

## Physiological Characteristics of Female Zimbabwe Soccer Players across Playing Positions

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### Abstract

The purpose of this study was to compare selected physiological characteristics of female league Zimbabwe soccer players across playing position. Sixteen (16) players, selected from the Bulawayo Province Zimbabwe Republic Police women soccer team volunteered to take part in the study. The players were categorized into four playing positions, goalkeepers (n=2), defenders (n=5), strikers (n=4), and midfielders (n=5). Flexibility, speed, agility and cardio-respiratory endurance (CRE) values were measured for each player, using standard soccer-testing protocols. Descriptive statistics (mean and standard deviation) were computed to represent the physiological characteristics. A One-way analysis of variance (ANOVA) was performed on the data (at  $p=0.05$ ) to determine any significant differences in the characteristics across playing positions. A Newman-Keuls post-hoc was also performed on the data, also at  $p=0.05$ , to locate the playing positions across which any significant differences in the physiological variables existed. The study found no significant differences in the Zimbabwean women soccer players in flexibility, speed, agility and CRE, across goalkeepers, defenders, midfielders and strikers  $\{F(3,12)=1.41, p=0.29$ ;  $F(3,12)=0.94, p=0.45$ ;  $F(3,12)=0.14, p=0.94$  and  $F(3,12)=2.1, p=0.15\}$ . It is concluded that Zimbabwe female soccer players are homogeneous in flexibility, speed, agility and CRE. It is recommended that Zimbabwe female

soccer trainers prescribe position-specific training in order to prepare players for specialized positional roles found in the game of soccer.

## Introduction

Soccer, also known as football, is the most popular team sport in Zimbabwe and the world. It is characterized by high intensity, short term actions and pauses of varying lengths. The sport comprises of sprints, jumps, change of direction, among other movements. It is practiced socially and professionally by many segments of the population. Several studies have been done on physiological profiles of elite soccer players in the America and Europe, among other profiles (Ostojic, 2002). Few such studies have however been done in Zimbabwe, and Africa. Clark (2007) [1] observes that positional roles are less well distinguished on the basis of physical fitness in Africa. Knowledge of the physiological attributes of players, among other attributes, is of paramount importance to coaches, trainers, players, educators and physiotherapists among countless other sports personnel, in order to for them to implement sound interventions in sports. It appears logical that if the main physical and physiological features that influence player performance in soccer can be identified, then they can be nurtured to yield success. (Bangsbo, 1994) observed that although soccer is not a science, science may help improve performance in soccer. Assessment of physical capacities of athletes is a very important issue in modern sport. Numerous tests are available for selecting players, for screening potential players, or for monitoring the efficacy of sports training regimes. These tests provide information for the coaches to better plan and improve training programs and help the players to enhance sports performance. Soccer in particular has developed to a stage where players have specialised roles, depending on the tactical play employed for each game. This study therefore investigated if Zimbabwean women soccer players show differentiated physiological attributes for different playing positions. The study hypothesized that there will be significant differences in flexibility, speed, agility, and maximal oxygen uptake (VO<sub>2</sub> max) of female league Zimbabwean soccer players across goalkeepers, defenders, midfielders and strikers. The study used the Bulawayo Zimbabwe Republic Police Women's Football Club as a case study. The research first, determined the physiological characteristics flexibility, speed, agility, and maximal oxygen uptake (VO<sub>2</sub> max) of the soccer players, and second, compared the physiological characteristics by playing positions. Results from the study are expected to provide baseline data upon which future related studies in soccer can refer to, and, to assist in the formulation of sound training strategies that will improve soccer performance. The study was delimited to one team, and to female soccer players, and to the physiological measures flexibility, speed, agility and VO<sub>2</sub> max.

## Related Literature

### Introduction

Soccer is the most popular sport in the world, played by males and females of different ages, race or ethnicity at varying levels of expertise. Playing football requires specific physiological characteristics, besides skill, experience and intelligence, and other characteristics (Ostojic, 2000) [2-4].

There is limited scientific information pertaining to physiological sports performance parameters in Zimbabwe [2]. Soccer is an invasive team sport lasting a minimum of 90 minutes, and characterized by intermittent regimens of effort. Physiological profiles of soccer teams will identify the general readiness of the team for competition, and the specific preparedness of a team to face other teams of known physiological profiles. Physiological profiles however change with factors including methods of exercises, volume of tournament, stage course of the season (Power *et al.*, 2004) [2,5,6].

### **Flexibility**

Flexibility is a key attribute in soccer, and involves full range of motion around joints (MacDougall *et al.*, 1991) [7,8]. Poor flexibility will increase risk of injury, reduce amplitude of motion, impair skilled movement, and reduce agility, among many other effects. Ekblom (2005) found that training using stretching could increase flexibility on the next day. Chin *et al.*, (1992) [9] argues that poor flexibility indicates tight hamstrings, a condition which can be improved by training.

### **Speed**

Stolen *et al.*, (2005) [3] notes that speed is an important component in soccer. This physiological variable influences the ability to accelerate, a phenomenon often deciding important outcomes in a soccer game. Soccer players accelerate quickly over short distances to meet the technical, tactical and physical demands of the game. Speed sprint tests have been shown to discriminate between different levels of players (Wisloff *et al.*, 2004). In elite football, forwards are the fastest players, and time observations show that they sprint the most during a match (Power *et al.*, 2004) [5,6]. Successful soccer teams have players who can operate at high speed, under intense pressure and in smaller spaces given the higher work-rate of the players who close on the player with the ball faster than before.

### **Agility**

Agility is crucial for soccer players (Reilly, 2005; Sheppard *et al.*, 2006) [4,10,11]. Agility is by definition the physical ability to rapidly change the body position and direction in precise manner. It is the speed with which an individual may change his body positions or fastness in changing direction while moving. Agility is a key physiological variable in team sports as it can become vital in performing key tasks such as defending and beating an opponent. The dynamic nature of soccer also requires agility. The ability to turn quickly, and the fact that soccer players should be able to run well dodging and performing spiral motions without losing balance and decelerate in order to pass the opponent underlines the importance of agility in soccer (Sheppard *et al.*, 2006; Reilly and Thomas, 1976; Bangsbo, 1994). Soccer is characterized by abrupt directional and speed changes. A soccer player who is agile is able to manoeuvre with enhanced balance and coordination is thus an asset in the team.

### **Cardio-Respiratory Endurance**

VO<sub>2</sub> max is the ability of the heart and lungs to take in and to transport adequate amount of oxygen to the working muscles for the activities that involve large muscles for long periods of time. It is alternatively called

aerobic power or cardio-respiratory endurance. The aerobic system is the main source of energy provision during soccer match play and the average values of VO<sub>2</sub> max for top level soccer players tend to be high [12,13]. Aerobic performance represented by VO<sub>2</sub>Max is regarded as an important physiological parameter for optimal performance in soccer. The importance of aerobic training to soccer has been confirmed by numerous studies (Ostojic, 2000) [3,4].

## Methods

### Data Collection Procedures

This study used a quantitative descriptive cross-sectional research design. The researchers measured the physiological variables under investigation once during the 2017-2018 soccer season. The population available to the research team included all the sixteen members of the team who were available, healthy and fit, on the day of data collection, and who voluntarily agreed to participate in this study. The subjects were fully informed of the procedures, the potential risks and the benefits of participating in the study, after which they consented to take part in the research by signing consent forms. Subjects were then familiarized with the testing procedures one week before the collection of data. The researchers used lecturers and fourth year students from the National University of Science and Technology Department of Sports Science as to collect the requisite data. All the participants were exempted from strenuous exercise 24 hours before testing, to minimize the possible effects of fatigue, and performed a 10-minute warm up before data collection. All the participants were assessed on two separate days, at the same time of the day, that is, from morning to mid-day. The tests were done in the same order, with 10 minutes rest between successive tests. Field tests were used instead of laboratory tests, as the former are relatively easier to administer, require less sophisticated equipment and experts, and have higher ecological validity over laboratory tests. Svensson and Drust (2005) [14] and MacDougall *et al.*, (1991) advise sports scientists to use field tests in order to evaluate specific aspects of soccer performance in order to get a better indication of their ability to perform in a soccer match, than laboratory based assessments and indicate that one limitation of physiological laboratory testing is that it is not possible to simulate the physiological demands of the sport. The test battery used comprised the sit and reach (for flexibility), the Illinois Agility Run Test (for agility), the 10m and 30m sprints (for speed) and the Yo-yo level 1 intermittent recovery test (for VO<sub>2</sub> max).

### Ethical Considerations

The researchers sought permission from the club authorities, the players, and the National University of Science and Technology, prior to the research. All the subjects gave their informed consent to participate in the study. Participants' data were stored in coded form in a private office with restricted access. Acknowledgements were made upon completion of the research, to appreciate all the contributions rendered for the completion of the study.

### Data Processing

Quantitative data were collected on the physiological characteristics under investigation. The data obtained were summarized using descriptive statistics (mean  $\pm$  standard deviation) and analyzed using One-Way

ANOVA, at the  $p=0.05$  level of significance, to determine any differences in physiological variables across playing positions, and a Neumann-Keuls post-hoc, (at  $p=0.05$ ), to locate the playing positions in which any differences in physiological variables, using Statistical Package for Social Sciences (SPSS Version 20.0).

## Results

### Introduction

This section summarizes analyses and discusses the data obtained from the study. It first presents tables of values of flexibility, agility, speed and VO<sub>2</sub> Max found from the study, and the relevant One-Way ANOVA results as computed from SPSS, and then, discusses the results obtained.

### Data Presentation and Analysis

**Table 1:** Differences in flexibility, speed, agility and cardiorespiratory endurance of Zimbabwe women soccer players across playing position.

Physiological Variable	Playing Position	N	Mean±sd	One-Way ANOVA Result
Flexibility	Goalkeepers	2	51.00±2.00 cm	There were no differences in flexibility across PP, $F(3.12)=1.41, p=0.29$
	Midfielders	4	54.63±4.84 cm	
	Strikers	5	50.50±3.25 cm	
	Defenders	5	50.20±2.92 cm	
Speed	Goalkeepers	2	1.85±0.08 s	There were no differences in speed across PP, $F(3.12)=0.94, p=0.45$
	Midfielders	4	1.86±0.15 s	
	Strikers	5	1.66±0.24 s	
	Defenders	5	1.69±0.24 s	
Agility	Goalkeepers	2	17.14±0.47 s	There were no differences in agility across PP, $F(3.12)=0.14, p=0.94$
	Midfielders	4	17.46±0.59 s	
	Strikers	5	17.38±0.36 s	
	Defenders	5	17.40±0.77 s	
Cardiovascular Endurance	Goalkeepers	2	47.82±1.70	There were no differences in CVE across PP, $F(3.12)=2.1, p=0.15$
	Midfielders	4	50.26±1.27	
	Strikers	5	49.13±0.13	
	Defenders	5	49.44±1.41	

## Discussion

### *a) Flexibility by Playing Position*

The study found no significant differences in flexibility across PP,  $F(3,12) = 1.41, p = 0.29$ . In contrast to this finding literature (MacDougall *et al.*, 1991) [7] single out flexibility as being important for amplitude of movement in soccer, and important for increasing speed and agility, among other benefits. Flexibility levels of players in a soccer team need to be different, because of the different work-loads of soccer players in a team. Kammoun *et al.*, (2020) [15] and Nikolaidis, (2014) [16] found positional differences in flexibility in female soccer players.

### *b) Speed by Playing Position*

This study found that there was no significant difference in speed across playing position  $F(3,12) = 0.94, p = 0.45$ . Boone *et al.*, (2011) [5] established that in soccer, attackers had more speed than midfielders, fullbacks, sweepers and goalkeepers. More to that, Little and Williams, (2005) isolate attacking and counter-attacking as specialized roles in soccer which require a combination of high speed and agility. Strikers with speeds similar to other playing positions would therefore be severely compromised in their functions. Kammoun *et al.*, (2020) [15] and Shendkar and Hamad, (2009) [17] found position-specific differences in speed among female soccer players.

### *c) Agility by Playing Position*

The study found no significant difference in agility across playing position  $F(3,12) = 0.14, p = 0.94$ . Literature (Reilly, 2005; Sheppard *et al.*, 2006) [4,10,11] indicates that agility is crucial in the striking, defending, dribbling roles of soccer players. Strikers, defenders and midfielders twist and turn more than other players as they perform their specialized roles in soccer. It would appear then that different soccer positions require varying levels of agility. Turner (2016) [18] and Goral (2015) [19] found positional differences in agility in women soccer players.

### *d) CVE by Playing Position*

This study found no significant difference in CVE across playing position,  $F(3,12) = 2.1, p = 0.15$ , in the players investigated. Tumilty (1993) [12] and Reilly *et al.*, (2000) [13] state that the aerobic system is the main source of energy provision during soccer match play. Bangsbo *et al.*, (1991) and Stolen *et al.*, (2005) [3], further argue that players in different team positions have different work-loads during a game, with midfielders running the longest distances of up to 11.5km, followed by forwards and defenders. Nikolaidis (2014) [16] however found no positional differences in CVE for female soccer players [17-74].

## Summary, Results, Conclusions and Recommendations and Recommendations

### Summary

The purpose of this study was to determine if any differences existed in the physiological characteristics

flexibility, speed, agility and CRE among Zimbabwean female soccer players across the playing positions goalkeepers, midfielders, strikers and defenders. Quantitative data were collected from sixteen female soccer players of the Zimbabwe Republic Police Women's soccer team, using the sit and reach (for flexibility), the 30m sprint for speed, the Illinois Agility Run Test (for agility) and the Yoyo level 1 intermittent recovery test for CVE. A One-Way ANOVA (at the  $p=0.05$  significance level) was performed on the data to establish any differences in each physiological attribute across playing position. A Newman-Keuls post hoc (again at the  $p=0.05$  significance level, was further performed to located the positions between which any significant differences in the physiological variables existed.

## Results

The study found no significant differences in the flexibility, agility, speed and CVE, across goalkeepers, defenders, midfielders and strikers, at the  $p=0.05$  significance level.

## Conclusions

The study result suggests homogeneity in flexibility, speed, agility and CVE for playing positions of goalkeepers, defenders, midfielders and strikers. We therefore reject the initial hypothesis, that there will be significant differences in flexibility, speed, agility and CVE across goalkeepers, defenders, midfielders and strikers. This result could imply that training for the female Zimbabwe soccer players is generalized, and not position-specific.

## Recommendations

It is recommended from the study that Zimbabwean women male league soccer plays should undergo position-specific training. Such training will make them attain the different levels of flexibility, agility, speed and CVE as required, to varying levels, for the different and specialized roles of goalkeepers, defenders, midfielders and strikers in soccer. Future related studies can also draw participants from a wider spectrum of women soccer teams in the country.

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