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COMPARATIVE EFFECTS OF THREE TRAINING MODES ON THE PHYSICAL FITNESS WITH REGARDS TO AGILITY AND STRENGTH OF UNDER 13 MALE SOCCER PLAYERS IN ALUU IKWERRE LGA OF RIVERS STATE

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ABSTRACT

The purpose of this study was to determine the suitability of circuit, continuous and interval training programmes on the physical fitness attributes of U-13 male soccer players. The subjects were U-13 male soccer players who participated in football teams of their junior secondary schools teams in Aluu, Ikwerre LGA of Rivers State Nigeria, post 2023/204 academic session. Fifty-four subjects were purposely drawn from 120 U-13 Amateur male soccer players. These Subjects were randomly assigned to three groups: circuit training group (A), continuous training group (B) and Interval training group (C) based on their possession of the actual ability and exponents suitable for the study. The exponents and ability include age, height, weight and participation in school junior team during the 2023/2024 academic session. Three school physical education instructors were adequately trained as assistants for the execution of this experimental work. The study adopted the pre-test randomized group study design. The subjects trained for four weeks using circuit, continuous and interval training regimens. Standardized, modified and physical fitness tests namely: modified Illinois Agility run and modified push-ups were used for the physical fitness attributes. Two research questions and two hypotheses were formulated based on the effects of the three training programmes on the endurance, flexibility, agility, strength, speed and power levels of U-13 male soccer players. Mean and Standard Deviation were used to answer research questions while one way Analysis of Variance (ANOVA) was used to determine the level of significance at 0.05. The Least Significant Difference (LSD) post hoc pairwise comparison test was used to determine the direction of the difference for significant gain mean scores of the attributes under study. The results revealed that (1) physical fitness attributes of U-13 male soccer players differed significantly due to the effect of circuit, continuous and interval training regimens performance in Agility and Strength, as well as Strength and Agility were significantly affected. Based on these findings, the researchers recommend among others that soccer coaches should use continuous and circuit training methods for developing, interval for Agility and Strength abilities. It was also suggested that the study should be replicated using females, different sports and environment.

Keywords: Comparative Effects; Three Training Modes; Physical Fitness; Agility and Strength; Under 13 Male Soccer Players

Introduction

Profiles of potential athletes have been receiving a lot of attention by sports scientists who have used them primarily to evaluate, design and modify some training programmes (Blanke, et al, 2021). Zein, et al (2020) earlier stated that profiles have also been widely used to establish levels and develop in understanding of the physical make up of athletes competing in various sports.

Soccer is by far the most popular spectator sport in the world and in many countries, it is the most revenue yielding sport (Jose et al 2015). This popularity has stimulated numerous research efforts aimed at understanding the sport and the factors that promote excellence in it. It is played at amateur and professional levels. The standard of the game has developed tremendously over the years especially in Europe and South America. North America, Asia and Africa have started working hard to improve the standard of the game (Zein et al, 2020). No part of the world is considered as under dogs anymore.

In modern soccer, teams are usually prepared to play what some coaches describe as "total football" consisting of mass attack and mass defense. In this type of soccer game, defenders can turn attackers and attackers can turn defenders when the need arises. This is a far cry from the old system of play in which the eleven (11) players made up of the goalkeeper, two full backs, three half backs and five forward line players had to maintain their positions on the field of play very rigidly. The system has since changed and players not only constitute themselves into different formations on the field but can over-lap and even exchange places on the field of play. Gil, (2007) emphasized that in the 4-2-4 formation for instance, we have the goalkeeper guarding the goal, four players playing the role of defenders, two midfield players and four attackers or strikers. Furthermore, in the 4-3- 3 formation, we have four defenders, three midfielders and three attackers. A team also experiments on other formations such as 4-4-2 and 2-4-4, depending on the objectives of the team for that match. It is also observed that in modern soccer even though players still specialize as defenders, midfielders, attackers and goalkeepers, every player is expected to know how to play the part of a defender or an attacker as a rule. Ability to play one or more positions is determined by the physical fitness status of an individual.

Furthermore, in modern soccer, all the players with expectation of the goalkeeper can switch positions tactically such that the defenders can occasionally overlap to become midfielders or even attackers (Boyaci & Afryo, 2017). Based on the foregoing explanations, the study is focused on determining which of three training methods would be suitable for the development of the physical fitness attributes of U-13 male soccer players in Aluu Ikwere LGA of Rivers State based on their playing positions.

Statement of the Problem

Physical fitness and conditioning factors are aspects of the scientific variables being utilized by developed countries to improve the standard of soccer game, this is affirmed by Ajiduah (1992), as he emphasized that the standard of soccer game has developed tremendously over the years, especially in

Brazil, Argentina and entire South America due to the application of physical fitness and conditioning variables during the training programme.

Observation showed that in modern soccer, the standard of performance for some Nigerian home-based soccer players appears to be very poor compared to their counterparts in the developed countries of the world. The level of physical fitness of a player makes the difference in his or her ability to sustain performance at high level in a game situation. Vardakis, et al, (2020) stated that enough physical fitness training both aerobic and anaerobic have not been included in the training programme of Nigeria football teams. He further stressed that soccer teams in Nigeria mostly concentrate training efforts on techniques, tactics and co-ordination hoping that physical fitness attributes should be developed as well. This study is designed to fill the gap in knowledge about the effectiveness of different training modes on the physical fitness attributes of amateur soccer players in Aluu, Rivers State of Nigeria.

Purpose of the Study

The main purpose of this study was to determine suitability of circuit, continuous and interval training programmes in the development of physical fitness attributes of U-13 male soccer players based on their playing positions.

Specifically, the study aimed at:

1. Identifying the effectiveness of circuit, continuous and interval training programmes on the Agility of U-13 male soccer players.
2. Determining the effectiveness of circuit, continuous and interval training programmes on the Strength U-13 male soccer players.

Significance of the Study

Specifically, the study would be helpful to sports handlers especially coaches to understand that training for physical fitness is among the key element to excellent performance in soccer. The results of this study could help the coaches in identifying the usefulness of a particular training method in relation to the specific physical fitness attributes. The result of this study could guide coaches in designing or modifying effective training regimen that could help players establish and maintain physical fitness levels required for soccer performance during the preparatory phases. Furthermore, this study could equally help coaches as well as the players to reassess their training techniques and opt for the best. The study could also help to improve the general health of the individual players, as the chances of suffering exhaustion will be limited during the actual play. It will also help in the development of confidence among the sports handlers and the players themselves.

The result of this study can not only help to develop the physical fitness potentials of the players, but also could help in blending such qualities into effective team work and finally help coaches and players maintain high standard of performance in soccer in Nigeria.

Scope of the Study

There are scientific variables for preparation of soccer players such as Psychological, Biomechanical, Nutritional, Sociological, Physical fitness and Conditioning variables.

However, the present study is limited to only physical fitness components as one of the scientific variables. The study is focused on the U-13 male soccer players in Aluu Rivers State who participated in school football team during the 2023/2024 academic session.

Research Questions

The following research questions guided the conduct of the study

1. What effectiveness would circuit, continuous and interval training programmes have on the Agility of U-13 male soccer players?
2. What effectiveness would the circuit, continuous and interval training programmes have on the Strength of U-13 male soccer players?

Hypotheses

The following null hypotheses were postulated for the study at 0.05 level of significance.

1. There is no significant difference on the effectiveness of circuit, continuous and interval training programmes on the Agility of U-13 male soccer players.
2. The effectiveness of circuit, continuous and interval training programmes on the Strength of U-13 male soccer players do not differ significantly.

Method

Research Design

Experimental research design was used for this study. It was used so as to investigate the cause-and-effect relationship that existed between the independent and dependent variables for the study. Specifically, laboratory type of experimental research design was adopted for this study. In this design according to Kendall (2003), subjects are studied in a closed setting so that researchers can maintain as much as control as possible over the subjects. It was a pre-test, post-test randomized group study, designed to determine the effectiveness of three training programmes on the physical fitness of U-13 male soccer players based on their playing positions. Three groups of subjects were involved in the study, each group comprised attackers, midfielders, defenders plus goalkeepers. The three groups were exposed to the different experimental treatments. There was no control group.

Area of the Study

The area of the study was Aluu Ikwerre LGA of Rivers State which comprises some. The study specifically centered on the towns within five (5) kilometers radius.

Population of the Study

All the 120 U-13 male soccer players within Aluu community who participated in their school football team in the 2023/24 academic session. Constituted the population for the study. These players were involved in this study because the group constituted a homogenous unit of skillful players fit for grassroots development of dependable soccer players for local and international soccer competition.

Sample and Sampling Technique

Purposive sampling technique was adopted in selecting the subjects for the study. The researcher adopted this technique because it is the most appropriate for the study. In purposive sampling technique, specific elements which satisfy some pre-determined criteria are selected and the criteria used are usually based on the researcher's judgment (Nworgu, 1991). The researcher exercises

this judgment in relation to what constituted a representative sample with respect to research purpose. Therefore, purposive sampling technique was adopted in the sense that the subjects possessed the required characteristics suitable for the sample of the study such as age, height, weight (exponents) and participation in school team. Anambra State. Fifty-four (54) out of 120 U-13 male soccer players were sampled by means of this sampling technique.

Instrument for Data Collection

Modified and standardized physical fitness tests were the main instruments used in collecting the data for the study.

These comprised:

i. Modified Illinois Agility run
ii. Modified Push ups

In addition, six training exercises suitable for the development of physical fitness attributes each in circuit training, interval training and continuous training were also used as data collecting instruments for the study. Furthermore, standard soccer pitch, stop watches, cones, pen, paper, six standard footballs, tag numbers, graduated ruler, red and white flags, dumbbells and whistle formed part of the instrument. A data sheet named Physical Fitness Conditioning Assessment Sheet (PFCAS) was developed by the researcher and used in collecting the final data for the physical fitness level of the subjects.

Validation of the Instrument

This study adopted two already standardized physical fitness test items which their validity has been established worldwide as stated by American Association of Health, Physical Education, Recreation and Dance (1988).

Reliability of the Instrument

To ensure the reliability of the modified instruments for the study, test-retest method was applied using the trial run group. The scores were correlated using Pearson product moment correlation coefficient, The scores from the tests yielded reliabilities co-efficient of 0.939, 0.893, 0.993 and 0.986 respectively for modified Coopers endurance run, sit and reach, Illinois agility run and pushups, thus indicating a good degree of reliability. These estimates were considered high enough for adopting the instruments for the study.

Method of Data Collection

The subjects were assembled at the standard football pitch. A pre-test was given to all the subjects in the three groups before the administration of the treatment. The treatment sessions lasted for eight weeks. At the end of the eight weeks of training, post-test was administered using pre-determined criteria.

Assigning the Subjects to Treatment Groups: The researchers assembled the fifty-four (54) subjects and randomly assigned them to the groups using the pre-test scores. In addition the three groups were assigned to the three training programmes namely circuit training group, interval training group and continuous training group using balloting technique.

Method of Data Analysis

Mean scores and standard deviations were used in answering the research questions. The hypotheses were tested using one way analysis of variance (ANOVA) at 0.05 alpha level. ANOVA was suitable in testing the hypotheses since it serves as a procedure for determining the contingencies of multiple

means which involves two independent estimation of the population variance. It is equally used in checking the homogeneity of variance between two samples. Oyeka (1992) emphasized that ANOVA is used for partitioning the total variation of a set of data into several components

Presentation And Analysis of Data

The main purpose of the study was to identify the effectiveness of the training methods on the physical fitness attributes of U-13 male soccer players based on their playing positions, the results of the analysis of data for the study were presented. The results attempted to answer the research questions and tested the hypotheses postulated for the study.

Decision Rule: The null hypothesis (Ho) is rejected if the probability value (p-value) given by the computer is less than the chosen significant level (α), that is 5% or 0.05.

Research Question 1: What effectiveness would circuit, continuous and interval training programmes have on the Agility of U-13 male soccer players?

The results obtained on this research question three are shown on table 3. Mean and standard deviation were used for the analysis.

Table 1: Mean and Standard Deviations of U-13 Male Soccer Players Using Gain on Agility

Players position	Circuit Training			Continuous Training			Interval Training			Total		
	X	SD	N	X	SD	N	X	SD	N	X	SD	N
D	3.2000	0.44721	5	2.4000	0.89443	5	4.0000	0.70711	5	3.2000	0.94112	15
A	2.0000	0.70711	5	2.0000	0.00000	5	3.6000	0.54772	5	2.5333	0.91548	15
M	4.0000	1.15470	4	2.2500	1.50000	4	4.0000	0.00000	4	3.4167	1.31137	12
G	6.7500	1.50000	4	6.2500	1.50000	4	6.0000	0.81650	4	6.5000	1.24316	12
Total	**3.8333**	**1.97782**	**18**	**3.2222**	**2.18432**	**18**	**4.3333**	**1.08465**	**18**	**3.7963**	**1.83652**	**54**

The data in Table 1 above showed that continuous training group had the least mean gain score followed by circuit training group and then interval training group. Their total mean gain scores and standard deviations were 3.2222 ± 2.18432, 3.8333 ± 1.97782 and 4.3333 ± 1.08465, this means that interval and circuit training prgrammes enhanced the Agility of U-13 male soccer players better than continuous training regimen.

Hypothesis 1: There is no significant difference on the effectiveness of circuit, continuous and interval training programs on the Agility of U-13 male soccer players.

ANOVA was used in testing this null hypothesis at 0.05 alpha level. The results obtained are summaries on table 2

TABLE 2: ANOVA summary using gain in Agility due to the effectiveness of circuit, continuous and interval training program

SOURCE	Ss	Df	MS	F*	P-value	decision
Type of training programme	9.950	2	4.975	5.894	0.006*	S
Position of players	118.709	3	39.570	46.881	0.000*	S
Error (within treatment)	35.450	42	0.844			

***P<0.05**

On the basis of the findings on table 2, the null hypothesis is rejected for the type of training group and position of players. The rejection on the hypothesis is based on the ground that the P-values for the type of training group (0.006) and position of players (0.000) are less than 0.05 alpha level. Therefore, the mean scores of under 13 male soccer players agility due to the effect of circuit, continuous and interval training programs differs significantly at 0.05 confidence limit. Furthermore, the agility mean scores of u13 male soccer players due to the training programs alo differed significantly at 0.05 alpha level based on the position they play.

In other to establish the direction of the difference for significant pairs of mean gain scores for the training programmes, post hoc pairwise comparison was conducted using least significant difference (LSD). The result is summarized on table 3

TABLE 3: LSD pairwise comparison on the Agility of players due to circuit, continuous and interval training regimens

S/N	training programmes	x	x difference	p-value	decision
1	**Circuit Continuous**	**3.988**	**0.638**	**0.045***	**S**
		3.350			
2	**intervals continuous**	**4.400**	**1.050**	**0.001***	**S**
		3.350			
3	**interval circuit**	**4.400**	**0.412**	**0.188**	**NS**
		3.988			

*P<0.05

Least significant difference analysis on table 3 showed that the p-value of circuit and continuous training programme of the mean difference (0.045), interval and continuous (0.001) were respectively less than 0.05 significant level. The p-value of circuit and interval training regimen (0.188) was greater than 0.05 significant level. Based on tis results, the following were deduced; interval and circuit training regimens had better effect of the agility of U-13 male soccer layers more than continuous training programmes.

Research Question 2: What effectiveness would the circuit, continuous and interval training regimens have on the Strength of U-13 male soccer players?

The data which attempted to answer this research question were analysed with mean and standard deviation.

The summary is shown on Table 4.

Table 4: Mean and Standard Deviations of U-13 Male Soccer Players Using Gain on Strength

Players position	Circuit Training			Continuous Training			Interval Training			Total		
	X	SD	N	X	SD	N	X	SD	N	X	SD	N
D	4.6000	1.51658	5	2.2000	0.83666	5	4.4000	1.14018	5	3.7333	1.57963	15
A	2.8000	0.44721	5	1.6000	0.54772	5	2.6000	0.89443	5	2.3333	0.81650	15
M	2.2500	1.25831	4	2.0000	0.00000	4	3.0000	1.15470	4	2.4167	0.99620	12
G	5.5000	0.57735	4	2.7500	0.95743	4	5.2500	0.95743	4	4.5000	1.50756	12
Total	**3.7778**	**1.62899**	**18**	**2.1111**	**0.75840**	**18**	**3.7778**	**1.43714**	**18**	**2.2567**	**1.52547**	**54**

From the analysis in table 4, it is seen that interval and circuit training groups had the same mean gain scores of 3.7778 while continuous training group had 2.1111 mean gain scores. Their standard deviations were 1.43714, 1.62899 and 0.75840 respectively: It means that interval and circuit training programmes improved the strength ability of U-13 male soccer players when compared to continuous training programme.

Hypothesis 2: The effectiveness of circuit, continuous and interval training programmes on the Strength of U-13 male soccer players do not differ significantly.

To test this hypothesis, an analysis of variance (ANOVA) was done to compare the effectiveness of circuit, continuous and interval training regimens as it relates to gain in strength. The results obtained are shown on Table 5.

Table 5: ANOVA Summary Using Gain in Strength on the Effectiveness of Circuit, Continuous and Interval Training Programmes

Source	SS	Df	Ms	F*	P-value	Decision
Type of Training Programme	32.763	2	16.381	18.274	0.006*	S
Position of Players	43.150	3	14.383	16.045	0.000*	NS
Error (within treatment)	37.650	42	0.816			

*P < 0.05

The data on table 5 revealed that the f calculated 18.274 with a p-value 0.000 for type of training group is less than 0.05 significant level. Thus, the null hypothesis for the type of training programmes is therefore rejected. This indicated that the strength of U-13 male soccer players differed significantly at 0.05 confidence limit due to the effectiveness of the three training programmes (circuit, continuous and interval). The same table further showed that there is significant difference on the strength of the players based on their playing positions as this had f calculated 16.045 and a p-value of 0.000 which is less than 0.05 alpha level.
In order to ensure the direction of the difference for significant pairs of mean gain scores for the type of training programmes, post hoc pairwise comparison was conducted with least significant difference (LSD) test. The data obtained are summarized on Table 6.

Table 6: LSD Pairwise Comparison on the Effectiveness of Circuit, Continuous and Interval Training Regimen on Strength of Players.

S/N	Training Programmes	X	X Difference	P-value	Decision
1	Circuit	3.787	1.650	0.000*	S
	Continuous	2.137			
2	Interval	2.137	1.675	0.000*	S
	Continuous	3.812			
3	Interval	3.787	2500t – 02	0.938	NS
	Circuit	3.812			

*P < 0.05

The data on table 6 indicated that the calculated p-values of Least significant difference pairwise comparison of circuit and continuous (0.000), interval and continuous (0.000) were less than the chosen significant level 0.05 while that of interval and circuit (0.938) was greater than 0.05. Hence interval and circuit training groups had better mean gain scores on the strength of the U-13 male soccer players than continuous training group.

Summary of Major Findings

The findings of this study are summarized as follows:

1. Physical fitness attributes of U-13 male soccer players differ significantly due to the effectiveness of circuit, continuous and interval training programme.
2. There is significant difference on the Agility of U-13 male soccer players due to the effects of the three training programmes however the significant difference is more in interval and circuit training groups than in continuous training groups.
3. The Agility of U-13 male soccer players differed significantly due to the positions they play.
4. Interval and circuit training groups had better mean scores on the Strength of U-13 male soccer players when compared to continuous training group.
5. The Strength of U-13 male soccer players differed significantly based on their playing positions.

Discussion, Conclusions and Recommendations

The purpose of the study was to determine the effects of circuit, continuous and interval training programmes in the development of physical fitness attributes of U-13 male soccer players. These physical fitness attributes include Agility and strength. The findings of the study are discussed in this section. Also highlighted are the conclusion, recommendations, implication of the study, limitation of the study and suggestions for further research.

Discussion

The Effectiveness of Circuit, Continuous and Interval Training Regimens in the Development of Agility in U-13 Male Soccer Players.

The finding indicated that interval and circuit training groups had better agility mean gain scores compared to the continuous training group. In addition, the playing positions of the players influenced the agility performance. These findings could be as a

result of the explosive twists and turns of selected exercises introduced in the circuit and interval training workout. However, Bucheheit, (2014) stated that interval and circuit training techniques imbibe the principles of fast contracting muscles which are basic for development of agility. He added that agility involves the qualities of speed, strength, endurance and flexibility.

The Outcome of Using Circuit, Continuous and Interval Training Programmes to Develop the Strength of U-13 Male Soccer Players

The finding revealed that circuit, continuous and interval training regimens enhanced strength of the U-13 male soccer players. However, the enhancement was higher in circuit and interval training groups than in continuous training group. This result could be attributed to the resistance nature of the training methods and the various loads, modes, speeds and frequencies involved in the selected exercises. Supporting this view Fitness for Soccer (2005) stated that the development of strength relies on resistance training and also involves exercising at various loads, modes, speeds and frequencies.

The finding equally showed that there was significant difference in the player's strength based on the positions they play. The implication of this finding lies in the fact that different positional play requires different strength ability. This is in line with Sports Fitness Advisors (2008), that soccer strength fitness depends upon the player's position and their role in the team. Therefore circuit and interval training regimens are suitable for the development of strength requirement for different playing positions of U-13 male soccer players.

Conclusions

Based on the findings of this study, the following conclusions were drawn.

1. Circuit, continuous and interval training programmes were found significant ($P<0.05$) in terms of enhancing U-13 male soccer players physical fitness attributes.
2. Interval and circuit training programmes improved the Agility level of U-13 male soccer players more than the continuous training programme.
3. The Agility level of U-13 male soccer players is significantly affected by the training programme based on the positions they play.

Recommendations

Sequel to the result of this finding, the researcher deems it necessary to recommend the following;

Soccer coaches should enforce physical fitness training of players as the basic training programme for soccer players.

Coaches should also use continuous and circuit training regimens for developing endurance and power abilities, interval for speed ability while interval and circuit training regimens should be used for flexibility, agility and strength abilities development.

Coaches should try as much as possible to adopt the seven training guide for building physical fitness suggested by Total Soccer Fitness (2005). This include aerobic and anaerobic endurance conditioning, programme of different preparation of

strength and power agility conditioning, flexibility conditioning, speed and conditioning, warming up and cooling down, testing soccer fitness and planning your soccer conditioning programme.

Well-trained physiologists should be employed to help in planning, monitoring, supervising and evaluating the training categories of soccer players.

Coaches and sports scientists should also plan the training programme based on the specific requirements of the soccer playing positions. On this issue knowledge of the physiological requirements of the playing positions becomes paramount for the coaches.

Coaches should also try as much as possible to follow the basic principles of training such as specificity, overload, intensity, progression and recovery during training periods.

Emphasis should be made by the coaches to know the particular period suitable for physical fitness training, whether during early pre-season, late pre-season, early in-season, late in season or off season.

Sport governing body should establish a policy that should guide the setting of tests for grading of national soccer coaches based on the different level of competition such as 13, U-17 and U-21.

Sport governing body should equally plan to send the national coaches for courses abroad so that they should acquaint themselves with the scientific approaches for training soccer players.

Sports ministries in collaboration with soccer clubs management bodies should make effort to organize seminars/workshops for coaches on the important of building physical fitness attributes of soccer players.

Implication of the Study

The result of this study has some implications for physical education and sports programme. It has provided empirical evidence as to the relative efficacy of the development of soccer players physical fitness attributes using circuit, continuous and interval training regimens. This suggests the need for coaches and sports scientists to adopt the new approach of training soccer players in physical fitness before going into techniques, skills and tactics involved in soccer game.

The study has also shown that there is significant improvement in the use of circuit, continuous and interval training regimens in the development of physical fitness attributes of soccer players. Therefore, this called for soccer coaches to start from the grass root to introduce the use of these training programmes so as to build the physical fitness attributes of soccer players thereby improving the standard of soccer performance in the state and Nigeria in general.

Suggestions for further Research

Further research which can be undertaken as a result of the findings of this study include to

1. Replicate this study using different sports and environment.
2. Explore the effects of circuit, continuous and interval training regimens on the prospective female soccer players.
3. Examine the effects of other training methods on the physical fitness attributes of female soccer players.

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