EXPLORING THE SYNERGISTIC EFFECTS OF CIRCUIT TRAINING AND YOGA ON FOOTBALL PLAYERS' PHYSICAL DEVELOPMENT

Dhinesh Raj N [1,2BCD], Senthilkumar P [1,2 BCD] K. Venkatachalam [1,2 BCDE] Suresh Kumar M[3,4ADE], Sankar A [3,4ADE]

[1]Department of Physical Education, Periyar University, Salem, Tamilnadu, India.
[2]Government Arts and Science College, Periyar Univeristy, Harur, Tamilnadu, India.
[3]Department of Physical Education, Periyar University, Salem, Tamilnadu, India.
[4]Ganesar College of Arts and Science, Bharathidasan University, Pudukkottai, Tamilnadu, India.
[5] Kongu Arts and Science College, Bharathiar University, Erode, Tamil Nadu, India

Authors' Contribution: A – Study design; B – Data collection; C – Statistical analysis; D – Manuscript Preparation; E – Funds Collection

Corresponding Author:**Senthilkumar P**,

Abstract

Objective: The purpose of the study was to find out the effect of circuit training and yogic practices on selected physical variables among football players. Material and Methods: To achieve the purpose of the present study, forty five football players from Hosur district, Tamilnadu, India were selected as subjects at random and their ages ranged from 18 to 25 years. The subjects were divided into three equal groups of fifteen subjects each. Group I acted as Experimental Group I (Circuit training), Group II acted as Experimental Group II (Yogic practices) and Group III acted as Control Group. The duration of experimental period was 12 weeks. After the experimental treatment, all the forty five subjects were tested on their physical variables. This final test scores formed as post test scores of the subjects. The pre test and post test scores were subjected to statistical analysis using Analysis of Covariance (ANCOVA) to find out the significance among the mean differences, whenever the 'F' ratio for adjusted test was found to be significant, Scheffe's post hoc test was used. In all cases 0.05 level of significance was fixed to test hypotheses. Results: The circuit training group produced significant improvement in physical variables than the control group. The yogic practices group produced significant improvement in physical variables than the control group. both the training groups showed similar better performance on speed, agility, explosive power, balance, cardio respiratory endurance and muscular strength & endurance. Conclusions: It was observed that the twelve weeks of circuit training have significantly improved the selected physical variables among football players than the control group.

Keywords: Circuit Training, Yogic Practices, Speed, Agility, Physical Variables, Football.

Introduction

Football players benefit greatly from circuit training since it builds muscle strength and endurance by combining resistance training with cardiovascular exercise. Professional athletes also use it to increase their speed, agility, and aerobic fitness. High-intensity aerobics are a key component of circuit training, which aims to

increase muscle strength and endurance. Because it blends cardiovascular and resistance training for a comprehensive workout, it is the perfect kind of exercise for football players [9].

One effective and difficult method of conditioning is circuit training. Strength, anaerobic and aerobic endurance, flexibility, and coordination are all effectively developed by it. Because of its versatility, it is well-liked by both elite athletes and the general public. It can help build a strong foundation of fitness and prime the body for more demanding training in the off-season and early preseason for both men's and women's sports. Circuit training is a well-organized method of working out that enhances all aspects of physical fitness [1,3,6].

Initial and final tests for the experimental and control groups were performed before and after training for variables like speed, agility, power, coordination, static balance, and dynamic balance. One type of exercise program that improves general fitness is circuit training. Regular circuit training will concurrently increase cardiovascular fitness, flexibility, muscular strength, and endurance. In 1953, circuit training was developed as a productive method for coaches to train a large number of athletes in a short period of time with a small amount of equipment. The exerciser performed a sequence of calisthenics or circuit training exercises one after the other [3,8].

The workout was fast-paced, lasting 15 to 45 seconds at each station, with little to no rest in between. This is now referred to as "circuit circuit training." It can improve muscular endurance and strength, according to research. Aerobic stamina improves somewhat, but only when rest intervals are kept to a minimum [9,12].

Circuit training is a useful technique that requires coordination in addition to some initial planning. Because it makes conditioning enjoyable and difficult through competition with teammates, athletes find it motivating. Circuit training is an ongoing set of exercises designed to enhance endurance and as many other aspects of physical fitness as possible. Six to twelve stations are usually up. The continuous nature of the performance is taken into account when choosing and ordering the activities within a circuit lap [12].

Another practical method of exercising is circuit training. It optimizes the overall volume of exercises (sets, repetitions, and weight) performed in a given amount of time. Because the exercises are performed consecutively, the amount of time spent exercising is shortened. Cardiovascular training is not required separately. Exercisers do not need to work out daily because all body parts are trained in a single session [14].

A circuit training program involves performing a series of timed exercises at a relatively fast pace, interspersed with short rest intervals. Workouts involving circuit training can focus on the arms, legs, or chest, or they can target the entire body. Furthermore, circuit training exercises can emphasize aerobics, strength training, or a mix of the two; the options are essentially endless. A timed circuit, a competition circuit, a repetition circuit, and a sport-specific/running circuit are the four general categories of circuit training exercises [20].

Yoga is an art of harmonizing a system of development for the mind, body, and spirit. It is a powerful tool for transformation and goes beyond simply a series of exercises that simultaneously energize and relax the body. Asana aids in opening up the body and getting it ready for the extended periods of meditation. In order to promote the upward movement of the kundalini, yoga poses stretch and stimulate the spine. Hatha yoga is a force that encompasses asanas, breathing techniques, meditation, focus, and moral codes. These are the means by which one can attain the state of yoga and union with the cosmic universal power [2,10].

Yoga is more than just a set of different stretching poses and postures to limber up the body, despite what some people believed. Breathing techniques, meditation, visualization, progressive relaxation techniques, self-analysis, and altruism are all incorporated into yoga. One becomes detached from his physical self as a result of these methods [11,13]. Yoga is an effective method for healing and achieving union. Yoga will raise our awareness, enabling us to more readily identify what is occurring both inside and outside of our bodies in any circumstance. We can change our behavior and eliminate all of life's negative aspects by practicing yoga [5,6,7].

Yoga poses benefit both the body and the mind, allowing us to feel calm, joyful, and relaxed. Yoga could signify: Combination: Union Sublimation: Merging: achieving eternal bliss and becoming one [15,16]. Yoga makes life more enjoyable, strengthens the mind, and increases intelligence. Yoga is a component of Indian religion and culture. In essence, yoga is the art of realizing oneself and learning everything there is to know about the soul. The goal of human birth is to gain a thorough understanding of oneself, nature, the Almighty, and his order of action. After realizing this, one should live in peace and contentment while honoring the order of functions [18]. A man can achieve this stage with the help of yoga. Giving the soul the safety, cleanliness, and rest it deserves is just as important as taking care of our bodies [17]. Yoga is good for the soul. Selfishness, conceit, and the desire for power and self are all alleviated by yoga. Man achieves the pinnacle of humanity when he recognizes the magnificence of his "self." By bringing out the sacred inner self, yoga will ensure peace within and around the practitioner. The gap between intellect and emotion is reduced by yoga [21].

Research Objectives

1. Investigate the effects of circuit training on physical variables in college-level football players.
2. Examine the impact of yoga training of college level football players.
3. Provide insights into the potential benefits of a comprehensive training program incorporating both circuit training and yoga for football players aiming to enhance their performance.

Methodology

The study's goal was to determine how certain physical characteristics of football players were affected by circuit training and yoga. Forty-five football players, ages 18 to 25, from the Hosur district of Tamilnadu, India, were chosen at random to serve as subjects for the current study. Three equal groups of fifteen subjects each were formed from the subjects (17). Group I represented Experimental Group I (circuit training). Group II represented Experimental Group II (yogic practices) and Group III represented the Control Group. To ensure participants' full cooperation and comprehension of the study's objectives, a comprehensive orientation session was conducted. Both pre and post the training period, participants underwent assessments covering physical fitness variables like speed, agility, explosive power, balance, cardio respiratory endurance and muscular strength & endurance (17,21). This methodical approach allows for a comprehensive analysis of the impact of the training interventions on the selected variables, contributing valuable insights to sports science and the advancement of football player development.

Training Protocol

In addition to their daily routine activities as planned, the experimental groups participated in their respective training programs during the training period. For twelve weeks, the experimental circuit training groups—and yogic practices — received their respective experimental training on three different days of the week. The resources gathered from books, periodicals, e-materials, and expert discussions were used to design the experimental training programs. The experimental training was scheduled to last for sixty minutes. For three different days of the week (Monday, Wednesday, and Friday), the circuit training program took place in the evenings from 5:00 to 6:00 p.m. The program of yoga exercises took place on three different days of the week (Tuesday, Thursday, and Saturday) and lasted from 6.30 to 7.30 a.m. Every participant in this study was closely observed during the training regimen and achieved a 90% attendance rate (17).

Statistical Methodology

Because the players were chosen at random and the groups were not matched with respect to the factors under investigation, analysis of covariance (ANCOVA) was calculated. As a result, when analysing the post-test mean differences, the three groups' pre-test mean differences had to be taken into consideration. This was accomplished by applying the analysis of covariance, which involved adjusting the final means for variations in the initial means and testing the significance of the adjusted means. The Scheffe's post-hoc test was used to determine the paired means difference whenever the adjusted post-test means were determined to be significant. A significance level of 0.05 was selected and deemed adequate for the study in order to test the variables' results (17).

Test of significance is the conclusion drawn from the analysis of the hypothesis is the most important part of the thesis. For this study, it was deemed necessary to test the hypothesis in accordance with the findings in relation to the level

of confidence, which was set at the 0.05 level. Since we determine whether or not there is a significant difference between the samples' pre-test and post-test scores, the tests are commonly referred to as the test of significance. A significance level of 0.05 was selected and deemed adequate for the study in order to test the variables' results. The hypothesis that there was a significant difference between the means of the groups compared was accepted in the current study if the obtained F-ratio was higher than the table F-ratio at the 0.05 level. Additionally, the hypothesis that there was a significant difference between the means of the groups under study was rejected if the obtained F-ratio was less than the table F-ratio at the 0.05 level (17,21).

Results and Evaluation

Table 1: Computation of mean and analysis of covariance on speed of circuit training, yogic practices and control groups

	CTG	YPG	Control Group	Source of Variance	Sum of Squares	df	Mean Square	F
Pre Test Mean	7.53	7.50	7.49	BG	0.01	2	0.006	1.28
				WG	0.19	42	0.005	
Post Test Mean	7.28	7.27	7.48	BG	0.42	2	0.21	107.55*
				WG	0.08	42	0.002	
Adjusted Post Test Mean	7.28	7.27	7.48	BG	0.41	2	0.20	106.48*
				WG	0.08	41	0.002	

* Significant at 0.05 level Table value for df 2, 42 was 3.21 and 2, 41 was 3.22

Results of Speed

An examination of above table indicated that the pretest means of circuit training, yogic practices and control groups were 7.53, 7.50 and 7.49 respectively. The obtained F-ratio for the pre-test was 1.28 and the table F-ratio was 3.21. Hence the pre-test mean F-ratio was insignificant at 0.05 level of confidence for the degree of freedom 2 and 42. This proved that there were no significant difference between the experimental and control groups indicating that the process of randomization of the groups was perfect while assigning the subjects to groups.

The post-test means of the circuit training, yogic practices and control groups were 7.28, 7.27 and 7.48 respectively. The obtained F-ratio for the post-test was 107.55 and the table F-ratio was 3.21. Hence the post-test mean F-ratio was

significant at 0.05 level of confidence for the degree of freedom 2 and 42. This proved that the differences between the post test means of the subjects were significant.

The above table indicates the adjusted mean value of speed of circuit training, yogic practices and control groups were 7.28, 7.27 and 7.48 respectively. The obtained F-ratio of 106.48 for adjusted mean was greater than the table value 3.22 for the degrees of freedom 2 and 41 required for significance at 0.05 level of confidence. The result of the study indicates that there was a significant difference among the experimental and control groups on speed. The above table also indicates that both pre and post test means of experimental and control groups differ significantly.

Table 2: Adjusted mean and differences between the means of circuit training, yogic practices and control groups on speed

CTG	YPG	Control Group	Mean Difference	CI Value
7.28	7.27	---	0.01	0.04
7.28	---	7.48	0.20*	
---	7.27	7.48	0.21*	

Table - 2 shows the adjusted m**e**ans on speed and difference between the means of the circuit training, yogic practices and control group. The mean differences of circuit training group and control group, yogic practices group and control group were 0.20 and 0.21 respectively was greater than the CI value 0.04. Hence there exists significant difference. The mean difference between circuit training group and yogic practices group was 0.01 lesser than the CI value 0.04. Hence there exists no significant difference.

Table 3: Computation of mean and analysis of covariance on agility of circuit training, yogic practices and control groups

	CTG	YPG	Control Group	Source of Variance	Sum of Squares	df	Mean Square	F
Pre Test Mean	11.71	11.72	11.68	BG	0.01	2	0.006	1.92
				WG	0.13	42	0.003	
Post	11.44	11.45	11.67	BG	0.52	2	0.26	32.38*

Test Mean				WG	0.34	42	0.008	
Adjusted Post Test Mean	11.44	11.45	11.67	BG	0.43	2	0.21	27.56*
				WG	0.32	41	0.008	

* Significant at 0.05 level Table value for df 2, 42 was 3.21 and 2, 41 was 3.22

Results of Agility

An examination of above table indicated that the pretest means of circuit training, yogic practices and control groups were 11.71, 11.72 and 11.68 respectively. The obtained F-ratio for the pre-test was 1.92 and the table F-ratio was 3.21. Hence the pre-test mean F-ratio was insignificant at 0.05 level of confidence for the degree of freedom 2 and 42. This proved that there were no significant difference between the experimental and control groups indicating that the process of randomization of the groups was perfect while assigning the subjects to groups.

The post-test means of the circuit training, yogic practices and control groups were 11.44, 11.45 and 11.67 respectively. The obtained F-ratio for the post-test was 32.38 and the table F-ratio was 3.21. Hence the post-test mean F-ratio was significant at 0.05 level of confidence for the degree of freedom 2 and 42. This proved that the differences between the post test means of the subjects were significant.

The above table indicates the adjusted mean value of agility of experimental circuit training group, experimental yogic practices group and control groups were 11.44, 1145 and 11.67 respectively. The obtained F-ratio of 27.56 for adjusted mean was greater than the table value 3.22 for the degrees of freedom 2 and 41 required for significance at 0.05 level of confidence. The result of the study indicates that there was a significant difference among experimental and control groups on agility. The above table also indicates that both pre and post test means of experimental and control groups differ significantly.

Table 4: Adjusted mean and differences between the means of circuit training, yogic practices and control groups on agility

CTG	YPG	Control Group	Mean Difference	CI value
11.44	11.45	---	0.01	0.08
11.44	---	11.67	0.23*	
---	11.45	11.67	0.22*	

Table - 4 shows the adjusted means on agility and difference between the means of the circuit training group, yogic practices group and control group. The mean differences of circuit training and control group, yogic practices group and control group were 0.23 and 0.22 respectively was greater than the CI value 0.08. Hence there exists significant difference. The mean difference between circuit training group and yogic practices group was 0.01 lesser than the CI value 0.08. Hence there exists no significant difference.

Table 5: Computation of mean and analysis of covariance of explosive power of circuit training , yogic practices and control groups

	CTG	YPG	Control Group	Source of Variance	Sum of Squares	df	Mean Square	F
Pre Test Mean	0.43	0.42	0.41	BG	0.00	2	0.00	1.04
				WG	0.009	42	0.00	
Post Test Mean	0.48	0.49	0.42	BG	0.03	2	0.01	55.21*
				WG	0.01	42	0.00	
Adjusted Post Test Mean	0.48	0.49	0.42	BG	0.03	2	0.01	51.16*
				WG	0.01	41	0.00	

* Significant at 0.05 level Table value for df 2, 42 was 3.21 and 2, 41 was 3.22

Results of Explosive Power

An examination of above table indicated that the pretest means of circuit training, yogic practices and control groups were 0.43, 0.42 and 0.41 respectively. The obtained F-ratio for the pre-test was 1.04 and the table F-ratio was 3.21. Hence the pre-test mean F-ratio was insignificant at 0.05 level of confidence for the degree of freedom 2 and 42. This proved that there were no significant difference between the experimental and control groups indicating that the process of randomization of the groups was perfect while assigning the subjects to groups.

The post-test means of the circuit training, yogic practices and control groups were 0.48, 0.49 and 0.42 respectively. The obtained F-ratio for the post-test was 55.21 and the table F-ratio was 3.21. Hence the post-test mean F-ratio was significant at 0.05 level of confidence for the degree of freedom 2 and 42. This proved that the differences between the post test means of the subjects were significant.

The above table indicates the adjusted mean value of explosive power of circuit training group, yogic practices group and control groups were 0.48, 0.49 and 0.42 respectively. The obtained F-ratio of 51.16 for adjusted mean was greater than the table value 3.22 for the degrees of freedom 2 and 41 required for significance at 0.05 level of confidence. The result of the study indicates that there was a significant difference among experimental and control groups on explosive power. The above table also indicates that both pre and post test means of experimental and control groups differ significantly.

Table 6: Adjusted mean and differences between the means of circuit training, yogic practices and control groups on explosive power

CTG	YPG	Control Group	Mean difference	CI value
0.48	0.49	---	0.01	0.02
0.48	---	0.42	0.06*	
---	0.49	0.42	0.07*	

Table - 6 shows the adjusted means on explosive power and difference between the means of the circuit training group, yogic practices group and control group. The mean differences of circuit training group and control group, yogic practices group and control group were 0.06 and 0.07 respectively was greater than the CI value 0.02. Hence there exists significant difference. The mean difference between circuit training group and yogic practices group was 0.01 lesser than the CI value 0.02. Hence there exists no significant difference.

Table 7: Computation of mean and analysis of covariance of balance of circuit training, yogic practices and control groups

	CTG	YPG	Control Group	Source of Variance	Sum of Squares	df	Mean Square	F
Pre Test Mean	29.28	28.59	30.34	BG	23.18	2	11.59	0.98
				WG	492.297	42	11.72	
Post	45.30	44.41	31.02	BG	1919.18	2	959.59	237.70*

Test Mean				WG	169.55	42	4.03	
Adjusted Post Test Mean	45.31	44.47	30.95	BG	1876.58	2	938.29	230.59*
				WG	166.83	41	4.06	

* Significant at 0.05 level Table value for df 2, 42 was 3.21 and 2, 41 was 3.22

Results of Balance

An examination of above table indicated that the pretest means of circuit training, yogic practices and control groups were 29.28, 28.59 and 30.34 respectively. The obtained F-ratio for the pre-test was 0.98 and the table F-ratio was 3.21. Hence the pre-test mean F-ratio was insignificant at 0.05 level of confidence for the degree of freedom 2 and 42. This proved that there were no significant difference between the experimental and control groups indicating that the process of randomization of the groups was perfect while assigning the subjects to groups.

The post-test means of the circuit training, yogic practices and control groups were 45.30, 44.41 and 31.02 respectively. The obtained F-ratio for the post-test was 237.70 and the table F-ratio was 3.21. Hence the post-test mean F-ratio was significant at 0.05 level of confidence for the degree of freedom 2 and 42. This proved that the differences between the post test means of the subjects were significant.

The above table indicates the adjusted mean value of balance of circuit training group, yogic practices group and control groups were 45.31, 44.47 and 30.95 respectively. The obtained F-ratio of 230.59 for adjusted mean was greater than the table value 3.22 for the degrees of freedom 2 and 41 required for significance at 0.05 level of confidence. The result of the study indicates that there was a significant difference among experimental and control groups on balance. The above table also indicates that both pre and post test means of experimental and control groups differ significantly.

Table 8: Adjusted mean and differences between the means of circuit training, yogic practices and control groups on balance

CTG	YPG	Control Group	Mean Difference	CI value
45.31	44.47	---	0.84	1.86
45.31	---	30.95	14.36*	

---	44.47	30.95	13.52*	

Table - 8 shows the adjusted means on balance and difference between the means of the circuit training group, yogic practices group and control group. The mean differences of circuit training group and control group, yogic practices group and control group were 14.36 and 13.52 respectively was greater than the CI value 1.86. Hence there exists significant difference. The mean difference between circuit training group and yogic practices group was 4.32 lesser than the CI value 1.86. Hence there exists no significant difference.

Table 9: Computation of mean and analysis of covariance of cardio respiratory endurance of circuit training, yogic practices and control groups

	CTG	YPG	Control Group	Source of Variance	Sum of Squares	df	Mean Square	F
Pre Test Mean	7.38	7.39	7.35	BG	0.013	2	0.007	1.27
				WG	0.21	42	0.005	
Post Test Mean	7.01	6.96	7.33	BG	1.19	2	0.59	94.31*
				WG	0.26	42	0.006	
Adjusted Post Test Mean	7.01	6.96	7.34	BG	1.16	2	0.58	92.10*
				WG	0.25	41	0.006	

* Significant at 0.05 level
Table value for df 2, 42 was 3.21 and 2, 41 was 3.22

Results of Cardio Respiratory Endurance

An examination of above table indicated that the pretest means of circuit training, yogic practices and control groups were 7.38, 7.39 and 7.35 respectively. The obtained F-ratio for the pre-test was 1.27 and the table F-ratio was 3.21. Hence the pre-test mean F-ratio was insignificant at 0.05 level of confidence for the degree of freedom 2 and 42. This proved that there were no significant difference between the experimental and control groups indicating that the process of randomization of the groups was perfect while assigning the subjects to groups.

The post-test means of the circuit training, yogic practices and control groups were 7.01, 6.96 and 7.33 respectively. The obtained F-ratio for the post-test was 94.31 and the table F-ratio was 3.21. Hence the post-test mean F-ratio was significant at

0.05 level of confidence for the degree of freedom 2 and 42. This proved that the differences between the post test means of the subjects were significant.

The above table indicates the adjusted mean value of cardio respiratory endurance of circuit training, yogic practices group and control groups were 7.01, 6.96 and 7.34 respectively. The obtained F-ratio of 92.10 for adjusted mean was greater than the table value 3.22 for the degrees of freedom 2 and 41 required for significance at 0.05 level of confidence. The result of the study indicates that there was a significant difference among experimental and control groups on cardio respiratory endurance. The above table also indicates that both pre and post test means of experimental and control groups differ significantly.

Table 10: Adjusted mean and differences between the means of circuit training, yogic practices and control groups on cardio respiratory endurance

CTG	YPG	Control Group	Mean Difference	CI value
7.01	6.96	---	0.05	0.07
7.01	---	7.34	0.33*	
---	6.96	7.34	0.38*	

Table - 10 shows the adjusted means on cardio respiratory endurance and difference between the means of the circuit training group, yogic practices group and control group. The mean differences of circuit training group and control group, yogic practices group and control group were 0.33 and 0.38 respectively was greater than the CI value 0.07. Hence there exists significant difference. The mean difference between circuit training group and yogic practices group was 0.05 lesser than the CI value 0.07. Hence there exists no significant difference.

Table 11: Computation of mean and analysis of covariance on muscular strength and endurance of circuit training, yogic practices and control groups

	CTG	YPG	Control Group	Source of Variance	Sum of Squares	df	Mean Square	F
Pre Test Mean	8.93	8.46	8.60	BG	1.73	2	0.86	0.60
				WG	60.26	42	1.43	
Post Test Mean	12.06	12.20	8.86	BG	106.84	2	53.42	42.28*
				WG	53.06	42	1.26	

Adjusted Post Test Mean	12.10	12.14	8.84	BG	108.40	2	54.20	46.10*
				WG	48.19	41	1.17	

* Significant at 0.05 level
Table value for df 2, 42 was 3.21 and 2, 41 was 3.22

Results of Muscular Strength and Endurance

An examination of above table indicated that the pretest means of circuit training, yogic practices and control groups were 8.93, 8.46 and 8.60 respectively. The obtained F-ratio for the pre-test was 0.60 and the table F-ratio was 3.21. Hence the pre-test mean F-ratio was insignificant at 0.05 level of confidence for the degree of freedom 2 and 42. This proved that there were no significant difference between the experimental and control groups indicating that the process of randomization of the groups was perfect while assigning the subjects to groups.

The post-test means of the circuit training, yogic practices and control groups were 12.06, 12.20 and 8.86 respectively. The obtained F-ratio for the post-test was 42.28 and the table F-ratio was 3.21. Hence the post-test mean F-ratio was significant at 0.05 level of confidence for the degree of freedom 2 and 42. This proved that the differences between the post test means of the subjects were significant.

The above table indicates the adjusted mean value of muscular strength and endurance of circuit training, yogic practices group and control groups were 12.10, 12.14 and 8.84 respectively. The obtained F-ratio of 46.10 for adjusted mean was greater than the table value 3.22 for the degrees of freedom 2 and 41 required for significance at 0.05 level of confidence. The result of the study indicates that there was a significant difference among experimental and control groups on muscular strength and endurance. The above table also indicates that both pre and post test means of experimental and control groups differ significantly.

Table 12: Adjusted mean and differences between the means of circuit training, yogic practices and control groups on muscular strength and endurance

CTG	YPG	Control Group	Mean difference	CI value
12.10	12.14	---	0.04	1.00
12.10	---	8.84	3.26*	
---	12.14	8.84	3.30*	

Table - 12 shows the adjusted means on muscular strength and endurance and difference between the means of the circuit training group, yogic practices group and control group. The mean differences of circuit training group and control group, yogic

practices group and control group were 3.26 and 3.30 respectively was greater than the CI value 1.00. Hence there exists significant difference. The mean difference between circuit training group and yogic practices group was 0.04 lesser than the CI value 1.00. Hence there exists no significant difference.

Conclusion

1. It was observed that the twelve weeks of circuit training have significantly improved the selected physical variables among football players than the control group.
2. It was observed that the twelve weeks of yogic practices have significantly improved the selected physical fitness variables among football players than the control group.
3. The significant mean difference does not exist among all the three groups in the pre test on speed, agility, explosive power, balance, cardio respiratory endurance and muscular strength & endurance.
4. In testing post test mean difference among the three groups statistically significant on variables of speed, agility, explosive power, balance, cardio respiratory endurance and muscular strength & endurance. In testing the post adjusted mean among the three groups also predicts the above result.
5. In comparing the effect of circuit training and yogic practices group on physical fitness variables, from the obtained f-ratios, it was observed that both the training groups showed similar better performance on speed, agility, explosive power, balance, cardio respiratory endurance and muscular strength & endurance.

Recommendations

1. Similar study may be conducted on women college level football players.
2. In addition to the selected variables, the present study can be added with physiological and bio-chemical variables.
3. A similar study may be conducted on players of various games and sports.
4. A similar study may be conducted for various age groups.

References

1. Baechle, T.R. and Earle, R.W. (2000). *Essentials of Strength Training and Conditioning*, 2nd Edition, Champaign, IL: Human Kinetics
2. Chen, K.M., Chen, M.H., Hong, S.M., Chao, H.C., Lin, H.S., & Li, C.H. (2008). Physical fitness of older adults in senior activity centres after 24-week silver yoga exercises. *J Clin Nurs.* 17(19):2634-46.
3. Chittibabu, B., & Akilan, N. (2013). Effect of basketball specific endurance circuit training on aerobic capacity and heart rate of high school male

basketball players, *International Journal of Physical Education, Fitness and Sports*, 2, 4.

4. Eswaramoorthy, A. & Suresh Kumar, M. (2020). Effect of yogic practices and aerobic training on flexibility among physical education students. Purakala, *31,8, 417-420.*
5. Eugene S.Rawles, (1997). *Yoga for Beauty and Health.* New York: Parker Publishing CompanyInc.
6. Freitas, Tomas T.; Calleja-Gonzalez, Julio; Alarcon, Francisco; Alcaraz, Pedro E. (2015). Acute effects of two different resistance circuit training protocols on performance and perceived exertion in semi-professional basketball players. *Journal of Strength & Conditioning Research*, 13.
7. Joshi.K (2001). *Yogic Pranayama*, New Delhi: Orient Paper Backs.
8. Malathy, C. & C Robert Alexandar (2016). A study of the influence of physical exercise, circuit training and yogic practice on strength among college girls in Tamilnadu state. *International Journal of Physical Education, Sports and Health.* 3, 1.
9. Meir, R., Newton, R., Curtis, E., Fardell, M. & Butler, B. (2001) Physical fitness qualities of professional rugby league football players: determination of positional differences. *J Strength Cond Res.* 15(4):450-8.
10. Moorthy A.M. & David Manual Raju, J. (1983). *Yoga for Health.* Madras: M.J.Publishers.
11. Muscandar, S. (1966). *Yogic Exercises.* Calcutter Orient Longmans Ltd.
12. Paul Kumar, P. P. S. (2013). The Effect of Circuit Training on Cardiovascular Endurance of High School Boys. *Global Journal of Human Social Science, Arts, Humanities & Psychology*, 13, 7.
13. Sharma, M. (2014). Yogaas an alternative and complementary approach for stress management: a systematic review. *J Evid Based Complementary Altern Med.* 19(1):59-67.
14. Singh, R. (1991). Comparativ effectivess of specific circuit training, weight training, combination of circuit training on selected skills among basketball players, India: *Unpublished thsis, jiwaji University*.
15. Suresh, Kumar M. (2017). Influence of Yoga Practices on Blood Pressure Among Rural College Girls. *Star International Research Journal, 5,1(3).*
16. Suresh, Kumar M. (2019). Effect of yogic practices on selected lung volumes among asthmatic men. The International journal of analytical and experimental modal analysis, *XI,VII, 1286-1290.*
17. Vijayarani, C.A., Dr.V.Vallimurugan & M.Suresh Kumar (2012). Influence of Yogic Practices on Selected Physiological and Psychological Variables of Adolescent Boys. *Recent Research in Science and Technology*. 3,1.
18. Vishal Kumar (2016). Impact of yogic practices and circuit training on power production and health care. *International Journal of Physical Education, Sports and Health*, 3, 1.

19. Vishaw Gaurav (2011). Effects of Hatha Yoga Training on the Health-Related Physical Fitness. International Journal of Sports Science and Engineering. 05, 03, 169-173.
20. Vrachimis, A., Hadjicharalambous, M. & Tyler, C. (2016. The Effect of Circuit Training on Resting Heart Rate Variability, Cardiovascular Disease Risk Factors and Physical Fitness in Healthy Untrained Adults. *Health*, 8, 144-155.
21. Yokesh, T.P. & Chandrasekaran, K. (2011) Effect of yogic practice and aerobic exercise on selected physical and physiological variables among overweight school boys. *International Journal of Current Research. 3, 9, 103-106.*
22. A. Sankar (2022). *Efficacy of resistance and yoga training on selected fitness variables among college level hockey players*. *International Journal of All Research Education and Scientific Methods (IJARESM)*, Volume 10, Issue 2022. ISSN: 2455-6211. Impact Factor: 7.42.

Information about the authors:

- **Dhinesh Raj N[1]: dineshrajsports@gmail.com; https://orcid.org/0009-0009-5058-8678** [1]Department of Physical Education, Periyar University, Salem, Tamilnadu, India.
- **Senthilkumar P[2];**senthil1848@gmail.com;**https://orcid.org/0009-0006-4384-5363 P[2]** [2]Government Arts and Science College, Periyar Univeristy, Harur, Tamilnadu, India.
- **Suresh Kumar M[3]; surhoc1139@gmail.com; https://orcid.org/0009-0008-3198-7828,** [3]Ganesar College of Arts and Science, Bharathidasan University, Pudukkottai, Tamilnadu, India.
- **Sankar A[4]** ; sankaralagar@gmail.com; https://orcid.org/0000-0003-0294-5246, Kongu Arts and Science College, Bharathiar University, Erode, Tamil Nadu, India