THE LINK BETWEEN BASKETBALL OFFICIATING EXPERTISE LEVEL AND THE REFEREES' PERFORMANCE DURING KENYA BASKETBALL FEDERATION PREMIER LEAGUE PLAY-OFFS 2022- 2023 SEASON

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,

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DECLARATION

This thesis is my original work, and has not been presented for a degree in any other University

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DEDICATION

To my dear parents, Mr. Davies Mwandiga and Mrs Esther Mwandiga, who have been a great pillar in my pursuit of higher education, take credit for this achievement. To my siblings Agnes Wambugha, Jimmy Brown, Catherine Kighenda, Nelly Gombe and the late Gibran Mwachongo (rest in peace); who have encouraged me all along, thank you for being there for me. To my partner, Clare Naliaka and my baby Esther Mlale this is our achievement.

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ABBREVIATIONS AND ACRONYMS

CAF:	Confederation of African Football
FIBA:	International Basketball Federation
FIFA:	Federation of International Football Associations
KBF:	Kenya Basketball Federation
KBRA:	Kenya Basketball Referees Association
KSSSA:	Kenya Secondary Schools Sports Association
NACOSTI:	National Commission for Science, Technology and Innovation
NIKE:	An American athletic footwear and apparel corporation.
NISOA:	National Intercollegiate Soccer Officials Association
PACER:	Progressive Aerobic Cardiovascular Endurance Run
SPSS:	Statistical Package for Social Sciences

OPERATIONAL DEFINITION OF TERMS

Americas in FIBA	A continental Federation of FIBA responsible for the organization and governance of the major international basketball competitions in the continent American. It is divided into 4 regional zones – North America, Central America, South America and Caribbean.
Basketball	Refers to the game played by two teams consisting of five players each.
Basketball Play-off	Refers to extra matches played after regular season among the top eight teams to determine the final winner
Expert Referee	A person who has expertise in officiating a sport
FIBA Certified Instructors:	Refers to trained basketball referees' instructors commissioned to develop basketball referees in Africa.
Game Management	Refers to the interpersonal communication skills—both spoken and unspoken—that referees use to interact with players in a proper manner. It covers the umpire's demeanor, level of professionalism, communication skills, presence on the field, credibility, team officiating, awareness of the game, and common sense.

Match Analysis	Refers to the process of FIBA Instructors watching video footage of KBF premier league play offs to analyse the performance of the referees officiating the matches
Mechanics in Basketball	Refers to proper positioning and appropriate signalling while officiating basketball.
Novice Referee	A person who lacks expertise in officiating a sport.
Officiate	Refers to taking charge/management of a basketball game as guided by the rules.
Officiating Expertise in Basketball	Refers to the referee's knowledge, mechanics and physical fitness during the game of basketball.
Physical Fitness	Refers to cardiorespiratory endurance as assessed by the beep-test.
Primary Coverage Area	The main area of responsibility of a referee as guided by the 3PO principle.
Referee	Refers to the head official in the game of basketball who monitors the match to ensure the rules are adhered to by the players, team coaches, officials and spectators: and arbitrating on matters arising from the play.
Referees Performance	Refers to decision making and game management skills by the referee guided by his officiating expertise.
Season	The competition period in a basketball league that could last a duration of up to 10 months.

Series	The number of matches that teams play at different levels during the play-offs.
Sub- Regional Level in FIBA	FIBA Sub Zone
Technical Bench in Basketball	Sport support personnel in charge of a team in a competition, which include the team manager, the coach, the assistant coach among other officials.
Umpire	Refers to one or two officials in a basketball competition who work together with the crew chief to note the infractions in the games and call them out.
Years of Experience	Refers to the number of years a referee has been involved in officiating the KBF premier league play offs.
3PO Principle	Three Person Officiating guiding laws in a basketball game.

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ABSTRACT

All sports depend on officiating to make the competition fair and moving forward—that is, sports should always be moving toward the objective of crowning a victor. In high-performance sports, officials are essential because they maintain order and regulation in an intricate and frequently unpredictable sporting event. The official basketball rules and regulations that control interactions between the different elements of the basketball community are set out by the International Basketball Federation (FIBA) (FIBA 2023). The game of basketball is managed by a number of officials, key among them being referees and umpires. Several studies have investigated the performance of football and rugby referees in different jurisdictions. However, there is minimal information on the performance of basketball referees. The main objective of this study was to establish any link between the level of expertise in basketball officiating and the performance of the referees/umpires in Kenya Basketball Federation Premier League Play-Offs. The specific variables under investigation were: (i) knowledge and application of rules, (ii) mechanics of officiating and (iii) physical fitness during the 2022-2023 KBF Premier League Play-Offs season. The target population was 11 referees who officiated during the premier league play-offs level. Purposive sampling was used to select 11 referees officiating during the basketball play-offs. A questionnaire was used to collect data concerning knowledge of the game and application of rules; while the beep test was used to collect data that revealed their physical fitness. A recorded video was used to analyse the referees'/umpires' mechanics and game management skills. Version 20.0 of the Statistical Package for Social Sciences (SPSS) program was used to code and analyze the data. For categorical variables, descriptive statistics were used, and at a significance level of 0.05, Pearson's Correlation Coefficient was used to evaluate hypotheses. The outcomes showed significant correlation between the study's factors and the referees' performance: Knowledge of the rules and performance, $r = 0.86$, $p = 0.006$; Mechanics of officiating and performance, $r = 0.99$, $p = 0.000$ and Physical fitness and performance, $r = 0.80$, $p = 0.017$. It was therefore, recommended that KBF organizes more structured technical training programmes for the development of the referees, evaluate referees/umpires' performance, and incorporate mentorship programs to induct new officials to mitigate the deficiencies in match officiating noted in the study. The policy formulation by relevant bodies on recruitment and training of basketball referees in Kenya should ensure that there is gender parity not only in the management of the game but also among the referees officiating the game. The study also recommended further investigation on the relationship between age and experience of referees and their overall performance in the KBF premier league play-offs. Additionally, further studies of referees officiating during the regular season of the premier league and those at lower leagues may add valuable contribution to the literature on basketball officiating in Kenya.

CHAPTER ONE: INTRODUCTION

1.1 Background to the Study

The goal of officiating is to maintain fairness in athletic events and it is crucial in all sports. The "Oswald Tower Philosophy" outlines this concept". The philosophy states that the intent of the rules is to impose penalty on a player who through his illegal action has disadvantaged the opponent. Officiating is meant to keep the game fair and constantly progressing towards its goal of deciding the winner (Davies & Robert 2012). Officiating expertise encompasses knowledge of the rules and their application, mechanics and physical fitness levels of the referees, which result in good game management and decision-making skills.

In high-performance sports, officials are essential because they maintain order and discipline in an intricate and frequently unpredictable sporting event (O'Brien & Rynne 2020). A vital component of both team and individual sports are the referees. Enforcing the regulations is their main duty in order to maintain safety and competitive fairness (Hancock et al., 2021). A referee's ability to make accurate choices is regarded as one of their most crucial qualities since a referee's single decision can have a significant impact on the result (Raab et al., 2019)

The official basketball rules and regulations that control the interactions between the many members of the basketball community are set forth by the International Basketball Federation (FIBA), which was established in 1932 (FIBA, 2023). A number of officials, key among them being referees and umpires manage the game of basketball. A referee and an umpire may work as a two-man crew in FIBA-sanctioned games, or they may work as a three-man crew with one referee and two umpires. Nonetheless, when it comes to controlling every part of the game, both types of officials

have equal rights (FIBA, 2023). Referees are regarded as the game's integrity in basketball, and they judge every aspect of the game and render decisions in a split second. (Mendes et al., 2021).

In sports, a referee's expertise is traditionally indicated by the level at which they officiate, such as regional, national, or international events (Avugos et al., 2021). Additionally, a key distinction between novice and expert referees lies in their teamwork, which includes their ability to coordinate and position themselves effectively in relation to the event and to one another (Avugos et al., 2021; Samuel et al., 2020). The level of the referee's expertise is vital to the performance outcome in basketball games. As at 2017, there were only 139 FIBA Licenced Referees in Africa, compared to 263 referees in the Americas, 321 in Europe and 301 in Asia (FIBA, 2016). FIBA issues Referee Licenses every two years, with each license being valid for a two-year term as stipulated by the FIBA Internal Regulations. According to the FIBA (2021) Book 3, Chapter 7; these licenses are categorized into three types. Black and White Licenses are available to all genders, while Green Licenses are specifically for females. Holders of the Black License are qualified to officiate international matches at both junior and senior levels. To be eligible for a Black License, referees must have officiated regularly in top-level senior men's games within a national member federation for at least the two seasons preceding their application. Holders of a Green License are authorized to officiate various international matches, including all senior women's games, all junior men's and women's games, and all senior and junior preparatory or friendly international games at the sub-regional level. To qualify for a Green License, candidates must be women and must have regularly officiated at the highest level of senior women's games within a national member federation for at least the two seasons prior. White License holders can officiate international junior-level

games at the regional level, as well as all senior and junior games at the sub-regional level, including all senior and junior international preparatory or friendly matches. Additionally, female referees seeking a White License must have consistently officiated at the highest level of senior women's games within a national member federation for at least the two seasons prior. Similarly, male referees applying for a White License must have regularly officiated at the highest level of senior men's games within a national member federation for the preceding two seasons (FIBA (2020) Game Officials Licensing 2021-2023- Guidelines for National Member Federations).

FIBA allocates a specific number of Referee Licenses to each national member federation. This allocation allows federations to apply for a set number of Referee Licenses as designated. However, after evaluating the candidates, FIBA ultimately decides whether to grant a license and determines its category. The FIBA Internal Regulations outline the maximum number of Referee Licenses allocated based primarily on the following criteria: (i) the national member federation's position in the FIBA World Ranking, (ii) the category or group of FIBA members to which the federation belongs, (iii) the number of FIBA Referees nominated from the federation for FIBA National Team Competitions in the past two years, and (iv) the advancement of new international referees and the promotion of gender equality among FIBA referees.

Referees are ineligible to apply for a FIBA Referee License if they meet any of the following criteria: (i) they will be 50 years old before the start of the License Period; (ii) they are first-time candidates who will be 25 years old on or after the start of the License Period; (iii) they will be 35 years old before the start of the License Period; or (iv) they hold the position of president or secretary general of a national member

federation or are directly or indirectly involved in the nomination process for FIBA Referee candidates by a national member federation.

Candidate referees must successfully complete several assessments to qualify for a FIBA Referee License, including: the FIBA written test, the FIBA physical fitness test, a medical examination, and any additional tests specified by FIBA. Only results from official tests and examinations sanctioned by FIBA are considered valid for the FIBA Referee licensing process (FIBA Game Officials Licensing Period 2019-2021).

National member federations must provide FIBA with their evaluation of each candidate referee's performance in national competitions over the past twelve months. If there are multiple candidates, the federation must also submit a recommended ranking of the candidates. Additionally, federations must ensure that all required forms are completed, stamped, signed by their president or secretary general, and by the FIBA Referee National Instructor (if applicable), and sent to FIBA by March 31 of the licensing year. FIBA may implement an online administration system for managing candidate applications. Failure to meet these requirements could result in the rejection of all candidates from a national member federation or any specific candidate, as appropriate.

This white to black grading of a referee by FIBA is dependent on that referee's national basketball federation's ranking in the world. In 2023, the Kenya Basketball Federation (KBF) was ranked number 96 among the men's federations and 66 among the women's federations in the world (NIKE, 2023). Due to this low ranking, Kenya was allocated only four slots for international referees' licensing: 1 Green license, 1 Black license and 2 White license slots (KBF 2023).

1.2 Problem Statement

Basketball is one of the fast-passed ball games where transition from offense to defense is very fast (Klatt et al., 2021); one second you might be attacking the next second you are defending. A score can occur in a split of a second and a game can also be won or lost within seconds. (FIBA, 2023) In this dynamic situation a referee needs to keep track of any eventuality on the ball and off the ball. Where a referee's officiating expertise, which encompasses his knowledge and application of the rules, his mechanics and his fitness levels, is low many mistakes will go undetected which has direct impact on the outcome of the game. By September 2023, Kenya had only three FIBA certified international referees who were all men (FIBA) and they are the one whose expertise level in officiating meets international standards. The low number of FIBA certified referees communicates the challenges that KBF faces with regards to referee's development. KBF has meagre finances that do no prioritise regular training and refresher courses for its referees exposing the leagues to mixed referee standards which compromises the quality of officiating. As indicated by Obonyo (2013), low funding appears to be the root cause of Kenyan referees' challenges of inadequate training. Situations where referees failed to call open and glaring infractions in a game; players, technical benches and fans emotions flared causing distraction to game flow.

Due to the complexities of the sport, FIBA introduced three man officiating for all top leagues in member federations and all international basketball competitions. In Kenya three-man officiating has been in use for over 15 years. Over the years the understanding of three-man officiating has been growing in the KBF premier league matches. This notwithstanding referee expertise is a great determinant of successful or failure in match officiating. This study focuses on investigating the link between

basketball officiating expertise level and the performance of referees during the KBF premier league play-offs 2022-2023 season.

1.3 Justification

The performance of basketball referees encompasses knowledge of the rules and their application, mechanics and physical fitness levels, which result in good game management and decision-making skills. Existing literature affirm that expertise in officiating can only be achieved when the three aspects are integrated. Despite extensive recognition of the importance of expertise in officiating, there is minimal information showing the association between officiating expertise and referee performance, particularly in basketball. Most existing studies focus on officiating rugby and football. Therefore, the findings of this study would provide reliable information on the performance of basketball referees and provide guidelines for a deliberate structured referee-training programme that addresses the three aspects of officiating that affects the performance of referees.

Ultimately, the study is justified by its potential to support sports talent development programmes in Kenya in line with Competency Based Education (CBE) by creating a pool of well-trained sports officials. This aligns with Kenya's Vision 2030 that focuses on building the creative sector and sports to support the country's economy.

1.4 Research Questions

The study was guided by the following questions:

1 What is the level of referees' knowledge and application of the rules while officiating during the KBF premier league play-offs 2022-2023 season?

2 How does the referee's expertise affect ones mechanics when officiating the KBF premier league play-offs 2022-2023 season?

3 How does physical fitness affect the referee's performance when officiating the KBF premier league play-offs 2022-2023 season?

1.5 Hypotheses

This study sought to test the following null hypotheses:

H_{o1}: There is no significant correlation between referees' knowledge and application of the rules and their performance when officiating during the KBF premier league play-offs 2022-2023 season.

H_{o2}: There is no significant correlation between the referees' mechanics and their performance when officiating during the KBF premier league play-offs 2022-2023 season.

H_{o3}: There is no significant correlation between the physical fitness of the referees and their performance when officiating during the KBF play-offs 2022-2023 season.

1.6 Objectives of the Study

The specific objectives of this study were to determine the link between:

i. the referees' knowledge and application of the rules and their performance while officiating during the KBF premier league play-offs 2022-2023 season,
ii. the referees' mechanics and performance when officiating during the KBF premier league play-offs 2022-2023 season and
iii. the referees' physical fitness level and their performance when officiating during the KBF premier league play-offs 2022-2023 season.

1.7 Significance of the Study

In view of the paucity of basketball information in Kenya, It was expected that the results of this investigation would provide the Kenya Basketball Federation empirically derived status concerning the expertise level of basketball referees in Kenya, which encompasses their knowledge, and application of the rules, their mechanics and their fitness levels. Such knowledge could enable KBF formulate clearly informed structured training programmes that would ensure continuous recruitment and development of basketball referees in Kenya with clear focus on how to improve their knowledge and application of rules, mechanics and fitness levels for optimal performance in the KBF premier league. This, in turn, would raise Kenya's ranking on the continent entitling it to more slots for international officials.

The elevated ranking would benefit upcoming basketball referees, providing them easier access to FIBA referee licensing at the international level. Such enhanced status could also motivate corporate sponsorship of KBF enabling increased training of basketball referees in the country and an overall improvement in Kenya's national team's performance. This study will add to relevant literature in basketball and form a

basis for further studies concerning basketball officiating in Kenya, Africa and the world over.

1.8 Delimitation and Limitation of the Study

The study included 11 KBF basketball referees who officiated during the national premier league play off games in Nairobi City County. It focused specifically on the link between basketball officiating expertise level and the referees performance. The study concentrated on the three integral aspects of officiating expertise namely knowledge and application of the rules, mechanics and physical fitness.

Limitation of this study is based on the small number of referees officiating during the KBF premier league play offs in Nairobi County in 2022-2023 season who consented to the study. Additionally, only the top ranked referees officiate at this level. Due to their high officiating expertise level, they may not adequately reflect the expertise level of referees officiating the KBF lower leagues such as the county leagues.

1.9 Conceptual Framework

The Cornerstones Performance Model of Refereeing identifies four critical areas: (i) knowledge and application of the Law, (ii) contextual judgment, (iii) personality and management skills, and (iv) positioning, mechanics, and physical fitness. Focus group interviews have validated the model's effectiveness as an assessment and training tool, leading the Rugby Football Union to adopt it for referee development across England. Additionally, the model has been endorsed by other organizations, including the Rugby Football League, US Major League Soccer, and the National Association of Sports Officials (Avugos et al., 2021).

The conceptual framework demonstrates the relationships between the study's dependent and independent variables (Figure 1.1).

The independent variables such as the referee's physical fitness, their knowledge and application of the rules of the game could influence his/her mechanics and positioning during the KBF play-offs and their game management skills (Figure 1.1). Consequently, the referee's mechanics and positioning during the play-offs could influence their game management skills and consequently their overall performance during the KBF play-offs.

Conceptual Framework

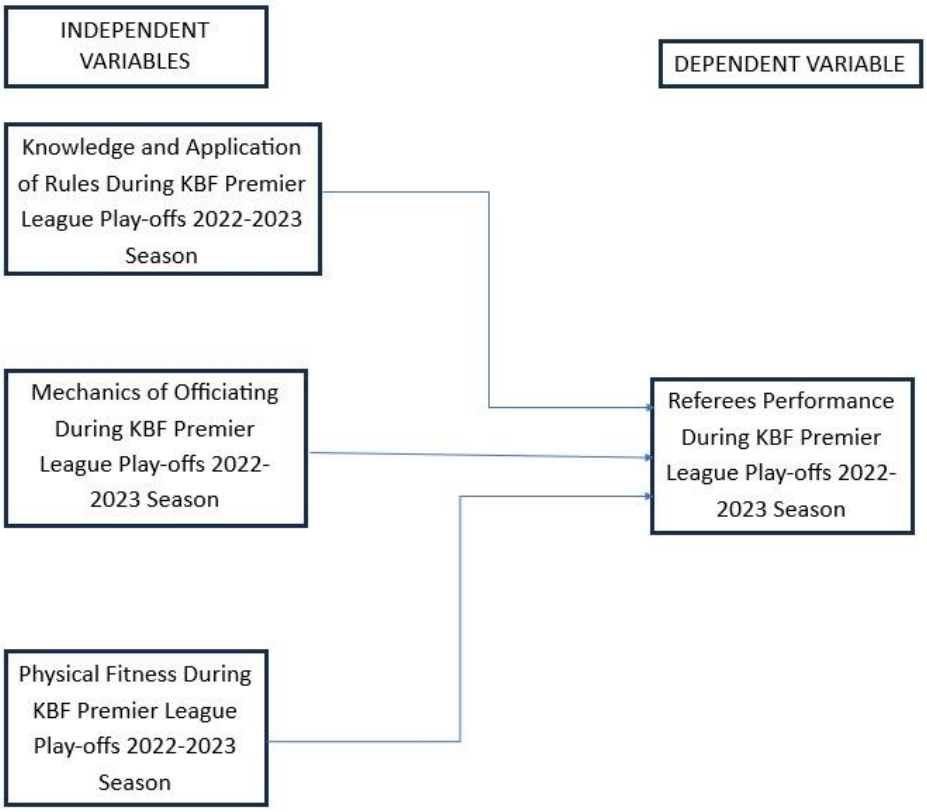

Figure 1.1 Conceptual Framework of the Interrelationships between the Independent and Dependent Variables Adapted from the Cornerstones Performance. Mascarenhas, Collins, & Mortimer (2005; Figure 1.1, (2005:371).

CHAPTER TWO: LITERATURE REVIEW

2.1 The Role of Referees in Sports

Referees, umpires, and other sports officials are crucial in organized sports, as they oversee games, enforce rules, and strive to ensure competitions are conducted safely. (Karaçam et al., 2023), every game has its rules and regulations that guide the operations as it is played; and basketball is no exception. The rules that are applied during the game are formulated by the technical committee of the game and adhered to by all participants. Referees are responsible for interpreting the rules of the game in a fair and firm manner; and also for regulating the play behavior of the participants (Guta, 2020).

The referees and umpires also signal participants and other officials when infractions occur (O'Brien & Rynne 2020). They regulate the play/competition and settle any claims of infractions or complaints from the participants (Samuel et al., 2020). Referee decision-making significantly impacts the flow of a game and the behavior of participants. Certain decisions may escalate tensions during a match, while others can help mitigate social conflicts and reduce misconduct among players (Devís-Devís et al., 2021). Thus, it is essential for referees to make precise decisions to maintain the integrity and fairness of the game.

The umpires, referees, and other sports officials are responsible for inspecting sports equipment, examining all participants, ensuring safety, judging performances in sports competitions to determine a winner and keeping track of event times such as starting or stopping play when necessary (Karafil & Akgül, 2021). These officials enforce the rules of the game and assess the penalties/rewards during the games. They also ensure that the rules of the game are observed and the game is enjoyable for all. Despite their

crucial influence on the outcome of the games, there is a dearth in literature concerning whether referees perform to the expectations or are left wanting (Avugos et al., 2021). By September 2023, Kenya had only three FIBA certified referees – the highest level of officiating expertise in basketball (FIBA, 2023) which meant even referees with low expertise level would be assigned to officiate the national premier league matches. This compromised the quality of officiating, which affected the performance of the national team in international competitions. This coupled with the paucity of information on any investigation into factors that could affect the basketball referees' performance in Kenya necessitated this study.

2.2 Referees' Knowledge and Application of the Game's Rules

Every sport has clear rules that must be adhered to during the game. These rules determine fouls or violations and the type of penalty that must be awarded (Avugos et al., 2021). It is the responsibility of the basketball referees to detect violations and determine the penalty (Klatt et al., 2021,). A referee's officiating performance is dependent on his/her knowledge of the rules of the game (Avugos et al., 2021). Referees need to have under-gone thorough training for officiating the games (Guta, 2020) was emphatic that the interpretation of the laws of the game demand people who have undergone intense technical training and who, over time have become well-versed in the rules, their interpretation and appropriate application. Additionally, research indicates that there is a positive significant relationship between basketball referee's physical fitness, game knowledge and decision-making and performance (Karaçam et al., 2019). (Guta, 2020) also reveals that there are several psychological, physiological and personal factors that influence a referee's performance.

The National Occupational Standards for Officiating in the United Kingdom (UK) require officials to have intensive and extensive knowledge of the rules/laws and ethics

of the game (O'Brien & Rynne, 2020). The official should be able to identify and access accurate information concerning the rules laws and ethics of the sport/activity study the rules and ethics; and integrate them in their work. The potential official is expected to participate in appropriate training sessions focusing on the interpretation and application of rules/laws and ethics, interpreting the laws/rules and ethics in line with the requirements of the official's national governing body. The official is also expected to review his/her own role and level, keep up-to-date with any changes in the rules/laws and ethics of the sport activity, their interpretations and application (O'Brien & Rynne, 2020).

Knowledge of the rules/laws of the game and their appropriate application could affect the referee's psychology to a large extent. Kenya is ranked quite low in performance in world basketball ranking (NIKE, 2023). This could be due to inadequate knowledge, inappropriate application of the laws of the games, physical and mechanical inability among referees in Kenya. Therefore, Basketball, with its complexity of rules/laws, is one of the most difficult sports to officiate (Klatt et al., 2021). Despite this, there is very little information regarding the referee's knowledge and application of the laws/rules of the game and their performance during KBF play-offs. The current study sought to bridge this information gap by examining referees' knowledge and their application of rules and mechanics during the KBF play-off in Nairobi.

2.3 Referees' Mechanics and Positioning while Officiating Games

Unique situations may occur rapidly during a highly contested game. The referee must be well-positioned for instantaneous observation and accurate interpretation of the situation without hesitation. As warned by the National Intercollegiate Soccer Association (Sobko et al., 2021) misapplication of any rule could lead to the conference, league or the association becoming involved in the outcome of the game. All officials,

including referees and umpires, must use proper mechanics when officiating a game. Proper mechanics include correct positioning and appropriate signalling. Officials need to be physically prepared to be in the best position possible to recognize fouls, misconducts and determine whether the ball is in or out of play. If an official is out of position, a subtle foul may go undetected escalating into future problems that could have a direct impact on the outcome of the game (Sobko et al., 2021). In professional basketball, three referees operate on the court simultaneously, working in unison according to the 3PO (Three-Person Officiating) principle. This approach involves the referees rotating their zones of responsibility as the ball and players move. Each referee assumes one of three positions: Lead, Center, or Trail, each responsible for a specific primary coverage area (Figure 2.1, left panel). Occasionally, functional coverage areas (Figure 2.1, right panel) overlap, which can result in double whistles, where two referees simultaneously make the same call (Sabag et al., 2023).

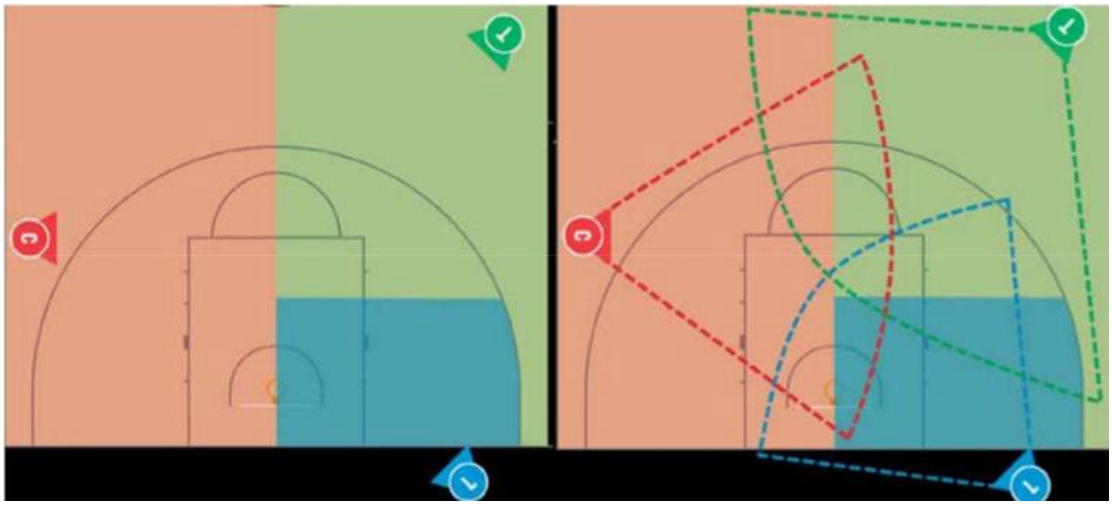

Figure 2.1 Primary Coverage Areas of the Lead, Centre and Trail Referees

Left Panel: Theoretical 3PO coverage, featuring the Lead (Blue), Center (Red), and Trail (Green) positions.

Right Panel: Real-time, functional court coverage, with the Lead (Blue), Center (Red), and Trail (Green) positions.

Mechanics affect basketball officiating in several ways: (a) whether referees maintain their designated areas of responsibility can impact the quality of their calls throughout the game; (b) the degree of overlap between referees' coverage areas can influence the accuracy of their decisions; and (c) the distance each referee is from the action within their designated area affects decision-making quality. Evaluating referees' actual positions and their proximity to the officiating situation, compared to the positions outlined by the 3PO principle, can help assess the accuracy of decision-making among basketball referees (Sabag et al., 2023).

Research regarding referee accuracy, as verified through use of technology, video-recorded matches, and assistant referees, has shown that wrong decisions by referees can be traced to simple reasons such as lack of speed or not being at the ‘optimum viewing angle’ (Hrusova & Hrusa, 2021) It is therefore, imperative for officials to use proper mechanics and be in the most appropriate position during the entire game to improve the overall quality of officiating and make the games more enjoyable for all (Avugos et al., 2021). A study among football officials found that there was no effect of distance from play or instantaneous velocity on decision-making accuracy during match (McEwan et al., 2024,). Unfortunately, such studies have been carried out among soccer referees in the western countries. However, none has been conducted among basketball referees especially in Kenya. Therefore, this study sought to establish whether basketball referees in Kenya observe optimum mechanical movement and positioning during basketball competitive games.

2.4 Physical Fitness Levels of Referees Officiating Games

Officiating any game places heavy physiological demands on the officials of any game including basketball. The officials must train and be in good physical condition to be able to cover the field for the entire game (Nevill et al., 2021). Certain human traits are crucial for exceptional performance in sports. These traits encompass physical fitness indicators such as speed, balance, agility, flexibility, neuromuscular coordination, and explosive power. (Parpa & Michaelides .,2022) Given that basketball is among the fast-moving games (Ferioli et al., 2020) , physical fitness is important for the referee to be able to run and keep up with the players and follow play. Referees are continuously required to be alert and near the scene of action during the match. As such, the referees' fitness must preclude fatigue from impairing their decision-making (Boullosa et al., 2020). Studies concerning football, recommend the involvement of referees in structured weekly training programmes with emphasis on intensive, intermittent training sessions (Avugos et al., 2021).

The fitness of elite referees is regarded as essential for effective officiating. Consequently, field testing has become a standard component of the selection criteria for referees, as established by both national and international officiating governing bodies. (Nabli et al., 2019). The Beep-test is one of the fitness tests used for evaluating individuals participating in sports such as athletes or basketball players (Inchauspe et al., 2020). The physical fitness test is designed to measure agility and endurance. A common assessment method for aerobic fitness is a running test over a set time or distance. These run tests are still popular, though a known limitation is the requirement of the participants to pace themselves well. Canadian sport scientist Luc Léger in the 1970s, the University of Montreal Track Test (Bok & Foster, 2021), developed a variation of a run test. This test was similar to a running test for distance, but was

progressive so that at regular intervals (every 2 minutes in this case) the running pace was increased. This test was the precursor to what we now call the beep test.

A new test evolved from the Track Test, the 20 meter shuttle run test, which maintained the progressive nature of the test, but modified it so it can be performed indoors and with much less space required. The test was first presented in its current format of 20-meter shuttles by Léger and his colleague Jean Lambert, though at first it was conducted with two-minute stages (Nevill et al., 2021).

Léger carried on refining and popularizing the shuttle run test throughout the 1980s. Subsequent studies examined the test's validity and reliability across a variety of sports and individuals across a wide age and fitness spectrum. The exam became popularly known as the "beep test," and it's easy to see where this moniker originated from: participants had to run between markers in sync with auditory "beeps." It's known as the 'bleep test' in the United Kingdom (UK) for some reason. Numerous other names for the exam exist as well, such as the multistage shuttle run test, PACER, and the wrongly sometimes-named yo-yo test.

It is the most widely used field test for cardiorespiratory fitness worldwide, and it has been adopted, modified, and renamed by researchers and test batteries all over the world. It is also the test of choice for aerobic testing in big athletic, educational, or occupational groups. International standards for the 20-meter shuttle run test were established by Tomkinson et al. (2017) through a thorough examination of numerous research and the use of data from 1,142,026 children and youth from 50 different nations.

A study assessing the physical fitness levels of soccer referees in relation to their officiating performance found that referees with higher physical fitness levels

performed better during games, regardless of their age or origin (Bouzas-Rico et al., 2021). Another study by Avugos et al. (2021) discovered that referees made accurate decisions on 64% of incidents during matches, but this accuracy was not significantly related to factors such as movement speed, heart rate, or cumulative distance covered. However, the study cautioned against interpreting these findings to suggest that decision-making and physical performance are independent. The complex interplay between these processes is influenced by various factors, including situational context, which should be studied comprehensively (Avugos et al., 2021).

Another study by Zhou et al., (2025) investigated the relationship between referees' physical fitness, their in game performance, and team dynamics in the Chinese Super League (CSL), the top football league in the Republic of China. The study found a significant positive correlation between the referees' performance and their physical fitness levels.

This study aims to address the knowledge gap regarding the impact of a referee's fitness level on decision-making accuracy during basketball matches, with a particular focus on Kenya.

2.5 Referees' Game Management Skills

Formal education in refereeing involves acquiring essential information and knowledge deemed necessary by experts for accreditation (Raab et al., 2020). The preferred teaching method for delivering education to coaches and referees is Sfard's (1998) acquisition learning metaphor. This approach involves presenters providing information to participants, who then apply this knowledge in practical, real-world settings (Raab et al., 2020). Additionally, learning through experience is recognized as equally important as formal educational programs (Passarelli et al., 2011).

Webb et al. (2021) explored factors contributing to football officiating excellence by examining the perceptions of English Premier League referees. The study focused on various aspects such as mental toughness, support networks, match preparation, and personal characteristics. The findings revealed that while many factors contribute to achieving excellence, mental toughness was identified by participants as particularly crucial for thriving in the demanding environment of football officiating.

There are many factors that could prompt a referee or umpire into making a wrong decision during a match. Evidence suggests that noise and comments from crowds, accuracy/error, regulations, opinion and concentration on the match greatly influence referee's decision-making during a soccer match (Samuel et al., 2020,). An experimental study conducted among referees using video footage of a match revealed Referees who officiated games with audible crowd noise made significantly fewer decisions against the home team compared to those who officiated in quieter settings. (Sors et al., 2020,) to those who watched without noise (Fischer & Haucap, 2021). Increased anxiety associated with crowd noise has also been associated with inconsistent decisions, usually in favour of the home team (Tilp & Thaller, 2020).

The goal and desire of any sports official is to be fair, impartial, and objective while making judgements (Sport New Zealand, 2017). Studies show that referees and officials are often vulnerable to anxiety, stress and burnout due to the critical roles they play (Avugos et al., 2021). Most officials face significant stressors, including maltreatment, spectator hostility, media criticism, anxious coaches, aggressive fans, dissatisfied players, the pressure to make accurate decisions, and inadequate financial support. (Avugos et al., 2021). A proficient official must manage the pressures of the game effectively and adapt to various factors, including the participants' age, skill level,

maturity, understanding of game protocols, strategic complexity, and the overall context of the game situation (Płoszaj et al., 2020).

Game management skills of a referee could help to reduce wrong or biased decisions during the match. These skills are the mental and physical aspects with which referees/ umpires approach each game they officiate. Key factors for an effective referee or umpire include their attitude, field presence, professionalism, communication skills, credibility, game awareness, fitness, team officiating, and common sense (Avugos et al., 2021). To be a competent official, maintaining a high level of consistency in decision-making is crucial. Research indicates that a referee's experience, age relative to the players, and exposure to different situations impact their psychological state during games, which in turn affects their performance (Guta, 2020). Developing adequate game management skills could therefore, help to reduce inaccuracies in the face of difficult situations and even help moderate the pressure of larger crowds as seen during late season basketball playoff between skilled competitors (Cunningham et al., 2022). The referees' game management skills in Kenya could therefore, be a factor influencing the performance of Kenya in the world basketball. However, few studies have been conducted on the relationship between game management skills of basketball referees and their performance during the highly competitive end of season matches in Kenya.

2.6 Summary of Literature Review

Several studies have been conducted concerning factors affecting the performance of officials during matches. Some studies have shown the importance of knowledge and application of the rules of the game and how it affects the referee's psychology. Others have focused on crowd factors causing increased anxiety among referees leading to inconsistent and inaccurate decisions. In addition, inability to be alert and near the scene

of action, lack of an optimal viewing angle, poor mechanics and positioning, all because of inadequate physical fitness, have been identified as determinants in the inaccuracy of decision making among referees. These studies were however, mostly conducted among referees/officials of other sports such as soccer/football and in foreign countries.

There exists an information gap concerning the effects of the referees' knowledge and application of rules, mechanics and positioning, physical fitness levels and game management skills on referees' performance in terms of accuracy in decision making during basketball matches, in Kenya.

CHAPTER THREE: MATERIALS AND METHODS

3.1 Research Design

This study utilized an analytical cross-sectional design. This design is appropriate because it can measure the cause and effect of a phenomenon at one point in time (Wang & Cheng, 2020). The phenomenon in this study is the link between basketball officiating expertise level and referees' performance. On officiating expertise levels, the study captured questionnaire data from the KBF premier league play-offs 2022-2023 season referees, the matches were video recorded and beep test conducted at Nyayo National Stadium Indoor Arena during the 2022-2023 season.

3.2 Research Variables

The basketball referee's level of expertise comprising his/her knowledge and application of the rules of the game, physical fitness, and mechanics of officiating skills constituted independent variables. The dependent variable in this study was the referee's performance in the Kenya Basketball Federation Premier League play-offs measured by their accuracy of decision-making during the games.

3.3 Location of Study

This study was carried out in Nairobi County. Nairobi is the capital and the largest city of Kenya. Nairobi County was selected because most of the KBF Premier League play-off games are played in this county. Hence, the place where most of the target respondents (referees/umpires) were to be found.

3.4 Study Population

The target population for this study comprised the 11 basketball referees / umpires in charge of officiating the KBF Premier League Play-offs in Nairobi City County as per the nomination from the Kenya Basketball Referees Association.

3.5 Sampling Techniques and Sample Size

The sampling technique used in the study was Census, which targeted all the referees that officiated the KBF premier league play offs in Nairobi. Of the 11 referees who officiated the KBF premier league play-offs in Nairobi, one referee did not consent to participate in the study, two referees were used during the pilot study hence did not feature in the main study. Consequently, the remaining eight consenting referees participated in the main study.

Table 3.1 Number of Matches Recorded for Analysis

LADIES	No. of matches at quarter finals	No. of matches at semi finals	No. of matches at finals
	8	6	4
MEN	No. of matches at quarter finals	No. of matches at semi finals	No. of matches at finals
	8	8	5

The recording of the number of matches shown in the table above was to ensure that each referee was observed officiating at least two matches in the KBF Premier league play-offs.

3.6 Data Collection Tools/Instruments

The instruments used for data collection included a questionnaire, observation checklist, beep test protocols and a video recorder.

3.7 Pilot Study

Pretesting data collection tools uncovers ambiguity, lack of clarity, or biases in question wording, which should be eliminated before administering to the intended sample (Bhattacherjee et al., 2012). The research tools were pretested using the remaining 10% (two referees) of the referees who met the study criteria but were not part of the main study

In August 2022, the researcher visited the Nyayo National Stadium basketball gymnasium for the pilot study. At this point, a meeting took place between the researcher and the assistants. Thereafter, the referees for inclusion in the pilot study were identified. A few days later, the researcher met the referees for the pilot study for a brief on the study and thereafter, the tools wre administered. In September, the researcher and the experts met and analysed the results of the pilot that were shared with the experts in the department. After further consultations, a few items that were deemed inconsistent with the objectives of the study were expunged from the tools. The tools were then validated by experts from the department**.** The detailed results of the pilot study are presented in Appendix E.

3.7.1 Validity

Validity refers to the accuracy of the data collection tool. This can be ascertained in various ways, among them is pretesting the tools. To ensure the validity of the tools in this study, the tools were piloted on a small number of participants before the main study. The content validity of the questionnaire was then quality assured by the experts from the department after expunging some parts of the questionnaire that were found to be inconsistent with the objectives of the study. The beep test protocol is globally used in assessing cardiorespiratory endurance and has been validated by previous studies (Salse – Batan et al.,2022)

3.7.2 Reliability

Reliability refers to consistency in the data collection tool. In this study, reliability was tested using Cronbach's Alpha which is a commonly measure of internal consistency. According to Nunnally & Bernstein (1994) Cronbach's alpha values above .70 are acceptable while values below .60 suggest inadequate reliability. In the pilot

study, the obtained coefficients ranged from moderate and insufficient internal consistency to strong and sufficient internal consistency. After the pilot study, in cases where alpha was less than .70 adjustments were done with the guidance of supervisors and experts from the department. The detailed results of the pilot study are presented in Appendix E.

3.8 Data Collection Techniques

Prior to the study, the researcher obtained a research permit from NACOSTI. Thereafter, the researcher visited the Kenya Basketball Federation Secretary General. Getting approval from the federation to carry out the study was the main goal of the visit. The researcher gave a brief explanation of the study's goals to the KBF Secretary General during the visit.

This then led to the collection of the study data during the premier league play offs from May 2023.The purpose of the study was explained to all potential participants. They were given opportunity to seek further information or clarification. They were assured that their participation was entirely voluntary, and each consenting signatory was at liberty to withdraw from participating in the study at any point without any repercussions or penalty

3.8.1 Questionnaire

A structured questionnaire (Appendix D) developed by the researcher was used to collect information on the referees' knowledge and application of the rules of basketball during KBF basketball play-offs. A questionnaire is a research instrument that gathers data over large sample (Mugenda & Mugenda, 2012). The questionnaire was administered directly by the researcher to the targeted respondents. It assessed the referees' Knowledge and Application of rules of Basketball. This was based on the

Likert Scale in which the referee rated the statement provided as Strongly Agree, Disagree, Neutral, Agree and Strongly Agree. It relied on the concept of self-assessment in appraising performance of individuals. Arrangements were made so that the questionnaire was administered and collected at the same time.

3.8.2 Observation Checklist

An observation checklist (Appendix B) designed by the researcher was used to capture the referees' mechanics and positioning during the basketball play offs as well as their game management skills. This observation data was captured by video recording the matches and scoring the proceedings based on the observation checklist. Measuring referee performance is quite difficult and complex and thus, the evaluation of a referee's performance was carried out by the experts. Spencer, (2015) documented that in order to determine referee performance, you need experts to do the evaluation and know the variables affecting their performance.

3.8.3 Beep Test Recording Sheet.

The physical fitness level of each referee was captured using the Beep test recording sheet. The beep test is a running test used to estimate an individual's aerobic capacity as described by Luc Leger in 1982 (Council of Europe, 1983). The test required participants to run back and forth between two points 20 meters apart, in sync with a pre-recorded audio track that emitted beeps at regular intervals. As the test progressed, participants advanced through different levels, with the beeps becoming faster at each level. The test concludes when a participant fails to reach the line for two consecutive beeps, and this point is recorded as the participant's final score. The last level completed was recorded on the beep test recording sheet (Appendix C) as the participant's fitness score.

The cut-offs that were used for the physical fitness test are shown in Table 3.2 (adopted from the standard Australian beep test version for adults (2021).

Table 3.2 Adult Physical Fitness Level (cut-offs) Based on the Beep Test Scores

Level	**Men**	**Women**
Excellent	> 13	> 12
Very Good	11 – 13	10 – 12
Good	9 – 11	8 – 10
Average	7 – 9	6 – 8
Poor	5 – 7	4 – 6
Very Poor	< 5	< 4

Source: https://www.topendsports.com

3.8.4 Video Recorder

Video capture aid identification of violations and infractions in an intense activity because of the ability to regulate the speed of replay (MacMahon et al., 2007). Standard video tools (Sony NX 100 Model Video Recorder) was were used in recording the KBF national league games at Nyayo Stadium. This equipment captured the entire game proceedings that were downloaded and processed on the researcher's laptop computer.

3.9 Data Analysis

Data analysis was subdivided into three distinct sections: match analysis, descriptive analysis and inferential analysis. Both descriptive analysis and inferential analysis were done using Statistical Package for Social Sciences (SPSS) Software version 20.

3.9.1 Match Analysis

Two research assistants recorded the basketball play-offs. Subsequently, two FIBA certified instructors (nominated by KBF- Appendix J) watched the video footage to

analyse the performance of the referees during the matches. Indices such as proper/dynamic positioning, clarity of signals given and accuracy of decisions made have been cited as important indicators of referee's performance. Each of the two instructors independently assigned scores to each item as per the observations made on each referee. The scores were then compared to determine the extent of agreement between the two instructors. Each referee was observed officiating in at least two matches.

The FIBA instructors tabulated the referees' mechanics and positioning during the basketball play offs and their game management skills from the recorded videos and gave a score which represent the referees mechanics.. The rating was based on a 3-point scale as follows:

Good- where the respondent was correct in 80 -100% of all the calls made.

Average- where the respondent was correct in 70 – 79% of all the calls made.

Poor: where the respondent was only correct in 60 – 69% of all the calls made.

3.9.2 Descriptive Analysis

Descriptive analysis comprise of frequencies and percentages that were presented in tables, figures and charts.

3.9.3 Inferential statistics

For the three objectives of this study correlation was done to establish relationships of the dependent and independent variables. Specifically, in objective one it the correlation between knowledge, application of the rules and referee performance. For objectives

two it was mechanics and referee performance while for objective three it was physical fitness level and referee performance.

3.10 Logistical and Ethical Considerations

The Kenyatta University Graduate School granted permission to perform this study(APPENDIX F), the National Council of Science and Technology Institute granted a permit (APPENDIX H), and the Kenyatta University Ethical Review Committee granted ethical clearance (APPENDIX G). The study was disclosed to KBF prior to its commencement and approval to conduct the study granted (APPENDIX I). Before any data was collected, the participants consented by signing the informed consent (APPENDIX A). This was accompanied by an explanation on the objectives of the research and the fact that participation would be voluntary. All participants were assured that the data collected would be handled with confidentiality and used for academic purposes only.

CHAPTER FOUR: RESULTS

4.1 Introduction

This chapter presents the results of the analysis of the data generated from the study. The study sought to examine the relationship between basketball officiating expertise level and performance of basketball referees during the Kenya Basketball Federation Premier League Play-Offs 2022-2023 Season.

The independent variables in this study were knowledge and application of the rules, mechanics of officiating and physical fitness of the referees officiating during KBF Premier League Play Offs. The dependent variable in the study was referees performance during KBF Premier League Play Offs while the intervening variable was decision-making and game management during KBF Premier League Play Offs.

The study distributed nine questionnaires to the participating referees who constituted the sample. Of the nine referees who received the questionnaire, eight referees (88.9%) completed the questionnaire. The results of this analysis are presented in the sections that follow.

Certain research issues were addressed using descriptive statistical techniques, and research hypotheses were tested using statistical tools as outlined in chapter 3. This chapter presents the data analysis and interpretation of the study findings. SPSS Version 20.0 was used for data analysis, and tables and figures arranged in accordance with the goals of the study were used to present the results. The Pearson's Correlation Coefficient was used to evaluate the hypotheses at the 0.05 significance level.

4.2 Demographic Information

The study, titled "Link Between Basketball Officiating Expertise Level and the Referees' Performance During Kenya Basketball Federation Premier League Play-Offs 2022-2023 Season," included the entire population of eight basketball referees who officiated the Kenya Basketball Federation (KBF) Premier League play-offs in Nairobi County during the 2022-2023 season. The demographic characteristics of these referees, including age, gender, weight, height, and years of experience, are summarized below based on the data collected through questionnaires.

4.2.1 Age Distribution

The age distribution of the referees, as presented in Table 4.1, shows a diverse spread across various age groups. Two referees (25.0%) were aged between 26–30 years, two (25.0%) were aged between 31–35 years, and one referee each (12.5%) fell into the 36–40 years, 41–45 years, 46–50 years, and above 50 years age groups.

Table 4.1 Age Distribution of Respondents

Age Group	Frequency	Percent (%)
26–30 Years	2	25.0
31–35 Years	2	25.0
36–40 Years	1	12.5
41–45 Years	1	12.5
46–50 Years	1	12.5
Above 50 Years	1	12.5
Total	**8**	**100.0**

4.2.2 Gender Distribution

As shown in Table 4.2, all eight referees in the population were male, representing 100.0% of the respondents.

Table 4.2 Gender Distribution of Respondents

Gender	Frequency	Percent (%)
Male	8	100.0

4.2.3 Weight Distribution

The weight distribution of the referees, presented in Table 4.3, shows an even spread across four weight ranges. Each range (60–70 kg, 71–80 kg, 81–90 kg, and 91–100 kg) included two referees, accounting for 25.0% of the population each.

Table 4.3 Weight Distribution of Respondents

Weight Range	Frequency	Percent (%)
60–70 KGS	2	25.0
71–80 KGS	2	25.0
81–90 KGS	2	25.0
91–100 KGS	2	25.0
Total	**8**	**100.0**

4.2.4 Height Distribution

The height of the referees, as shown in Table 4.4, varied across six different measurements. Two referees (25.0%) were 170 cm tall, two (25.0%) were 183 cm, and one referee each (12.5%) measured 173 cm, 174 cm, 177 cm, and 190 cm.

Table 4.4 Height Distribution of Respondents

Height (cm)	**Frequency**	**Percent (%)**
170	2	25.0
173	1	12.5
174	1	12.5
177	1	12.5
183	2	25.0
190	1	12.5
Total	**8**	**100.0**

4.2.5 Referees' Experience in Years

The study sought to collate the range of experience among the participating referees. The results are tabulated in Table 4.5 below

Table 4.5 Distribution of Referees Experience in Years

Experience Range	**Frequency**	**Percentage**
4-8 Years	2	25 %
9-13 Years	3	37.5%
14 - 19 Years	1	12.5 %
20-24 Years	1	12.5 %
30 and above	1	12.5 %
Cumulative		**100.0 %**

Table 4.5 depicts the distribution of referees' experience in years categorized into five intervals. Majority of the referees, accounting for 37.5% (3) of the referees had between 9 – 13 years' experience. The ranges between 14 – 19 years and between 20 – 24 years each had 12.5 % (1) of the participating referees. Similarly, participating referees with30 years and above experience formed 12.5% (1). This implied that majority of the referees had the required experience as referees.

4.3 Referees' Knowledge and Application of the Rules and Performance

The study sought to explore the participating referees' self-knowledge of the rules and performance. The assessment was conducted during the Kenya Basketball Federation Premier League Play-Offs 2022- 2023 Season.

Table 4.6 Ratings of the Participating Referees Knowledge and Application of the Rules

Survey Item	Rating				
	1 Strongly Disagree	**2 Disagree**	**3 Neutral**	**4 Agree**	**5 Strongly Agree**
Referees have adequate knowledge on the rules of the game	0% (0)	0% (0)	0% (0)	62.5% (5)	37.5% (3)
The referees always apply the rules of the game correctly	0% (0)	0% (0)	12.5% (1)	37.5% (3)	50% (4)
Referees adhere to all rules of the game	0% (0)	0% (0)	12.5% (1)	37.5% (3)	50% (4)
The referees recognize persistent offenders and act	0% (0)	0% (0)	12.5% (1)	62.5% (5)	25% (2)
Pre and postgame procedures are normally followed	0% (0)	25% (2)	25% (2)	25% (2)	25% (2)
The referees able to determine if the ball is in or out of play	0% (0)	0% (0)	0% (0)	25% (2)	75% (6)
Referees manage substitutions according laws of the game	0% (0)	0% (0)	0% (0)	37.5% (3)	62.5% (5)
It's difficult to correctly interpret and apply rules of the game	12.5% (1)	25% (2)	12.5% (1)	25% (2)	25% (2)
Knowledge of rules and application leads to better officiating	0% (0)	0% (0)	0% (0)	0% (0)	100% (8)

Table 4.6 above presents ratings based on perceptions regarding referees' knowledge and application of rules when officiating Kenya Basketball Federation Premier League Play-Offs 2022-2023 Season matches. While there was indication of consensus at 62.5% (5) that the participating referees possess adequate knowledge of the game's rules, there was some uncertainty at 37.5% (3) among respondents.

There was a split opinion regarding application of the rules. Half of the respondents agreed that referees consistently apply the rules correctly, while the other half were

either undecided or disagreed. Similarly, there was a 50-50 split regarding referees' adherence to all game rules.

The 62.5% (5) of the respondents constituting a majority, acknowledged that they were capable of recognizing persistent offenders. However, a notable 25% (2) expressed disagreement on this matter. Respondents were divided with regard to procedural aspects. Only 25 % (2) agreed that pre- and postgame procedures are usually followed, while the remaining 75% (6) expressed varying degrees of disagreement or uncertainty. This confirmed that no all referees adhere to the procedures of the basketball game.

During the game, majority 75% (6) of the participating referees were able to determine whether the ball was in or out of play. Thus suggesting confidence in this specific aspect of officiating. Furthermore, 62.5% (5) provided strong consensus that referees managed substitutions according to the rules of the game. However, there were mixed opinions regarding the difficulty of interpreting and applying rules, with no clear majority viewpoint. There was unanimous agreement that a strong knowledge of rules and their application led to better officiating.

4.3.1 The Relationship between Referees' Knowledge and Application of the Rules and their Performance

To determine whether there was a meaningful correlation between rule understanding and application and referee performance, a Pearson's Correlation Coefficient was computed. The results in Table 4.3 confirm that there was a very strong, positive correlation between the two variables, $r(6) = 0.861, p = 0.006$ indicating that increased rule understanding and application was associated with higher referee performance.

Table 4.7 Pearson's Correlation Coefficient Test Results on Referees Knowledge and Application of the Rules and Performance

	Value	Approx. T	Approx. Sig.
Pearson's R	0.861	4.143	.006[c]

The test statistic of t = 4.143; p = 0.000 confirms a highly statistically significant correlation between rule understanding and application and referee performance.

Referees Knowledge and Application of the Rules and Performance

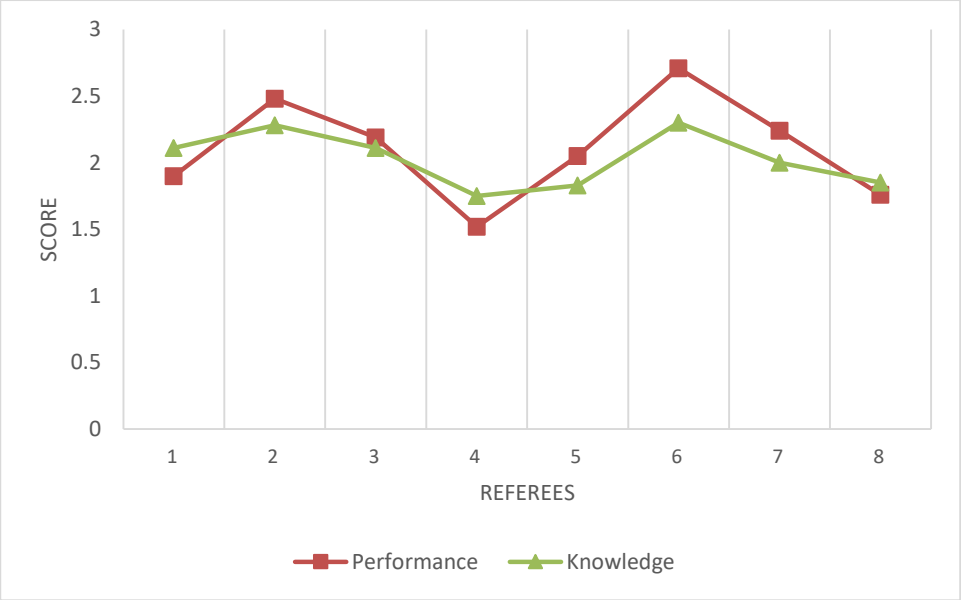

Figure 4.1 Relationship between Referee Knowledge of the Rules and Performance

Figure 4.1 shows the correlation between referees having adequate knowledge of the rules of the game and their performance. The two line graphs show a direct correlation between the referees' knowledge of the rules and their practical application when officiating: as is evident from the Figure 4.1 that when knowledge is low, the performance outcome is equally low. Similarly, when knowledge is high, performance is equally high. Therefore, the null hypothesis; there is no significant correlation

between referees' knowledge and application of the rules and their performance was rejected.

4.4 Referees Mechanics Analysis Based on Recorded Videos

Referee mechanics were assessed by analysing video recordings of Kenya Basketball Federation Premier League Play-Offs Season matches. The videos were analysed against a checklist of expected standards of officiating basketball. The findings from this observational analysis are detailed in Table 4.8 below.

Table 4.8 Referees Mechanics of Officiating and Performance

Category	Poor	Average	Good
Proper and timely entry to the court		100.0 % (8)	
Adherence to pre-game procedures		100.0% (8)	
Proper/dynamic positioning during the play-offs	62.5% (5)	12.5% (1)	25.0% (2)
Maintenance of good posture during the play-offs	37.5% (3)	50.0% (4)	12.5% (1)
Proper use of hand signals during the play-offs	12.5% (1)	25.0% (2)	62.5% (5)
Proper use of verbal reporting during the play-offs	50.0% (4)	12.5% (1)	37.5% (3)
Clarity of signals given	12.5% (1)		87.5% (7)
Timely whistling		75.0% (6)	25.0% (2)
Accurate detection of violations/ fouls	25.0 % (2)	75.0% (6)	
Fast decision making during the play-offs	25.0% (2)	62.5% (5)	12.5% (1)
Decisiveness during the play-offs	25.0% (2)	12.5% (1)	62.5% (5)
Appropriate mobility during the play-offs	25.0% (2)	62.5% (5)1	12.5% (1)
Having agility and balance during the game	50.0% (4)	37.5% (3)	12.5% (1)
The referee's stamina was adequate for the game	25.0% (2)	12.5% (1)	62.5% (5)
Focus/control under pressure during the play-offs	25.0% (2)	25.0% (2)	50.0% (4)
Proper and timely whistling of any problems with fouls/scores	25.0% (2)	12.5% (1)	62.5% (5)
Timely communication before each quarter ends		62.5% (5)	37.5% (3)
Ensuring proper work ethics with other officials	37.5% (3)	37.5% (3)	25.0% (2)
Maintaining professionalism during the play-offs		25.0% (2)	75.0% (6)
Displaying confidence as a referee	25.0% (2)	25.0% (2)	50.0% (4)
Determining and dealing appropriately with persistent misconduct	12.5% (1)	37.5% (3)	50.0% (4)

4.4.1 Relationship between Referees' Mechanics and Performance

The referees' mechanics was subjected to further test to ascertain any significant relationship between mechanics and performance. A Pearson's Correlation Coefficient was computed. The results in Table 4.9 confirm that there was a very strong, positive correlation between the two variables, r(6) =0.999,p = 0.000 indicating that proper referee mechanics was associated with higher referee performance.

Table 4.9 Pearson's Correlation Coefficient Results on Referees Mechanics and Performance

	Value	Approx. T	Approx. Sig.
Pearson's R	0.999	45.593	.000

The test statistic of t = 45.593; p = 0.000 confirms a highly statistically significant correlation between officiating mechanics and referee performance.

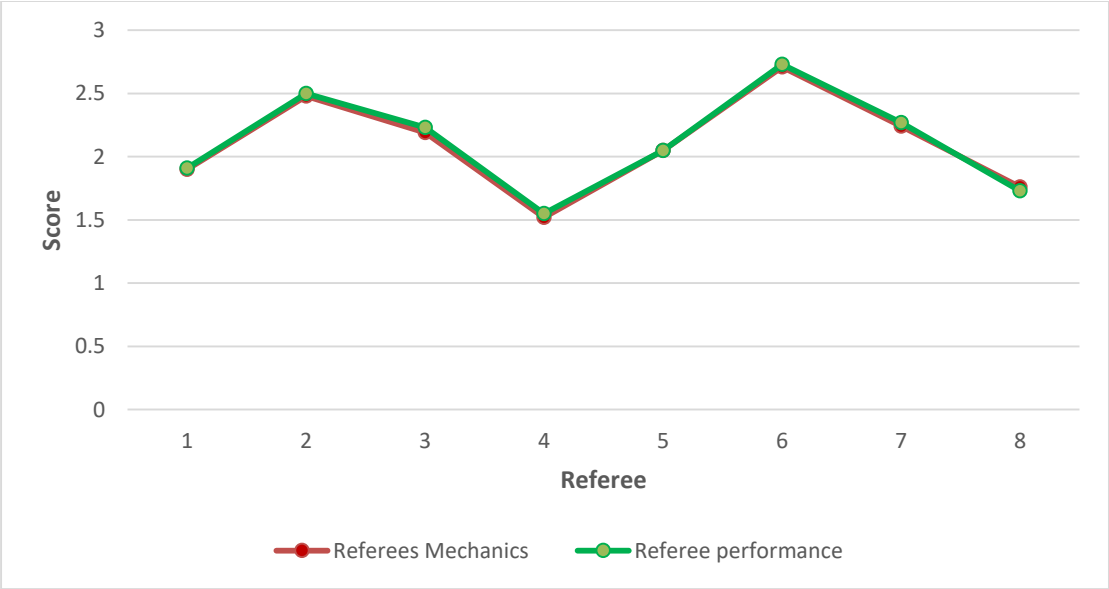

Figure 4.2 Relationship between Referees Mechanics and Performance

The Figure 4.9 above shows the relationship between the referees mechanics and their performance. The two line graphs presented a direct correlation between the referees' mechanics and their performance. When the referees' mechanics was high, the performance was also high. Likewise, when the referees' mechanics was low, the performance was also low. Therefore, the null hypothesis; there is no significant correlation between the referees' mechanics and their performance was rejected.

4.5 Referees Physical Fitness Assessed using Beep Test

The physical fitness of the referees was assessed using the beep test and recorded on the beep test recording sheet. The physical fitness results are presented in Figure 4.3

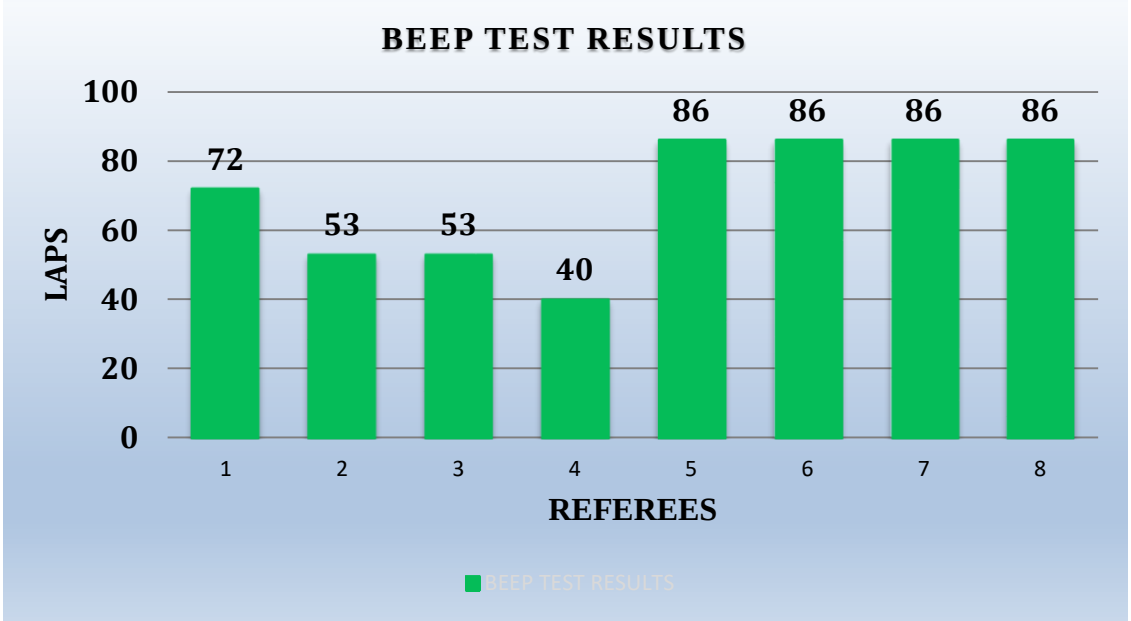

Figure 4.3 Referees' Beep Test Results

This analysis examined the beep test results of eight referees. The results reveal an interesting trend amongst referees 5, 6, 7, and 8. All four referees achieved the expected score of 86, suggesting comparable cardiorespiratory endurance. This implies they possess the requisite capacity to maintain the required pace and endurance throughout the game.

In contrast, referee 1 reached level 72, indicating a respectable level of endurance but falling short of the expected levels of endurance. Referees 2 and 3 finished at level 53, demonstrating a similar level of cardiorespiratory endurance to each other, but lower than the expected. Finally, referee 4 achieved a score of 40, suggesting a lower level of endurance compared to the other referees. This implies that the referee may not have the capacity to maintain the required pace and endurance throughout the game and needs a fitness programme to arrive at the expected level of fitness for optimal performance. The same applies to referee 1, 2 and 3.

4.5.1 The Relationship between Referees' Physical Fitness and their Performance

The referees' physical fitness was subjected to further test to ascertain any significant relationship between referees' physical fitness and referee performance. A Pearson's Correlation Coefficient was computed. The results in Table 4.6 confirm that there was a very strong, positive correlation between the two variables, $r(6) = 0.801, p = 0.017$ indicating that increased referees' physical fitness was associated with higher referee performance.

Table 4.10 Pearson's Correlation Coefficient Test Results on Referees Physical Fitness and Performance

	Value	**Approx. T**	**Approx. Sig.**
Pearson's R	0.801	3.276	0.017

The test statistic of $t = 3.276$; $p = 0.017$ confirms a statistically significant correlation between referees' physical fitness and referee performance.

Table 4.10 indicates the correlation coefficient test results as 0.80 implying that as one variable increased, the other variable also increased.

Relationship between Referees Physical Fitness and Performance

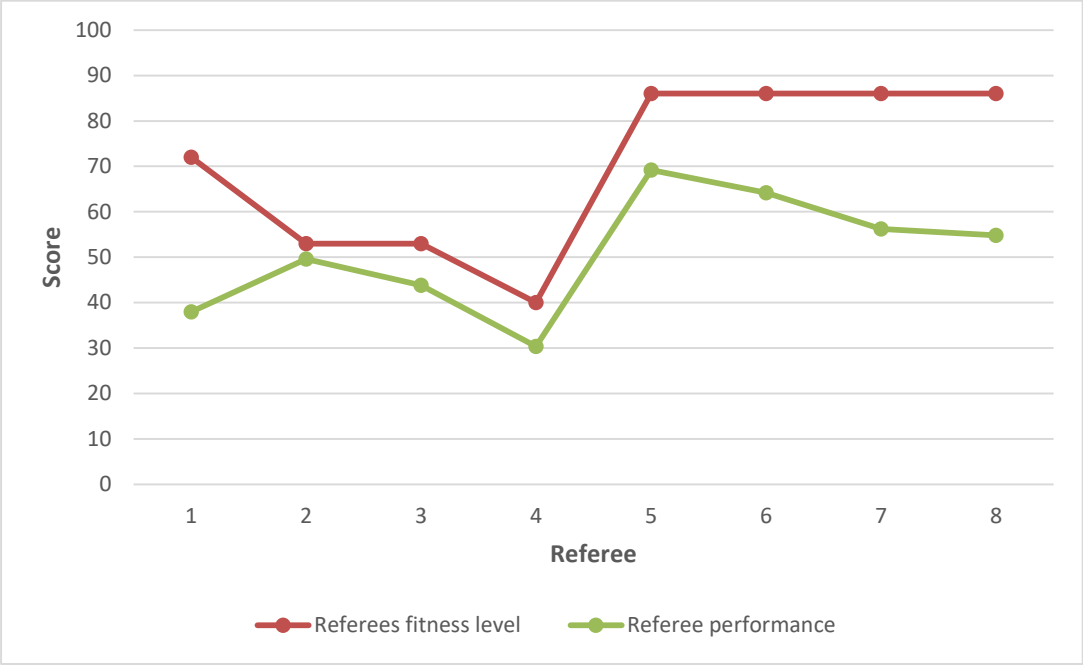

Figure 4.4 Relationship between Referee Fitness and their Performance

Figure 4.4 above shows the relationship between the referees' physical fitness and their performance. The two line graphs show a direct correlation between the referees' physical fitness and their performance. This implies that when the referees' physical fitness is high, the performance is also high. Similarly, when the referees' physical fitness is low, the performance is also low. As a result, the null hypothesis; there is no significant correlation between the physical fitness of the referees and their performance was rejected.

CHAPTER FIVE: DISCUSSION, CONCLUSIONS AND RECOMMENDATION

5.1 Discussion

The study sought to explore the link between basketball referees' officiating performance and their expertise level during the Kenya Basketball Federation Premier League Play-Offs Season. Specifically, the research aimed to ascertain the relationship between (i) the referees' knowledge and application of the rules and performance, (ii) the referees' mechanics and performance, (iii) the referee physical fitness level and performance when officiating during the Kenya Basketball federation premier league play-offs 2022-2023 season.

5.1.1 Referees' Knowledge and Application of the Rules and their Performance

The Pearson's Correlation Coefficient was calculated to determine if the referees knowledge and the application of the rules and their performance were related.

From the current study results on the link between basketball officiating expertise level and the referees performance during KBF premier league play offs 2022 – 2023 season, r = 0.86 0.65, p = 0.006 0.081, it was clear that there was a positive relationship between referees knowledge of the rules and their performance. The correlation coefficient indicates a clear tendency for referees with better knowledge and application of the rules to perform better. Additionally, with a p value of 0.006 it is clear that there is a linear relationship between the two variables. This suggests a significant relationship between referees' knowledge of the rules and their performance. In other words, the data suggests that referees who have a higher level of knowledge on the rules of the game tend to have better performance; likewise, referees who have lower level of knowledge on the rules of the game tend to have lower performance. Therefore, the

null hypothesis; there is no significant correlation between referees' knowledge and application of the rules and their performance was rejected.

An examination of referee performance during the Kenya Basketball Federation Premier League Play-Offs 2022-2023 Season, as assessed through a self-appraisal form, revealed varying levels of referees' knowledge of the rules of the game. Majority of the referees had adequate knowledge of the game's rules. In addition, half of the respondents agreed that referees consistently apply the rules correctly. There were mixed signals regarding the difficulty of interpreting and applying rules, with no clear majority. There was unanimous agreement that a strong knowledge of rules and their application resulted in better officiating thereby raising the standards of the game of basketball.

The findings of this study agree with the National Occupational Standards for Officiating in the United Kingdom (UK) that require officials to have intensive and extensive knowledge of the rules/laws and ethics of the game (Sports Officials UK Ltd, 2011). It provides benchmarks for officials and guidance for training and development. Similarly, the findings of this study also agrees with Avugos et al,. (2021) who stated that a referee's officiating performance is dependent on his/her knowledge of the rules of the game. This supports the rationale for expertise in referees for good officiating. The study highlights the importance of experience and expertise in explaining individual variations in officiating. In FIBA Referees Manual, this has been labelled Individual Officiating Technique (IOT).

Additionally, Guta, 2020 was emphatic that the interpretation of the laws of the game demand people who have undergone intense technical training and who, over time have become well-versed in the rules, their interpretation and appropriate application. The

fact that the current study did not find a strong relationship between referees knowledge and application of the rules and their performance could be attributed to chance, and other factors like experience and decision-making skills which may play a significant role in the performance of referees.

5.1.2 Referees' Mechanics and Performance

Pearson's Correlation Coefficient was computed to establish whether there was a relationship between the Referees' Mechanics and the referees' actual performance. From the results it is clear that there is strong evidence against the null hypothesis of independence between Referees' Mechanics and Performance Level, $r = 0.99$, $p = 0.000$. In other words, there is a significant association between these two variables. Hence, the null hypothesis; there is no significant correlation between the referees mechanics and their performance was rejected.

The findings of this study that proper mechanics of officiating leads to optimal performance of the referee agrees with those of Avugos et al., (2021), whose earlier study affirmed that officials needed to use proper mechanics and be in the most appropriate position during the entire game to improve the overall quality of officiating and make the games more enjoyable for all.

This is also echoed by Sabag et al., (2023) who stated that evaluating referees actual positions and their proximity to the officiating situation, compared to the positions outlined by the 3PO principle, can help assess the accuracy of decision-making among basketball referees.

An examination of referees' performance during the Kenya Basketball Federation Premier League Play-Offs Season, as assessed through video recordings of game play, revealed a mixed performance across various categories of officiating skills. A majority

of referees were observed to adhere to proper and timely entry to the court, and pre-game procedures. However, proper/dynamic positioning during the play-offs was only observed in minority of the referees. Maintaining good posture during the play-offs was also a challenge for a majority of the referees.

Majority of the referees used clear signals especially the hand signals together with clear verbal reporting while officiating. Timely whistling was also a strength among majority of the referees making calls at the expected times.

Detecting violations and fouls was a weakness among the referees, with just a minority being rated as good, while majority of them were rated as average. Similarly both, fast decision-making and accurate decision-making during the play-offs, were weaknesses, with only a minority of referees being rated as good in each category. Referees' physical attribute of cardiorespiratory function appeared adequate, with majority rated as good for appropriate mobility during play-offs as well as having sufficient stamina for the play offs.

Mental aspects of officiating showed some variation. Focus and control under pressure was rated as good for only half of the referees. Maintaining professionalism was a strength with majority of the referees being rated as good. Displaying confidence was rated as good for half of the referees as was their ability of dealing with persistent misconduct. Indeed, observing actual positions of the referees and their distance from the given officiating situation in comparison to their position derived from the 3PO principle could assist in evaluating better the decision-making accuracy among basketball referees (Sabag, et al., 2023)

From the study, it is evident that referees with good mechanics were more successful in officiating the game of basketball. The findings of the current study agree with an

earlier study Sobko et al,. (2021) affirms that when an official is out of position, he may not be able to detect a subtle foul thereby escalating into future problems that could have direct impact on the outcome of the game. Additionally, Hrusova &Hrusa (2021) affirm that wrong decisions by referees can be traced to simple reasons such as lack of speed or not being at the optimum viewing angle.

On the other hand, the findings of the current study differ with s study carried out among football referees (McEwan et al., 2024) which found that there was no effect of distance from play or instantaneous velocity on decision-making accuracy during matches.

In conclusion, the results suggest that there is room for improvement in several areas of officiating in Kenya. This is particularly so in aspects of positioning, decision-making, and detecting fouls/violations, all of which will go a long way towards improving the performance of the referees.

5.1.3 Referees Physical Fitness

Pearson's Correlation Coefficient was computed to establish any relationship between the referees' physical fitness and their performance. Findings of the current study revealed referees physical fitness was an integral part in the performance of the referees. From the results, it was clear that at $r = 0.80$, $p = 0.017$, there was a strong positive relationship between the referees physical fitness and their performance. The test statistic ($t= 3.265$) reinforces this relationship. Data from the study showed that the referees who met the requisite physical fitness as measured by the beep test, also performed better in officiating. Consequently, the hypotheses; there is no significant correlation between referees physical fitness and their performance was rejected. .

The findings of this study agree with those of Boullosa et al., (2020) an earlier study that emphasized referees' fitness level as a precursor to proper decision making during officiating since fatigue has been proven to interfere with decision making.

Likewise, the current study also agrees with that of Zhou et al., (2025) that investigated the relationship between referees' physical fitness, their in game performance, and team dynamics in the Chinese Super League. The study found a significant positive correlation between the referees' performance and their physical fitness levels. Indeed, for successful officiating at both national and international level, the fitness of the elite referees is considered key (Nabli et al., 2019).

The current study findings also agree with Karaçam et al,. (2019) who examined the relationship between referee performance and self-efficacy. The study found a positive significant relationship between basketball referee's physical fitness, game knowledge and decision-making and their performance.

Interestingly, research regarding accuracy in football refereeing, as verified through use of technology, video recorded matches, and assistant referees, indicates that wrong decisions by referees can be attributed to simple reasons such as lack of speed or not being at the 'optimum viewing angle' (Hrusova & Hrusa 2021). This stresses the importance of physical fitness for the referee to make the correct judgement when officiating.

Additionally, another study concerning football, recommended the involvement of referees in structured weekly training programmes with emphasis on intensive intermittent training sessions (Avugos et al., 2021). That study was emphatic that referees have requisite physical fitness expected when officiating football matches. This could definitely apply to officiating basketball, which is a very a fast-paced game.

5.2 Conclusion

The study sought to explore the link between basketball officiating expertise level and the referees' performance during the 2022-2023 Kenya Basketball Federation Premier League Play-Offs Season.

5.2.1 Referees' Knowledge and Application of the Rules of Basketball

The referees' knowledge and application of the rules of basketball were analysed under the seven parameters of:

1 Consistency in the correct application of the rules

2 Consistency in determining whether the ball was in or out of play

3 Consistency in managing substitutions

4 Consistency in identifying persistent offenders and acting accordingly

5 Consistency in following pre- and post-game procedures

6 Consistency in the correct interpretation and application of the rules

7 Adequacy in the knowledge of the rules.

In the ultimate analysis, the results revealed inadequacy or insufficiency in the four parameters of correct application of rules, in managing substitutions, in determining whether a ball was in or out of the court, and in the correct application and interpretation of the rules. Obviously, these areas need appropriate intervention among the referees to rectify the situation.

Based on the correlation significance results in table 4.3 the study rejected the null hypothesis (H_{01}) which stated that there is no statistically significant correlation between rule knowledge and application, and referee performance. The study concluded that a very strong statistically significant correlation exits between rule knowledge and application, and referee performance.

5.2.2 Referees' Mechanics

All matches were video recorded to determine the sixteen criterion parameters for good mechanics and positioning. The analysis revealed statically significant deficiencies among the Referees warranting serious corrective measures in the areas listed:

1 Detecting obvious violations and /fouls where in some instances it appeared that obvious violations and fouls were not detected.

2 Detecting subtle and tactical fouls in which it appeared difficult to detect some tactful fouls.

3 Accuracy in warnings given to players where some warnings to players were not given in time.

4 Clarity of warnings given to players where in some instances the warnings were vague.

5 Correct and/appropriate signals in which there were instances of inappropriate signals and incorrect calls.

6 Correctness/consistency of calls made throughout the game was not the case since there was lack of consistency in some calls.

7 Timeliness of calls made was not adhered to since there were instances of late calls.

8 Adherence to pre-game procedures was not applied in all the games.

9 Proximity to play; in some cases referees were far from the play.

10 Mobility and movement during the game was a challenge evident in slow movement of the referees in some cases.

11 Remaining with the pace of the game was also a weakness in some of the referees.

12 Proper and timely entry on to the court procedure was not adhered to in some instances.

13 Proper and/dynamic positioning was noted as a challenge in some instances.

14 Maintenance of good posture was a weakness in some instances.

15 Timely communication before the end of each quarter was not adhered to in all instances.

Based on the correlation significance results in table 4.5 the study rejected the null hypothesis (H_{02}) which stated that there is no statistically significant correlation between mechanics and referee performance. The study concluded that a very strong statistically significant correlation exits between mechanics and referee performance.

5.2.3 Physical Fitness of Referees

With regard to the referees' physical fitness as determined by the beep test, and the analysis of their performance, it was evident from the results that just 50% of the referees had the expected level of physical fitness to officiate in the KBF Premier League. Thus, it is evident that half of the Kenyan Basketball referees are in dire need of improving their physical fitness.

This study concludes that more frequent technical training of referees needs to be undertaken to rectify noted deficiencies in the performance of referees. The introduction of refresher clinics for referees to improve on quality of match officiating and dissemination of novel developments in match officiating would go a long way towards improving the performance of referees.

Based on the correlation significance results in table 4.6 the study rejected the null hypothesis (H_{03}) which stated that there is no statistically significant correlation

between referees' physical fitness and referee performance. The study concluded that a statistically significant correlation exits between referees' physical fitness and referee performance.

5.3 Recommendations

5.3.1 Recommendations from the Study

The study concentrated on basketball officiating expertise level during the KBF premier league play offs and there seems to be a deficiency in performance of some of the referees. Therefore, the following are the recommendations from the study:

i. Structured technical training programmes for the development of referees,
ii. Periodic evaluation of referees' performance by the federation
iii. Affirmative action to be taken in the training of more female referees to reduce the gender disparity among referees.

5.3.2 Recommendations for Further Research

The study focused on the basketball officiating expertise level during the KBF premier league play offs 2022-2023 season and there are inadequate studies in other aspects that may affect the officiating expertise. Therefore, the study recommends further studies to establish the link between age and experience in the performance of basketball referees during the KBF premier league play offs. Additionally, in further studies, inclusion of referees officiating during the regular season of the premier league and those at lower leagues may add valuable contribution to the literature on basketball officiating in Kenya.

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APPENDICES

Appendix A: Informed Consent

My name is **Godfrey Mwaloma ILAOH** I am a Masters student from Kenyatta University I am conducting a study titled **Link between Basketball Officiating Expertise Level and the referees Performance during KBF Premier League Play-Offs 2022-2023 Season.** The information will be used to determine the association between basketball officiating expertise level and referees' performance during KBF premier league play-offs 2022-2023 season. The study may help KBF to understand the status of basketball referees in Kenya, in a bid to acquire expertise in officiating basketball.

You will be asked to fill a questionnaire and also take part in a fitness test. Every match you officiate will be video recorded and your positioning and mechanics tabulated by two FIBA qualified referees' instructors to determine your performance in this aspect

You are free to decline taking part in this research. Recall that participation in this study is entirely voluntary. You are always welcome to ask questions about the study.

If you participate in this study, you will help KBF to understand the status of basketball referees in Kenya, in a bid to acquire expertise in officiating basketball. This will enable KBF to formulate clear structured training programs to ensure continuous recruitment and development of basketball referees in KBF premier league.

There is no payment or reward if you participate in this study.

Participation in the survey and the answers you provide are private and anonymous.

Contact Information

If you have questions about the study call Supervisors: Dr. Yasmin Goodwin - 0724935594 or Dr. Wairimu Mwangi- 0721354297. The researcher's phone number is 0728658166. Email address-gmwaloma@gmail.com.

But if you have any inquiries concerning your rights as a research participant, you can email the chairman.kuerc@ku.ac.ke to the Kenyatta University Ethical Review Committee Secretariat.

Participant's statement

I understand the information above about my involvement in the study. I've been given an explanation of the study, given the opportunity to ask questions, and had satisfactory answers to my questions. I willingly choose to participate in this study in full. I am aware that any information collected from me will be kept confidential and that I am free to withdraw from the study at any moment.

Name of Participant: _____

Signature: _____

Date: _____

Researcher's statement

I, the undersigned, have explained to the volunteer in a language s/he understands, the procedures to be followed in the study and benefits in_____

Name of Interviewer _____

Signature _____

Date _____

Appendix B: Observation Checklist

Please rate the referee's game management skills, mechanics and positioning by ticking in the appropriate box.

Referee's Code:_____Date:_____

	Poor 60-69%	Average 70-79%	Good 80-100%
Proper and timely entry to the court			
Adherence to the pre-game procedures			
Proper/dynamic positioning during the play offs			
Maintenance of good posture during the play offs			
Proper use of hand signals during the play-offs			
Proper use of verbal reporting during the play-offs			
Clarity of signals given			
Timely whistling			
Accurate detection of violations/fouls			
Fast decision making during the play offs			
Accurate decision making during the play offs			
Decisiveness during the play offs			
Appropriate mobility during the play offs			
Having agility and balance during the game			
The referee's stamina was adequate for the game			
Focus/control under pressure during the play offs			
Proper and timely settling of any problems with fouls, scores, etc.			
Timely communication before each quarter ends			
Ensuring proper work ethics with other officials			
Maintaining professionalism during the play-offs			
Displaying confidence as a referee			
Determining and dealing appropriately with persistent misconduct			

Appendix C: Beep Test Recording Sheet

Date:_____Time:_____Conditions:_____

(The weather and running surface)

Instructions

- Measure and mark out the course.
- Explain the test procedures to the participants obtain informed consent.
- Ensure that the participants are adequately warmed-up
- The individual monitoring the test must ensure that the participant who arrives at the cone prior to the beep waits until the beep to return to the other end.
- Line through each run completed along the row for each level. Circle the misses.
- When participant misses two in a row, he/she is retired. Circle the highest level attained by each participant before failing to keep up and write their name next to that line: This will be recorded as the score for that test.

Level	**Run**															
1	1	2	3	4	5	6	7									
2	1	2	3	4	5	6	7	8								
3	1	2	3	4	5	6	7	8								
4	1	2	3	4	5	6	7	8	9							
5	1	2	3	4	5	6	7	8	9							
6	1	2	3	4	5	6	7	8	9	10						
7	1	2	3	4	5	6	7	8	9	10						
8	1	2	3	4	5	6	7	8	9	10	11					
9	1	2	3	4	5	6	7	8	9	10	11					
10	1	2	3	4	5	6	7	8	9	10	11					
11	1	2	3	4	5	6	7	8	9	10	11	12				
12	1	2	3	4	5	6	7	8	9	10	11	12				
13	1	2	3	4	5	6	7	8	9	10	11	12	13			
14	1	2	3	4	5	6	7	8	9	10	11	12	13			
15	1	2	3	4	5	6	7	8	9	10	11	12	13			
16	1	2	3	4	5	6	7	8	9	10	11	12	13	14		
17	1	2	3	4	5	6	7	8	9	10	11	12	13	14		
18	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
19	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
20	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
21	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Appendix D: Referees' Opinion/Perception About Own Expertise Level in Basketball Officiating

Demographic Information

Questionnaire no.	Date:
Code of respondent:	Age: ……years
Gender: 1=Male; 2=Female	Weight: ……Kg
Height: ……cm	Years of experience as a referee/umpire:

1. Referees Positioning and Mechanics Analysis

The Referees Positioning and Mechanics Analysis will be based on the Research Assistants' tabulation of the Referees' performance as observed in the recorded videos of the matches during the play-offs their assessment of the Referee

VARIABLES TO BE OBSERVED	Poor 60-69%	Average 70-79%	Good 80-100%
Accurate detection of obvious violations/fouls			
Accurate detection of subtle and tactical fouls			
Accurate warnings given to players			
The warnings given were clear			
The signals used were correct/appropriate			
Correct calls made throughout the game			
Calls made were timely			
Pre-game procedures adhered to			
Proximity to play			
Mobility and movement during the game			
Remaining with the pace of the game			

2.Knowledge and Application of the Rules of Basketball

Please indicate how much you agree or disagree with the following remarks on the performance of the referee during the KBF playoffs. (Tick where appropriate)

Statement	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
1. All the referees officiating KBF play-off have adequate knowledge on the rules of the game					
2.The referees always apply the rules of the game correctly					
3.The referees normally adhere to all rules of the game during the play-offs					
4.The referees are normally able to recognize persistent offenders and act accordingly during the playoffs					
5.Pre- and post-game procedures are normally followed to the later by the referees officiating the KBF play-offs					
6.The referees are always able to determine if the ball is in or out of play using the rules					
7.The referees always manage substitutions according to the laws of the game					
8.It is difficult to always correctly interpret and apply the rules during the game					
9.Having adequate knowledge of rules and applying them leads to better performance of a referee during the basketball play-offs					

Appendix E: Results of the Pilot Study

The study conducted the pilot on two referees who responded to the questions in appendices B and D. The first tool was the observation checklist (Appendix B) that had 22 items, the second the expert's evaluation of referees' positioning and mechanics (Appendix D – Section 1) that had 11 items and finally the referee's self-evaluation on knowledge of rules and application(Appendix D – Section 2) that had 11 items. The study run a reliability analysis of the pilot data collected at Nyayo National Stadium, Basketball Gymnasium and findings are as discussed.

Experts observation checklist reliability analysis on referee's game management skills, mechanics and positioning

The internal consistency of the 22-item instrument designed to assess referee game management skills during playoffs was evaluated using Cronbach's alpha, yielding a coefficient of $\alpha = 0.587$ (Table 1).

Table 1: Reliability Statistics

Cronbach's Alpha	N of Items
.587	22

According to Nunnally and Bernstein (1994), Cronbach's alpha values above .70 are acceptable, while values below .60 suggest inadequate reliability. Thus, the obtained coefficient indicates moderate but insufficient internal consistency, implying that several items may not be measuring the same underlying concepts consistently.

Further analysis in the reliability analysis was on item correlation and Item-total correlations revealed notable variability among items. Items such as *Fast decision making during the playoffs*, *Accurate decision making during the playoffs*, and *Appropriate mobility during the playoffs* showed strong corrected item-total correlations ($r = 1.000$), indicating strong alignment with the overall scale. Conversely,

items like *Proper and timely entry to the court* and *Having agility and balance during the game* recorded negative correlations (r = –1.000) as shown in Table 2 suggesting misalignment with the intended construct.

Table 2: Item-Total Statistics

Item	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Proper and timely entry to the court	-1.000	.758
Adherence to the pregame procedures	.000	.588
Proper or dynamic positioning during the playoffs	.000	.588
Maintenance of good posture during the playoffs	.000	.588
Proper use of hand signals during the playoffs	.000	.588
Proper use of verbal reporting during the playoffs	-1.000	.758
Clarity of signals given	.000	.588
Timely whistling of fouls	.000	.588
Accurate detection of violations or fouls	.000	.588
Fast decision making during the playoffs	1.000	.394
Accurate decision making during the playoffs	1.000	.394
Appropriate mobility during the playoffs	1.000	.394
Focus and control under pressure during the playoffs	1.000	.394
Maintaining professionalism during the playoffs	1.000	.394
Displaying confidence as a referee	1.000	.394

Dealing appropriately with persistent misconduct	1.000	.394

The "Cronbach's Alpha if Item Deleted" results indicate that removing weaker items could improve the coefficient (up to approximately .758). However, the small sample size (N = 2) limits the stability of reliability estimates. Tavakol and Dennick (2011) noted that Cronbach's alpha is highly sensitive to both sample size and item intercorrelations**,** and small samples can distort the reliability outcome. These findings suggested that while the instrument was conceptually comprehensive, it required further refinement to ensure accurate measurement of the study variables. Reliable tools are critical to ensure fair evaluation, referee development, and game integrity (García-González et al., 2019).

Referees Positioning and Mechanics Recording Sheet Analysis

The internal consistency of the 11-item instrument assessing officiating positioning and mechanics yielded a Cronbach's alpha $\alpha = 0.880$ (Table 3**)**. This suggests that the items measure a consistent construct of referee's effectiveness in decision-making, signalling, and procedural adherence.

Table 3: Reliability Statistics

Cronbach's Alpha	**N of Items**
.880	11

The item-total correlations showed that items such as *Accurate detection of subtle and tactical fouls*, *Correct calls made throughout the game*, and *Calls made were timely* have strong positive correlations (r = 1.000), demonstrating their strong contribution to the scale's reliability. Conversely, items like *Accurate detection of obvious violations*

or fouls and *Mobility and movement during the game* have weaker correlations (r = .000), though their removal would not significantly enhance reliability (Cronbach's alpha if deleted = .833–.889) as shown in Table 4.

Table 4: Item-Total Statistics

Item	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Accurate detection of obvious violations or fouls	.000	.889
Accurate detection of subtle and tactical fouls	1.000	.833
Accurate warnings given to players	.000	.889
Warnings given were clear	1.000	.833
Signals used were correct and appropriate	.000	.889
Correct calls made throughout the game	1.000	.833
Calls made were timely	1.000	.833
Pregame procedures adhered to	.000	.889
Proximity to play	1.000	.833
Mobility and movement during the game	.000	.889
Remaining with the pace of the game	.000	.889

Referee's self-evaluation analysis

The internal consistency of the 11-item self-evaluation instrument for referees was assessed using Cronbach's alpha. The coefficient of $\alpha = .615$ indicated moderate reliability, suggesting that while the items measure similar constructs, some inconsistency exists among them (Table 5).

Table 5: Reliability Statistics

Cronbach's Alpha	N of Items
.615	11

According to Nunnally and Bernstein (1994), a Cronbach's alpha value above .70 is generally considered acceptable for social science research, while values between .60 and .69 are regarded as marginally reliable. Therefore, this finding implied that the instrument requires refinement to enhance its ability to consistently measure referees' self-assessed competencies.

The analysis also produced item-based correlation. The item-total statistics reveal substantial variability in item performance**,** with corrected item-total correlations ranging from –1.000 to 1.000 (Table 6)**.**

Table 6: Item-Total Statistics (*Only representative items are displayed for clarity***)**

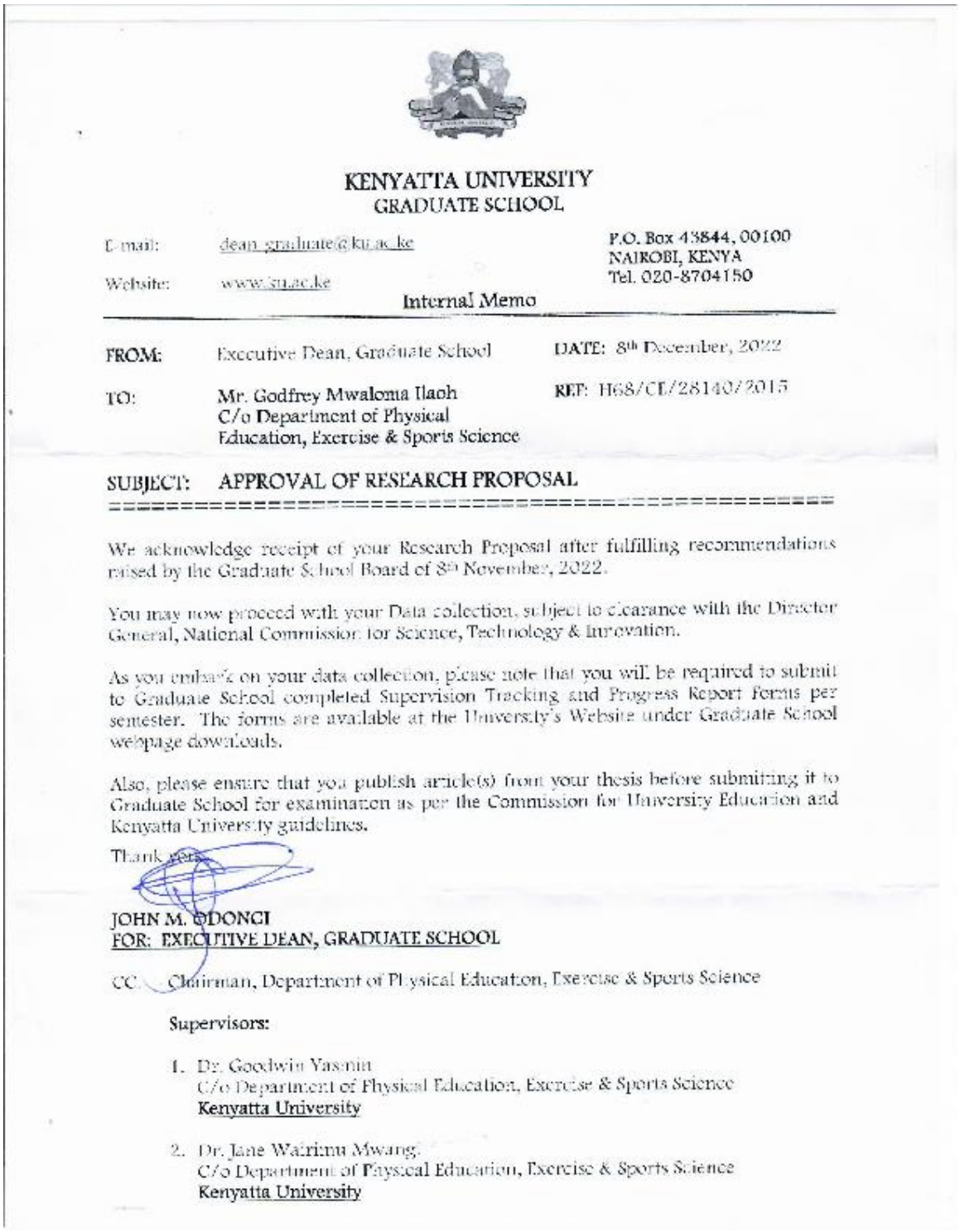
Item	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Referees have adequate knowledge on the rules of the game	–1.000	.683
The referees always apply the rules of the game correctly	–1.000	.683
The referees recognize persistent offenders and act	1.000	.545
Pre- and post-game procedures are normally followed	1.000	.545
It's difficult to correctly interpret and apply rules of the game	1.000	.474
The referees' mechanics influence their performance	1.000	.354

Referees normally have adequate acceleration and speed	–1.000	.747
It is challenging to maintain calmness during the game	1.000	.474
It is challenging for referees to always make accurate decisions	1.000	.407

Items such as *The referees recognize persistent offenders and act* and *Pre- and post-game procedures are normally followed* demonstrate strong positive correlations**,** suggesting they align closely with the overall construct and contribute meaningfully to internal consistency. In contrast, several items (e.g., *Referees have adequate knowledge on the rules of the game* and *Referees normally have adequate acceleration and speed*) show negative correlations, which indicate they may not measure the same underlying construct as other items or could have been misinterpreted by respondents. These negatively correlated items likely weakened the overall reliability coefficient.

Furthermore, the "Cronbach's Alpha if Item Deleted" values (ranged from .354 to .747) suggest that removing certain weak items could improve the scale's reliability. The study enhanced instrument construct through item revision, rewording, and elimination of ambiguous statements. In cases where alpha was less than 0.7 adjustments were done with the guidance of supervisors and experts from the department.

Appendix F : Approval by Graduate School Kenyatta University



KENYATTA UNIVERSITY
GRADUATE SCHOOL

E-mail: dean_graduate@ku.ac.ke
Website: www.ku.ac.ke

P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 020-8704150

Internal Memo

FROM: Executive Dean, Graduate School

DATE: 8th December, 2022

TO: Mr. Godfrey Mwaloma Ilaoh
C/o Department of Physical
Education, Exercise & Sports Science

REF: H68/CE/28140/2015

SUBJECT: APPROVAL OF RESEARCH PROPOSAL

We acknowledge receipt of your Research Proposal after fulfilling recommendations raised by the Graduate School Board of 8th November, 2022.

You may now proceed with your Data collection, subject to clearance with the Director General, National Commission for Science, Technology & Innovation.

As you embark on your data collection, please note that you will be required to submit to Graduate School completed Supervision Tracking and Progress Report Forms per semester. The forms are available at the University's Website under Graduate School webpage downloads.

Also, please ensure that you publish article(s) from your thesis before submitting it to Graduate School for examination as per the Commission for University Education and Kenyatta University guidelines.

Thank you.

JOHN M. ODONGI
FOR: EXECUTIVE DEAN, GRADUATE SCHOOL

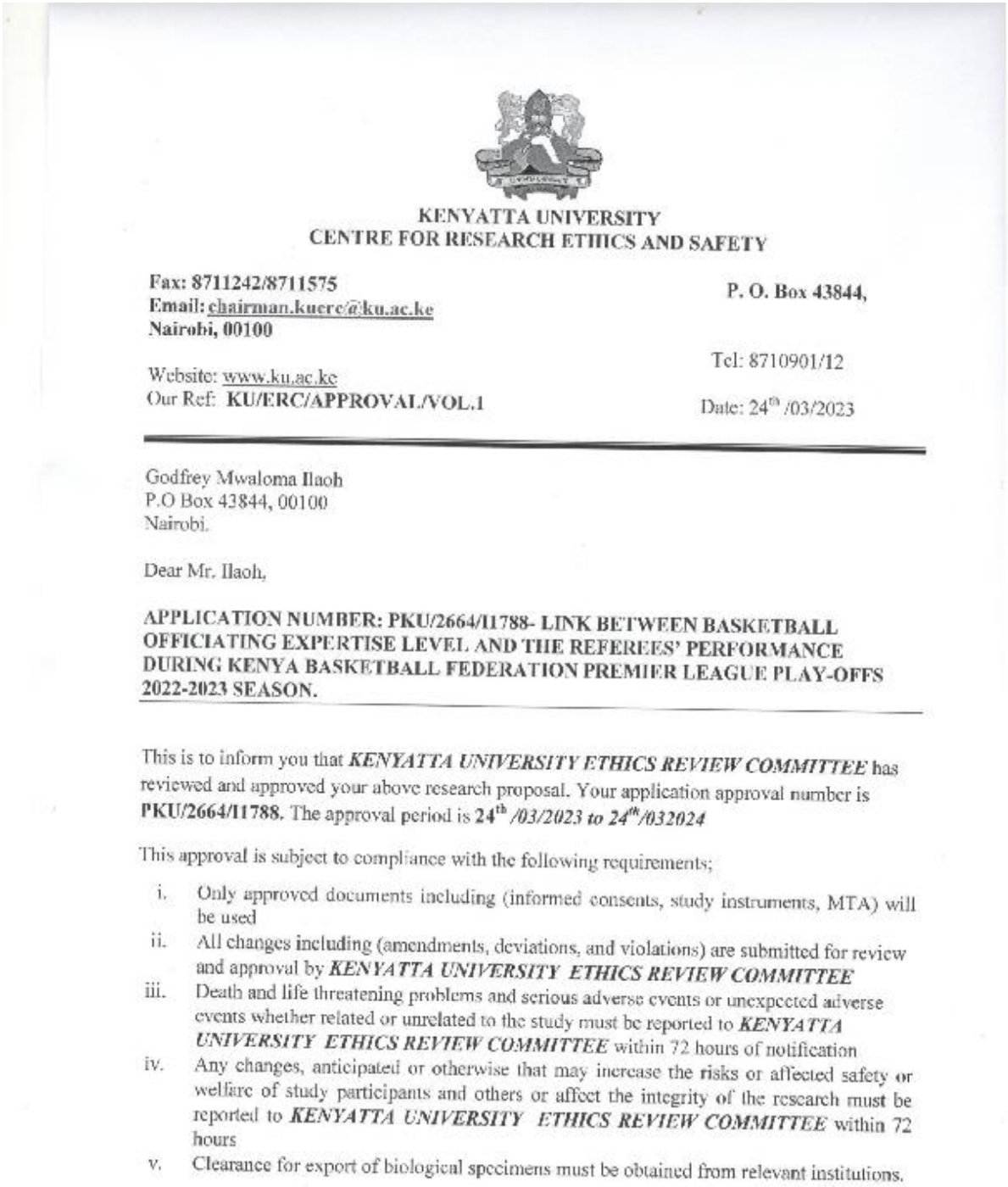
CC: Chairman, Department of Physical Education, Exercise & Sports Science

Supervisors:

1. Dr. Goodwin Yasmin
   C/o Department of Physical Education, Exercise & Sports Science
   Kenyatta University

2. Dr. Jane Wairimu Mwangi
   C/o Department of Physical Education, Exercise & Sports Science
   Kenyatta University

Appendix G: Ethical Review-Approval Kenyatta University



KENYATTA UNIVERSITY
CENTRE FOR RESEARCH ETHICS AND SAFETY

Fax: 8711242/8711575
Email: chairman.kuerc@ku.ac.ke
Nairobi, 00100

P. O. Box 43844,

Website: www.ku.ac.ke
Tel: 8710901/12

Our Ref: KU/ERC/APPROVAL/VOL.1

Date: 24th /03/2023

Godfrey Mwaloma Ilaoh
P.O Box 43844, 00100
Nairobi.

Dear Mr. Ilaoh,

APPLICATION NUMBER: PKU/2664/I1788- LINK BETWEEN BASKETBALL OFFICIATING EXPERTISE LEVEL AND THE REFEREES' PERFORMANCE DURING KENYA BASKETBALL FEDERATION PREMIER LEAGUE PLAY-OFFS 2022-2023 SEASON.

This is to inform you that ***KENYATTA UNIVERSITY ETHICS REVIEW COMMITTEE*** has reviewed and approved your above research proposal. Your application approval number is **PKU/2664/I1788.** The approval period is **24th /03/2023 to 24th/032024**

This approval is subject to compliance with the following requirements;

i. Only approved documents including (informed consents, study instruments, MTA) will be used
ii. All changes including (amendments, deviations, and violations) are submitted for review and approval by ***KENYATTA UNIVERSITY ETHICS REVIEW COMMITTEE***
iii. Death and life threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to ***KENYATTA UNIVERSITY ETHICS REVIEW COMMITTEE*** within 72 hours of notification
iv. Any changes, anticipated or otherwise that may increase the risks or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to ***KENYATTA UNIVERSITY ETHICS REVIEW COMMITTEE*** within 72 hours
v. Clearance for export of biological specimens must be obtained from relevant institutions.

Appendix H: Research Permit Nacosti

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: 174162

Date of Issue: 29/April/2023

RESEARCH LICENSE

This is to Certify that Mr.. GODFREY MWALOMA ILAOH of Kenyatta University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Nairobi on the topic: LINK BETWEEN BASKETBALL OFFICIATING EXPERTISE LEVEL AND THE REFEREES' PERFORMANCE DURING KENYA BASKETBALL FEDERATION PREMIER LEAGUE PLAY-OFFS 2022-2023 SEASON for the period ending : 29/April/2024.

License No: NACOSTI/P/23/25062

174162

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.

See overleaf for conditions

Appendix I: Permission from KBF to Conduct the Study

C/o Kenya Academy of Sports
P. O. Box 9056-00200
NAIROBI

6th March, 2023

The Secretary General
Kenya Basketball Federation
P.O. Box 52107-00200
NAIROBI.

Dear Sir,

RE: PERMISSION TO COLLECT STUDY DATA

I am a post graduate student in Kenyatta University pursuing a master's degree in Physical Education in the school of Public Health and Applied Human Sciences. I am therefore conducting a study entitled 'Link between Basketball Officiating Expertise Level and the Referees' Performance during Kenya Basketball Federation (KBF) Premier League Play-Offs 2022-2023 Season.

The purpose of this letter is to request your office to permit me to access and record the KBF Premier League Play Offs games for my research.

I look forward to a positive response from your office.

Yours Faithfully,

GODFREY MWALOMA ILAOH
H68/CE/28140/2015
gmwaloma@gmail.com
0728658166

Approved:

Kenya Basketball Federation
Nyayo National Stadium Langata Road
P.O. Box 52107
00200 City Square - Nairobi
Kenya

Ambrose Kisoi

SECRETARY GENERAL.

Appendix J: Letter from KBF nominating FIBA Certified Instructors for the Study

Kenya Basketball Federation
P.O. Box 52107-00200 City Square
NAIROBI
E-mail : kbfexec@yahoo.com

21st March 2023

GODFREY MWALOMA ILAOH
H68/CE/28140/2015

C/o Kenya Academy of Sports
P. O. Box 9056-00200
NAIROBI.

Dear Sir,

RE: PERMISSION TO COLLECT STUDY DATA.

We acknowledge your letter about your study entitled 'Link between Basketball Officiating Expertise Level and the Referees' Performance during Kenya Basketball Federation (KBF) Premier League Play-Offs 2022-2023 Season.

Your request for names of FIBA Certified Instructors to work with during the KBF Premier League Play Offs games for your research is granted and the following are hereby nominated:

1. Vitalis Gode
2. Fred Awuor

We wish you all the best.

Regards,

Kenya Basketball Federation
Nyayo National Stadium Langata Road
P.O. Box 52107
00200 City Square - Nairobi
Kenya

Ambrose Kisoi

SECRETARY GENERAL.