVA). When compared to the control group, it was discovered that there was a considerable improvement and significant existed owing to the influence of resistance band training on strength, speed, and balance among intercollegiate Kabaddi players.

Taheri (2014) investigated effect of plyometric & resistance training on agility, speed & explosive power in soccer players. 30 male soccer players who aged 18-25 voluntarily participated in study. They were randomly assigned in plyometric (n=15) & resistance (n=15) groups. Both groups performed selected soccer-specified plyometric & resistance training for eight weeks. Data was analyzed using paired t-test, independent t-test, & covariance statistical methods. The results showed that levels of agility, speed, & explosive power in plyometric training group (p=0.0001), and agility & explosive power in resistance training group (p=0.0001) were significantly improved in post-test compared to pre-test. Between-groups comparison showed better records in agility, speed & explosive power for plyometric compared with

---





resistance training group after eight weeks (respectively  $p=0.032$ ,  $p=0.0001$  &  $p=0.002$ ). According to results, it can be concluded that both plyometric & resistance training exercises increase agility & explosive power & reduce sprint time in football players. Plyometric exercises also showed more favorable effects on study variables compared with resistance exercises. Therefore, these types of training methods are suggested to soccer players & coaches for improving speed & performance skill.

Rao and Kishore (2014) investigated the effect of combined strength and plyometric training on selected motor fitness components of male kabaddi players. Forty-eight (48) male collegiate kabaddi players were chosen from Acharya Nargarjuna University's affiliated institutions. These players were divided into two groups: those who received strength and plyometric training (SPTG: 24) and those who did not (CG: 24). Speed, power, and agility were chosen to be dependent variables in this study. Speed, power, and agility were measured using the 50-yard sprint, vertical leap test, and shuttle run test. For ten weeks, three days each week, a combination of strength and plyometric training was used. The combined training program comprises of both strength and plyometric training programs, with two plyometric and one strength training session per week in even weeks and one explosive and two strength training sessions in odd weeks completed. The pre & post data were collected from both SPTG & CG. The collected data was evaluated using Analysis of Covariance (ANCOVA). Paired t test was calculated to assess changes within a group before & after nine weeks of training intervention. The result of study clear show that there is significant difference b/w groups on speed ( $F = 109.46$ ,  $p = 0.000$ ) & power ( $F = 11.57$ ,  $p = 0.001$ ). However, agility ( $F = 0.025$ ,  $p = 0.875$ ) showed no significant difference b/w groups. It is inferred that ten weeks of combined strength & plyometric training showed significant improvement in speed & power of male intercollegiate kabaddi players.

Kumar (2015) was to explore the impact of continuous method on cardio respiratory endurance among thirty collegiate athletes whose age ranged from 18-25 years in Alagappa University. The students were grouped into experimental group & control group each with 15. Cardio respiratory endurance was tested using 12min run/walk test. Pre-test was taken before activity time frame & post-test was estimated after six weeks of training. The data obtained from the experimental period was analysed with 't' ratio. 0.05 certainty level was fixed in all the cases. Continuous training led to the significant difference in the experimental group on cardio respiratory endurance.

Mande (2016) investigated effect of training namely continuous running, fartlek & interval method on skill based performance, criterion variables such as throw in for distance of male soccer players. 60 Inter Collegiate players with an age range of 18 to 25 years were chosen randomly. They were grouped equally into 4 namely experimental A, B,C and a control group D with 12 week training of continuous, fartlek, interval and control techniques respectively. Statistical analysis of the collected data using ANCOVA with the fixation of significance level at 0.05 in prior and immediately after training was carried out. Schaeffer's post test was applied to discover level of significance among the paired main differences at the significant occurrence of 'F' ratio. The results of study revealed significant improvement of the continuous, fartlek and interval training methods than the control group, and also of the throw in performance in comparison with control on the effect of selected training methods.

---

---

Golda and Margaret (2018) conducted a study to determine combined effectiveness of different training on the selected dependent physical fitness variables namely speed & muscular strength among the athletes. For purpose of study 40 male athletes who played for their college in Inter Collegiate athletic event, Bharathiar University, Coimbatore. The obtained data was analyzed using ANCOVA. The significance level was maintained at 0.05 in all cases. The result concluded with the significant improvement of combined training on the dependent variables of speed & muscular strength.

Dr. S Jayakumar and Dr. C Lakshmanan (2019) study was to investigate effect of resistance training on selected physical fitness variables among inter collegiate kabaddi players. Forty out of kabaddi players were randomly selected from Bharathidasan university, Trichy district, the selected players were divided into two groups consisting of 20 inter collegiate kabaddi players. No attempt was made equate groups. The age of subjects ranged b/w 18 to 21 years. The influence of the resistance training was assessed on physical fitness. The training load was increased from the maximum working capacity of subject doing pilot study. The duration of training period was restricted to eight weeks & number of sessions per week was confined to three. The data obtained from all groups before and after the experimental period were statistically analyzed by dependent 't' test to find out significant improvement if any, 0.05 level of confidence was fixed to the level of significance b/w pre & post test means of all groups.

G Kalpana (2021) study was to find out the effect of specific training on selected physical fitness components & skill performance of intercollegiate Kabaddi player. To achieve this purpose of study, fifteen Kabaddi players who participated in intercollegiate tournaments were randomly selected as subjects from Thanjavur District. The age of subjects were ranged between 20 to 25 years. The selected physical fitness components namely endurance and flexibility were selected and ankle hold and blocking were selected as skill variables. The data were collected among the Kabaddi players were statistically analysed by using student t-test. In all cases 0.05 level of confidence was fixed to test significance. The "t" ratio was employed as a statistical tool to find out the appropriate result of study & provided significance at 0.05 level of confidence. There was a significant difference between pre and post test of endurance, flexibility & skill performance among Kabaddi players.

Pooyan Sabet (2021) study effect of a 12-week different resistance training protocols on muscular strength of secondary school male students of Jahrom country, Iran. The subjects of this study consisted of 30 male secondary school students with the average age of 13/3 years which were divided into 3 groups of 10 people (2 experimental groups & 1 control group). The first Experimental group (n=10) performed a high repetition-moderate load resistance training program; the second experimental group (n=10) performed a low repetition-heavy load resistance training program; & control group (n=10) did not take part in any resistance training. The Experimental groups had sessions of resistance training three times in a week for 12 weeks. The first group, performing the high repetition-moderate load program, had 3 sets of 13-15 repetitions; and the second group, performing a low repetition-heavy load program, had 3 sets of 6-8 repetitions. The overall result of this study reveals that if performed correctly, strength training is not dangerous and harmful, but on the contrary, it can improve health and muscular strength.

Pradeep Shankar Patil (2022) study was “Development of knowledge test for elite female Kabaddi players of Pune district in Maharashtra”. The study is confined to the Kabaddi players of 18 to 25 years age group. The study is restricted to Pune district in Maharashtra state only. The study has been delimited to the elite female Kabaddi players. The Kabaddi players may be able to assess and understand their own knowledge-status on the game. This study may help to enhance their knowledge-status on Kabaddi in such a way so that the coaches of this game may get a readymade standard test for testing the knowledge-status of the players to whom they are going to coach. Accordingly the coaching strategy may be modified to exhibit top performance.

**DATA ANALYSIS AND DATA INTERPRETATION**

**ANALYSIS OF COVARIANCE FOR SPEED**

**TABLE 1 ANALYSIS OF COVARIANCE FOR SPEED ON PRE TEST AND POST TEST DATA OF EXPERIMENTAL AND CONTROL GROUPS (in Seconds)**

Test	Concurrent Training Group	Fartlek Training Group	Control Group	Source of Variance	Sum of Squares	df	Mean Squares	‘F’ Ratio
<b>Pre-test</b>								
<b>Mean</b>	7.09	7.04	6.92	<b>B</b>	.22	2	.11	.52
<b>SD</b>	.54	.47	.39	<b>W</b>	9.19	87	.22	
<b>Post-test</b>								
<b>Mean</b>	6.70	6.62	6.93	<b>B</b>	.79	2	.39	2.51
<b>SD</b>	.43	.38	.38	<b>W</b>	6.64	87	.16	
<b>Adjusted Post-test</b>								
<b>Mean</b>	6.67	6.61	6.98	<b>B</b>	1.16	2	.58	5.07*
				<b>W</b>	4.69	86	.11	

\* Significant at 0.05 level.

The Required table for df (2&87) at 0.05 level of confidence = 3.22

(2&86) at 0.05 level of confidence = 3.21

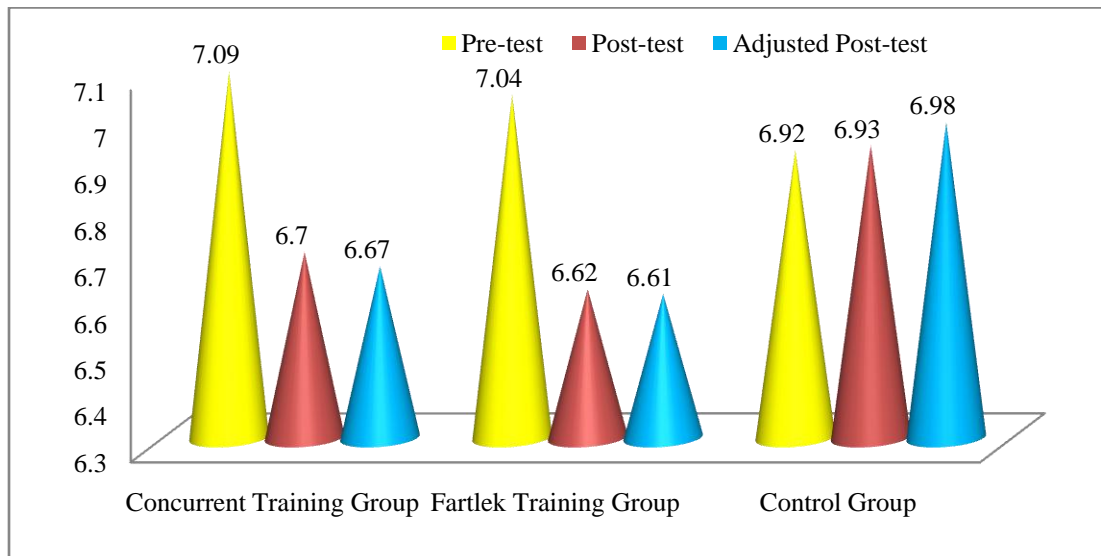
It is derived from table 1 that the pre test means on speed of the experimental and control groups are 7.09, 7.04 and 6.92 respectively. The obtained ‘F’ ratio value 0.52 for the pre test mean is lesser than the required table value 3.22 for 2 & 87 degrees of freedom at 0.05 level of confidence. There is no significant difference between the experimental and control groups on speed for the pre test data.

The post test means on speed of the experimental and control groups are 6.69, 6.62 and 6.93 respectively. The obtained ‘F’ ratio value 2.51 for the post test data is lesser than the required table value 3.22 for 2 & 87 degrees of freedom at 0.05 levels of confidence. It shows that there is no significant difference between the experimental and control groups on speed following the experimental training.

The adjusted post test means on speed of the experimental and the control groups are 6.67, 6.61 and 6.98 respectively. The obtained ‘F’ ratio value of 5.07 for the adjusted post test data is greater than the required table value 3.21 for 2 & 86 degrees of freedom at 0.05 level of confidence. It reveals that there is significant change on speed as a result of the experimental training. The result revealed that there is a significance difference, among the three groups. Since the difference exists in the adjusted post test mean, further multiple comparison tests was applied.

**TABLE 2 SCHEFFES POST-HOC TEST FOR MEAN DIFFERENCE BETWEEN GROUPS ON SPEED (IN SECONDS)**

Mean Value			Mean Difference	'F' value	C.I
Concurrent Training	Fartlek Training	Control Group			
6.67	6.61		.06	0.25	6.42
6.67		6.98	.31	6.49*	6.42
	6.61	6.98	.37	9.25*	6.42



**FIGURE 1 GRAPHICAL ILLUSTRATION OF PRE - TEST, POST -TEST AND ADJUSTED POST -TEST MEANS OF EXPERIMENTAL AND CONTROL GROUPS ON SPEED (in Seconds)**

Table 2 shows the paired mean difference among the three groups' namely Concurrent Training and fartlek training and control group. The mean difference between Concurrent Training and fartlek training is 0.06, where the f value of mean gains between the Concurrent Training and fartlek training is 0.25, which is lower than the C.I value. Therefore is no significant difference between Concurrent Training and fartlek training. The mean difference between the Concurrent Training and control group is 0.31, where the f value of mean gain between the Concurrent Training and control group is 6.49, which is higher than the C.I value. Therefore there is significant difference between Concurrent Training and control group. The mean difference between the fartlek training and control group is 0.37, where the f value of mean gain between the fartlek training and control group is 9.25, which is higher than the C.I value. So there is significant difference between fartlek training group and control group.



**ANALYSIS OF COVARIANCE FOR AGILITY**

**TABLE 3 ANALYSIS OF COVARIANCE FOR AGILITY ON PRE TEST AND POST TEST DATA OF EXPERIMENTAL AND CONTROL GROUPS (in Seconds)**

Tests	Concurrent Training Group	Fartlek Training Group	Control Group	Source of Variance	Sum of Squares	Df	Mean Squares	'F' Ratio
<b>Pre Test</b>								
Mean	9.57	9.61	9.59	B	.01	2	.01	.06
SD	.38	.28	.26	W	4.07	87	.09	
<b>Post Test</b>								
Mean	9.35	9.25	9.78	B	2.33	2	1.17	7.66*
SD	.39	.41	.37	W	6.38	87	.15	
<b>Adjusted Post Test</b>								
Mean	9.37	9.24	9.78	B	2.44	2	1.21	16.78*
				W	2.98	86	.07	

\* Significant at 0.05 level.

The Required table for df (2&87) at 0.05 level of confidence = 3.22

(2&86) at 0.05 level of confidence = 3.21

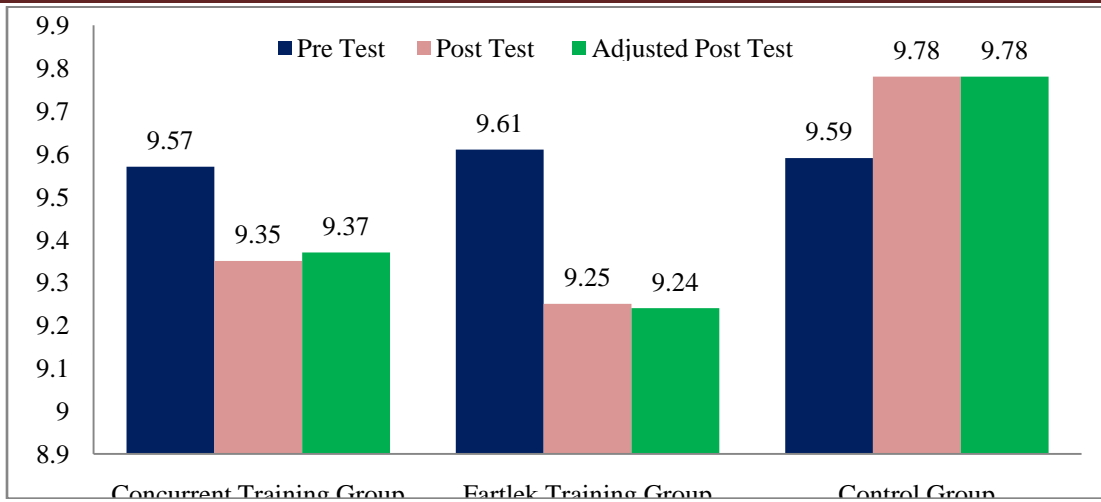
It is derived from table 3 that the pre test means on agility of the experimental and control groups are 9.57, 9.61 and 9.59 respectively. The obtained 'F' ratio value 0.06 for the pre test mean is lesser than the required table value 3.22 for 2 & 87 degrees of freedom at 0.05 level of confidence. This reveals that there is no statistically significant difference between the experimental and the control groups on agility for the pre test data.

The post test means on agility of the experimental and the control groups are 9.35, 9.25 and 9.78 respectively. The obtained 'F' ratio value 7.66 for the post test data is greater than the required table value 3.22 for 2 & 87 degrees of freedom at 0.05 levels of confidence. It shows that there is statistically significant difference between the experimental and the control groups on agility following the experimental training.

The adjusted post test means on agility of the experimental and the control groups are 9.37, 9.24 and 9.78 respectively. The obtained 'F' ratio value 16.78 for the adjusted post test data is greater than the required table value 3.21 for 2 & 86 degrees of freedom at 0.05 level of confidence. It reveals that there is significant change on agility as a result of the experimental training. Since the result revealed that there is a significance difference, among the three groups. Since the difference exists in the adjusted post test mean, further multiple comparison tests was applied.

**TABLE 4 SCHEFFES POST-HOC TEST FOR MEAN DIFFERENCE BETWEEN GROUPS ON AGILITY (in Seconds)**

Mean Value			Mean Difference	'F' value	C.I
Concurrent Training Group	Fartlek Training	Control Group			
9.37	9.24		0.13	1.82	6.42
9.37		9.78	0.41	17.97*	6.42
	9.24	9.78	0.54	31.16*	6.42



**FIGURE 2 GRAPHICAL ILLUSTRATION OF PRE - TEST, POST -TEST AND ADJUSTED POST -TEST MEANS OF EXPERIMENTAL AND CONTROL GROUPS ON AGILITY (in Seconds)**

Table 4 shows the paired mean difference among the three groups' namely Concurrent Training and fartlek training and control group. The mean difference between Concurrent Training and fartlek training is 0.13, where the f value of mean gains between the Concurrent Training and fartlek training is 1.82, which is lower than the C.I value. Therefore there is no significant difference between Concurrent Training and fartlek training. The mean difference between the Concurrent Training and control group is 0.41, where the f value of mean gain between the Concurrent Training and control group is 17.97, which is higher than the C.I value. Therefore there is significant difference between Concurrent Training and control group. The mean difference between the fartlek training and control group is 0.54, where the f value of mean gain between the fartlek training and control group is 31.16, which is higher than the C.I value. So there is significant difference between fartlek training and control group.

**ANALYSIS OF COVARIANCE FOR MUSCULAR ENDURANCE**

**TABLE 5 ANALYSIS OF COVARIANCE FOR MUSCULAR ENDURANCE ON PRE TEST AND POST TEST DATA OF EXPERIMENTAL AND CONTROL GROUPS (in Counts)**

Tests	Concurrent Training Group	Fartlek Training Group	Control Group	Source of Variance	Sum of Squares	Df	Mean Squares	'F' Ratio
<b>Pre Test</b>								
Mean	26.21	31.28	28.81	B	192.59	2	96.30	.65
SD	9.59	16.11	9.65	W	6219.74	87	148.10	
<b>Post Test</b>								
Mean	30.08	35.48	26.74	B	582.72	2	291.37	2.65
SD	7.77	14.57	7.62	W	4629.61	87	110.24	
<b>Adjusted Post Test</b>								
Mean	32.22	33.37	26.71	B	380.56	2	190.29	29.43
				W	265.20	86	6.48	*

\*Significant at 0.05 level.

The Required table for df (2&87) at 0.05 level of confidence = 3.22

(2&86) at 0.05 level of confidence = 3.21

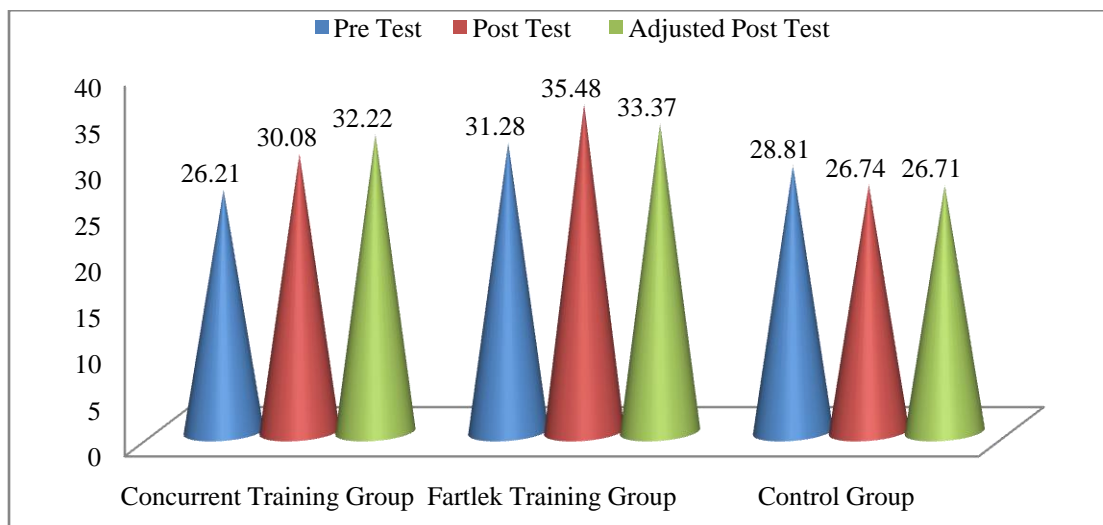
It is derived from table 5 that the pre test means on muscular endurance of the experimental and control groups are 26.21, 31.28 and 28.81 respectively. The obtained ‘F’ ratio value 0.65 for the pre test mean is lesser than the required table value 3.22 for 2 & 87 degrees of freedom at 0.05 level of confidence. There is no significant difference between the experimental and the control groups on muscular endurance for the pre test data.

The post test means on muscular endurance of the experimental and the control groups are 30.08, 35.48 and 26.74 respectively. The obtained ‘F’ ratio value 2.65 for the post test data is lesser than the required table value 3.22 for 2 & 87 degrees of freedom at 0.05 levels of confidence. It shows that there is no statistically significant difference between the experimental and the control groups on muscular endurance after the experimental training.

The adjusted post test means on muscular endurance of the experimental and the control groups are 32.22, 33.37 and 26.71 respectively. The obtained ‘F’ ratio value of 29.43 for the adjusted post test data is greater than the required table value 3.21 for 2 & 86 degrees of freedom at 0.05 level of confidence. It reveals that there is significant change on muscular endurance as a result of the experimental training. Since the result revealed that there is a significance difference, among the three groups. Since the difference exists in the adjusted post test mean, further multiple comparison tests was applied.

**TABLE 6 SCHEFFES POST-HOC TEST FOR MEAN DIFFERENCE BETWEEN GROUPS ON MUSCULAR ENDURANCE (in Counts)**

Mean Value			Mean Difference	‘F’ value	C.I
Concurrent Training Group	Fartlek Training	Control Group			
32.22	33.37		1.15	1.58	6.42
32.22		26.71	5.51	36.09*	6.42
	33.37	26.71	6.67	52.75*	6.42



**FIGURE 3 GRAPHICAL ILLUSTRATION OF PRE - TEST, POST -TEST AND ADJUSTED POST -TEST MEANS OF EXPERIMENTAL AND CONTROL GROUPS ON MUSCULAR ENDURANCE (in Counts)**

Table 6 shows the paired mean difference among the three groups’ namely Concurrent Training and fartlek training and control group. The mean difference between Concurrent

Training and fartlek training is 1.15, where the f value of mean gains between the Concurrent Training and fartlek training is 1.58, which is lower than the C.I value. Therefore there is no significant difference between Concurrent Training and fartlek training. The mean difference between the Concurrent Training and control group is 5.51, where the f value of mean gain between the Concurrent Training and control group is 36.09, which is higher than the C.I value. Therefore is significant difference between fartlek training and control group. The mean difference between the fartlek training and control group is 6.67, where the f value of mean gain between the fartlek training and control group is 52.75, which is higher than the C.I value. So there is significant difference between fartlek training group and control group.

**ANALYSIS OF COVARIANCE FOR CARDIO-RESPIRATORY ENDURANCE**

**TABLE 7 ANALYSIS OF COVARIANCE FOR CARDIO-RESPIRATORY ENDURANCE ON PRE TEST AND POST TEST DATA OF EXPERIMENTAL AND CONTROL GROUPS (in Meters)**

Tests	Concurrent Training Group	Fartlek Training Group	Control Group	Source of Variance	Sum of Squares	Df	Mean Squares	'F' Ratio
<b>Pre Test</b>								
Mean	2740.71	2812.73	2811.32	B	50897.79	2	25448.90	.95
SD	232.93	93.85	133.47	W	1132160.01	87	26956.20	
<b>Post Test</b>								
Mean	2886.74	2941.31	2766.01	B	241453.34	2	120726.68	14.51*
SD	112.56	47.94	100.07	W	349666.68	87	8325.41	
<b>Adjusted Post Test</b>								
Mean	2909.1	2930.1	2755.1	B	271097.40	2	135548.71	53.77*
				W	103369.90	86	2521.23	

\* Significant at 0.05 level.

The Required table for df (2&87) at 0.05 level of confidence = 3.22

(2&86) at 0.05 level of confidence = 3.21

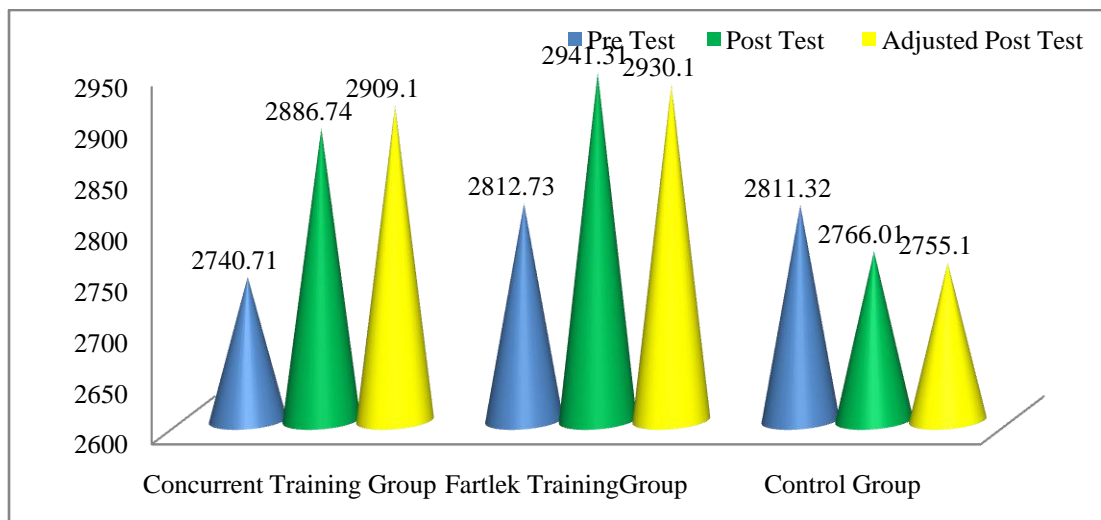
It is derived from table 7 that the pre test means on cardio respiratory endurance of the experimental and control groups are 2740.71, 2812.73 and 2811.32 respectively. The obtained 'F' ratio value 0.95 for the pre test mean is lesser than the required table value 3.22 for 2 & 87 degrees of freedom at 0.05 level of confidence. There is no significant difference between the experimental and the control groups on cardio respiratory endurance for the pre test data.

The post test means on cardio respiratory endurance of the experimental and the control groups are 2886.74, 2941.31 and 2766.01 respectively. The obtained 'F' ratio value 14.51 for the post test data is greater than the required table value 3.22 for 2 & 87 degrees of freedom at 0.05 levels of confidence. It shows that there is significant difference between the experimental and the control groups on cardio respiratory endurance following the experimental training.

The adjusted post test means on cardio respiratory endurance of the experimental and the control groups are 2909.1, 2930.1 and 2755.1 respectively. The obtained 'F' ratio value of 53.77 for the adjusted post test data is greater than the required table value 3.21 for 2 & 86 degrees of freedom at 0.05 level of confidence. It reveals that there is significant change on cardio respiratory endurance as a result of the experimental training. Since the result revealed that there is a significance difference, among the three groups. Since the difference exists in the adjusted post test mean, further multiple comparison tests was applied.

**TABLE 8 SCHEFFES POST-HOC TEST FOR MEAN DIFFERENCE BETWEEN GROUPS ON CARDIO RESPIRATORY ENDURANCE (in Meters)**

Mean Value			Mean Difference	'F' Value	C.I
Concurrent Training Group	Fartlek Training	Control Group			
2909.1	2930.1		21	1.36	6.42
2909.1		2755.1	154	72.37*	6.42
	2930.1	2755.1	175	93.45*	6.42



**FIGURE 4 GRAPHICAL ILLUSTRATION OF PRE - TEST, POST -TEST AND ADJUSTED POST -TEST MEANS OF EXPERIMENTAL AND CONTROL GROUPS ON CARDIO RESPIRATORY ENDURANCE (in Meters)**

Table 8 shows the paired mean difference among the three groups' namely Concurrent Training and fartlek training and control group. The mean difference between Concurrent Training and fartlek training is 21, were the f value of mean gains between the Concurrent Training and fartlek training is 1.36, which is lower than the C.I value. Therefore is no significant difference between Concurrent Training and fartlek training. The mean difference between the Concurrent Training and control group is 154, were the f value of mean gain between the Concurrent Training and control group is 72.37, which is higher than the C.I value. Therefore is significant difference between fartlek training and control group. The mean difference between the fartlek training and control group is 175, were the f value of mean gain between the fartlek training and control group is 93.45, which is higher than the C.I value. So there is significant difference between fartlek training and control group.

**DISCUSSION ON FINDINGS**

The discussion on the results of the twelve weeks of Concurrent Training and fartlek training on selected physical, physiological and skill related variables are as follows.

- The result of this study reveals that there is no significant difference in speed in the pre test and the post tests of the experimental and the control groups. But there is significant difference in the adjusted post test mean due to the twelve weeks of the training programme.





- From the findings of Subramanian Tamizhappan (2010), stated that varied package of physical training had significant change in speed than the control group. It is also similar findings from.
- The result of the study reveals that there is no significant difference between pre test experimental and control groups. But the twelve weeks of Concurrent Training and fartlek training results in significant change in the agility for post test experimental groups than the control group.
- From the findings of Dhanalakshmi (2011), stated that aerobic exercise had significant change in agility than the control group. It is also similar findings from.
- The result of this study reveals that there is no significant difference in muscular endurance in the pre test and the post tests of the experimental and the control groups. But there is significant difference in the adjusted post test mean due to the twelve weeks of the training programme.
- From the findings of, stated that fartlek training had significantly improved muscular endurance than the control group. It is also similar findings from Chidambara Raja (1992),
- The result of the study reveals that there is no significant difference between pre test experimental and control groups. But the twelve weeks of Concurrent Training and fartlek training results in significant change in the Cardio respiratory endurance for post test experimental groups than the control group.
- From the findings of stated that Concurrent Training had significantly improved cardio respiratory endurance than the control group. It is similar finding in this investigation also from revealed that fartlek training group had significantly improved cardio respiratory endurance than the control group. It is also similar findings from Subramanian Tamizhappan (2010).

## CONCLUSIONS

Physical factors such as speed, agility, muscular endurance, and cardiopulmonary endurance were shown to differ substantially between the two experimental groups and the control group. There was no statistically significant difference between the two experimental groups.

## REFERENCES

1. Anshuman Prasad (2002) The Coming of Age of Interpretive Organizational Research Volume 5, Issue.
2. Borremans, E., Rintala, P., & McCubbin, J. A. (2010). Physical fitness and physical activity in adolescents with Asperger syndrome: A comparative study. *Adapted Physical Activity Quarterly*, 27(4), 308-320.
3. Kamalavathi, U. M. & Shunmuganathan, D. (2011). Effect of Physical Exercise on Muscular Endurance Among Sedentary Men. *Indian Journal for Research in Physical Education and Sports Science*, 27-32.
4. Vaczi M, Tollar J, Meszler B, Juhasz I, Karsai I (2013), Shortterm high intensity plyometric training program improves strength, power and agility in male soccer players, *Journal of Human Kinetics*, Mar 28;36:17-26.



5. Devaraju.K (2014), Effect of plyometric training on explosive strength Among Kabaddi players, Star Physical Education, Vol.2 Issue 2. 07.
6. Nageswaran. A.S.(2014), Effect of Resistance Band Training on Strength Speed and Balance among Inter Collegiate Kabaddi Players, Star Physical Education, Vol.2 Issue 2. 05.
7. TaheriEskandar, AsgharNikseresht and EbrahimKhoshnam(2014), The effect of 8 weeks of plyometric and resistance training on agility, speed and explosive power in soccer players, European Journal of Experimental Biology, 2014, 4(1): 383-386.
8. RaoChunduVenkata, Y. Kishore(2014),Combined Effect of Strength and Plyometric Training Programme on Selected Motor Fitness Components of Male Kabaddi Players, International Journal of Recent Research and Applied Studies, Volume 1,Issue 2(12) July.
9. Kumar. M. M. (2015). Effect of Continuous Training on Cardio Respiratory Endurance among College Men Long Distance Runners. International Journal of Recent Research and Applied Studies, 2, 8(5), 19 - 21.
10. Mande, S. B. (2016). Effect of Continuous Running Fartlek Training and Interval Training on Selected Skill Related Performance Variables Among Male Football Players.
11. Golda, J., & Margaret, J. (2018). Coimbed effect of various training on speed and muscular strength among athletes. Asian Journal of Multidimensional Research (AJMR), 7(2), 64-68.
12. Dr. S Jayakumar and Dr. C Lakshmanan (2019) "Effect of resistance training on selected physical fitness variables among inter collegiate men kabaddi players" International Journal of Physiology, Nutrition and Physical Education 2019; 4(2): 607-609.
13. G Kalpana (2021) "Effect of resistance training on selected physical fitness variables among inter collegiate men kabaddi players" International Journal of Physical Education, Sports and Health 2021; 8(5): 243-245: <https://doi.org/10.22271/kheljournal.2021.v8.i5d.2267>.
14. Pooyan Sabet (2021) "The Effect of a 12-Week Resistance Training on Muscular Strength of Secondary School Male Students of Jahrom County, Iran" January 2021 Entire Research, Volume-XIII, Issue-I ISSN 0975-5020.
15. Pradeep Shankar Patil (2022) "Development of Knowledge Test for Elite Female Kabaddi Players of Pune District in Maharashtra"Entire Research, Volume-XII, Issue-I ISSN 0975-5020.
16. Tamizhappan (2010)static balance Velmaragan (2011) ability to perform amovement or coveradistance The ability of body systems to gather, process, and deliver oxygen(Lamorte,2016).
17. Dhanalakshmi (2011) "Effect of Short Duration Aerobic Exercises on Resting Blood Pressure and Heart Rate in Pre-hypertensive and Stage 1 Hypertensive Subjects" Corpus ID: 74565639 <https://www.semanticscholar>.
18. Chidambara Raja (1992) "Effect of Resistance and Endurance Training on Back Strength and Cardio-Respiratory Endurance" Online International Interdisciplinary Research Journal, {Bi-Monthly}, ISSN2249-9598, Volume-IV, Issue-IV, July-Aug 2014.