

## ANALYSIS OF SELECTED PHYSIOLOGICAL FITNESS PROFILE OF FOOTBALL REFEREES IN CROSS RIVER AND AKWA IBOM STATES, NIGERIA

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### Abstract

The purpose of this study was to compare selected physiological fitness profile of football referees in Cross River and Akwa Ibom States. Physiological fitness profile compared were resting heart rate, resting systolic and diastolic blood pressures and estimated maximum oxygen uptake ( $\text{max } \text{VO}_2$ ), as a measure of cardiovascular endurance. Standardized equipment and procedures were employed in the tests. To achieve the objectives of the study, two research hypotheses were raised to serve as a guide to the study. The quasi-experimental research design was adopted for the study. A total of twenty (20) subjects were selected using stratify random sampling technique. Data collected were analysed using descriptive and inferential statistics. The descriptive statistics were the mean, range and standard deviation while the inferential statistic was the independent “t” test employed to test for significant difference between the mean scores of subjects from the two states. The level of significance was set at .05 with 18 degree of freedom. Findings of the study revealed that referees from Cross River and Akwa Ibom states were similar in resting heart rate, resting systolic and diastolic pressures. Based on these findings of the study, appropriate conclusions and recommendations were made.

**Keywords:** Physiological Fitness Profile and Football Referees.

### Introduction

A referee is an official who supervises a game or match to ensure that the rules are adhered to. According to Anshel, Hamill, Haywood, Horvat and Plowman (1991), a referee is the person who enforces the rules of participation in sports competition and administers sanctions (penalties) in case of rule violations, i.e. being in overall control of the game. He is helped by two other officials on the field of play called assistants referees and the fourth official called the administrative referee (Cox, 1999). Although there is no clear definition regarding the referee in the “Laws of the Game”, the International Board specifies that, the referee has full authority to enforce the laws of the Game in connection with the match to which he has been appointed (FIFA, 2012/2013:24). So the four officials have the power to decide everything regarding a football game, but the only one who is directly responsible is the referee because he has the final decision regarding the game. The assistants and the fourth official (administrative referee) “assist the referee to control the match in accordance with the Laws of the game” (FIFA, 2012/2013:24).

Physiological and motor performance skills such as cardiovascular endurance, muscular endurance, and muscular strength, resting heart rate, blood pressure, speed, agility and mental skills such as visual perception, attention, concentration, composure and decision-making are all required by referees at any level of the game. The ability to cope with the pressures of refereeing had increased. As referees are required to keep up with the game, they are likely to suffer from physical fatigue and this will no doubt affect their physiological, motor and mental performance and hence decision making. (<http://www.soccerperformance.org/html/home.htm>, 2011).

The responsibilities of soccer referees are to control players’ behaviour and implement the rules of the game during competitive football. These place strenuous task on the referee’s speed performances as well as bio-physiological functioning. The Nigerian Soccer Referees are always seen to have good speed

performance when officiating in the National Professional League competitions but were not seen at International levels, (Abass, Moses, Alabi, Adedugbe, Falolas&Abayomi, 2011). Asagba (2004) established that officiating officials in soccer have some moments of robust runs and sudden stoppages, intermingled with uneven walks and shuttles in different directions. Abass (2005) supported that; aerobic ability cannot see a soccer referee through successfully in ball games because of these frequent changes of space and need for sudden sprints. Sumiya, Tashima, Nakahara, and Shohoji (2001) submitted that attempt for referees to carry out their functions demands for maturity in terms of age, a biological parameter. They added that age poses strenuous task on the cardiorespiratory functioning of any individual and mostly referees and that soccer referees must be reaching and maintaining a high level of fitness. In this direction, therefore, referees must maintain a constant training programmed from time to time as they mature with officiating age. Asagba (2004) contributed by saying that, a soccer referee is supposed to be within 10 to 15m range from the ball at any time during play. Baumhake, Kindermann, Kindermann and Bohn (2007) submitted that referees should have good physical condition as requirements during a match.

### **Literature Review**

Cardiovascular endurance is the most important aspect of fitness. It is basically how strong your heart is, which can potentially add years to your life. The heart is the most important muscle in the human body and if kept healthy you can avoid numerous health problems. Another reason that cardiovascular endurance is important is because the heart controls the oxygen flow to all the muscles, meaning cardiovascular health has a direct impact on the performance, both endurance and strength wise (<http://generalfitness.tripod.com.d4.html>, 2013).

According to Mack (2013) cardiovascular endurance is the body's ability to continue exertion while getting energy from the aerobic system used to supply the body with energy. He again stated that cardiovascular endurance is most useful for long distance sports; for marathon training, long distance running, jogging and swimming, however it will also be useful for everyone else and a lack of it will lead to individuals becoming quickly tired and out of breath.

Galanti, Pizzi, Lucarelli, Stefani, Gianassi, Di-Tante, Toncelli, Moretti and Delfuria (2008) observed that, during a soccer game, referees need to have high levels of physical fitness. Stolen, Chamari, Castagna and Wisloff (2005) also asserted that, to referee a soccer game, they must be alert and near the scene of action, and their level of fitness must be such that fatigue will not impair their decision-making. To Reilly and Gregson (2006) referees are often subjected to proportionally increasing physical demands as years go by. They concluded that, referees peak performance is usually between 30 and 45 years of age, when cardiovascular athletic performance starts to decline. Investigation by Castagna and D'ottavio (2001) showed that referee's hearts present an increase in left ventricular mass and normal systolic and diastolic function, similar to that in soccer players. Thus a referee's heart can also be considered a physiological athletes' heart. Galanti et al. (2008) concluded that, it is in fact importance that a referee's physical performance should not decrease, in order to guarantee the physiological aspects of refereeing, which are certainly improved with specific experience within the sporting context.

Takanami, Iwane, Kawai and Shiemonitsu (2000) submitted that, cardiorespiratory endurance is the ability of the cardiovascular and respiratory systems to deliver blood and oxygen to working muscles, which in turn enables the working muscles to perform continuous exercise. They concluded that, a person who possesses good cardiorespiratory fitness will be able to perform higher intensity activity for a longer period of time than a person with poor cardiorespiratory fitness. The standard test to measure cardiovascular endurance is 12 minutes run-walk test developed by Cooper (1968).

As defined by Serendip (2007) heart rate is the number of heart beats per unit of time, typically expressed as beats per minute (bpm). He went further and stated that, heart rate can vary as the body's need to absorb oxygen and excrete carbon dioxide changes, such as during physical exercise, sleep or illness. He again stated that, heart rate is measured by finding the pulse of the body and that pulse rate can be measured at any point on the body where the artery's pulsation is transmitted to the surface by pressuring it with the index and middle fingers; often it is compressed against an underlying structure like bone.

Resting heart rate as observed by Scooby (2012) is a very good indicator of overall cardiovascular fitness level. He stated that highly trained athletes have very strong hearts that when resting can supply the bodies' needs with a very slow heart rate. He also said that, the weaker hearts of untrained and out of shape people have to work much harder just to supply the resting bodies' needs. Heart rate recordings have demonstrated that soccer refereeing at an elite-level places a high physiological demand upon referees (Johnson & McNaughton, 1994).

The physiological stresses imposed on the elite soccer referee are similar to that endured by mid-field soccer players (Weston & Brewer, 2002). Despite the irregular fluctuations in exercise intensity during match-play, the mean heart rate during a game can provide a reasonable estimate of the energy expended (Bengsbo, 1994; Reilly, 1997). Catteral et.al (1993) reported resting heart rates of 100 bpm in 71 English referees in the dressing room before going on to pitch. Johnston and McNaughton (1994) reported 98 bpm for the Australian referees after light warm-up. Pluim, Lamb, Kayser, Leujes, Beyerbach, Zwinderman, Vander Laarse, Vliegen, de Roos and Van der Wall (1998) affirmed that the referees' mean heart rate during a game stood at  $162 \pm 2.06$ pm. Igbano (2001) opined that functional changes that occur with acute exercises are responses which include rise in heart rate, blood pressure, ventilation and sweating rate. Abass et.al (2011) reported that, the heart rate was with a means of  $65.68 \pm 5.68$ bpm.

Quinn (2012) observed that cardiorespiratory adjustment is a very important factor in the performance of physical activity. This is because it is through this system that the working muscle cells are provided with the required energy and role of the heart is this supply of energy. Since it is the same volume of blood that is circulated to supply energy, an efficient heart will be able to do this job with less strain, resulting in a reduced resting heart beat per minute and an increased working capacity before reaching the maximum heart rate for a given work load. Resting heart rate is however, being affected by age, body position, fitness level and environmental factors such as attitude, heat and cold. Soccer is played over long duration, sometimes stretching over the official time into extra time; therefore, soccer referees with low resting heart rate should be preferred to officiate this game.

## **Methodology**

The study was a quasi-experimental research design in which status of football referees in both Cross River and Akwa Ibom states were compared. Their means values in selected physiological fitness profiles were compared to determine whether or not, there was any significant difference between the two groups. The population of the study consisted of 54 Grade one (1) referees in the two states comprising twenty eight (28) referees from Cross River and twenty six (26) referees from Akwa Ibom States. These subjects (referees) were certified by their States Training Officer (STO) as having been travelling out for league matches or other competitions of similar importance. Stratified random sampling technique was employed in this study. The stratified sampling was employed considering the heterogeneous nature of the referees in terms of their categories such as Nation Wide League Referees, National League Referees and Premier League Referees. This sampling technique reduces sampling error as it enables the researcher to identify and consider the heterogeneous characteristics of the population while drawing the sample. In selecting referees from the categories, each category was considered a stratum. Thus, from each stratum, the number of referees was proportionally selected using the simple random sampling technique. The selection criterion was based on the numbers of referees in each category. The aim was to have 4 referees from the premier league, 8 each from the national and nation-wide leagues totaling twenty (20) referees from the two states i.e. ten (10) referees from each state. From the population of 54 football referees in the two states, a total sample size of 20 subjects (referees) was obtained. This results to 4 premier league referees, 8 each from national and nation-wide leagues referees from the two states. The research instruments used in this study was a standardized instrument (Test Batteries). The University of Calabar exercise physiology laboratory and U.J. Esuene Sports Stadium Calabar were used as testing venues. The University of Calabar exercise physiology laboratory served as venue for the determination/estimation of the following variables; resting heart rate, blood pressures, while U.J. Esuene sports stadium was the venue for the determination of the estimation of cardiovascular endurance using the 12 minutes run-walk test.

### Hypothesis one

There is no significant difference in the maximum oxygen up-take (max  $vo_2$ ) values of referees in Cross River and Akwa Ibom states as a measure of their cardiovascular endurance status. The result of the analysis is presented in table 1

**TABLE I**  
Means, standard deviations, ranges and independent t-values of the cardiovascular endurance fitness characteristics of football referees in Cross River and Akwa Ibom States

Variable	Groups	No	Means	Standard Deviation	Ranges	t-Value
Ex.max. $Vo_2$	CRS	10	49.0640	6.11229	36.19-57.77	.505
	AKS	10	50.2520	4.23147	44.46-56.33	

Not Significant at .05 level, critical  $t=2.101$ :  $df= 18$ .

Table I above contained the means, standard deviations, ranges and t-values for the cardiovascular endurance fitness characteristics. The result of the analysis showed that Cross River referees had a mean of 49.0640ml/kg/m for estimated oxygen uptake, a standard deviation of 6.11229ml/kg/m with a range of 36.19-57.77ml/kg/m. Akwa Ibom referees had a mean of 50.2520ml/kg/m with a standard deviation of 4.23147ml/kg/m, their range was 44.46-56.33ml/kg/m. It was observed that the calculated t-value of -.505 was less than the critical t-value of 2.101 when tested at .05 level of significant with 18 degree of freedom. By implication, the null hypothesis which states that there is no significant difference in the maximum oxygen up-take (max  $vo_2$ ) values of referees in Cross River and Akwa Ibom States as a measure of their cardiovascular endurance status, was accepted thereby answering the research question one which seeks to know what extent does referees in Cross River and Akwa Ibom States differ in their estimated maximum oxygen up-take (max  $vo_2$ ) values as a measure of their cardiovascular endurance status.

### Hypothesis two

There is no significant difference in the resting heart rate of football referees in Cross River and Akwa Ibom states. The result of the analysis is presented in table 2.

**TABLE 2**  
Means, standard deviations, ranges and independent t-values of the resting heart values fitness characteristics of Cross River and Akwa Ibom states football referees

Variables	Groups	No	Means	Standard Deviations	Ranges	t-Values
Resting H/R	CRS	10	54.20	5.692	45-60	-.471
	AKS	10	55.40	5.700	48-64	
Resting Systolic	CRS	10	115.10	5.174	108-124	-.207
	AKS	10	115.60	5.621	109-126	
Resting Diastolic	CRS	10	67.80	3.327	60-70	.146
	AKS	10	67.40	8.030	59-40	

Not Significant at .05 level, critical  $t=2.101$ :  $df= 18$ .

Table 2 above contained the means, standard deviations, ranges and t-values for resting heart values fitness characteristics. Cross River referees had a means of 54.20 beats per minute with a standard deviation of 5.692 beats per minute and a range of 45-60 beats per minute. Akwa Ibom referees were observed to have a mean resting heart rate of 55.40 beats per minute with a standard deviation of 5.700 and range of 48-64 beats per minute. The calculated t-values for significance were -.471. For resting systolic blood pressure, Cross River State referees had a mean of 115.10mm.Hg with a standard deviation of 5.174mm.Hg and a range of 108-124mm.Hg.while Akwa Ibom referees had a mean of 115.60mm.Hg. With a standard deviation of 5.621mm.Hg and a range of 109-126mm.Hg. The calculated t-value was -.207 at .05 confidence level. The mean resting diastolic blood pressure for Cross River referees was 67.80mm.Hg. with a standard deviation of 3.327mm.Hg. and a range of 60-70mm.Hg. Akwa Ibom referees had a mean of 67.40mm.Hg, standard deviation of 8.030mm.Hg. and a range of 59-80mm.Hg. The "t" value was .146 for this variable. These results were insignificant despite the mean differences of the two groups. This implies that there is no significant difference between the two groups. Thus the null hypothesis was upheld. This therefore answered the research question two which seeks to know how referees in Cross River and Akwa Ibom states differ in resting heart rate.

### Discussions and Findings

This section was concerned with the discussion of findings arising from the results of the statistical analysis of the two hypotheses directing the study. The presentation was done hypothesis by hypothesis. The estimated maximum oxygen uptake ( $\text{max } \text{VO}_2$ ) was used as a measure of subject cardiovascular endurance and Cross River referees had a mean  $\text{max } \text{VO}_2$  of 49.0640ml/kg/min while a mean of 50.2520 was observed for Akwa Ibom referees. When compared, there was no significant difference. Because the computed t-value of -.505 was far less than critical t of 2.101 set at .05 and degree of freedom of 18, thus referees from the two states were similar in their cardiovascular endurance. With this the null hypothesis which states that there would be no significant difference in the maximum oxygen up-take value of referees in Cross River and Akwa Ibom State as the measure of their cardiovascular endurance status was accepted. Cross River referees had a range of 36.19-57.77 ml/kg/min with a standard deviation of 6.11229ml/kg/min while Akwa Ibom referees on the other hand recorded a range of 44.46-56.33ml/kg/min with a standard deviation of 4.2317ml/kg/min. The high degree of standard deviation was an indication of lack of homogeneity amongst referees from the two states. The observed lack of homogeneity was an indication that, as far as this variable may contribute to success in the performance of their assignment; all the referees may not be performing equally. Those with higher values especially above the observed mean will definitely perform more than those whose values fall below the means. The implication here is for them to work harder to improve on their rating as far as this variable is concerned.

However, the mean value observed for referees from the two states was higher than  $48.7 \pm 4.3$ ml/kg/min reported by Caballero, Ojeda, Garcia-Aranda, Mallo, Helsen, Sarmineto, Valdiviedso and Garcia-Manso (2011) on the Spanish soccer referees and  $46.6 \pm 4.8$ ml/kg/min suggested by Johnston and McNaughton (1994) as physical fitness norm for Australian football referees. Specifically the Akwa Ibom referees with a mean of 50.2520ml/kg/min compared well with the mean of 50.5ml/kg/min which was reported by Krstrup and Bangsbo (2001) for top soccer referees, while their Cross River counterpart with a mean of 49.064ml/kg/min were slightly inferior. Soccer referees in this study had lower values compared with mean values of 55.290ml/kg/min, reported by Bangsbo, Mohr, Paulsen, Perez-Gomez and Krstrup (2006) and 54.56ml/kg/min reported by Galanti, Pizzi, Lucarelli, Stefani, Giannassi, Di-Tante, Toncelli, Moretti & Del. Furia (2008) for soccer referees.

With this submissions above one may conclude that referees from the two states have to work harder to improve on this very important physical fitness profile which is a major determinant in physical performance such as refereeing.

The mean resting heart rate for Cross River referees was 54.20 beats per minute (bpm), as against Akwa Ibom referees who had a mean of 55.40 beats per minute (bpm). When compared, there was no significant difference between the two groups as this yielded a t-value of -.471 at 0.05 and degree of freedom of 18. The mean resting heart rate recorded for Cross River and Akwa Ibom referees in this study was far lower than the heart rate mean of  $65.68 \pm 5.68$ bpm reported by Abass et.al (2011) for Nigerian FIFA



referees. Pluim et.al (1998) had reported a mean of  $162 \pm 2.06$  bpm during a game. Johnston and McNauton (1994) had reported a mean heart rate of 98 beats per minute for Australian referees. Since low resting heart rate results in an increased stroke volume and greater efficiency of the heart, resulting from adequate training (Scooby, 2012) one may conclude that the Cross River and Akwa Ibom referees used in this study were in a better shape than those referees in England and Australia. The relatively low resting heart rate for referees of the two states was an indication of high level of physical fitness. A heart rate of between 70-75 beat per minute is considered normal (Scooby, 2012) though it is not unusual for conditioned individuals to have lower values. All the referees from the two states were below normal range cited above. Cross River referees range was 45-60bpm while Akwa Ibom referees had a range of 48-64bpm.

For resting systolic blood pressure, a mean of 115.10mm.Hg and 115.60mm.Hg were recorded for Cross River and Akwa Ibom referees respectively. These were seen to be normal. Scooby (2012) had suggested that a normal systolic blood pressure varies between 110mm.Hg and 140mm.Hg and that trained individuals may have lower values. Abass et.al (2011) confirmed that, good physical condition/fitness is a function of expected age of at least 1 year ahead of the match players; they stated that, normal blood pressure stood at (110 mm.Hg) heart rate (50 to 65 bpm). The fitness status of subjects used in this study was further confirmed here as they were within the range of what was considered normal. Abass et.al (2011) recorded  $123.48 \pm 11.24$  mm.Hg for Nigerian football FIFA referees. This value was higher than 115.10mm.Hg and 115.60mm.Hg observed for referees in this study. This implies that, Cross River and Akwa Ibom referees, for this season, were better conditioned than those used by Abass in 2011. This is in line with Krstrup&Bangsbo (2001) who stated that subjects that have an active style of life possess a pressure, systolic and diastolic, smaller in comparison to the sedentary ones. Both groups have a range of 108-124mm.Hg and a standard deviation of 5.174 for Cross River referees and a range of 109-126mm.Hg with a standard deviation of 5.621mm.Hg for Akwa Ibom referees.

The resting diastolic blood pressure of 67.80mm.Hg and 67.40mm.Hg were recorded as means for Cross River and Akwa Ibom referees respectively with no significant differences between them. These two groups were within the normal range of 60mm.Hg and 80mm.Hg as suggested by Scooby (2012). Abass et.al (2011) reported a mean of  $75.32 \pm 6.95$  mm.Hg for Nigerian FIFA referees. This was higher than 67.80mm.Hg and 67.40mm.Hg observed for this study again indicating their superior fitness status. This low mean diastolic blood pressure observed in these two states may come as a result of a more intense training than those referees in previous studies cited above. Both states recorded a range of 60-70mm.Hg with standard deviation of 3.327mm.Hg for Cross River referees and 59-80mm.Hg as range observed and a standard deviation of 8.030mm.Hg recorded for Akwa Ibom referees.

### **Conclusion and Recommendation**

The result of the statistical analysis revealed that:

1. There is no significant difference in the maximum oxygen up-take ( $\max \text{VO}_2$ ) values of referees in Cross River and Akwa Ibom states as a measure of their cardiovascular endurance status.
2. There is no significant difference in resting heart rate of referees in Cross River and Akwa Ibom states.

Based on the conclusion of the study, it was recommended that: since physiological profile reveals moderate aerobic cardiac adaptations to training and match officiating and match demands are relative to the standard of competition, the referees should increase their physiological parameters to be able to cope with the demands imposed by the players.

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