ASSESSMENT OF ANTHROPOMETRIC CHARACTERISTICS AND PHYSICAL FITNESS OF SELECTED FOOTBALL REFEREES VERSUS FIFA RECOMMENDED STANDARDS

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A DISSERTATION SUBMITTED TO THE DIRECTORATE OF RESEARCH AND GRADUATE TRAINING IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF SCIENCE IN SPORTS SCIENCE OF KYAMBOGO UNIVERSITY

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DECLARATION

I the undersigned, declare that all of the work in this study report is entirely my own original work.

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Sign……. Date…….

APPROVAL

This research dissertation was made by the candidate under our supervision as university supervisors.

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DEDICATION

This research report is dedicated to my mother Labanya Agnes and my wife Adokorach Stella for their support towards my academic progress, my brother Ocan Denis for encouraging me in all my academic progress.

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LIST OF ABBREVIATIONS

AFCON	African Cup of Nations
BIA	Bioelectrical Impedance Analysis
BMI	Body Mass Index
CECAFA	Council of East and Central Africa Football Associations
DEXA	Dual-Energy X-ray Absorptiometry
FIFA	Federation of International Football Associations
FUFA	Federation of Uganda Football Associations
GPS	Global Positioning System
IAAF	International Associations of Athletic Federations
ISAK	International Society for the Advancement of Kinanthropometry
LRA	Lord Resistance Army
NRFA	Northern Region Football Associations
NRFR	Northern Region Football Referees
RSA	Repeated Sprint Ability
RTCRSSF	Referees Technical Committee of the Royal Spanish Soccer Federation
UPL	Uganda Premier League
UWSL	Uganda Women Super League
VAR	Video Assistant Referees
VO2max	Maximum Oxygen Uptake
WHO	World Health Organisation
WHR	Waist Hip Ratio
YYIR	YoYo Intermittent Run

ABSTRACT

Football refereeing requires precise anthropometric indicators and a high level of physical fitness to ensure effective refereeing on the field and accurate decision-making. FIFA has now established clear standards for referee selection and performance evaluation. Still, there is a significant knowledge gap regarding whether the current populations of referees in regions like sub-Saharan Africa meet these international standards. This study aimed to assess the anthropometric and physical conditioning of selected football referees in Northern Uganda and evaluate their compliance with FIFA's recommended standards. A descriptive cross-sectional study was conducted with 59 football referees (57 males and 2 females) from the Northern Region Football Association. Anthropometric data included height, weight, and Body Mass Index (BMI). Physical performance was assessed using FIFA's official criteria: The repeated Sprint Ability (RSA) test (6 × 40m sprints) and the Interval Test (40 × 75m runs with 25m walking rests). Data analysis was performed using SPSS version 25, with independent t-tests used to test the hypotheses at an alpha level of 0.05. Participants ranged from 20 to 42 years old (mean: 29.41 41 ± 5 5.68 years), with 96.6. 3.4% male and 3. 4% female. Findings show that most referees (89. 8%) officiated at the regional level, and 78. 0% were at level three, with an average experience duration of less than five years. Anthropometric profiles showed a weight ranging from 51. 30 to 86. 86.10 kg (mean: 65.34 ± 7.93 kg), heights from 1.55 to 1.87 meters (mean: 1.72 ± 0.074 m), and BMIs from 18. 20 to 29. 29.30 kg/m ² (mean: 22 25 ± 2 2.68 kg/m ²). The BMI distribution indicated that 81. 3% of referees were within the normal weight range, 6. 8% were underweight, and 11. 9% were overweight. In terms of physical fitness, 91. 3% passed the RSA test, and 80.4% passed the Interval Test. Independent t-tests revealed no statistically significant differences between successful and unsuccessful referees regarding BMI in either the RSA ($t(57) = -0.31$, $p = 0.196$) or the Interval Test ($t(57) = -0.02$, $p = 0.988$). The anthropometric profile of the Northern Uganda referees indicates that most fall within normal BMI ranges. Although sprint performance was excellent, with 91. 91.3% compliance, aerobic endurance performance was less optimal at 80. 80.4% compliance. The analysis suggests that referees possess basic skills that can be further developed through targeted training, particularly in cardiovascular endurance. These findings provide baseline data for evidence-based referee development initiatives in the region.

CHAPTER ONE

INTRODUCTION

1.0 General Introduction

Football refereeing has evolved considerably over the past decades, with a growing focus on the physical and anthropometric requirements needed to officiate at the highest levels (Casajús & Gonzalez-Aguero, 2015a). As a passionate football watcher in Northern Uganda and having seen many matches where referee performance seemed hindered by physical limitations, I was motivated to examine whether our regional referees meet the international standards of FIFA. This personal observation and the underrepresentation of Northern Uganda referees in high-profile competitions like the Uganda Premier League and international tournaments sparked my interest in conducting a thorough assessment of their anthropometric traits and physical fitness levels.

The choice of this research topic arises from the understanding that referee performance directly influences the quality and fairness of football matches. Poor physical conditioning can cause positioning mistakes, delayed decisions, and ultimately compromise the integrity of the game. Furthermore, the historical context of Northern Uganda, having endured prolonged conflict that disrupted normal sporting development, requires an evidence-based understanding of current referee skills to guide targeted improvements.

1.1 Background of the Study

Football, the world's most popular sport, demands officials who can uphold the highest performance standards during 90 minutes of intense physical activity (Krustrup et al., 2009a). The Federation of International Football Associations (FIFA) has set comprehensive standards for referee fitness and physical

characteristics to ensure consistent officiating quality across all competitions worldwide. These standards have developed from simple observational assessments in the early days of football to advanced, scientifically-based testing protocols that assess both anthropometric characteristics and physical fitness of referees.

Anthropometry is the quantitative measurement of the muscles, bones, and adipose tissues (Casadei & Kiel, 2022). The central components of anthropometry are stature, weight, body circumferences (waist, hip, and appendages), skinfold thickness, and appendage breadth and these components are utilized for deciding body composition (Kobel, Kristen & Kelsen, 2022). These traits can provide useful information about the body and prospective performance of football referees. Body composition and anthropometric variables are important instrument to examine changes that take place in the body makeup of the referee due to physical need of the game. Body composition can be assessed using different strategies counting bioelectrical impedance, dual-energy X-ray absorptiometry, body thickness, add up to body water gauges, and calculation through anthropometric components (Dana, 2008).

Physical fitness is another crucial component determining the performance of football referees. Football involves intense and irregular workouts with movements that change in pace from four to six seconds (Hostrup & Bangsbo, 2023). As a result, referees must be extremely fit (D'Ottavio & Castagna, 2001). According to (DeMet and Wahl-Alexander, 2019), the components of physical fitness are separated into two categories: skill-related (agility, balance, coordination, power, speed, and reaction time) and health-related (cardiovascular endurance, flexibility, muscular endurance, muscular strength, and body

composition). (Stulp et al., 2012) , however, states that the official physical fitness test for referees is comprised of two tests. The first test, Repeated Sprint Ability (RSA), gauges the referee's speed by having them run 40 meters repeatedly. The second test, the interval test, assesses the referee's endurance by having them run a total of 75 meters at a high pace with 25-meter walking breaks in between.

Referees' mental, technical, and physical attributes all affect how well they perform on the playing field (Weston et al., 2012a). Due to the physical need of the game, there must be regular supervision and training, just as football players (Weston et al., 2012a). In light of this, in 1989, FIFA established physical fitness test as a model to enhance standard of refereeing at various game phases (Mallo et al., 2012; Weston et al., 2012b). Numerous studies at high levels of competition were conducted in numerous nations to look at the anthropometrics, morphology, medical profiles, physical fitness, and performance of elite football referees.

International research has shown the important link between referee physical fitness and match performance. Studies done on different continents, including Europe (Weston et al., 2012a), South America (D'Ottavio & Castagna, 2001), and Africa (Banda et al., 2015), have consistently found that referees with better body measurements and physical fitness perform better in positioning, make more accurate decisions, and have fewer fatigue-related mistakes during games.

Between 2007 and 2009 Mallo and colleagues (Mallo, 2007; 2009) published report on FIFA referees at the confederation cup of 2005 and revealed that performance of referees largely depend on their physical fitness and anthropometric profile. Other studies conducted in England (Weston et al., 2012a) Greece, (Cerqueira, Silva & Marvins, 2011), the United States of America (Barbero-Alvarez, Soto, Barbero-Alvarez & Granda-Vera, 2008; Castagna &

D'Ottavio, 2001), Denmark (Bangsbo, Mohr & Krustrup, 2006a), South Africa (Lategan, Bahdur & Lombard, 2011), and Italy (Castagna, Abt & Ottavio, 2004) which reflect that performance of referees still depend on their physical fitness and anthropometry. The aforementioned research has been crucial to comprehending, advancing, and enhancing football referee's performance. Furthermore, the findings of this research have influenced and motivated the creation and execution of training plans meant to assist football referees in reaching the proper fitness level of the match (Castagna et al., 2004).

In Africa, football refereeing faces unique challenges related to infrastructure, training resources, and systematic development programs. Countries such as South Africa have documented specific issues with referee physical fitness (Kruger et al., 2012), while studies in Zimbabwe have highlighted the importance of comprehensive fitness assessment programs (Banda et al., 2015). These regional studies have emphasized the need for context-specific research to understand how local conditions influence referee development and performance. Meanwhile (Kruger et al., 2012) reported that South African football referees' primary issue was a lack of physical fitness. Heart rate records made during games are useful for classifying the level of exertion since they seem to be associated with the separation that the referees officiating the match have achieved (Mallo, Navarro, Aranda & Helsen, 2009). Banda et al. (2015) in their study in Zimbabwe reported that the total of the referees' highly concentrated running was the primary indicator of physical performance during the diversion.

The East African region has been working to harmonize referee standards across member countries through organizations such as the Council for East and Central Africa Football Associations (CECAFA). However, significant disparities

exist between countries and regions within countries, particularly regarding access to standardized training and assessment facilities.

Uganda's football refereeing is governed by the Federation of Uganda Football Associations (FUFA), which is responsible for implementing FIFA standards and developing local officiating capacity. The country has produced several international-level referees who have officiated in major tournaments, including the Africa Cup of Nations and FIFA World Cup qualifiers. However, the distribution of elite referees across Uganda's regions has been markedly uneven, with the central region producing a disproportionate number of high-level officials.

The Uganda Premier League and other FUFA-organized competitions require referees to meet specific fitness standards, yet the accessibility of standardized testing and training programs varies significantly across different regions. This geographical disparity in resources and opportunities has implications for referee development and career progression, particularly for officials from regions outside the central area.

Northern Uganda presents a unique case study in referee development due to its complex socio-political history and geographical challenges. The region encompasses several districts under the Northern Regional Football Association, each with varying levels of football infrastructure and development.

The region's football development has been significantly influenced by historical factors, including the prolonged insurgency from 1986 to 2006 led by the Lord's Resistance Army (LRA). This conflict disrupted normal social and sporting activities, affecting an entire generation of potential athletes and officials. Many current referees in the region experienced their formative years during this period,

when access to proper nutrition, physical training, and sporting infrastructure was severely limited.

Research has consistently demonstrated that anthropometric characteristics play a crucial role in referee performance. Height, weight, and body composition affect a referee's ability to maintain optimal positioning, cover required distances, and project authority on the field (Jackson et al., 2013). Body Mass Index (BMI) has been adopted by FIFA as a primary indicator of referee body composition, with specific ranges recommended for optimal performance.

Studies across different populations have shown variations in anthropometric profiles of successful referees. European referees tend to have different height and weight distributions compared to their African counterparts (Mallo et al., 2009), suggesting the need for region-specific assessments rather than universal application of standards developed primarily from European populations.

The evolution of football toward faster, more intense gameplay has correspondingly increased the physical demands on referees. Modern referees are required to cover distances comparable to midfield players, with significant portions at high intensity (Weston et al., 2012b). FIFA's current fitness testing protocol, consisting of the Repeated Sprint Ability (RSA) test and the Interval Test, reflects these contemporary demands.

The RSA test evaluates a referee's capacity to maintain speed over multiple sprint efforts, simulating the repeated high-intensity running required during matches. The Interval Test assesses aerobic endurance through alternating high-intensity running and recovery periods, reflecting the intermittent nature of football officiating demands.

Northern Uganda's referee development faces several specific challenges that distinguish it from other regions. The geographical distance from Uganda's capital, Kampala, where most national training programs are conducted, creates logistical and financial barriers for referee development. Travel costs and time away from primary occupations (as most referees have other professions) limit participation in centralized training and assessment programs.

However, the region also presents significant opportunities. The strong football culture and community support for the sport provide a solid foundation for referee development. Additionally, the establishment of regional assessment centers and training programs could address current geographical barriers while building local capacity for sustainable referee development.

This study therefore seeks to provide the first comprehensive assessment of anthropometric characteristics and physical fitness among Northern Uganda referees, establishing baseline data that can inform targeted interventions and development strategies tailored to the region's specific context and needs.

1.2 Statement of the Problem

Effective football officiating requires optimal physical conditioning and specific anthropometric characteristics that enable referees to maintain precise positioning, sustain high-intensity movement patterns, and make accurate decisions throughout competitive matches (Casajús & Gonzalez-Aguero, 2015b). While the Fédération Internationale de Football Association (FIFA) has established comprehensive fitness and body composition standards as global benchmarks for referee performance assessment and professional development, a critical knowledge gap exists regarding the anthropometric profiles and physical fitness levels of football referees operating in Northern Uganda. The region's referee

development framework currently lacks empirical baseline data that could inform selection processes, training program design, and performance optimization strategies, creating several interconnected challenges that compromise both individual referee development and overall officiating quality. Current referee selection and evaluation processes operate without systematic anthropometric and fitness assessments aligned with FIFA standards, preventing objective comparison of local referee capabilities against international benchmarks and hampering evidence-based decision-making in development programs. Consequently, Northern Uganda referees remain significantly underrepresented in prestigious competitions including the Uganda Premier League, Council for East and Central Africa Football Associations (CECAFA) tournaments, and FIFA-sanctioned international matches, potentially reflecting inadequate preparation and assessment systems that fail to identify and develop referee talent to international standards. Without baseline anthropometric and fitness data, regional football associations cannot design targeted, evidence-based training interventions that address specific physical deficiencies or build upon existing strengths, perpetuating a cycle of suboptimal preparation and missed advancement opportunities. The absence of regular FIFA-standard fitness monitoring raises concerns about match officiating quality, as some referees may be operating below international performance thresholds, potentially affecting competitive integrity and limiting career progression within national and international football structures. A comprehensive scientific evaluation of Northern Uganda football referees' anthropometric characteristics and physical fitness levels, systematically benchmarked against established FIFA standards, is therefore essential to provide crucial baseline data for evidence-based referee development strategies, establish objective selection

criteria, and create targeted training programs that enhance both individual referee performance and regional football officiating standards.

1.3 Objective of the Study

1.3.1 General Objective

The general objective of the study was to assess the anthropometric characteristics and physical fitness of selected football referees versus FIFA recommended standards

1.3.2 Specific Objectives of the Study

The following specific objectives guided the study:

1. To assess the anthropometric characteristics of football referees from northern Uganda.
2. To assess the physical fitness of referees from northern Uganda.
3. To evaluate the compliance of anthropometric characteristics and physical fitness of referees from northern Uganda versus FIFA standards

1.4 Research Questions

1. What are the anthropometric characteristics of referees from Northern Uganda?
2. What is the level of physical fitness of referees from Northern Uganda?
3. What is the compliance in relation to anthropometric characteristics and physical fitness of referees from northern Uganda versus FIFA standards?

1.5 Research Hypotheses

1. There is no significant difference in body mass index and speed of referees from northern region and FIFA referees' standards

2. There is no significant difference in body mass index and aerobic endurance of referees from northern region and FIFA referees' standards

1.6 Conceptual Framework

As illustrated below, the researcher shows the compliance of anthropometric characteristics and physical fitness. It demonstrates that performance of referees as the dependent variables directly results from the anthropometry and physical fitness as the independent variable.

The independent variables that were studied included body mass, body height, and boy composition in terms of body mass index, and the physical fitness components that were studied included speed and endurance which would directly contribute to referee's performance

However, the extraneous variables that were not studied and the researcher acknowledged that to some extent they affect referee's performance included nutrition, psychological factors, spectators' influence and age.

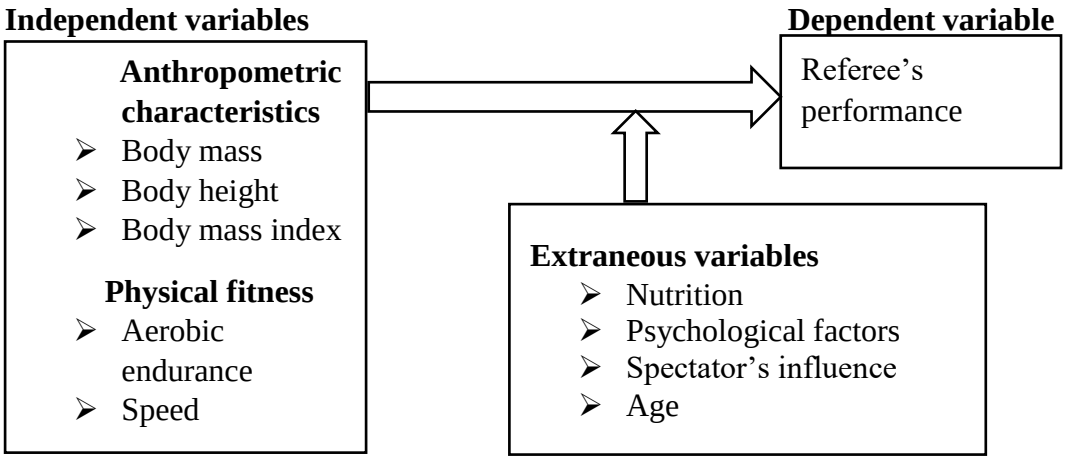


Figure 1.1 Conceptual Framework

Adapted from (Bouchard & Shephard, 1994)

From the conceptual framework, performance of referee is influenced by anthropometry and physical fitness. This study focused on anthropometric characteristics that is weight, height and body composition in terms of Body Mass Index (BMI) and physical fitness that included speed and aerobic endurance because the researcher associated performance of referee with the body make up

and physical fitness. This means performance of referees depend on anthropometric characteristics and physical fitness.

Authority in refereeing may be correlated with height. Football referees are fully mandated to implement the rules of the game and can demonstrate control and assist in managing the game through their body language (Stulp et al., 2012). On the other hand, weight indicate greater success of referees. The key performance indicators for referees, such as speed and VO2max, are improved in referees with higher body mass index (Castagna & D'Ottavio, 2001). High body fat has a negative impact on referees' performance, speed, VO2max, endurance, power, strength, agility, and appearance. BMI, body circumferences, skinfold thickness, and limb breadth are the measurements used to determine body fat (Kristen & Lesley, 2008).

(Castagna et al., 2007) revealed that the entire referee crew is becoming faster and more explosive as football players do. In order to have the best chance of making the correct call, head referees and assistant referees must be able to stay up with play in every aspect of the game, including fast-paced slide tackles and breakaway counterattacks. Additionally, they must be able to physically arrange themselves in the most advantageous positions.

The cardiorespiratory system is put under a lot of strain during a football match (Reilly & Gregson, 2006). Referees for football must maintain a high level of physical fitness. To effectively supervise a football match, they must be alert, close to the action, and sufficiently fit to prevent fatigue from impairing their judgement. Referees deal with more difficult physical demands throughout time. They usually perform at their best between the ages of 30 and 45, which is also when their cardiovascular athletic skills start to deteriorate. Numerous studies have

demonstrated that referees' athletic ability declines with ageing (Castagna & D'Ottavio, 2001). All these other factors must be controlled well in order to realize positive influence of anthropometry and physical fitness in improving performance of referees.

1.7 Delimitation of the Study

The study was delimited to:

Both male and female referees with FUFA badges and regional badges in Northern region football association licensed to officiate in the season of 2022-2023.

1.8 Limitations

The researcher encountered difficulty in getting referees. This was overcome through making prior appointment. There was also limited literature on the study of referees in Uganda. The researcher used related literature from studies conducted in other countries such as Zimbabwe, South Africa, Hungary, Spain, among others to ascertain the literature gaps in Ugandan setting.

1.9 Significance of the Study

Unlike other parts of Uganda, Northern region has presented very few referees at FIFA level in big tournaments like African cup of nations (AFCON), Council for East and Central Africa Football Associations (CECAFA) and at other events organized by the Federation of Uganda Football Associations (FUFA) such as Star times Uganda Premier League (UPL), Uganda Women Super League (UWSL), among others. There have been questions about why the majority of referees in the Northern region are not chosen to officiate these high-level events.

As far as the researcher is aware, limited previous studies have been done to profile referees from the Northern region which can be utilized to provide a good basis for nurturing these referees.

In addition, there is a need for additional data pertaining the anthropometric traits and level of physical fitness of the referees from the region. This information can help enhance their performance since it will allow fitness instructors to create customised training plans based on the study's findings.

Additionally, the information gathered from this study will serve as a roadmap for future research on football referees in the area and the nation at large.

Lastly, this research would improve the researcher’s knowledge and capabilities in conducting more research in future and as well as partial fulfillment for award of a Master degree in Sport Science of Kyambogo University.

1.10 Scope of the Study

1.10.1 Content Scope

This study evaluated anthropometric characteristics and physical fitness levels of selected football referees against FIFA recommended standards. This study evaluated the;

Anthropometric characteristics of referees from northern region football association

Physical fitness of referees from northern region football association

Compliance of anthropometric characteristics and physical fitness of referees from northern Uganda versus FIFA standards

1.10.2 Geographical Scope

This study was conducted on the referees in four districts located in the Northern Regional Football Associations (that is Gulu district, Nwoya district, Amuru district, and Omoro district).

1.10.3 Time Scope

The study was carried out between November 2022 and November 2023. These years were chosen so as to ensure that the data collected is current and reflect the most current condition relevant to this research. This time frame also allows for an analysis of contemporary development and provide highly pertinent insights.

1.11 Operational Definitions of Terms

1.11.1 Anthropometric Measurements: Measurement of height, weight, body circumferences, skinfold thickness, and limb breadth by using stadiometer, weighing scale, tape measure, skinfold callipers, and Vanier callipers respectively.

1.11.2 Body Composition: was determined using Body Mass Index only.

1.11.3 Physical Fitness: speed and aerobic endurance was used as parameter for determining physical fitness.

1.11.4 Northern Region Football Association: FUFA body that administer football game in northern region of Acholi and Lango sub regions.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter provides a comprehensive review of existing literature on the anthropometric characteristics and physical fitness of football referees. The review is organized thematically to align with the study's specific objectives, analysing global research findings and highlighting gaps in knowledge, particularly relating to the African and Ugandan contexts. The literature review examines theoretical frameworks, empirical results, and methodological approaches that contribute to understanding referee performance standards.

2.1 Theoretical Framework

2.1.1 Human Performance Theory in Sports Officiating

The theoretical basis for understanding referee performance is grounded in human performance theory, which states that optimal performance results from the interaction of physical, psychological, and environmental factors (Bouchard & Shephard, 1994). In sports officiating, this theory indicates that anthropometric traits and physical fitness are fundamental elements that help referees meet the cognitive and decision-making demands of their role. Motor learning theory further emphasizes the importance of physical capacity in skill execution, asserting that adequate physical fitness provides the foundation for effectively applying technical officiating skills (Schmidt et al., 2019) . This perspective is especially relevant to football refereeing, where officials must simultaneously handle complex cognitive tasks while maintaining high physical performance levels.

2.1.2 Exercise Physiology Principles

The physiological demands of football refereeing align with established principles of exercise physiology, particularly those related to intermittent high-intensity exercise. The energy system demands of refereeing mirror those of football players, requiring aerobic and anaerobic capacity (StølenT et al., 2005). Understanding these physiological principles is crucial for establishing appropriate anthropometric and fitness standards for referees.

2.2 Anthropometric Characteristics of Football Referees

2.2.1 Global Anthropometric Profiles

International research has established distinct anthropometric profiles for elite football referees across continents. European studies have consistently reported mean heights ranging from 181-183 cm for top-level referees (Krustrup et al., 2009b; Mallo et al., 2009), with body masses typically falling between 75-82 kg. These measurements have been associated with optimal field coverage and decision-making positioning. South American referee populations demonstrate slightly different anthropometric characteristics, with Brazilian referees showing mean heights of 178 ± 6.2 cm and body masses of 76.4 ± 8.9 kg (Fernandez P. et al., 2011a). These variations suggest potential genetic and environmental influences on anthropometric development across different populations.

Castagna et al. (2007), pointed out that performance is negatively impacted by obesity. According to Willmore, Costil and Kenney (2007), there is a link between low body fat percentage and subpar agility, balance, speed, and endurance. Low muscle mass and a large proportion of fat tissue are thought to be performance-limiting variables (Sutton, Scott, Wallace & Reilly 2009). It's crucial to keep an eye on body fat percentage because overweight referees experience

more challenging and physically demanding match lengths. Therefore, monitoring referee body composition is important for health, nutritional advice, and the development of specific training programs for both male and female referees (Cerqueira et al., 2011; da Silva, 2007).

2.2.2 African Referee Anthropometric Studies

Limited research exists on African referee populations, creating a significant knowledge gap. (Lategan et al., 2011) conducted one of the few comprehensive studies on South African referees, reporting mean heights of 174.6 ± 6.8 cm and body masses of 71.2 ± 9.4 kg for national-level officials. These measurements were notably lower than their international counterparts, suggesting regional variations in anthropometric profiles. According to (Banda et al., 2015) examined Zimbabwean referees and found similar patterns, with body masses averaging 68.5 ± 7.2 kg and heights of 173.4 ± 5.9 cm. These studies highlight the need for region-specific anthropometric assessments rather than the universal application of standards developed primarily from European populations.

2.3 Anthropometric Measurements

The rational study of estimating the physical characteristics of the human body, primarily dimensional descriptors of body measure, proportion, and shape, is known as anthropometry (McArdle, Katch & Katch, 2010). Heyward and Wagner (2004), reported that measures of the dimensions and dimensions of the human body are known as anthropometry. It means from both definitions that anthropometry encompasses the methods for measuring size and shape of the body. One significant contributor to the standardisation of anthropometric measurement methods and procedures has been the International Society for the Advancement of Kinanthropometry (ISAK) (Norton & Olds, 1996). Anthropometric

measurements such as sagittal abdominal diameter, body mass index, and waist-hip ratio have been used in estimate, shape, and size in order to identify health risk conditions, (Heyward & Wagner, 2004). Anthropometric measuring procedures does not include introduction of instruments in to the body and the equipment utilized is portable and affordable (Norton & Olds, 1996).

Body composition refer to percentage of fat, bone and muscle mass found within the human body (Dale R et al., 2000). The proportion of various elements, including muscles, fat, bones, and organs, forms a portion of the body. A human body's average fat-free mass is around 19.4% protein, 6.8% minerals, and 73% water (Dale et al., 2000). Fat mass incorporates both essential and non-essential fats. According to (McArdle et al., 2010) men's essential fat makes up about 3% of total body fat, whereas women's essential fat makes up 12%. Fat tissue is where it is kept (McArdle et al., 2010). It is made up of belly fat, that is formed and is deposited throughout visceral organs in the abdominal region, and peripheral fats, which is located below the skin of the human body. Because it acts as a store of energy, facilitates the transport of fat-soluble vitamins, insulates the body from the cold, and guards the body's key organs, fat is a crucial component of the body (McArdle et al., 2010).

Measuring body composition is crucial for identifying obesity and other health issues in referees (Cerqueira et al., 2011; Reilly and Gregson 2006). Powell-Wiley et al., (2021) pointed out that the chance of getting cardiovascular illnesses increments with excessive body fat. According to (Jackson et al., 2013) nutrition may be a key constituent to life, and measurement of body make up are important in controlling body adjustments caused by proper feeding for long time. Measurement of body composition is additionally vital in assessment of

monitoring, evaluating, creating, and optimizing training programmes (Fernandez et al., 2011). Measurement of body composition among referees is advantageous in providing detail data about health-related issues, physical make-up and functional evaluation (Cerqueira et al., 2011; Fernandez & Inácio Da Silva, 2011; Reilly & Gregson, 2006). Concurring to (Fernandez et al., 2011), it is possible to track variations in body composition among football referees due to factors such as age, training, diet/nutrition, physical demands of the game, and manner of life. Concerns about body composition in relation to referees' health and performance are becoming more and more important as performance (Fernandez et al., 2011).

2.4 Estimation of Body Composition

Body composition can be assessed in very many ways such as bioelectrical impedance, dual-energy X-ray absorptiometry, body thickness, add up to body water gauges, and calculation through anthropometric components (Banda et al., 2015). A few of the anthropometric measurement include weight, heights, girths, skinfolds, and bone breath (Norgan, 2005).

Height: Measure the vertical distance from the floor to the top of the head using a stadiometer or a wall-mounted measuring tape.

Weight: Measure body weight using a calibrated scale while the person is lightly clothed and without shoes.

Body Mass Index (BMI): BMI is obtained by getting the ratio of weight in kilograms to the square of the height in meters (BMI = weight (kg) / height^2 (m^2)).

Skinfold Thickness: Measure the thickness of subcutaneous fat at specific sites using calipers. Common skinfold sites include the triceps, biceps, subscapular, and suprailiac.

Circumferences and Girths: Measure the circumference or girth of specific body segments using a flexible measuring tape. Common measurements include neck circumference, waist circumference, hip circumference, mid-arm circumference, and thigh circumference. The average normal values for the different body circumferences are Neck Circ. Men 37.6cm, Neck Circ. Women 33.3cm, Upper Arm Circ. Men 33.0cm, Upper Arm Circ. Women 30.7cm, Hip Circ. Men 96.0cm, Hip Circ. Women 95.9cm, Thigh Circ. Men 51.7cm, Thigh Circ. Women 51.1cm. Men's waist circumference is classified as "low risk" if it is less than 94 cm, "high risk" if it is between 94 and 102 cm, and "very high" if it is greater than 102 cm (WHO, 2008). A woman's risk is minimal if she is under 80 cm, high if she is between 80 and 88 cm, and very high if she is over 88 cm. These are the rules for people of mixed, European, African, and Middle Eastern ancestry (WHO, 2008).

Breadths and Lengths: Measure the width or breadth of body segments using a spreading caliper or anthropometer. Examples include biacromial breadth (shoulder width) and trochanteric breadth (hip width). Biacromial breadth for Men 41.1cm and Women 36.7cm are the average for normal circumference. Body Composition: The amount of body fat is calculated using methods such as dual-energy X-ray absorptiometry (DEXA), bioelectrical impedance analysis (BIA), or anthropometric calculations based on skinfold thickness measurements. These measurements provide insights into different aspects of body size, shape, and composition. They are used in various fields, including health and nutrition, sports science, ergonomics, and clothing design (Stewart & Marfell, 2006).

2.5 Body Composition in Terms of Body Mass Index

By using height, body mass, and circumference, one can measure and state body composition and size in the most ideal method. Hawes et al. (1996), the circumferences are used to calculate the body's circumference. It is predicated on the fact that lean body mass is linked to sizes, which consider both fat and fat-free mass (Heyward & Wagner, 2004). The body mass index (BMI) is the ratio of a person's weight to their squared height in metres (Heyward & Wagner, 2004). FIFA has been using BMI and waist-hip ratio (WHR) to determine overweight and obesity, and this is often how they identify referees who are underweight, overweight, or obese. It is easy to collect and compute these measurements. Weight is divided by height squared in metres to get BMI. BMI is correlated with relative body fat and may be a quick approach to determine body composition (Willmore et al., 2007).

However, BMI has also drawn criticism from a number of writers. Sutton et al. (2009) claimed that while BMI may be used to classify people as overweight or obese, underweight, or at a typical weight, it does not provide a clear picture of a person's body composition. The strategy does not appear in case and person is just muscular, overweight or obese (Blackburn & Jacobs, 2014). Sutton et al., (2009) suggest that BMI ought to not be utilized to decide level of fatness among athletes. Research on football referees worldwide revealed that Demark FIFA referees and assistance referees are on average 181 cm tall (range 168 to 192). They also receive less training than centre referees. Krustrup et al., (2009), and (Mallo et al., 2009) the FIFA referees in the Confederations Cup of 2005 had a mean height of 183 ± 0.4 cm. Similarities exist between the BMIs of referees from several studies, with values typically over the normal weight and overweight range. Nuttall (2015),

categorises ordinary weight between 18.5 kg/m2 and 24.9 kg/m2. Reilly and Gregson (2006), reported a BMI value of 27.1 kg/m2 among English referees, which is exceptionally high. Most of the studies reveal mean values over 75 kg and under 80 kg, suggesting that most referees have body masses that fall between 70 and 82 kg. South African referees were smaller in weight than their international counterparts, but their assistant referees were shorter and rather overweight (Lategan et al., 2011). Jackson et al. (2013), surveyed soccer referees from around the world and found that taller referees had a better view of the pitch and were more likely to make accurate decisions. However, it is not known whether similar findings apply to Ugandan football referees**,** as there may be cultural and contextual differences affecting referee selection and performance in this particular region.

2.6 Skinfolds

Skinfold callipers are a commonly used tool for measuring skinfolds and predicting percentages of body fat and body density using regression equations. (McArdle et al., 2010; Norton & Olds, 1996; Sutton et al., 2009). According to (Heyward & Wagner, 2004), the calculations are based on fat mass and fat free mass. Prediction equations, which are derived from laboratory procedures, are used to identify unique body parts. Using data from skinfold measurements, the equations are used to calculate the amount of body fat and body density (Lukaski, 1987). Most popular formulas used by (Siri, 1961;Hawes et al., 1996; Sutton et al., 2009). Since these calculations are established from the general populace from whom they were derived, the skinfold technique has limitations in terms of precision and mistake when using its data to compute body fat (Lukaski, 1987).

Skinfolds are easy and inexpensive, and this method has been used in a few studies to determine body composition.

2.7 Body Composition and Age

Fernandez et al., (2011) the majority of the morphological abnormalities seen in the referees were caused by elevated fat mass with age. According to (Casajus and Castagna 2007), senior referees may be able to sustain their aerobic fitness by keeping a suitable body composition. Thus, it is fundamentally important to observe referees' physical composition. In a brief survey, English referees (mean age 37.5 ± 4.7 years) had a higher percentage of body fat than players (mean age 26.3 ± 5.0 years) in the same league, (Reilly & Gregson, 2006) . The body fat percentage of football referees was 18.9 ± 3.7%, while players' percentage was 13.0 ± 2.0%. They also mentioned that the referees' body fat percentage were typical of their age group.

Prior research (Castagna et al., 2004) that older Italian referees performed poorly in the tests for physical fitness, such as the 50-meter sprint and 12-minute run test, but there was no discernible difference between the junior and senior referees in relation to height, body mass, and percentage of body fat. A report by (Castagna et al., 2007) revealed that the average body mass of top-level referees from Italy (n = 14, mean age 37.5 ± 4.5 years) was 78.5 ± 5.6 kg, which was greater than the average body mass of top-level referees from other countries (n = 14, mean age 24.8 ± 1.2 years) (77.6 ± 3.6 kg). Despite the limited test sizes, both studies demonstrated that older referees had a higher likelihood of being overweight than younger referees.

2.8 Body Composition and Physical Exercise

Casajus and Castagna (2007), the anthropometric measurements of the younger and older referees showed similarity. They credit the older referees' attention to preserving their oxygen-consuming fitness for their ability to maintain suitable body composition values. For performance, low body fat percentages are therefore preferred. Although there are no strict guidelines for appropriate body composition or size, referees must be physically fit and able to pass the FIFA physical fitness test in order to officiate at the highest level (Castagna et al., 2007; Helsen & Bultynck, 2004; Reilly & Gregson, 2006; Weston et al., 2012).

2.9 Physical Fitness Levels of Referees

Refereeing may be a multi-dimensional activity, because it incorporates diverse shapes and levels of investigation (Stølen et al., 2005). Among them incorporate technical, biomechanical, tactical, mental and physiological components as well as cognitive, anthropometric and mental components (Stølen et al., 2005). Since the referees move quickly across the football pitch and are "the shadow" of every team movement, it is also necessary to have well-organised muscle and cardiorespiratory speed function. They must oversee fair play, keep an eye on things, interpret the regulations, and make decisions. Guillén and Feltzn (2011), identified six essential elements of success in officiating: Decision-making skills, cerebral aptitude, strategic aptitude, game control and communication, and physical fitness.

Putting under consideration that referees are answerable for making basic choices so that games played are agreeing to the laws of the game (Castagna & D’ottavio, 2001) they are supposed to keep up with the play (Weston et al., 2012).

Hence, refereeing could be an exceptionally physically and physiologically requesting work (Barbero-Alvarez et al., 2008). Research report have revealed that field referees ran 889 327 m at high speed (> 19.8 kmh^{-1}) during the English Premier League, covering 11,770 808 m in total. They also ran 21.3-30.5 m sprints at a speed exceeding 25.2 kmh^{-1} (Weston et al., 2012). Within the top two Denmark leagues, field referees performed 1269 action changes each match (Bangsbo et al., 2006a) and within the first division of the Italian championship, field referees were included in backward and sideways running during 13.2% of the match time (Castagna & D'Ottavio, 2001).

Indeed, field referees spend more time walking, running, cruising, and sprinting than assistant referees, despite the fact that assistant refereeing has also been described by short bursts of vigorous forward and sideways running interspersed with times of low activity (Krustrup et al., 2009b). These findings are consistent with FIFA's requirements, which include a variety of physical requirements for infield referees and assistance referees (Mallo et al., 2009). A high level of physical fitness may help referees stay close to the action due to the intense demands of the contest, giving them excellent placement to make fundamental decisions (Weston et al., 2012). Additionally, the higher accumulated fatigue during the game might increase injury risk (C. M. Jones et al., 2017).

Physical fitness in this manner is not only a fundamental factor one of a kind to referees, but it is exceptionally critical to them. It has been suggested that higher level referees are far more appropriate than lower-level referees (Bartha et al., 2009; Cerqueira et al., 2011a). The most elevated level of referees within the Italian Championship outperformed the lower level of referees within the intermittent yo-yo recovery test (Castagna et al., 2007). Since competition level shows up to play

a vital part in a referee's fitness level, assessing their physical capacity makes a difference decide fitness standards for both top and lower-level referees to help within the plan of preparing programs (Castagna et al., 2007; Cerqueira et al., 2011a).

Lategan and colleagues (2011) added that while there is limited specific research available on the physical fitness level of football referees in Sub-Saharan Africa, it can be inferred that referees in this region face similar physical demands as referees else where in the world. Refereeing at elite levels of performance in football requires exceptional endurance, agility, speed, and good decision-making abilities. To maintain their fitness, football referees often undergo regular physical training and fitness assessments. These assessments may include tests for cardiovascular endurance, sprinting speed, agility, and strength. Fitness training programs for referees typically focus on improving aerobic capacity, speed, flexibility, and muscular endurance, and they are mandatory (Cerqueira et al., 2011a).

In recent years, there has been an increased emphasis on the physical fitness of football referees worldwide. Major football associations and governing bodies have implemented fitness standards and periodic fitness testing for referees to ensure they can meet the demands of the game (Lategan et al., 2011). Therefore, in most professional football leagues and tournaments around the world, including Uganda, referees are expected to maintain high physical fitness level in order to pass fitness test and officiate high profile competitions.

Table 2.1: Sport related physical fitness components of referees and its measurements

Sport related physical fitness components	Measurements
Aerobic Endurance	**Interval Test** Referees must complete 40 X 75-meter runs and 25-meter walks. This is the same as ten 400-meter track laps or 4,000 meters. **Optional test 1** Dynamic Yo-Yo **Optional test 2** Yo-Yo Intermittent test
Speed	**Repeated Sprint Ability** The referee sprints 40m x 6 times. In not more than 6.0s for men and 6.4s for women

Adapted from (Sánchez et al., 2022)

2.10 Physical Fitness Test

2.10.1 FIFA Physical Fitness Tests for Referees

In respect to rising levels of competition in the 1980s, FIFA mandated physical fitness testing and health examinations for referees (Cerqueira et al., 2011a). To be admitted to the worldwide referees list in 1989, referees had to complete the tests (Reilly & Gregson, 2006). Formerly, the only method used to determine referees was to watch referees during games. The purpose of the fitness tests was to help referees perform better. However, this has been difficult because these fitness tests should be related to the workouts that are done during the game. The purpose of the fitness tests was to help referees perform better. FIFA suggested that the referee's heart rate be measured before the test began (Weston et al., 2009). A heart rate of 60 to 100 beats per minute indicates that the referee is physically fit

and capable of performing a fitness test. The referees were then required to complete a physical test consisting of four shuttle runs of 10 metres in less than 11.5 seconds, two runs of 50 metres in less than 7 seconds, two runs of 200 metres in less than 32 seconds, and at least 2700 metres in 12 minutes (Cerqueira et al., 2011a). From FIFA Confederation cup of 2005, FIFA presented a new test (Mallo et al., 2007), which are still being used up to date. The test should be run on a 400-meter athletics track. It is made up of 6x40-meter repeat sprints spaced out with a 90-second recovery period. For assistant referees and national referees, each sprint must be performed in less than six seconds, and for referees and assistants, it must take less than six seconds. The referees are given a six- to eight-minute break after the repeated sprints, and then they must complete 20 x 150-meter high-intensity runs. Maximum 30 seconds are allotted to category one referees and assistant referees for each run. After that, officials have to recover for 50 metres, taking 35 seconds for referees and 40 seconds for assistant referees (Stulp et al., 2012). Referees must run a total of 4000 metres (20 x 150 metres at a high intensity) in order to pass the exam. Faster than the run and walk time limits.

According to (Stulp et al., 2012). there are two components to the official fitness test for football referees. The first test, Repeated Sprint Ability (RSA), assesses the referee's capacity to run 40-meter sprints. Test 2, that is Interval Test, assesses the referee's ability to run at a fast pace for 75 metres while alternating between 25-meter walking intervals. There should be a maximum of six to eight minutes between the conclusion of Test 1 and the beginning of Test 2. Tests must be conducted on an athletics track, or natural/artificial football field. You are not allowed to wear athletic spikes during the tests. The FIFA Fitness Test must be passed by referees at least once every year. It is advised that a certified physical

fitness instructor administer all fitness tests. Throughout the whole testing period, an ambulance that is properly equipped must be present.

2.10.2 FIFA-Approved Optional Tests

Referees meeting the recommended levels for aerobic fitness may also be evaluated using the "YO-YO Intermittent Test Level 1" and the "Dynamic YO-YO Test" in addition to the official test (Martin-Sanchez et al., 2022).

2.10.3 Optional Test 1

Dynamic Yo-Yo

Cones have to be arranged as shown in the following diagram. The red and yellow cones must be positioned precisely 20 metres apart, as well as that the colour be red and yellow to designate the boundaries of the running course (Stulp et al., 2012). Referees may begin at either the red or yellow cones. Starting from each cone, it is advised that the test be administered in groups of no more than two referees.

Referees shall run to a red cone, turn, and race to the next yellow cone after starting at a yellow cone. There is a recovery interval between each run.

Referees shall run to a yellow cone, turn, and race to the next red cone after starting from a red cone. Every run has a break in between.

The audio file will determine the duration of each recovery interval and the speed of the runs. Referees must follow the audio file at the proper speed until they reach the suggested level.

The test leader shall give a clear warning to the referee if they do not step onto the "finish cone" in time. The test leader should remove a referee from the test if they are late for the second time (Sánchez et al., 2022)

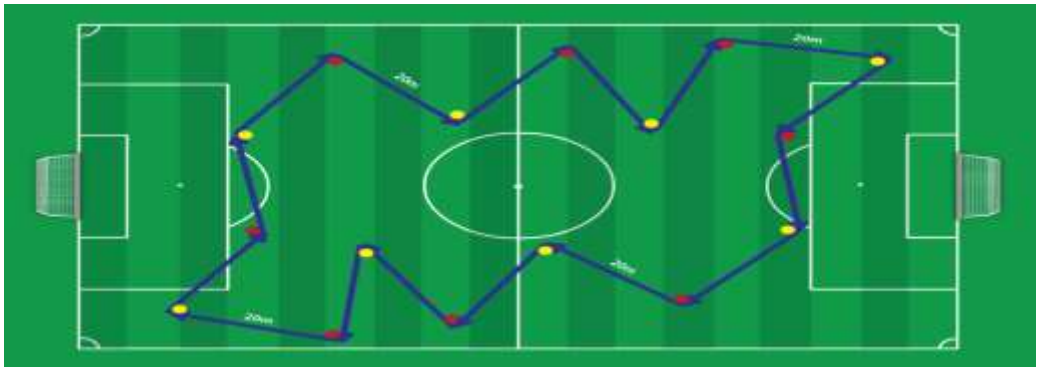


Figure 2.1: Dynamic Yo Yo path

Table 2.2: Reference time for male referees (Dynamic Yo Yo)

Category	**Level**	**Distance**
International and category 1	18-8	2,040 meters
Category 2	18-5	1,920 meters
Category 3	18-1	1,760 meters

From (Sánchez et al., 2022)

Table 2.3:Reference time for female referees (Dynamic Yo Yo)

Category	**Level**	**Distance**
International and category 1	17-8	1,720 meters
Category 2	17-5	1,600 meters
Category 3	16-8	1,400 meters

From (Sánchez et al., 2022)

2.10.4 Optional test 2

Yo-Yo Intermittent Test

Cones have to be arranged as the following diagram shows. There are five metres separating A and B. Twenty metres are separating B and C.

Referees are required to finish this sequence at the speed specified by the audio file.

Run 20m (B-C), then turn and run another 20m (C-B). b. Walk 5m (B-A), then turn and walk 5m (A-B).

The duration of each recovery interval and the speed of the runs will be determined by the audio file of the Yo-Yo Intermittent Recovery run (level 1). Referees are required to follow the audio file at the prescribed speed until they reach it.

The referee must begin in a motionless stance with their front foot on the line (B). Officials are required to step on the turning line C. The test leader shall give a clear warning to the referee if they do not step foot on line C or do not return to line B in a timely manner. The test leader should remove a referee from the game if they fail to step onto line C or return to line B in a timely manner twice (Sánchez et al., 2022)

Figure 2.2: Yo Yo intermittent test path

Table 2.4: Reference time for male referees (Yo Yo intermittent)

Category	**Level**	**Distance**
International and category 1	18-2	1,800 meters
Category 2	17-7	1,680 meters
Category 3	17-4	1,560 meters

From (Sánchez et al., 2022)

Table 2.5: Reference time for female referees (Yo Yo intermittent)

Category	Level	Distance
International and category 1	16-4	1,240 meters
Category 2	15-7	1,040 meters
Category 3	15-3	880 meters

From (Sánchez et al., 2022)

2.11 Speed

According to Banda et al. (2015) "The fastness of the movement of a limb" is the definition of speed. The categories of speed are maximal speed (the fastest an individual can run), ideal speed (controlled speed), increasing speed (rate at which one's speed changes), response time (time it takes to react to a stimulus), and speed endurance (ability to run continuously at a fast pace even as one's level of fatigue rises). In general, a person's stride length and repetition determine their speed. Numerous factors, including an individual's stature, appendage length, muscle fibre type, flexibility, posture, and prior or present injuries, might affect their running biomechanics (Banda et al., 2015).

The repeated sprint ability test (RSA) is a test that replicates the close maximal high intensity sprinting that is typically observed in group sports, particularly football (Oliver, Williams & Amstrong, 2006). Finding out if a person can produce repeated sprint efforts is the test's goal (Oliver et al., 2006). Football referees have also used this test, and the results show that it is a trustworthy indicator of fitness related to matches since it replicates player’s running (Weston et al., 2012b). Because different sports have different needs for high-intensity running matches, scholars have suggested different distances and recovery times for RSA tests (Spencer, Bishop & Lawrence, 2004). Spencer and colleagues

(2008) reported that between high-speed running workouts, the average recovery time for first-class English referees (n =59) was 45.1 ± 14.2 seconds. Weston et al. (2012b) critiqued the FIFA 6 × 40m test's 90-second recovery interval, arguing that it was not representative of the typical work-to-rest ratio encountered by football referees during high-speed bouts during games. They recommended that the sprint test recovery time be reduced to the 25s utilised by (Spencer et al., 2008) or the 20s between sprints indicated by (Rampinini et al., 2007), as these rest periods are more in accordance with the actual match physical fitness needed. Mallo et al., (2009) reported that FIFA referees (n = 11) had a mean time of 5.77 ± 0.17 seconds and a mean quickest time of 5.77 ± 0.17 seconds in the 40-meter RSA test.

This test also looked at the relationship between match performance and the FIFA physical fitness test. There was no correlation found between the referees' 40 m RSA performance and their high-speed running distance during the match (mean 6 × 40 m RSA, r = -0.02, p =.96 and best 6 x 40 m RSA, r = -0.13, p =.74). It was shown that there was little correlation between this test and match activity and results were non-significant. Weston, Castagna, Helsen and Impellizzeri (2009) there was a mean timing of 5.71 ± 0.19s (range 5.37 to 5.95s) and a mean quickest time of 5.59 ± 0.21s (run of 5.25 to 5.87s) amongst top class English referees (n = 17). In an attempt to determine whether the FIFA testing was measuring physical fitness related to matches, (Weston et al., 2009) discovered a correlation between the fastest 40-meter running split second time and the overall distance travelled (r = -0.69, p =.002), remove secured in sprinting over distance (r = -0.75, p <.001) and high intensity running (r = -0.76, p <.001). Based on this discovery, (Weston et al., 2012b) concluded that the fastest 40-meter speed had enough legitimacy to

be employed as a football referee fitness test. In actuality, despite being addressed by several scholars, the 40-meter RSA test remains part of the FIFA exam battery.

2.12 Aerobic Capacity

A football match is made of two 45-minute halves, separated by no more than a 15-minute intermission minutes (Casajus & Castagna, 2007). Despite being an intermittent sport that involves short bursts of intense exercise and running, the oxygen-consuming framework is still the player's main source of energy (Bangsbo, 1994; Casajus & Castagna, 2007; Stølen et al., 2005). These studies also showed that high levels of aerobic fitness are related to a player's ability to move quickly across large distances and to execute delayed submaximal exercises during a game. This also holds true for football officials, who go a considerable distance on the field to observe plays during the game.

Oxygen-consuming capacity is often measured as the maximal oxygen uptake rate (VO2max) during a strenuous exercise session. Individuals with elevated VO2max values possess the ability to endure longer periods of exercise at submaximal workloads (Iaia, Ermanno & Bangsbo, 2009). In addition, athletes with greater VO2max levels have higher muscular glycogen stores and recover more quickly. Furthermore, they have the ability to use glycogen sparingly during intense workouts, which frees it up for more focused workout like sprints and allows player to run more throughout the match (Stølen et al., 2005). Krustrup et al. (2009) reported that among top class Danish assistant referees (n = 12) using the incremental treadmill running test, the mean VO2max was 45.93 ml·kg·min-1 (range 40.9 to 53.6 ml·kg·min-1). They also discovered a significant correlation ($r = 0.68$, $p < .05$) between the referees' VO2max readings and the distance covered

during the contest. Furthermore, referees who have higher VO2max levels tend to cover a greater distance than those who have lower VO2max values.

Stølen et al. (2005) discovered that referees' aerobic levels of fitness were often low, most likely as a result of their advanced age. Most studies showed that football referees' aerobic capacity declines with age (Bangsbo et al., 2006a; Castagna et al., 2004). Caballero et al. (2011) the mean VO2max of the Spanish referees, who were 26.0 ± 4.9 years old, was 48.7 ± 4.3ml/kg/min^{-1}. Banda et al. (2015) reported the mean value of 42.50 ± 4.46 ml·kg·min^{-1} was lower for older referees (n = 8), who were 42 ± 1 years old, and higher for younger top Italian referees (n = 8), who were 33.5 ± 2.5 years old. Numerous studies have evaluated the VO2max levels of football officials using a range of aerobic measures, including as the Cooper 12-minute run test, the multi-stage shuttle run or beep test, and a laboratory test on a cycle or treadmill. The problem is that these tests are not specific to any one sport, and therefore have no bearing on sporadic sports like football (Bangsbo et al., 2006a). It is difficult to evaluate a person's ability to execute repeated high-intensity workouts because these tests are continuous in nature (Krustrup et al., 2009b).

Bangsbo et al., (2006b) presented the Yo Yo intermittent recovery test (YYIR), which made of running between markers that are 20 metres apart, continually extending repeated periods lasting 40 metres, and recovering for 10 seconds in between. This test measures a person's ability to recover from high intensity intermittent exercise and engage in repeated, rigorous activity (Iaia et al., 2009; Krustrup et al., 2009b). One test that may be used to evaluate physical capacity for intermittent workouts, such as football, is the YYIR (Iaia et al., 2009). Castagna and colleagues (2004) found that there was some difference between the YYIR

results and the 12-minute run test. Additionally, they discovered that the YYIR test encompassed movement patterns that resembled those observed during a match, making it possible to differentiate between referees at various levels

Krustrup and Bangsbo (2001), detailed a significant correlation between the YYIR and the distance travelled during high-intensity running during a game among 18 elite Danish referees. The last mentioned can be assessed from the data, even though the purpose of the YYIR is not to measure VO2max (Bangsbo et al., 2006b; Iaia et al., 2009; Krustrup & Bangsbo, 2001). More so, this test can be used to assess training-induced increases in performance (Bangsbo et al., 2006b). Eighteen Belgian referees were watched during a football season, and weekly training regimens were suggested for them (Weston et al., 2012b). Throughout the season, they underwent four tests using the YYIR Level 1. These referees did better, rising from 1720 ± 276 m to 2330 ± 268 m, than the national first-class referees, who improved from 1290 ± 407 m to 1985 ± 279 m from the beginning of the season to the finish. A noteworthy change or impact was noted in both groups at the conclusion of the season ($p = .025$). The YYIR test was used to evaluate the referees' performance during the season in relation to the advantages of their high-intensity, sporadic training programme. It has been observed that FIFA referees are more physically fit than lower-level referees (Cerqueira et al., 2011a). Even while the national top referees showed significant improvement, which could be related to the rigorous and sporadic training regimen they underwent, the FIFA referees outperformed the first-class national referees in this study.

2.13 Regional Variations in Referee Development

Research from various regions has highlighted significant disparities in referee development infrastructure. Developed countries typically provide

centralized training facilities, regular fitness assessments, and professional development opportunities that may not be available in developing regions (Weston et al., 2012a).

These infrastructure differences have measurable impacts on referee performance outcomes. Studies comparing referee fitness levels between countries with well-developed versus limited infrastructure consistently show performance gaps that correlate with resource availability (Cerqueira et al., 2011b).

Socioeconomic factors significantly influence referee development pathways. In many African contexts, refereeing serves as a secondary occupation, with officials maintaining primary careers in teaching, business, or other fields (Lategan et al., 2011). This dual-career approach can limit time available for specialized training and development activities.

Cultural attitudes toward authority and gender roles also influence referee recruitment and retention. Studies have documented significant gender disparities in referee populations across different regions, with cultural factors playing a substantial role in determining participation rates (Perreau-Niel & Erard, 2015).

2.14 Research Gaps Identified from Systematic Literature Review

The systematic literature review reveals significant geographical gaps in referee research, particularly concerning sub-Saharan African populations. While extensive research exists on European and North American referee populations, limited studies have examined African referees comprehensively. This gap is particularly pronounced for East African countries, where no published studies have specifically examined referee anthropometric characteristics and physical fitness in relation to FIFA standards.

Existing research has predominantly focused on elite, professional referees, with limited attention to regional and developing referee populations. This creates a knowledge gap regarding the applicability of international standards to referees operating in resource-constrained environments or those with limited access to specialized training facilities.

Current literature lacks comprehensive examination of how historical, social, and economic factors influence referee development in post-conflict regions. The Northern Uganda context, characterized by recovery from prolonged conflict and limited sporting infrastructure, represents a unique case that has not been adequately addressed in existing research.

Most existing studies have employed cross-sectional designs, limiting understanding of longitudinal trends in referee development. Additionally, few studies have examined the relationship between local training conditions and FIFA standard compliance, particularly in regions with limited resources for referee development.

Research on female referees in African contexts remains extremely limited, despite growing international emphasis on gender equality in sports officiating. This gap extends to understanding how cultural and structural barriers affect female referee participation and development in traditional societies.

The identified research gaps justify the need for comprehensive, region-specific studies that can inform evidence-based interventions for referee development in underrepresented populations and contexts.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This chapter produces a detailed approach to methods used in this study. It outlines the study area, target population, sampling techniques and sample size, research instruments, validity and reliability, data gathering methods, data analysis and presentation techniques, and ethical considerations.

3.1 Research Design

This study employed a descriptive cross-sectional research design to assess anthropometric characteristics and physical fitness of selected football referees against FIFA recommended standards. The selection of this research design was based on several methodological considerations that align with the study's objectives and practical constraints.

The cross-sectional design was chosen as the most appropriate approach for this study for several compelling reasons. Firstly, it allows for the simultaneous assessment of multiple variables (anthropometric characteristics and physical fitness components) within a single data collection period, making it particularly suitable for establishing baseline profiles of referee populations (Wang & Cheng, 2020). This design enables researchers to capture a snapshot of the current status of referees in Northern Uganda, providing essential baseline data for future longitudinal studies and intervention programs.

Secondly, the cross-sectional approach is highly practical for football referees who are always involved in active officiation with limited availability for repeated testing sessions. Given that referees maintain primary occupations and have weekend officiating commitments, a design requiring multiple data collection

points would have been logistically challenging and likely resulted in significant participant attrition.

Thirdly, this design facilitates direct comparison between study participants and established FIFA standards, as it provides point-in-time measurements that can be directly benchmarked against international criteria. The descriptive nature of the design allows for comprehensive characterization of the referee population while maintaining focus on compliance assessment rather than causal relationships.

Cross-Sectional Design Advantages in This Context

The cross-sectional design offers several specific advantages for this study. It provides cost-effective data collection, requiring minimal resources while generating comprehensive baseline data. The design also minimizes participant burden, requiring only single-session participation, which was crucial for maintaining high participation rates among busy referee populations (Rindfleisch et al., 2008).

Additionally, the design allows for immediate practical application of findings. Results can be quickly translated into recommendations for training programs and policy adjustments without waiting for longitudinal data collection periods. This immediacy is particularly valuable in the Northern Uganda context, where evidence-based interventions are urgently needed to improve referee development outcomes.

Limitations and Mitigation Strategies

While acknowledging the limitations of cross-sectional designs, including inability to establish causal relationships and potential temporal variations in fitness levels, several strategies were employed to enhance the study's validity.

Data collection was timed to coincide with the active officiating season, ensuring that fitness measurements reflected referees' peak performance capacity. Standardized measurement protocols were strictly followed to ensure comparability with international studies.

The study also incorporated demographic and experiential variables to provide contextual interpretation of findings, partially compensating for the design's inability to capture developmental trajectories. This comprehensive approach maximizes the utility of cross-sectional data while acknowledging its inherent limitations.

3.2 Study Area

The study was done on FUFA national and assistant referees (FUFA badge) and FUFA Regional referees (FUFA regional badges) in Acholi Sub-region in Gulu district, Amuru district, Omoro district and Nwoya district that is under Northern region football association in Uganda.

Map of Uganda showing the study area.

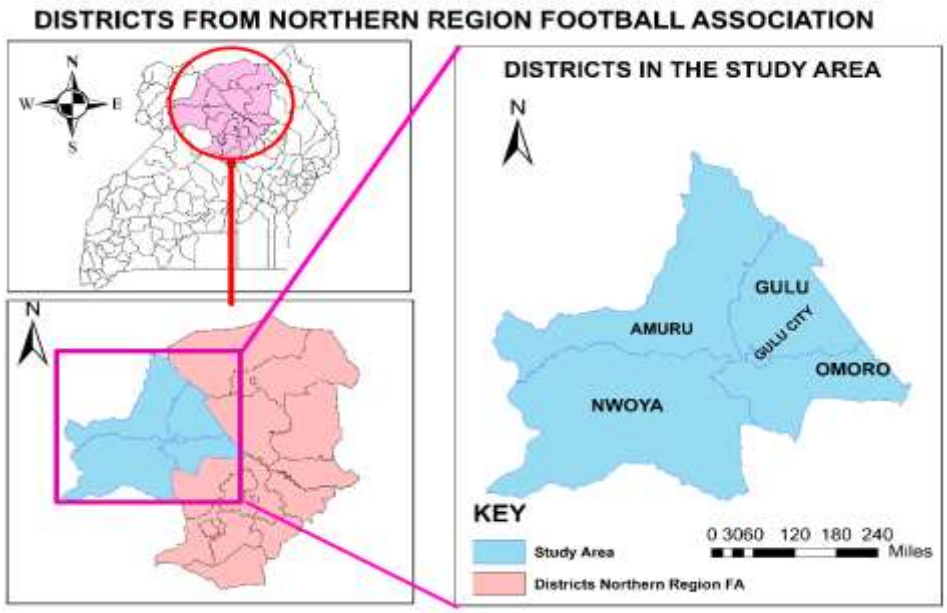


Figure 3.1: Map of Uganda showing study area

3.3 Study Participants

Male and female Northern Region Football Association referees, licenced by FUFA for the 2022–2023 season, participated voluntarily in this study.

According to Northern Region Football Association [NRFA] (NRFA, 2022), The referees licensed to officiate in the season of 2022/2023 are shown in the table below.

Table 3.6: Showing study population

Gender	National Badge	Regional badge	Total
Male	04	54	58
Female	02	0	2
Total	06	54	60

3.4 Sampling Procedure

The referees were obtained by a non-probability sampling method since they are only sixty. A purposive sampling was used since the referees are the only category that will provide the information required in this study. The referees were stratified according to gender in these tests.

3.5 Research Instruments

The researcher prepared a data entry form (Research instrument) with section A containing data related to anthropometric characteristics that is weight (kg), height (m), and BMI (kg/m^2) for each participant and section B containing data to related to physical fitness parameters that is speed and aerobic endurance (See Appendix III).

3.6 Research Tools

International Society for the Advancement of Kinanthropometry [ISAK] (da Silva & Vieira, 2020) came up with tools that can be used to measure anthropometric elements, and they include;

A Stadiometer which was used to measure height to the nearest 0.5cm.

Toledo self-zeroing weighing scale was used to determine body mass.

These tools have been tested and used before by (Norton & Olds, 1996; Stewart & Marfell, 2006). The researcher used these tools for measurement of anthropometric elements.

For physical fitness, the equipment used were electronic gate, cones and tape measure for speed and aerobic fitness. These tools have been tested and used by (Martin-Sanchez et al., 2022).

3.7 Validity and Reliability

3.7.1 Validity of Instruments

Oso & Onen (2005) confirmed that the degree to which an instrument measures what it is intended to measure is referred to as validity. With the assistance of the research supervisors, the researcher created a data collection tool in the form of a data entry form. The researcher made sure the tool was legitimate and utilised it prior to data collection to assess its accuracy.

3.7.2 Reliability of Instrument

Oso & Onen (2005), reliability of an instrument means the extent of consistence with which the instruments measure what it is supposed to measure even when repeated several times. The data entry form was piloted with 4 referees; 2 female and 2 males selected from out of the target population.

Two research assistants were trained on the exact procedures to be followed and made to get used with the measurement procedures and recording of height, weight, BMI and physical fitness as speed and aerobic endurance. Research Assistants were guided with respect to the appropriate behaviour required during data collection.

3.8 Data Collection Procedures

The researcher obtained an introduction letter from Directorate of Research and Graduate Training of Kyambogo University that introduced the researcher to the chairperson northern region football association. In addition, the researcher also obtained authorization letter from chairperson northern region referees association and a convenient day was chosen to carry out the measurements with the referees and explained the procedures to them. Each participant had their own data entry form on which the researcher recorded all the anthropometry and physical fitness. During time for data collection, there were three stations where participants went through in measuring and recording of anthropometric characteristics and physical fitness.

3.8.1 Measurements of Body mass, Height and BMI

Body mass was measured using Seca Clara 803 digital scale (Hamburg, Germany). The scale was placed on a hard, flat, and even surface to avoid inconsistency in measurements. In order to take a reading, participants had to take off their shoes and any other clothing or belongings. They also had to stand straight on the scale for at least five to ten seconds. Reading was taken when the digits are not changing.

The Seca Stadiometer type 213 1721009 (Hamburg, Germany) was utilised to measure the height of the subject by measuring the distance between the vertex

and the inferior aspects of the feet. The stadiometer was placed on a flat surface on the floor and subjects were requested to remove their shoes and they stood with the feet flat on the stand and upright with eyes looking forward straight ahead. The headboard of the stadiometer was then lowered until it touched the top of the head. The reading was then read and recorded.

Body mass index of every participant was then calculated by dividing the weight in kilograms by the square of the height in meters (BMI = weight (kg) / height^2 (m^2)).

3.8.2 Measurements of Physical Fitness

For Test 1, Repeated Sprint Ability (RSA)

1. The "start" and "finish" gates were designated with electronic timing gates (photocells) at 0 and 40 meters, respectively. The "start line" was marked out 1.5 meters ahead of the start gate.
2. Referees lined up at the start with their front foot touching the "start line."
3. Referees had a maximum of 60 seconds to recover between each of the six 40-meter sprints.
4. During this time, the referee who stumbled or fell was given another chance (one trial is equal to 1 X 40 m).
5. A referee who failed one of the six trials was given a seventh trial right after the sixth. The match official has failed the test if they failed two of the seven trials.

   The international category 1 reference time for men was set at 6.0 seconds, while the reference time for women was 6.40 seconds.

Figure 3.2: Repeated sprint ability path

Figure 3.0.1

3.8.3 Test 2, Interval Test

1. The referees ran 40 X 75 metres and walked 25 metres 40 times. This is equivalent to 4,000 metres or 10 laps in 400-meter athletics track. The audio file set the pace, and reference times were established.

2. The referees began in standing position. They began when the whistle is blown. Assistant test leaders were placed at each start line to oversee the start and make sure referees didn't start early.

3. Every referee must have entered the "walking area" prior to the whistle blowing at the conclusion of each run. A line that was 1.5 meters in front of and 1.5 meters behind the 75-meter line delineated the walking area.

4. The test leader issued a clear warning to referees who did not step foot within the walking area on time. The test leader stopped those who failed to step inside the walking area on time for the second time and told them they had failed the test.

Referenced time was set at international category 1 for men at Maximum 15 seconds per 75m run and 18 seconds per 25m walk and women at Maximum 17 seconds per 75m run and 20 seconds per 25m walk

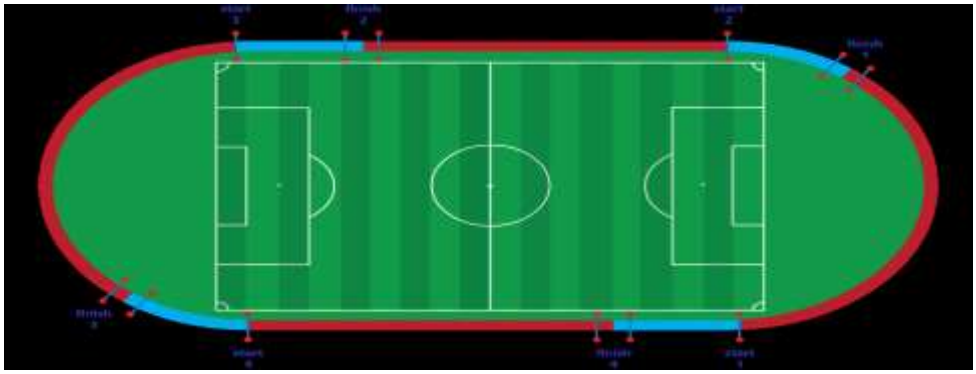


Figure 3.3: Interval test path

3.9 Data Analysis and Interpretations

The data analysis strategy was designed to comprehensively address each objective through appropriate statistical methods aligned with the study's descriptive cross-sectional design. For the first specific objective, which aimed to assess anthropometric characteristics of football referees from Northern Uganda, the analytical approach involved calculating measures of central tendency (mean, median) and dispersion (standard deviation, range) for height, weight, and BMI to provide a comprehensive characterization of the anthropometric profile of the referee population. Frequency distributions were analysed according to WHO BMI classifications (underweight <18.5, normal weight 18.5-24.9, overweight 25.0-29.9, obese ≥30.0 kg/m²) to determine the proportion of referees in each category. At the same time, graphical representations including histograms and box plots were developed to visualize the distribution of anthropometric variables and identify potential outliers or unusual patterns in the data.

For the second specific objective, focusing on assessing physical fitness levels of referees from Northern Uganda, the analysis involved calculating mean and median performance times for each component of the RSA test (six individual sprints) and overall pass/fail rates for both RSA and Interval tests. Performance distribution analysis assessed the distribution of performance scores to identify

patterns in fitness capabilities and potential areas of concern, while component-specific analysis separately examined sprint consistency (variation across the six RSA trials) and endurance performance (completion rates and timing for the Interval Test).

The third specific objective, evaluating compliance with FIFA standards, was addressed through a comparative analysis that directly compared study findings with FIFA benchmark standards using descriptive statistics and percentage compliance calculations. Gap analysis identified specific areas where referees fall short of FIFA standards, including quantification of the magnitude of performance gaps. At the same time, categorical compliance assessment analysed compliance rates across different demographic subgroups (age categories, experience levels, officiating grades) to identify factors associated with standard compliance.

The hypothesis testing framework employed independent samples t-tests to test the study hypotheses comparing BMI and physical fitness performance between Northern Uganda referees and FIFA standards. This parametric approach was chosen based on the continuous nature of the dependent variables and the comparative framework of the study. Prior to conducting t-tests, assumptions of normality and homogeneity of variance were assessed using Shapiro-Wilk tests and Levene's test, respectively, with alternative non-parametric approaches identified as backup analytical strategies if parametric assumptions were violated. A significance level of $\alpha = 0.05$ was established for all hypothesis testing, with Cohen's d calculations planned to assess the practical significance of any detected differences. This comprehensive analytical framework ensures that each research objective is addressed through appropriate statistical methods while maintaining alignment with the study's descriptive cross-sectional design and practical

constraints of the research context. The statistical software package SPSS version 25 was utilised to perform the analyses.

3.10 Ethical Considerations

This study received ethical approval from the Directorate of Research and Graduate Training of Kyambogo University and is exempt from further ethical approval by the Uganda National Council for Science and Technology. During the study, ethical considerations such as an introductory letter, informed consent, an authorisation letter, privacy, and confidentiality will be considered. The researcher informed participants about the significance of the research and the test procedures. Informed consent was obtained from participants before the data collection began. The participants were assured they could freely choose to participate in the study. They were also informed that the information collected would be used solely for academic purposes and that all data obtained would be treated as private and confidential.

CHAPTER FOUR

PRESENTATION AND DISCUSSIONS OF RESULTS

4.0 Introduction

This chapter delves into a comprehensive presentation, analysis, and interpretation of findings of anthropometric characteristics and physical fitness among selected referees, assessing them against the established standards recommended by FIFA. The initial section provides insight into the referees' demographic details in terms of age, educational background, refereeing experience, grade level, and concurrent occupations. Subsequently, an in-depth measurement of anthropometric characteristics is conducted, incorporating descriptive statistics to calculate key parameters such as mean, median, standard deviation, and range for variables such as weight, height, and BMI.

In addition to the anthropometric evaluation, an assessment of physical fitness is carried out, with performance outcomes summarised for each test, including mean and median scores and pass/fail rates. This analysis explores the distribution of results in alignment with FIFA recommendations. The chapter culminates in comparative analysis, wherein the referees' data is cross-referenced against FIFA standards for anthropometric characteristics and physical fitness. This comparative approach serves to identify areas where referees either meet or deviate from the established FIFA guidelines.

This research aims to gain insights into the current status of referees in northern Uganda, pinpoint potential areas for improvement, and align the region's officiating standards with the international benchmarks set by FIFA. Through this thorough examination, I endeavoured to contribute valuable information that can

inform targeted interventions to elevate the quality of refereeing in northern Uganda to meet or exceed global standards.

4.1 Demographic Characteristics of Referees

This report provides a detailed examination of the demographic characteristics of referees, shedding light on key variables such as gender, age, level of officiation, grade, years of experience, and other occupations. The data, gathered from a sample size of 59 out of the targeted 60 referees, where one was sick during this data collection, offers valuable insights into the diverse composition of this vital group within the sports community.

Table 4.7: **Demographic Characteristics of Referees**

VARIABLE	FREQUENCY (N=59)	PERCENTAGE (%)
GENDER		
Male	57	96.6
Female	2	3.4
LEVEL		
National	6	10.2
Regional	53	89.8
GRADE		
One	2	3.4
Two	11	18.6
Three	46	78.0
YEAR OF EXPERIENCE		
<5	44	74.6
5 To 10	10	16.9
11 To 15	3	5.1
16 To 20	1	1.7
Above 20	1	1.7
OTHER OCCUPATION		
Counsellor	1	1.7
Entrepreneur	10	16.9
Farmer	8	13.6
Health Worker	1	1.7
Manson	1	1.7
Social Worker	1	1.7
Soldier	1	1.7
Student	7	11.9
Teacher	29	49.2
AGE GROUP		
20-24	12	20.3
25-29	21	35.6
30-34	11	18.6
35-39	14	23.7
40 and above	1	1.7

Source: Data analysis

The demographic profile of referees, derived from a sample of 59 individuals, illustrates a pronounced gender disparity, with 96.6% identifying as male and a smaller 3.4% as female. The majority of referees, constituting 89.8%, operate at the regional level, showcasing a robust local presence, while a select 10.2% officiate at the national level. Regarding grading, 78.0% hold a Grade Three status, attesting to a low level of national and international experience, while 3.4% and 18.6% have achieved Grades One and Two, respectively. The distribution of years of experience reveals that 74.6% have less than five years of officiating, 16.9% fall within the 5 to 10 years range, and a smaller percentage have 11 to 15 years, 16 to 20 years, or above 20 years of experience. Beyond their officiating roles, referees engage in various secondary occupations, with teaching being the most prevalent at 49.2%, followed by entrepreneurship at 16.9%. Age distribution among referees varied, with the highest proportion falling within the 25-29 age group (35.6%) with mean 29.41±5.688. These findings provide valuable insights into the demographics and characteristics of referees, which could inform strategies for recruitment, training, and support within the sports officiating community.

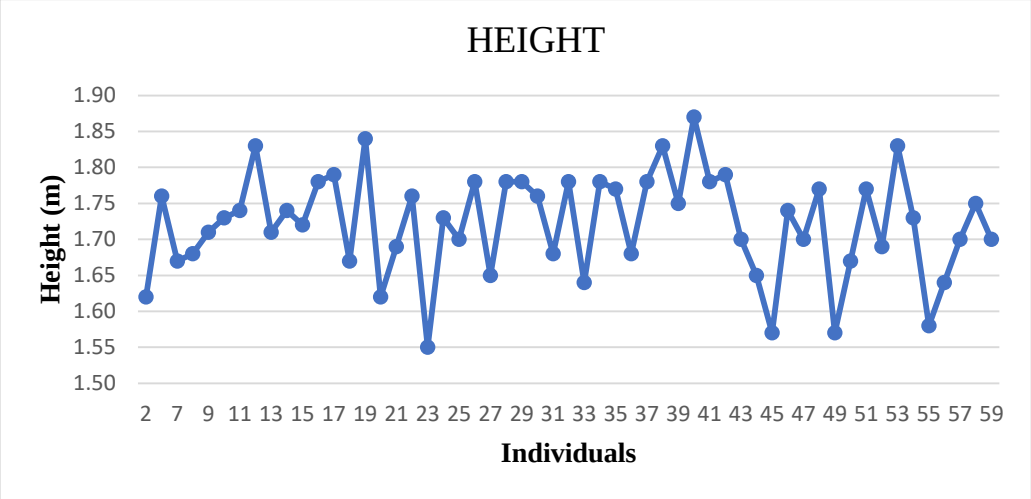
4.2 Anthropometric Characteristics

Referees play a crucial role in sports, ensuring fair play and enforcing rules during competitions. Understanding their health status, particularly in regions where resources may be limited, is essential for ensuring their well-being and effectiveness. This report presents findings on the body compositions of the referees in terms of Body Mass Index (BMI) distribution among referees in Northern Uganda.

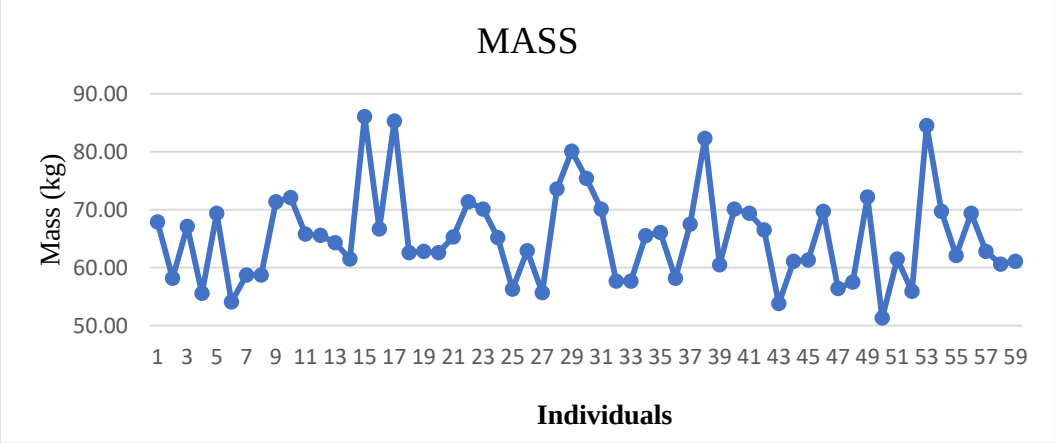
This report examines 59 referees' anthropometric characteristics, the section provides an in-depth analysis of the anthropometric characteristics of referees in the study area.

4.2.1 The Line Graph Showing Weight and Height Measurements of referees

4 0: Height Measurements of the referee



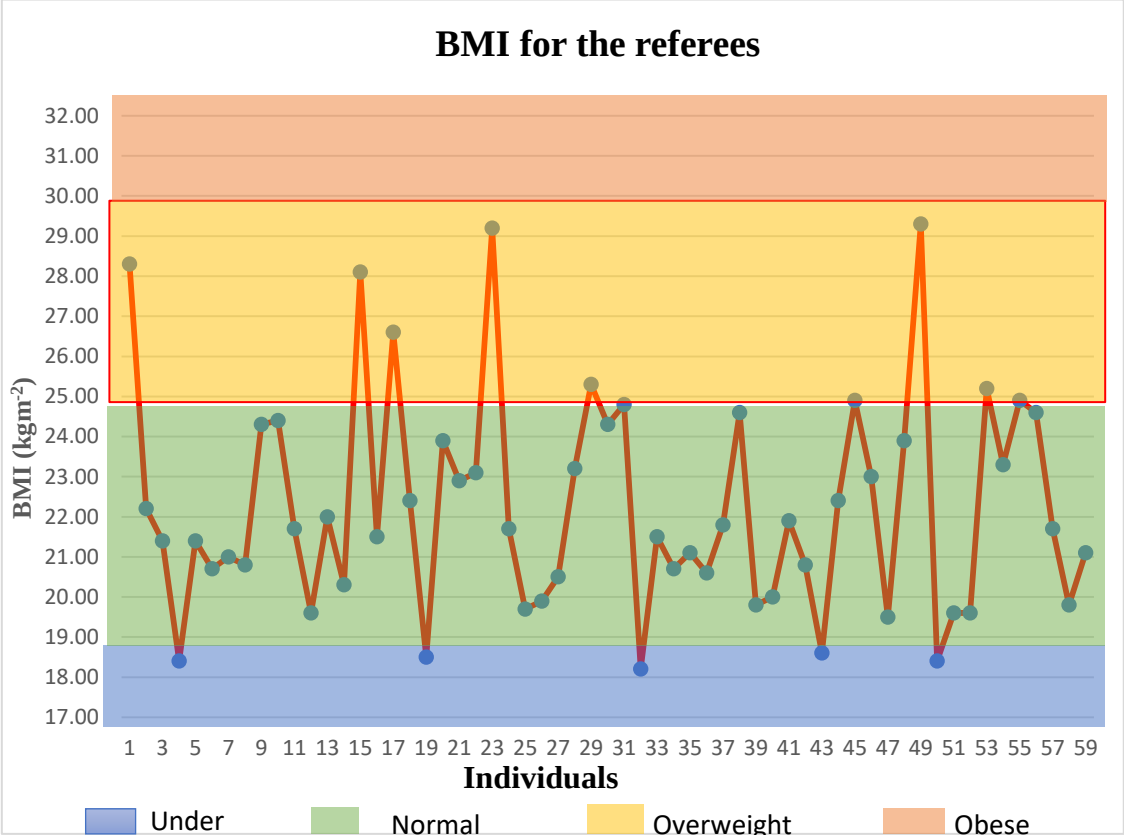
4.1: **Mass measurement of the referees**



Graphs 4.0 and 4.1 comprise the referees' weight and height measurements. The dataset consists of 59 observations. Weight measurements range from 51.30 kg to 86.10 kg, with a mean of 65.34kg and SD 7.93, while height measurements range from 1.55 meters to 1.87 meters, with a mean of 1.72 m and SD 0.074.

The measurements in this study were therefore utilized to calculate Body Mass Index (BMI), a

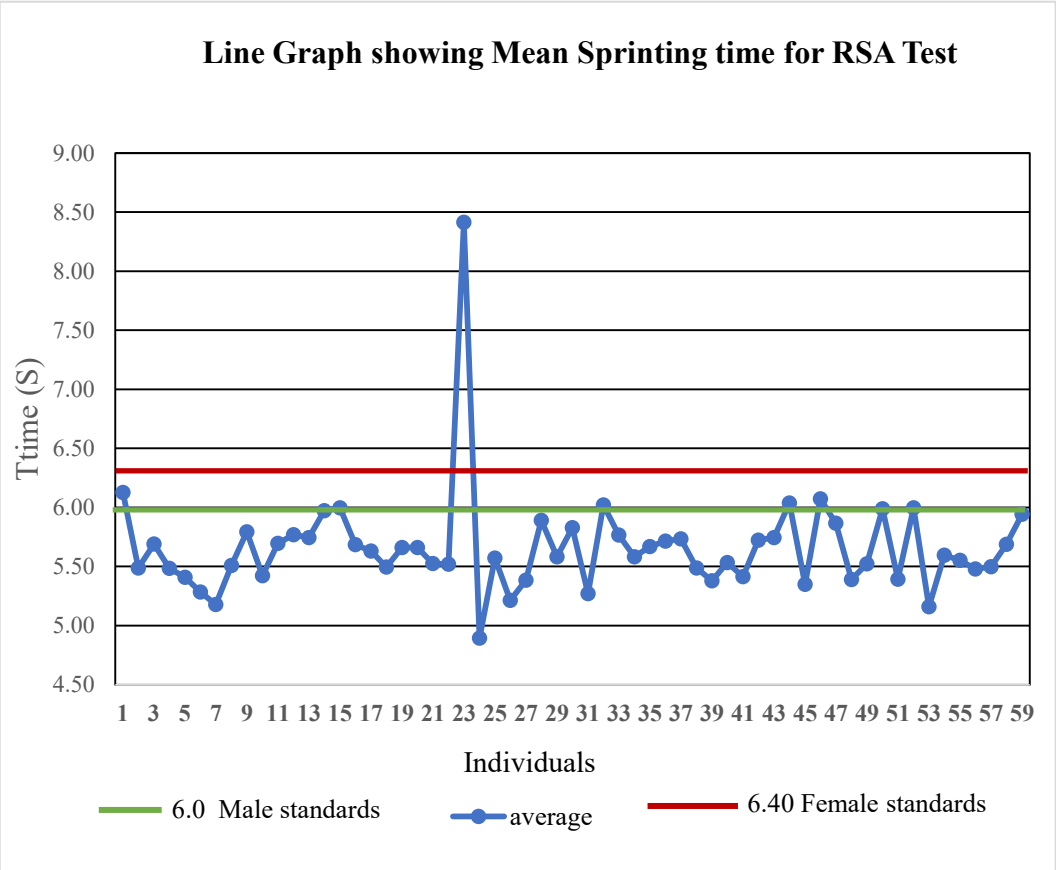
popular metric for evaluating a person's body composition and any health hazards related to weight.



This study revealed minimum BMI of 18.20 kg/m^2 and maximum of 29.30 kg/m^2 with mean of 22.25 kg/m^2 and SD 2.68. This implies that the referees' body composition in terms of BMI is that 81.3% of them fall within the normal weight, 6.8% of them were under weight, and 11.9% of them were overweight.

Therefore, 81.3% of the referees in this study that participated in the officiating in the Season of 2022/2023 had healthy body weight.

4.3 Physical Fitness Test of Referees

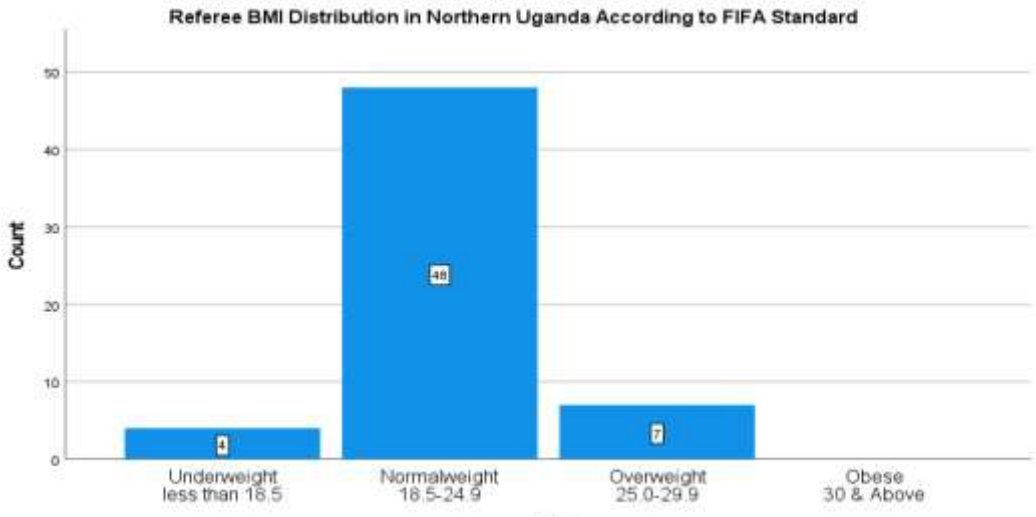


The graph above illustrates a noteworthy discovery: many referees possess commendable sprinting prowess. Only a minimal 8.7% (4) fell short of meeting the standards set by the sprinting test. Notably, all female referees successfully surpassed the sprinting ability test, aligning with the test standard of 6.40 seconds for females and 6.0 seconds for males.

For interval test, 47 (80.4%) successfully completed the endurance test while 12 (19.6%) did not complete the endurance test. Therefore, this finding strongly suggests that referees in the Northern region exhibit impressive sprinting and aerobic endurance capabilities.

4.4 Compliance of Referees to FIFA Standards in Relation to Anthropometric Characteristics

The figure below presents the level of compliance on the FIFA recommended standards from the study done on the referees from northern region.



BMI Categories (kgm^{-2})

In the bar graph, the findings of the anthropometric characteristics that is body composition in terms of BMI among referees in Northern Uganda indicate that the majority complied to the FIFA recommended standards of normal weight range (81.4%), suggesting overall good health and potential positive impacts on their performance. However, there are concerns regarding the proportions of underweight (6.8%) and overweight (11.9%) individuals, highlighting the need for targeted interventions to address weight-related issues and promote overall well-being. Therefore, maintaining a healthy weight is crucial for referees to carry out their duties during sports events effectively, and addressing these concerns through health promotion initiatives tailored to the needs of referees in Northern Uganda is essential.

4.4.1 Compliance of Referees to FIFA Standards in Relation to Physical Fitness

The section discussed the physical fitness findings of referees, aligning with the rigorous standards set by FIFA. The assessment encompasses various key tests, each contributing to an overall evaluation of the referees' fitness levels. As shown in Table 4.7

Table 4.8: Physical Fitness Assessment of Referees

Test	Mean (Second)	Median (Second)	Pass Rate	Fail Rate
First	5.74	5.72	84.8% (50)	15.2% (9)
Second	5.77	5.74	93.5% (55)	6.5% (4)
Third	5.79	5.76	91.3% (54)	8.7% (5)
Fourth	5.82	5.81	93.5% (55)	6.5% (4)
Fifth	5.88	5.81	91.3% (54)	8.7% (5)
Sixth	5.77	5.74	93.5% (55)	6.5% (4)
Repeated Sprint Ability	-	-	91.3% (54)	8.7% (5)
Interval test (Aerobic Endurance)	-	-	80.4% (47)	19.6% (12)

Source: Data analysis

From the data shown above, the referees have robust performance throughout, with the mean and median of every evaluation almost the same. The more impressive results are good scores on the second, fourth, and sixth tests, which are over 93.5%. Nevertheless, the analysis also highlights the areas of improvement, most notably in stamina, which registers a relatively poor pass rate of 80.4%.

The physical fitness assessment of referees, according to the FIFA criteria, serves as a general summary of their performance on different tests. The data revealed that in RSA, 91.3% of the referees complied with FIFA-recommended

standards, while only 8.7% were unable to comply. For the interval test, the data revealed that 80.4% of the referees complied with FIFA-recommended standards, and only 19.6% were unable to comply with FIFA standards.

In order to fill this gap, we suggest special training programs that improve the total level of fitness among the referees. Further to this, sprint capacity is usually accepted, and it fulfils the FIFA standards; however, there remains an insistence on constant attempts to maintain and develop more in this section. The result constantly emphasises the necessity for referees' physical condition monitoring and assessment in order to make sure that FIFA's strict requirements are being met over an extended period. Finally, this means that these results can be used as a solid basis for custom training measures, focused on establishing an undying aptitude among referees to maintain the necessary qualifications to meet the high physical demands of their occupation.

4.5 Hypothesis Testing

This section presents the results of hypothesis testing examining the relationship between Body Mass Index (BMI) and physical fitness performance among referees from northern Uganda compared to FIFA referee standards. Two specific hypotheses were formulated and tested using independent samples t-tests to evaluate potential differences in physical performance metrics.

Research Hypotheses

HO1: There is no significant difference in body mass index and speed performance (Repeated Sprint Ability) between referees from the northern region and FIFA referee standards.

HO1: There is no significant difference in body mass index and aerobic endurance performance (Interval Test) between referees from the northern region and FIFA referee standards.

4.5.1 BMI and Physical Fitness Performance Results

Independent samples t-tests were conducted to examine the relationship between Body Mass Index and physical fitness performance by comparing BMI values between referees who successfully passed FIFA fitness assessments and those who failed to meet the required standards.

Repeated Sprint Ability (RSA) Test Results

Prior to conducting the t-test, the assumption of equal variances was assessed using Levene's Test for Equality of Variances. The results indicated a violation of the equal variances assumption, $F(1, 57) = 13.88$, $p < .001$, necessitating the use of the equal variances not assumed correction.

The analysis revealed no statistically significant difference in BMI between referees who passed the RSA test ($M = 22.07$, $SD = 2.27$) and those who failed ($M = 23.40$, $SD = 4.59$), $t(57) = -0.31$, $p = .196$, 95% CI [-3.36, 0.70]. The mean difference of -1.33 kg/m² suggests that referees who failed the test had slightly higher BMI values, but this difference was not statistically significant at the $\alpha = .05$ level.

Aerobic Endurance (Interval Test) Results

For the aerobic endurance assessment, Levene's test indicated that the assumption of equal variances was met, $F(1, 57) = 0.04$, $p = .848$. The subsequent t-test analysis showed no statistically significant difference in BMI between referees who passed

the interval test (M = 22.25, SD = 2.68) and those who failed (M = 22.26, SD = 2.81), t(57) = -0.02, p = .988, 95% CI [-1.83, 1.80].

The minimal mean difference of -0.01 kg/m² between groups indicates virtually identical BMI values regardless of test performance, with the p-value of .988 providing strong evidence against any meaningful relationship between BMI and aerobic endurance performance.

Hypothesis Testing Conclusions

Based on the statistical analyses conducted:

HO1 is not rejected: There is insufficient evidence to reject the null hypothesis regarding BMI and speed performance. The lack of significant difference (p = .196) suggests that BMI is not a reliable predictor of repeated sprint ability among the referees tested.

HO1 is not rejected: There is insufficient evidence to reject the null hypothesis regarding BMI and aerobic endurance. The non-significant result (p = .988) indicates no meaningful relationship between BMI and interval test performance.

These findings suggest that BMI alone is not significantly associated with either sprinting ability or aerobic endurance performance among referees from northern Uganda when evaluated against FIFA fitness standards. The results indicate that other factors beyond BMI may be more influential in determining physical fitness performance in football referees.

Table 4.9: Independent Samples t-test Results Comparing BMI by FIFA Test Performance

Test Type	Group	M	SD	F	p (Levene's)	t	df	p (2-tailed)	Mean Diff.	SE Diff.	95% CI
RSA	Pass	22.07	2.27	13.88	<.001	-0.31	57	.196	-1.33	1.01	-3.36-0.70
	Fail	23.40	4.59								
Interval Test	Pass	22.25	2.68	0.04	.848	-0.02	57	.988	-0.01	0.90	-1.83-1.80
	Fail	22.26	2.81								

Note. RSA = Repeated Sprint Ability test; BMI = Body Mass Index; M = mean; SD = standard deviation; SE Diff. = standard error of the difference; CI = confidence interval.

4.6 Discussion

FIFA recommends that national associations consider multiple factors age, physical condition, psychological traits, health status, and familiarity with the laws of the game, when identifying and developing outstanding referees (Stulp et al., 2012). Understanding these attributes within the Northern Region Football Association (NRFA) context, and benchmarking them against international literature, can highlight areas for development. This study examined anthropometric characteristics, particularly Body Mass Index (BMI), alongside FIFA's Repeated Sprint Ability (RSA) and interval tests to assess physical fitness, comparing results with FIFA standards and findings from other countries.

4.6.1 Demographic Variables

Most NRFA referees (89.8%) officiate at the regional level, with only 10.2% at the national level lower than in other contexts, such as Spain, where national-level representation is higher (Caballero et al., 2011). Prior studies suggest that

younger, lower-level referees may enter officiating as an alternative to competitive playing (Delorme et al., 2013). At higher levels, referees tend to exhibit stronger self-esteem, confidence, and physical-physiological resilience (Castillo-Rodríguez et al., 2022). For NRFA referees, progression to national and international levels is a key developmental need.

A large proportion (78.0%) hold Grade Three status, indicating limited domestic and international experience compared with contexts such as Brazil, where elite referees predominantly hold Grade One (Fernandez P. et al., 2011b). Experience and education positively correlate with officiating level (Nurcahya et al., 2021; Samuel et al., 2023), highlighting the need for structured progression pathways.

Gender disparity is stark: 96.6% male vs. 3.4% female. This contrasts with trends in England, where female referee numbers have risen sharply (Drury et al., 2022). Although research shows physical performance differences between male and female referees (Martin-Sanchez et al., 2022), competence in officiating is not determined by biological sex (C. Jones & Edwards, 2013). Cultural and structural barriers remain key issues (Perreau-Niel & Erard, 2015).

Nearly half (49.2%) of NRFA referees are teachers, with others engaged in entrepreneurship (16.9%) or various secondary careers. This aligns with findings that refereeing is rarely a sole occupation (Perreau-Niel & Erard, 2015). Career progression often follows two phases individual skill development early on, and match management focus later (Loghmani et al., 2021). Job satisfaction is influenced by variety and task significance, with resilience against abuse and external pressures being a common trait (Parsons & Bairner, 2015).

Most referees are aged 25–29, younger than the averages reported in Brazil, Greece, and Spain (Casajus & Castagna, 2007; Cerqueira et al., 2011b; Fernandez

P. et al., 2011a). While ageing impacts sprint capacity and jump performance (Castagna et al., 2007; Weston et al., 2011), older referees can maintain positional accuracy. NRFA's younger profile may indicate rapid turnover and earlier promotion compared to other federations (Caballero et al., 2011).

The majority have <5 years' experience, far below figures for Belgian or FIFA-level referees (Catteeuw et al., 2009). Match count, not just years, is critical for skill acquisition. The relatively low experience levels may explain the limited representation of NRFA referees at elite competitions.

4.6.2 Anthropometric Characteristics and Physical Fitness

NRFA referees have an average height of 172 cm and a mean body mass of 65.34 kg, slightly below many international averages (Caballero et al., 2011; Lategan et al., 2011). BMI falls within the normal range for 81.4% of referees, consistent with FIFA guidelines and WHO classifications. This profile is similar to referees from Denmark (Krustrup et al., 2009b) and Brazil (A. I. Silva & Rodriguez-Añez, 2003), but lower than English referees (Reilly & Gregson, 2006). Mean RSA best time was 5.79 s, closely matching values reported for FIFA referees in multiple studies (Mallo et al., 2009; Weston et al., 2009). A majority (91.3%) met FIFA's passing standard, indicating strong anaerobic performance.

In the interval test, 80.4% passed, slightly lower than some international studies where all referees passed (Casajus & Castagna, 2007; Cerqueira et al., 2011b). However, those who passed demonstrated aerobic capacity within FIFA norms, comparable to VO_2 max values of elite referees (Caballero et al., 2011).

4.6.3 Compliance with FIFA Standards

NRFA referees largely comply with FIFA anthropometric and fitness standards. Body composition indicators align closely with elite-level norms reported

internationally (Casajus & Castagna, 2007; Majid Seifi Azarnejad et al., 2014). Although physical fitness scores are generally within standard ranges, international comparisons suggest targeted endurance training could increase pass rates in the interval test.

4.6.4 Summary

Overall, NRFA referees demonstrate anthropometric and physical fitness profiles comparable to many international counterparts, particularly in RSA performance. However, demographic factors, especially officiating level, experience, and gender representation, highlight areas for strategic development. Addressing these through structured training, mentorship, and recruitment diversity could strengthen the NRFA's representation at higher competitive levels.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents a comprehensive discussion of the findings from Chapter Four, offering insights into the demographic characteristics, anthropometric profiles, and physical fitness of football referees in Northern Uganda. The analysis provides a foundation for understanding the current state of refereeing in the region and the extent of compliance with FIFA standards. Based on the study's findings and the correlation analysis results, this chapter outlines specific recommendations for enhancing the quality of refereeing in Northern Uganda and suggests directions for future research.

The study examined 59 referees from the Northern Region Football Association (NRFA). It evaluated their anthropometric characteristics (weight, height, and BMI) and physical fitness parameters (speed and aerobic endurance) against FIFA-recommended standards. The findings revealed both strengths and areas requiring improvement within the regional referee population.

5.2 Summary of Key Findings

5.2.1 Demographic Characteristics

The demographic profile of referees in Northern Uganda reveals several significant characteristics that influence refereeing quality. A vast majority (96.6%) of referees are male, with only 3.4% being female, indicating a notable gender disparity. Most referees (74.6%) have less than five years of officiating experience, suggesting that the cohort is relatively inexperienced. Regarding competition levels, only 10.2% officiate at the national level, while a substantial 89.8% operate at the regional level. The mean age of referees is 29.41 years, with

a standard deviation of 5.68 years, and the largest age group (35.6%) falls within the 25-29 years range. Additionally, nearly half (49.2%) of the referees are teachers, reflecting a strong educational background within the population.

5.2.2 Anthropometric Characteristics

The anthropometric analysis demonstrated generally positive outcomes. The mean height was 1.72 ± 0.074 meters, with a range from 1.55 to 1.87 meters. The average weight was 65.34 ± 7.93 kg, ranging from 51.30 to 86.10 kg. The mean Body Mass Index (BMI) was 22.25 ± 2.68 kg/m², with a range between 18.20 and 29.30 kg/m². In terms of BMI distribution, 81.3% of individuals fell within the normal weight range, while 6.8% were underweight, and 11.9% were overweight.

5.2.3 Physical Fitness Performance

The physical fitness assessments showed that referees performed very well in speed, with 91.3% of them passing the Repeated Sprint Ability (RSA) test, which demonstrates excellent sprint performance. In terms of endurance, 80.4% passed the Interval Test for aerobic endurance, indicating there is still room for improvement in cardiovascular fitness. Notably, all female referees successfully completed both fitness assessments.

5.2.4 Compliance with FIFA Standards

Overall, compliance with FIFA standards was generally satisfactory. Anthropometric compliance was observed, with body composition indicators aligning with FIFA recommendations and the majority maintaining healthy weight ranges. In terms of physical fitness, sprint performance exceeded expectations, demonstrating strong capabilities. However, endurance capabilities require targeted improvement to fully meet FIFA standard compliance rates.

5.3 Conclusions

Based on the comprehensive analysis of demographic characteristics, anthropometric profiles, and physical fitness assessments, several key conclusions emerge:

The predominantly male referee population with limited experience at national levels suggests systemic barriers to career advancement and gender inclusion. The young age profile presents both opportunities for development and challenges related to experience accumulation. The strong educational background among referees provides a solid foundation for comprehensive training programs.

Northern Uganda referees demonstrate anthropometric characteristics that generally align with FIFA standards and international norms. The healthy BMI distribution among the majority of referees indicates good baseline physical condition suitable for officiating demands.

While referees excel in sprint performance, the lower pass rate for aerobic endurance testing (80.4% vs. 91.3% for RSA) indicates a specific area requiring targeted intervention. This finding is particularly significant given the continuous nature of football officiating and the importance of sustained performance throughout 90-minute matches.

The study reveals that Northern Uganda possesses a refugee population with fundamental capabilities that can be enhanced through strategic interventions. The alignment with FIFA anthropometric standards and strong sprint performance provides a solid foundation for improvement initiatives.

5.4 Recommendations

Based on the study findings, the following evidence-based recommendations are proposed to enhance referee quality and FIFA standard compliance:

5.4.1 Recommendations for Anthropometric Characteristics

A comprehensive body composition assessment should be conducted by implementing additional measurement techniques beyond BMI to offer more detailed physiological profiling. Regular monitoring protocols for anthropometric characteristics ought to be established throughout the officiating season, complemented by educational programs aimed at enhancing referees' understanding of optimal body composition for performance. Additionally, a longitudinal monitoring system should be developed, including a database to track anthropometric changes over time, setting baseline measurements for all registered referees, and implementing annual reassessment protocols to monitor changes and trends.

5.4.2 Recommendations for Physical Fitness Enhancement

Targeted Endurance Training Programs involve designing specific aerobic capacity improvement programs to address the 19.6% failure rate in interval testing. These programs include implementing high-intensity interval training (HIIT) protocols that mirror match demands and establishing position-specific training regimens that account for different officiating roles. Continuous fitness monitoring is essential, with fitness assessments conducted at least twice annually, pre-season and mid-season, and heart rate monitoring technology utilized during training sessions to optimize intensity zones. Additionally, individualized training programs should be developed based on initial fitness assessment results. Training program diversification further enhances referee readiness by incorporating sport-specific movement patterns into routines, implementing varied fitness testing protocols beyond FIFA requirements to comprehensively assess capabilities, and establishing mentorship programs that pair experienced referees with newcomers.

5.4.3 Recommendations for FIFA Standard Compliance

The Systematic Monitoring Framework involves establishing continuous assessment protocols to ensure ongoing compliance with FIFA standards, creating performance tracking systems that monitor both anthropometric and fitness parameters, and implementing corrective intervention programs for referees not meeting standards. Technology integration includes utilizing wearable technology to monitor real-time physiological responses during matches, implementing data analytics to identify performance patterns and areas for improvement, and establishing digital platforms for tracking individual referee development progress. Capacity building initiatives focus on developing partnerships with sports science institutions to enhance training quality, establishing regional training centres with appropriate facilities and equipment, and creating certification programs for referee fitness instructors.

5.4.4 Systemic Development Recommendations

Gender inclusion programs should focus on implementing targeted recruitment strategies to increase female referee participation and addressing cultural and structural barriers that prevent women from entering officiating roles. Establishing mentorship programs specifically designed for female referees can further support their development. For experience development pathways, creating structured progression systems from regional to national levels ensures clear advancement opportunities, complemented by minimum experience requirements and associated development initiatives. Additionally, exchange programs with other regions can broaden referees' exposure and enhance their skills. Professional development support involves providing continuing education opportunities tailored to referees' primary professions and establishing flexible training

schedules that accommodate their other occupations. To retain experienced referees, implementing financial incentive structures is essential.

5.5 Implications for Practice

The findings provide clear direction for resource allocation and program development priorities. Investment in endurance training programs and systematic monitoring systems will yield the greatest improvements in FIFA standard compliance.

Referees should prioritize aerobic capacity development while maintaining their demonstrated sprint performance capabilities. Regular self-assessment and participation in structured training programs will enhance career advancement opportunities.

Sports science programs should incorporate referee-specific training modules and consider partnerships with football associations to provide specialized expertise in referee development.

5.7 Suggestions for Future Research

Future research should employ longitudinal designs to track changes in anthropometric characteristics and physical fitness over multiple seasons. This approach would provide insights into seasonal fitness variations, career development patterns, long-term effects of training interventions, and age-related performance changes.

Investigate the application of emerging technologies in referee assessment and development, including GPS tracking systems for match analysis, virtual reality training for decision-making enhancement, wearable sensors for real-time physiological monitoring, and mobile applications for training program delivery.

Expand research to include other Ugandan regions and neighboring countries in order to identify best practices from higher-performing regions, understand cultural and environmental factors affecting referee development, establish regional benchmarks for comparison, and develop region-specific improvement strategies.

5.8 Conclusions

This study provides valuable insights into the current state of football refereeing in Northern Uganda and offers a foundation for evidence-based improvements. The generally positive anthropometric profiles and strong sprint performance capabilities indicate a solid foundation for referee development. However, the identified areas for improvement, particularly in aerobic endurance and career progression pathways, require targeted interventions.

The recommendations presented offer a comprehensive approach to enhancing referee quality through systematic improvements in training, monitoring, and development programs. Implementation of these recommendations, combined with continued research and assessment, will contribute to elevating Northern Uganda's refereeing standards to meet and exceed FIFA requirements.

The ultimate goal of these efforts is to develop a cohort of highly qualified referees capable of officiating at national and international levels, thereby enhancing the quality of football competition within the region and providing career advancement opportunities for dedicated officials. Through sustained commitment to evidence-based development programs, Northern Uganda can significantly improve its representation in elite football competitions while contributing to the overall advancement of the sport within the region.

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APPENDICES

APPENDIX I: INTRODUCTION LETTER

KYAMBOGO UNIVERSITY
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APPENDIX 8: INTRODUCTORY LETTER

Date: Nov 12, 2023

Chairperson Northern Regional,
Refereess Associations

Dear Sir/Madam,

RE: ONYANGO GILBERT

This is to introduce to you the above named student Reg: No **21/U/GMSS/14573/PE** pursuing Master of Science in Sports Science, Department of Sports Science, Kyambogo University.

She intends to carry out research on on **"Assessment of anthropometric characteristics and physical fitness of selected football referees versus FIFA recommended standards "** in partial fulfillment of the requirements of the award of Master of Science in Sports Science of Kyambogo University.

The purpose of this letter therefore is to request you to introduce the student to relevant offices as well as support with any necessary assistance and guidance.

Any assistance rendered to her will be highly appreciated.

Yours sincerely,

Prof. Bosco Bua
AG. DIRECTOR

KYAMBOGO UNIVERSITY
★ 12 NOV 2023 ★
DIRECTOR
DIRECTORATE OF RESEARCH AND GRADUATE TRAINING

APPENDIX II: INFORMED CONSENT FORM

KYAMBOGO UNIVERSITY

CONSENT TO PARTICIPATE IN RESEARCH

TOPIC: ASSESSMENT OF ANTHROPOMETRIC CHARACTERISTICS AND PHYSICAL FITNESS OF SELECTED FOOTBALL REFEREES VERSUS FIFA RECOMMENDED STANDARDS

You are cordially invited by ONYANGO GILBERT to take part in research study for Masters of Science in Sports Science from Kyambogo University. You were enrolled in this research as a participant due to the fact that you are officiating in the 2022/2023 Star times Uganda premier league/Betpawa Big League/Women Super League/Women Elite League/regional league, licensed to officiate in the season 2022/2023 and affiliated with Northern region football association referees

1. Purpose of the study

Purpose of this study is to evaluate anthropometric characteristics and physical fitness of selected referees against FIFA recommended standards

2. Procedures

If you agree to take part in this study, you will be asked to fill out forms with personal and professional refereeing information, have your height and body mass measured, and complete the following physical fitness tests:

i Repeated sprint ability tests 6 x 40m sprints (Speed) in not more than 6 seconds for men and 6.4 seconds for women, six times with rest interval of 60 seconds in between.

ii Interval test (endurance) where men will perform 75m run in not more than 15 seconds and 25m walk in not more than 18 seconds per walk and women will perform 75m run in not more than 17 seconds and 25m walk in not more than 20

seconds or will perform optional test 1 (Dynamic Yo-Yo) where men will run level 18-8 and distance of 2,040 meters and women will run level 17-8 and distance of 1,720 meters.

3. Probable risks and discomforts

The exercise intensity during 40m repeated sprints and interval test or dynamic Yo-Yo will be similar to FIFA and FUFA fitness test that you undergo at the beginning of season and mid-season. Given that you will be expected to put in your best or full effort, they could be uncomfortable and exhausting. The next day, you can experience muscle discomfort. But the level of activity will be comparable to the sporadic movement you'll always encounter in a game.

4. Probable gain to you or society

You will receive information on your current body composition and level of physical fitness in exchange for taking part in the study. Your involvement in the research will aid in the development of a database including referee profiles in Uganda. Understanding the present anthropometric profile and physical fitness of referees from football associations in the northern region will be made easier with the use of the data that will be gathered. This will assist in creating training courses that are pertinent to and appropriate for all Ugandan referees.

5. Cost for participation

There are no fees associated with taking part in the study. On the day of testing, participants will receive free water for the repeated sprint ability test and interval test/ Dynamic Yo-Yo.

6. Confidentiality

Any identifiable information that is gathered for this study and that relates to you will be kept private and shared only with authorization. Each study participant will

be assigned a code number, meaning that names will not be used to identify them. Records containing unique code numbers that connect the participants' identities will be stored apart from other records. If necessary, each participant will receive a personal report following the examinations. The study's group results will be presented at scientific conferences or published in a scholarly publication, all while maintaining participant anonymity.

7. Participation and withdrawal

You are free to choose whether or not to take part in this study. Should you consent to take part in this research, you are free to leave at any time with no repercussions. You may be removed from this study by the researcher if you become ill, are hurt, or experience any negative side effects.

8. Signature of research subject

The information above was explained to me in English/Luo by Onyango Gilbert, and I am fluent in this language. I had the chance to ask questions, and I was satisfied with the answers I received.

I thus provide my voluntary agreement to take part in this research. This form has been supplied to me in copy form.

The participant's signature..... Date .....

The researcher's signature.....

APPENDIX III: DATA ENTRY FORM

DATA ENTRY FORM

Preamble

Date of Testing: ……..

Gender: Male ☐ Female: ☐ Year of experience: …….….

Level: National ☐ Regional ☐ Grade ……... Age ……

Other occupation ……

SECTION A (ANTHROPOMETRIC CHARACTERISTICS)

Anthropometric components	**Measurements**	**Scores**
Body mass index (kg/m^2)	Weight (kg)	
	Height (m)	
	BMI (kg/m^2)	

SECTION B (PHYSICAL FITNESS TEST)

1. Test 1

Repeated sprint ability (RSA), which measures speed (FIFA standards: men 6.0s and women 6.4s).

Trials	1st	2nd	3rd	4th	5th	6th	7th (If any)
Time (s)							

Recommendation

Passed ☐

Failed ☐

2. Test 2

Interval test which measures endurance, FIFA standards for men is 40 times run of Maximum 15 seconds per 75m run and 18 seconds per 25m walk and women Maximum 17 seconds per 75m run and 20 seconds per 25m walk

Recommendation

Passed ☐

Failed ☐

APPENDIX IV: PROCEDURES FOR MEASUREMENT PROCEDURES FOR MEASUREMENT

For anthropometric measurements

Body mass was measured using Seca Clara 803 digital scale (Hamburg, Germany). The scale was placed on a hard, flat, and even surface to avoid inconsistency in measurements. In order to take the reading, participants were instructed to take off their shoes and any other clothing or belongings, stand straight on the scale, stand on the scale for at least 5-10 seconds. Reading is taken when the digits are not changing

The Seca Stadiometer type 213 1721009 (Hamburg, Germany) was used to measure the height of the subject by measuring the distance between the vertex and the inferior aspects of the feet. The stadiometer was placed on a flat surface on the floor and it was requested that participants take off their shoes and they stood with the feet flat on the stand and upright with eyes looking forward straight ahead. The headboard of the stadiometer was then lowered until it touches the top of the head. The reading was the read and recorded.

Body mass index of every participant was then calculated by dividing the weight in kilograms by the square of the height in meters (BMI = weight (kg) / height^2 (m^2)).

Procedures for physical fitness test

Repeated Sprint Ability (speed)

The sprints were timed using electronic timing gates, also known as photocells. The height of timing gates was limited to 100 centimetres from the ground. There were two gates: one at 0 metres and the other at 40 metres. 1.5 metres in front of

the "start" gate was the designated "start line." Referees placed their front foot on the "start line" when they lined up at the beginning. The referees were asked to sprint when the electronic timing gates are set**.** Referees had a maximum of 60 seconds recovery between each of the 6 X 40m sprints. During their recovery, the referees were asked to walk back to the start.

The referee who failed one trial out of the six, was given a seventh trial immediately after the sixth trial. Those who failed two trials out of seven, the match official has failed the test.

For interval test (aerobic endurance)

Referees completed 40 x 75m run / 25m walk intervals. This equates to 4,000m or 10 laps of a 400m athletics track. The pace was dictated by the audio file and reference times was set. Referees started from a standing position. They did not start before the whistle. To ensure that referees do not start early, research assistants were stationed at each start line to manage the start. The whistle was blown and the referees began to run. Every referee has to have reached the "walking area" prior to the whistle blowing at the conclusion of each run. A line that is 1.5 metres ahead of and 1.5 metres behind the 75-meter line delineates the walking area. The test leader gave a clear warning to a referee who did not go inside the walking area in time. The test leader stopped a referee who had missed their second opportunity to step inside the walking area on time and told them they had failed the test.

APPENDIX V: AUTHORITY LETTER

16th October 2023

Dear Mr Onyango Gilbert,

RE: PERMISSION TO CARRY OUT STUDY AMONG REFEREES FROM NORTHERN REGION FOOTBALL ASSOCIATIONS

We would like to thank you for choosing your study on the referees from Northern Regional football associations.

We are pleased to inform you that Northern Region Football association has granted you permission to carry out a study entitled "Anthropometric characteristics and physical fitness of selected football referees against FIFA recommended standards"

We agreed that you can collect your data among the referees in your study scope and that you can use the results obtained in your Master degree thesis and any research journals publications.

We believe that such research will improve referees' performance in Northern Uganda.

Wish you well in your studies

Yours faithfully

FUFA COMPETITIONS
FUFA
16 OCT 2023
DIRECTORATE

Ogwal Boniface 0772016111

Chairperson Northern Region Football Referees' Association