UNIVERSITY OF CAPE COAST

ANALYSIS OF ANTHROPOMETRIC AND MOTOR PERFORMANCE VARIABLES OF SOCCER PLAYERS IN GUSA GAMES

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BY

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Thesis submitted to the Department of Health, Physical Education and Recreation of the Faculty of Science and Technology Education, College of Education Studies, University of Cape Coast, in partial fulfilment of the requirements for award of Master of Philosophy degree in Physical Education.

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DECLARATION

Candidates' Declaration

I hereby declare that this thesis is the result of my own original research and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature: ……………………….. Date: …………………..

Name: Timothy Kwabena Mensah

Supervisors' Declaration

We hereby declare that the preparation and presentation of this thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast.

Principal Supervisor's Signature: ……………… Date:………………..…

Name: Dr. Monday Omoniyi Moses

Co-Supervisor's Signature: …………………… Date: ………………….

Name: Dr. Charles Domfeh

ABSTRACT

The purpose of this study was to analyze the anthropometric and motor performance variables of soccer players in GUSA games. 44 female and 44 male soccer players with mean ages of 21.54±1.79 and 22.61±1.87 years respectively (Appendix D) were evaluated on height, weight, leg length, thigh girth, calf girth, fore arm length, upper arm length, upper arm girth, chest girth and finger span. The participants also performed 36.58m dash, vertical jump, agility, flexibility, sit-ups and push-ups. Additionally, they dribbled and kicked the ball for distance and accuracy. The results were compared institutionally and internationally on gender basis. There were significant differences in the thigh girth (p = .003), calf girth (p = .002), abdominal strength (p = .001) and distant kick (p = .009) of the female soccer players and the fore arm length (p = .001), leg power (p = .040), abdominal strength (p = .005), agility (p = .001), flexibility (p = .009), and upper body strength (p = .023) of the male soccer players. The weight, thigh and calf girths put together influenced the distant kick (p=.012) in the female soccer players. The speed and agility put together also influenced dribbling (p=.011) in the females. All the male anthropometric variables influenced the distant kick (p = .002), the thigh girth, chest girth and finger span were also individual predictors. Flexibility (p = .042) and agility (p = .004) were individual predictors and together influenced the dribbling (p=.001) in males. It was recommended that coaches in GUSA should develop and concentrate on the combination of the above significant anthropometric and motor performance variables when practicing kicking and also, generate data base of players' profiles for reference and use it as part of the criteria to select players.

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DEDICATION

To my entire family

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CHAPTER ONE

INTRODUCTION

Background to the Study

It is a common knowledge that Soccer (also known as Association Football) is the most popular sport in the world. Soccer provides a thrilling and spectacular environment to both players and spectators apart from its status as a very healthy recreational sport (Hencken, & White, 2006). It has achieved a universally acceptable platform in modern times because of its competitiveness, the energetic physical workout and skills (Amansingh, & Raghuveer, 2010).

In Ghana universities, soccer basically is used as a co-curricular activity which is an integral part of the total education. Thus, among universities in Ghana, soccer is used as a pervasive tool to develop students for future goals (Acquah, & Anti-Partey, 2014).

In fact, well organized competitive soccer in the tertiary institutions in Ghana, especially in the universities, is played intramurally (inter-hall and inter-faculty games) and extramurally which include inter-university competitions such as Ghana University Sports Association (GUSA) games. International competitions in which universities in Ghana participate in soccer are West Africa University Games (WAUG), Federation of Africa University Sports (FASU) games and International University Sports Federation (FISU) games.

Soccer players at the university level, chiefly those who represent their university or the National Federation at the national and international levels are anticipated to possess the physical and physiological qualities–physique, stature, speed, agility, muscular and general strength, high skill level, endurance and coordination) needed to excel in that chosen sport. Domfeh (2002) defined physique as the size, shape and strength; and stature as the individual's height. He farther explained that, the physique and stature of the individual cannot be overlooked in any sporting discipline.

Agbonjimi (1995) indicated that an aerial view of physique and performance show a striking relationship between the two in most sports. This shows that body size and stature play significant roles in performance of most sports such as rugby, basketball, volleyball and soccer. Jaric (2003) also submitted that individual physique and body composition either greatly limit or in some instances predispose individuals to successful participation in one activity or the other.

Domfeh (2002) citing Watson (1983) said that, individuals of various sizes are better equipped for different types of activities. He explained that, the human body is three dimensional. If the height of a three-dimensional object is doubled, its surface area increases four times and its mass is multiplied eightfold. Thus when individuals of different sizes are considered, the body surface area and the cross-sectional area of muscle (and therefore, strength and stature) tend to vary in proportion to the square of the height. Domfeh (2002) further stated that, variables such as weight and blood volume increase in line with height-cubed. It can easily be inferred that these changes in size tend to produce differences in the relationships between such variables as strength, weight, power-output, acceleration and work capacity.

Anthropometry is a standardized method to measure the size and proportion of the human body (Kamal, 2006). Anthropometric measurements, such as stature, weight, circumferences, skinfolds, and skeletal diameters are always measured for assessing body composition or to evaluate the health and nutritional status of populations. Anthropometric characteristics of athletes in relation to the sports they play determine their success rate in those sports or events in various ways (Gabbett, Jenkins, & Abernethy, 2011). The knowledge of these characteristics is necessary to establish their importance for success in competitive sport.

Modern competitive soccer employs the use of scientific methods which includes body type (body morphology, anthropometry and body compositions), age, muscular strength, speed, agility, endurance, coordination and skill of the individual (Domfeh, 1996). Domfeh explained that, in a team game like soccer, strength, physique and stature of players play important roles in the individual's contribution towards the team's total output. He further buttressed the point when he said that, apart from the psychological advantage these characteristics offer to those who have them, the physical advantages cannot be overemphasized. Since players struggle to gain possession of the ball and fair contact or charge is allowed in the game, there is no doubt that the size and strength of the players are great assets. Bakinde (2014) supported these assertions when he said that, physical variables in a sport contributes to its success and enables sport differences among athletes of different modalities, which is of great interest to both sport coaches and scientists. He further stated that sports performance is based on a complex and intricate diversity of variables, which include physical (general and specific conditions), psychological (personality and motivation) and physiological (body morphology, anthropometry and body compositions) factors. This implies it becomes an advantage for a team and especially the coach to know the physical and physiological qualities of his or her players and rough estimates of that of their opponents in order to compare and contrast for a necessary tactical play to win competitions.

Statement of the Problem

Many factors contribute to the supremacy of soccer players and teams all over the world. Chiefly amongst them are the anthropometric and motor performance characteristics of the players (Agbonjimi, 1995; Gabbett, Jenkins, & Abernethy, 2011; Jaric, 2003) apart from their nutritional (Curell, Conway, & Jeukendrup, 2009) and psyche status (Cole, 2008). These are scientifically proven aspects of modern competitive soccer. However, these phenomena have not been established currently in the Ghanaian competitive soccer. As such, there is a dearth of literature generally on these two major characteristics (anthropometric and motor performance) in Ghana. This situation is not different from what pertains in the public universities in Ghana which are the citadel of knowledge. Therefore, just like any other coach in Ghana, the coaches in these universities use the soccer players just as they come into the universities and select them based on the impressions the players make on the field of play or the suggestions the players give to the coaches. This is non-scientific as explained earlier and certainly, it hinders the optimal performance and the full potentials of the players even though they might have been exerting their maximum efforts.

Therefore, modern day competitive soccer coach is expected to have and always update a data base of these characteristics of his or her players in order to always compare them to their opponents for a possible tactical play. Certainly, because this is nonexistent, particularly in the public universities in Ghana, these coaches do trial and error in pitching players for competitions which always yield minimal results. Thus, the need to assess these characteristics of the soccer players in the public universities and compare them by institutions to discover if they have major differences and challenges so as to make recommendations for necessary improvements.

Purpose of the Study

The dual purpose of this study were to analyze (measure and compare) the anthropometric and motor performance variables of soccer players in GUSA games and to find whether these variables influenced the kicking ability of the players.

Hypotheses

The following hypotheses were tested in the study separately for both male and female soccer players in GUSA games:

1. There will be no significant difference in the Anthropometric Variables of Soccer Players in GUSA games by institutions.
2. There will be no significant difference in the Motor Performance Variables of Soccer Players in GUSA games by institutions.
3. There will be no significant difference in the Kicking Ability of Soccer Players in GUSA games by institutions.
4. There will be no significant influence of Anthropometric and Motor Performance Variables on the Kicking Ability of Soccer Players in GUSA games.

Significance of the study

This study was designed to aid coaches of Ghana universities, Ghana national soccer teams, schools, soccer players, Physical Education specialists and physiotherapist as follows:

1. It would afford coaches, especially those in GUSA, the platform and criteria to select soccer players and use them in the best possible roles to bring out their best in tournaments. For instance, tall defenders, attackers and goalkeepers are always very useful in the middle because of aerial balls.
2. Soccer players in GUSA would get to know more about their anthropometric and motor performance profiles.
3. It would provide data on the anthropometric and motor performance variables of university soccer players in Ghana which will serve as the basis for future research that may aid the selection of soccer players into the national teams and clubs.
4. Finally, this study would serve as reference for other researchers who wish to know more about anthropometric and motor performance variables of university soccer players.

Delimitations

This study was delimited to the following:

1. Soccer players who played for their university soccer teams in the 6^{th} Mini GUSA games.
2. The measurement of some selected anthropometric variables (height, weight, leg length (LL), thigh girth (TG), calf girth (CaG), upper arm length (UAL), fore arm length (FAL), upper arm girth (UAG), chest girth (CG) and finger span (FS).
3. The measurement of some selected health and motor performance variables (speed, leg power, upper body strength, kicking ability,

abdominal endurance, agility and flexibility) of university soccer players in GUSA.

Limitations

Differing nature of athletics tracks in the various institutions may have had a slight effect on the speed of the soccer players.

Definition of Terms

Physique: This refers to body constitution, body composition, body type, body carriage, and bone age (Domfeh, 2002).

Stature: It indicates the height or the tallness of an individual (Domfeh, 2002).

Anthropometric variables: These include body height, body weight, finger span, leg length, arm length, forearm length, upper arm length, upper arm girth, mid- thigh and forearm girth (Kamal, 2006).

Motor Performance Variables: It is a collection of basic elements in performing physical activities, particularly in relation to sport performance. These include power, speed, agility, flexibility and strength (Baumgartner et al., 2003).

Body Mass: This is the quantity of matter in a body which is calculated through the measurement of weight – the force that the matter exerts in a standard gravitational field (Kamal, 2006).

Finger Span: The distance between the metacarpale laterale and metacarpale mediale (Bakinde, 2014).

Upper Arm Girth: The circumference of the arm at the level of the mid-acromia radiale site, perpendicular to the long axis of the arm (Bakinde, 2014).

Fore Arm Girth: The maximal circumference of the forearm perpendicular to its long axis, distal to the humeral epicondyles (Carter, 2002).

Organisation of the study

Chapter one was based on matters that went into the selection of the topic for the study and its importance as well as the short comings. Review of related literature is in chapter two. Chapter three is structured under methodology; research design, population, sampling procedures, instrumentation, data collection and data analysis. Chapter four dealt with results and discussions whereas chapter five was structured with summary, conclusions and recommendations.

CHAPTER TWO

LITERATURE REVIEW

The purpose of this study was to analyze the anthropometric and motor performance variables of soccer players of the public universities in Ghana. The related literature was reviewed under the following sub-headings:

1. Concept of Anthropometry
2. Anthropometric Variables versus some Motor Performances in sports
3. Anthropometry, Physical Performance and Kicking Ability
4. The Arm versus Catching and Throwing of Objects
5. Sports Performance and Stature
6. Sports Performance and Body Weight
7. Sports Performance and Speed
8. Sports Performance and Flexibility
9. Sports Performance and Agility
10. Muscular Endurance and Sport Performance
11. Sports Performance and Leg Power
12. Brief History of Ghana University Sports Association Games
13. The Game of Soccer
14. Summary

Concept of Anthropometry

According to Kamal (2006) the word anthropometry is a combination of anthropo (human) and metron (measure) - both having a Greek origin. Anthropometry is the field of science which aims at collecting body measurement data of high quality using standardized calibrated equipment and examination procedures (Kamal, 2006). It is also a systematic quantitative representation of the dimensions of the human body in relation to the various lengths, sizes and shapes of the parts (Carter, 2002).

Kamal (2006) has established a set of guidelines that must be followed when anthropometry is being undertaken. These include standardization of the equipment and techniques, uniform landmarks, and establishing conditions for the measurements. It also involves making precise, highly standardized measurements so that size and shape of the body can be described quantitatively. Basic anthropometric measurements include those for body mass (weight), stature (height), and skinfold thickness whilst the complex ones has to do with the various distances and lengths between certain specific body landmarks and the determination of circumferences of the body parts (Carter, 2002). Even though the procedures for taking anthropometric measurements are very strict, precise and standardized, there may still be some deviations. However, these deviations can be standardized via proven processes from references to get averages to represent the measured marks. One of these approaches used in the presentation of individual values during the data analysis is the percentiles placement. This approach permits the researcher to compare the discrete values to the percentile ranges given in the anthropometric standard. Thus, a discrete measurement may be expressed as being either close, above or below a percentile. The Z score is yet another approach that can be used to express discrete values in the data analysis --the individual value minus the reference mean for the age and sex, per the standard deviation-- to correct all deviations.

In many sports, success is often associated with a particular body configuration. For this reason, anthropometry can be used by coaches and trainers to help predict the activities or roles that an individual is most likely to succeed in. The anthropometric variables of players may be the essential factors that guarantee this success in sports and games (Ostojic, Mazic, & Dikic, 2006). Thus, the concept of morphological optimization has been used to describe athletes within particular sports and/or playing positions, who, as part of natural selection and training adaptations, appear to have the optimal body structure to suit their sport (Norton, Olds, Scott, & Craig, 2002).

Many anthropometrical studies have identified ideal values for the body dimensions of athletes in different sports. However, some athletes who deviate from this norm are still able to excel because they may have other attributes which affect their athletic performance.

Making use of anthropometric data is often a fundamental part of the process to achieve good fit in the abilities of humans. Anthropometric data according to Mardberg, Carlson, Bohlin, Hanson and Hogberg (2012) can be divided into functional (dynamic) dimension and structural (static) dimensions. The dynamic anthropometry deals with distances of the body that are measured when the body is in motion or engaged in physical activity (e.g. reach: extension of the arm by goalkeepers to deflect balls) whilst static anthropometry is responsible for the physical characteristics of the body and its parts when it is motionless (Mardberg et al., 2012).

Even though different sports require different motor abilities, there are specific requirements on body composition and proportions in every sport (Gabbett et al., 2006). Various anaerobic and aerobic performance variables have been tested in sports to evaluate the effects of training on athletes, and to provide information to coaches on which materials to select for which competition and level (Lidor, Falk, Amon, Cohen, & Segal, 2005). However, anthropometry provides coaches with the foundations and information concerning the variables of motor ability, which leads to high level performance and achievement. These measurements involve the components of fat, muscles and bones to give the coaches, an expert's eye to select athletes to achieve high levels of athletic performance in their chosen fields (Gabbett, 2000). Below is a report on some anthropometric features of university male soccer players that are relevant to this study;

Table 1: *Some Anthropometric characteristics of Soccer Players in some Universities*

Variables	Male	Female
Upperarm girth (cm)	31.55 (Reeves et al., 1999).	24.42 (Idrisovic, 2014)
Calf girth (cm)	38.10 (Burdukiewcz et al., 2014)	35.45 (Sporis, Canaki, & Barasic, 2007) 35.19 (Idrisovic, 2014)
Chest girth (cm)	88.51 (Bakinde, 2014) 91.00 (Thomas, & Reilly, 1979)	89.18 (Bakinde, 2014) 89.28 (Richards, 2004)
Thigh girth (cm)	55.00 (Thomas, & Reilly, 1979) 59.50 (Burdukiewcz et al., 2014)	56.65 (Sporis, Canaki, & Barasic, 2007) 51.60 (Idrisovic, 2014)
Forearm length (cm)	29.05 (Bakinde, 2014) 28.78 (Moghadam et al., 2012)	42.44 (Dawal et al., 2012) 28.91 (Bakinde, 2014)
Upper arm length (cm)	35.31 (Dawal et al., 2012) 32.44 (Singh, Singh, & Singh, 2010)	26.58 (Sporis, Canaki, &Barasic, 2007) 33.02 (Dawal et al., 2012)
Leg length (cm)	87.30 (Saha, & Bhowmick, 2014) 95.40 (Burdukiewcz et al., 2014)	94.93 (Sporis, Canaki, & Barasic, 2007) 81.77 (Idrisovic, 2014)

Anthropometric Variables verses some Motor Performances in sports

Soccer demands a complete physical conditioning programme including exercises to develop flexibility, agility, speed, strength, power and muscular endurance. The interest in anthropometric characteristic and body composition of the players of different sports has increased over the last decade. It has been well described that, there are specific physical characteristics in many sports such as anthropometric profile that indicate whether the player would be suitable to compete at the highest level in specific sports (Nuhmani, & Akthar, 2014).

Athletic performance is, to a large extent, dependent on the athlete's ability to sustain power (anaerobically and aerobically) to overcome resistance or drag. These factors are interrelated with the athlete's body composition. Athletes generally strive hard to attain a certain appearance or an ideal body composition in relation to their chosen sports and this often becomes a central theme of training. Besides the aesthetic and performance reasons for wanting to achieve an optimal body composition, there may also be safety reasons (Nuhmani, & Akthar, 2014). They further reported that, there is a high positive correlation between most anthropometric variables and motor performance (e.g. the mean for muscle mass, thigh girth and calf girth exhibited a positive relationship with mobility description).

Speed: This is a physical conditioning factor, which enables a person to react fast when stimulated and to perform the fastest possible movement. Speed is influenced by a number of factors, some of which include the elasticity, contracting and relaxing capacity of the muscles, generating power through adaptation to exercise. These factors result in the hypertrophy of the muscle which is directly proportional to the production of strength (Shaver, 2008). He further expatiated that such developments are very pronounced in world-class athletes like Usian Bolts and Shirley Fresier Ann Price of Jamaica.

Thus, speed and quickness of executing a physical activity tasks are integral part of most sports which require the movements of segmental body parts to effect the total translation of the whole body across a distance or from one point to another (Turner, Walker, Stembridge, & Moody, 2011). Sprinting is a component in most sports that determines how successful a performer can be in that sport and the ability to accelerate in soccer underlies successful game play (Little, & Williams, 2005; Murphy, Lockie, & Coutts, 2003). Straight-line sprinting can be broken down into 3 phases: acceleration, attainment of maximal speed, and maintenance of maximal speed or speed-endurance (Moir, Sanders, Button, & Glaister, 2007). However, these sprinting actions are originated from the muscles in the arms and the legs. For instance, it takes a great force to move the body from one point to the other because of the weight of the body. These movements are initiated and sustained by the hamstring and quadriceps muscles which are responsible for the flexion and extension of the lower leg. Perhaps this is why the thigh muscles are bulky (Tozeren, 2000).

Okley, Booth and Chey (2004) has noted that, running and other motor performance skills (jumping, throwing, catching), have a lot to do with anthropometrical variables (body mass, body height, BMI, body shape and part circumferences).

Agility: Is the ability to change body position or direction of the body rapidly. Agility tests require the subject to run around a circuit of objects; turning, stopping and starting. Many sporting events are automatically involved with activities that require athletes to be agile (Barnes et al., 2007). Agility is influenced by balance, coordination, position of center of gravity, running speed and skill (Hoeger, & Hoeger, 2011). This implies that, since speed is positively correlated to anthropometric variables, it is therefore suggestible that, there may be a positive relationship between some of these anthropometric variables and agility in some sports.

Sheppard, Young, Doyle, Sheppard and Newton (2006) have established that certain anthropometric variables and factors are responsible for the athlete's ability to quickly change direction in reaction to a situation during performance. These include stature, limb length, and the location of the centre of gravity of the athlete. They further noted that, the lower the centre of gravity the quicker the athlete. In another study, Cronin, McNair and Marshall (2003) proved that limb length has a relation with lunges typical of directional changes in badminton, squash and tennis. These lunges or directional changes are mainly seen in defensive movements in games including soccer, basketball, rugby, and handball.

Strength: Muscle strength is defined as the amount of force a muscle or group of muscles can exert in one maximal effort (McArdle, Katch, & Katch, 2007). The development of adequate muscular strength through a conditioning programme would ensure good appearance, improved physical fitness, protection against some orthopaedic diseases, improved skill performance and the development of other physical fitness components (McArdle et al., 2007). However, when these muscles perform repeated contractions, it is termed as endurance. This is sometimes referred to as localized endurance as it is related to a particular muscle or muscle groups. For example, you can develop the endurance of muscles of the right arm separate from that of the left arm.

Most actions in active sports are very explosive. Some of these activities include throwing, kicking, hitting, tackling (charging and blocking), jumping and being agile. All of the above actions cannot be executed efficiently if there is no muscular strength. Thus, anthropometric and physiological predispositions have a high muscular strength, which also diminishes the risk of injury (Reilly, Bangsbo, & Franks, 2000).

Strength generally enhances a person's health and well-being throughout life. The need for good muscular strength is not also, only confined to highly trained athletes, fitness enthusiasts, and individuals who have jobs that require heavy muscular work. In fact, a well-planned strength-training program leads to increased muscle strength and endurance, muscle tone, tendon and ligament strength, and bone density, all of which help to improve and maintain everyday functional physical capacity (Hoeger, & Hoeger, 2011). An enhanced reactive strength ability results in an increased jumping and hopping heights, a reduced ground contact time at all running speeds, and an increased rate of force development and contributes to an athlete's ability to change direction (Arampatzis, Schade, Walsh, & Bruggemann, 2001).

More specifically, good strength enhances the performer's lean muscle, destress the bones, preserves bone density, and decreases the risk for osteoporosis .It also helps to increase and maintain resting metabolism and encourages weight loss and maintenance. Strength improves balance and restores mobility and makes lifting and reaching easier. It lowers cholesterol, high blood pressure, and the risk for developing diabetes as well as promoting psychological well-being (Arampatzis et al., 2001).

Furthermore, with time, regular strength training decreases the heart rate and blood pressure response to lifting a heavy resistance. This adaptation reduces the demands on the cardiovascular system when performing activities such as repeated or endurance running in soccer (Chamari et al., 2005).

There are various categories of body strength some of which include upper body strength, lower body strength and abdominal strength. Upper body strength is the strength in the arms (Mathavan, 2012) and that of the lower body has to do with the strength in the legs (Johnson, 2001). Abdominal strength is the strength that emanates from the trunk, specifically the abdomen (American College of Sports Medicine, 2010).

There are indications that, some anthropometric variables positively correlate with strength through testing --missile projection, pushups, pull ups, and vertical jump--. This can be explained through the distance covered by the projected missile or the velocity with which the missile travelled. The number of pull or pushups and the height attained by an individual in vertical jump also determines upper and lower body strengths respectively (American College of Sports Medicine, 2010).

According to Gorostiaga, Granados, Ibanez and Izquierdo (2005) and Van de Tillar and Ettema (2003) strength production from the bodydepends on body mass, BMI and body size. This is evident from the results obtained from Gosh and Goon (2014) which has thigh girth significantly correlating with distant kick in soccer (.595). A previous study by Ramakrishnan, Bronkema and Hallbeck (1994) also revealed that, body dimensions have a lot to do with the strength of an individual. They established high correlations between basic hand dimensions (palm thickness, wrist circumference, and finger span)and grasp strength through the use of stepwise regression analysis which gave an R^2 value of 0.82.

To further elucidate, these relationships between body dimensions and strength must be analyzed in relation to the muscle mass and the flow of energy via the limbs during the kick or throw (Gorostiaga et al., 2005; Van de Tillaar, & Ettema, 2004). Even though some parts of the body's muscle mass can increase up to about 20.7% from childhood to adulthood in cross-sectional area (Deighan, De, Grant, & Armstrong, 2006), the development of strength is highly related to muscle hypertrophy (Hansen et al., 1999) through exercise.

Anthropometry, Physical Performance and Kicking Ability

Athlete's excellent performance in sports depends largely on his/her requisite anthropometric characteristics, physical and motor components of fitness, which enables him/her to perform successfully a particular motor skill, game or activity (Raschka, & Wolthausen, 2007). They further listed the specific motor fitness components as agility, balance, coordination, power, reaction time, and speed. These components of motor fitness are also referred to as skill-related fitness. A combination or all of the above specific motor fitness components are needed to perform tasks in most sports especially soccer. Thus, it can be deduced that kicking ability in soccer which is made up of kicking for distance, kicking for accuracy and dribbling (Gosh, & Goon, 2014) rely greatly on the skill related fitness for success apart from the anthropometric characteristics. For instance, a study by Silassie and Demena (2016) revealed that, performance in dribbling depends on good speed and agility.

Distant kick in soccer is fundamentally meant to give a long pass, score from afar or kicking the ball to safety whereas accuracy has to do with directing the movement of the ball towards an intended target as explained in the earlier chapter. Distant kick usually relies on accuracy and/or sometimes timing for success whatever the intent of the kick may be. Accurately passing the ball to a team mate is an essential ability required for success (Haaland, & Hoff, 2003).

Dribbling is thus maneuvering and manipulating the ball with any part of the body except the hands as in field play to outwit an opponent or to keep possession of the ball. According to Gosh and Goon (2014) Dribbling and Distant kick are successfully executed with a very formidable and firm thigh girth but not correlated with calf girth which was not in consonance with the findings of Prem and Ramesh (2015). Manilal (1985) also concluded that, calf girth has a lot to do with playing ability with the reverse for chest girth.

A study by Malekar (2015) on the Relationship of selected anthropometric measurements and strength to kicking ability of soccer players revealed that, there is a very high correlation between kicking and leg length, leg explosive power and abdominal strength. Meanwhile some other studies published the following mean values for kicking ability from some international universities;

Table 2: *Kicking Ability characteristics of Soccer Players in some international Universities*

Variables	Male	Female
Distant kick (m)	44.21 (Malekar, 2015)	22.95 (Mengesh, 2014)
Accuracy (Points)	3.36 (Gosh, & Goon, 2014)	3.33 (Ali, 2011)
Dribbling (Sec)	14.83 (Ali, 2011)	18.04 (Mengesh, 2014)

The Arm versus Catching and Throwing of Objects

Measurement of the hand and its segments is often included in large-scale anthropometrical studies (Jurimae, Hurbo, & Jurimae, 2009; Nag, Nag, & Dessai, 2003; Staszkiewicz, Ruchlewic, & Szopa, 2002). Finger span in particular makes a lot of difference in sports that encompass throwing and/or catching --Basketball, Handball, Netball, some aspects of Soccer and

Athletics-- as a component of the game. Its functions include activities such as pushing, adjusting objects, striking, blowing and supporting the body in space. It is a measure that has been used for many years to determine the success rate of shooting and/or passing in Basketball, Handball, Netball and so on (Katie, Cavala, & Srhoj 2007; Skoufas, Kotzamanidis, Hatzikotoylas, Bebetsos, & Patikas, 2003). Finger span also has a lot to do with goalkeeping, throw-in from within the goal area and the side lines in Soccer because it enables effective manipulation of the ball in relation to upper body strength (Katie et al., 2007; Skoufas et al., 2003). Katie et al. (2007) further established that different types of throws and passes are crucial elements of all the hand games, goalkeeping and throw-in in soccer.

Ball handling, manipulation and throwing is one of the most multi-joint movements requiring excellent coordination between joints. Ball throwing is not only for high speed but also precision (Hirashima, Kudo, Watarai, & Ohtsuki, 2007). Humans can throw a ball with high speed and also hit/kick high speed ball with the same accuracy level (Hirashima, Kudo, & Ohtsuki, 2003). Studies have shown that skilled throwers are able to control their finger grip force in over-arm throws which is proportional to the back force in accordance with the constant amplitude of finger opening to ensure accuracy in the throw (Hirashima et al., 2007; Hore, Watts, Leschuk, & MacDougall, 2001).

The lengths of the fore and upper arms are longer than the hand. Thus the angular velocity of the elbow and the shoulder ensures the increase in ball speed and subsequently the distance the ball would cover. The wrist just controls the finger grip force to ensure an accurate ball release (Hirashima et al., 2003). However, the speed of the ball generated by shorter arms is always greater than longer arms which produce farther distances (Marshall, 2007). However, Tibayan and Vasquez (2011) concluded that, the arm girths have no effect on throwing in soccer.

Energy transmitted to the hand ensures the grasp and control for accurate release in efficient throwing (Young, 2003). The thumb must be long enough and sufficiently mobile to position its fingertip pad to the ball on one side while the other fingers oppose their distal pads to their opposite side (Young, 2003). For adults, Nicolay and Walker (2005) used 6 parameters and Nag et al. (2003) studied 51 hand dimensions that include different length, breadth, circumference, depth, spread and clearance parameters of the hand and fingers. The hand perimeters are essential for goalkeepers and field players in soccer because they grasp or catch the ball and throw from the goal area and the side lines respectively (Visnapuu, 2009). However, the speed and accuracy of the throw or shot depend on different anthropometric al parameters of the player as well. Generally, taller players have some advantages compared to shorter players when it comes to catching and throwing of objects (Housh, Thorland, Johnson,&Thrap, 1984; Sidhu, Kansal, & Kanda, 1975). Grasping of objects (handball, basketball, and goalkeeping in soccer) is the outcome of simultaneous movements of several joints-transporting the hand of the object, pre-shaping the fingers into an appropriate grip and orienting the wrist. All of these movements may differ widely but they all attempt the same final purpose; to achieve a stable grasp for holding and manipulating the object (Paulignan, Frak, Toni, & Jeannerod, 1997). Objects may be grasped in several ways due to their physical properties, the context surrounding the object or goal of the grasping (Ansuini, Giosa, Tuurella, Altoe, & Castiello, 2008). A study on grasping kinematics of objects based on different goals showed that the nature of the risk to be performed after grasping affects the positioning of the fingers during the reaching phase (Ansuini et al., 2008). The maximum grip aperture during prehension is linearly related to the size of the object being grasped (Safstrom, & Edin, 2008). If the object was larger than expected, the moment of contact occurred earlier, and conversely if the object decreased in size, the moment of contact occurred later. Mazyn et al. (2007) reported that successful catch depends on the forward displacement of the hand and on the dynamics of the hand closure.

By placing the hand on a paper and marking the tips of the thumb and the other fingers, the finger span can be measured on a straight line. This is a better method than placing the hand directly on the ruler (Jurimae et al., 2009). Meanwhile, Bakinde (2014) reported the finger span of university players as 56.85 (cm) with a range of (45.50-64.20) for female and 58.94 (cm) with a range of (43.50-69.30) for male.

Sports Performance and Stature

Physique is very important in some roles in some sports. Even though it is believed that physical fitness is trainable and leads to success in sports, the impact of one's physique and body composition seem to play a greater role in the determination of his/her achievement in high level performance. Reilly, Bangsbo and Franks (2000) have stated that, anthropometric predisposes positional roles within soccer; with taller players being the most suitable for central defensive positions, goalkeeping, and central attack. To further support their view, Reilly et al. (2000) quoted the overall mean (±*sx*Å)value for stature of nine soccer squads as reported by Reilly (1990) as 1.77±0.15m.

In some Sports such as basketball, tallness is an advantage while taller and more powerfully built players have an advantage in handball, rugby and soccer (Carter, Ackland, Kerr, & Stapff, 2005). This has manifested in many reports of authors; some of which are as below:

Table 3: *Heights of Soccer Players in some international Universities*

Male (cm)	Female (cm)
175.75 (Reeves et al., 1999)	166.83 (Sporis et al., 2007)
178.26 (Coelho et al., 2007)	165.60(Green et al., 2013)
	162.60(Almagia et al., 2008)

Sports Performance and Body Weight

Body weight as described by Malina (1975) and reported by Bakinde (2014) is a measure of body mass, a composite of independently varying tissue components primarily bones, muscles, fats and viscera. Total body weight can be divided into two components namely: the lean body mass and the stored fat (Bakinde, 2014). The two components are needed for optimal performance in sports; however, the degree of importance of the two components is not the focus. The emphasis here is on the absolute weight or total body weight.

Many studies have been carried out on sports performance in general and body weight. This subject becomes rather more interesting in soccer. The sizes of players have always been discussed as an important issue. Both coaches and soccer players put a lot of importance on bodyweight. Coaches always want the biggest athletes possible because body size and weight does play an important role in body strength (Johnson, 2001). It was also found that, typically larger and heavier athletes produce greater absolute strength and power than smaller athletes (Bale, Colley, Mayhew, Piper, & Ware, 1994).

Bodyweight is undeniably a very significant anthropometric measure to be evaluated by coaches, physiotherapists and physical education specialists. It has become a very important issue, with regards to its direct correlation to performance. Being a larger athlete may increase performance capabilities in some roles in soccer, although, having an excess amount of body fat may be detrimental to the athlete's performance (Nuhmani, & Akthar, 2014).

There are differences in body weight when it comes to successful soccer players and evidences can be found in literature. However, it is within a particular range and hovers around some particular means as reported below:

Table 4: *Weights of Soccer Players of some international Universities*

Male (Kg)	Female (Kg)
74.18 (Reeves et al., 1999)	60.08 (Sporis et al., 2007)
60.58 (Saha et al., 2014)	62.80(Green et al., 2013)
67.28(Dawal et al., 2012)	62.10 (Almagia et al., 2008)
74.90(Burdukiewicz et al., 2014)	63.90(Martinez, & Coyle, 2006)
	61.70 (McCurdy et al., 2010)
	61.90 (Sjo¨kvist, etal.,2011)
	64.80 (Vescovi et al., 2006)
	64.80 (Vescovi & McGuigan, 2008)
	60.70 (Wells, & Reilly, 2002)

Sports Performance and Speed

The test for speed is an important component of an athlete's physical capabilities to be measured. The 40-yard dash or 36.58m sprint is a universal test for speed in many dynamic sports. Speed is a very important criterion for a soccer player's ability. It is also one important criterion measure, which could be used to test the concurrent validity of predictors of soccer playing ability. Soccer is clearly a sport which engages all-out explosive bursts of power play in performance (Burke, Winslow, & Strube, 1980).

The 36.58m dash is now an extremely controversial test for speed. Speed is often tested with the 36.58m dash. It is doubtful this practice will ever be discontinued because; the 36.58m dash is a test that most professionals and nonprofessionals identify soccer players with speed. The 36.58m sprint has been the traditional 'gold standard' of assessing speed in soccer players, although few players ever run this distance in a game. This is especially true for wingers. This distance is probably most important for many special team players, who routinely cover from 36.58m to 54.86m or 60 yards during counter attacks. As with many traditional beliefs in soccer, almost all professional scouts and most professional, collegiate, and high-school teams have used this test as a marker of soccer speed (Kraemer, & Gotshalk, 2000). Many people believe that the 36.58m dash is a poor test of speed. There have been questions as to the specificity of this test since there is rarely a time when soccer players run 36.58m (Crews, & Meadors, 1978). Many people believe that the 36.58m dash is not representative of speed for soccer players since they rarely run that distance. These opposers of the 36.58m dash consider a 5m to 30m dash as a more comparable test for speed among soccer players (Turner et al., 2011). This doubt is a reflection of the fact that there are few times a player actually runs 36.58m during a game. This is especially true of wingers. However, the 36.58m-test is meant to get the top speed of the players which is generally attained at that distance.

Crews and Meadors investigated this problem with the testing of speed in 1978. They found out that there was a high positive relationship between 5 and 36.58m run times (.80) and between 15 and 36.58m run times (.94). It is apparent that performance in a 36.58m run is representative of how fast a player moves through a shorter or longer distance, and thus is an appropriate test of soccer speed (Crews, & Meadors, 1978). Speed is an important physical ability in soccer. Many conditioning programs seek to develop and test the athlete's speed (Ebben, 1998).

A test of how fast male soccer players of mean age 22.32 years old were, revealed a mean of 4.74 seconds over 36.58m (Johnson, 2001), whiles the female revealed 5.19 seconds (Haagen, & Seiler, 2014). Wood (2008) also reported the following mean ranges of speed measured in seconds over a distance of 36.58m for male and female university soccer players: Male - 4.60 - 4.90;Female - 4.90-5.80.

Sports Performance and Flexibility

Flexibility is defined as the functional capacity of a joint to go through a full range of movements. Flexibility is a specific physical conditioning component, which is related to the specific joint of the body. It cannot therefore be evaluated by just one test. Everybody possesses some degree of flexibility (Zhang, 2006).

Active sports are generally characterized by movements caused by an action or a reaction of an event. These motions are possible as a result of the joints within the body and their ranges of motion (Hargrove, 2012). Nevertheless, fitness participants generally have underestimated and overlooked flexibility fitness. The most significant detriments to flexibility are sedentary living and physical inactivity (Hargrove, 2012). This is not to say that active people do not have flexibility issues. Physically inactivity people lose their muscles elasticity, and their tendons and ligaments tighten and shorten. Generally, flexibility exercises to improve range of motion around the joints are conducted following an aerobic workout. Stretching exercises seem to be most effective when a person is warmed up properly because changes in muscle temperature can increase or decrease flexibility or joint range of motion by as much as 20 percent. Because of the effects of muscular temperature on flexibility, many people prefer to do their stretching exercises after the aerobic phase of their workout.

According to Hargrove (2012), the vast majority of movements in sport take place within ranges of motion easily achievable by the average person. This can be seen in most games including football, soccer, tennis, and basketball, where there is no unusual display of flexibility. He further explained that, one common rationale for increasing range of motion at a joint is to prevent injury from overextension of the joint, such as a pulled muscle. So for example if you want to be able to prevent a groin strain, you would try to increase your range of motion into hip abduction. This makes sense in theory but the evidence in support appears weak.

Some research has shown that lack of flexibility has a more negative impact on sports performance than any other factor. That means that no matter how much good a performer may be, if he/she is not flexible, he/she will not likely perform well in that sport. This is because there is a length-tension relationship that a performer must take advantage of. That means that in order to get the full potential out of a muscle, we need to be able to use as much of the length of the muscle as possible. Once the muscle is pre-stretched, it is ready for quick and explosive action. If it is too tight, the performer may not be able to put certain muscles on a pre-stretch, thus robbing him/her elasticity. Another way that lack of flexibility will affect your performance is through joint and body positioning. If you are tight in specific muscle groups, you may not be able to put parts of your body in positions that are advantageous for your performance. For example, if you are tight in your calf muscles, you likely will walk with your feet pointed outward, with your feet pointed outward in this way will cause you to only use half of your calf muscle when it contracts. It's not hard to figure out that this will limit your performance.

Likewise, if a person tries to run with tight hip flexors, he or she will not be able to reach full hip extension even if there is a hard push against the ground. This will limit the glute and hip muscles that robs the individual of valuable reach. A study by Saha and Bhowmick (2014) put to bare a mean flexibility range of 19.9cm - 21.54cm for Indian soccer men with a mean age range of 21.7years - 24.73years.The ranges below also indicate general expected scores for flexibility (in cm) for adults (Wood, 2012).

Table 5: *Norms for Flexibility test for adults*

Grade	Male (cm)	Female (cm)
Super	>+27	>+30
Excellent	+17 to+27	+21 to +30
Good	+6 to+16	+11 to +20
Average	0 to +5	+1 to+10
Fair	-8 to -1	-7 to 0
Poor	-20 to -9	-15 to -8
Very poor	<-20	<-15

Even though there are some variations in how flexibility test are measured (either with the zero point at the level of the feet or 23cm at the level of the feet), there are no enhancement or reduction in the scores obtained (Wood, 2012). Raven, Gettman, Pollock and Cooper (1976) reported the following means and range for flexibility test in inches which was converted into centimeters by the researcher for soccer players with an age range of 19 to 32 years: Reach – 52.96; Range – 30.48 to 58.42. Meanwhile, exrx.net reported the mean flexibility for 17+years male and female as 32.40cm and 34.40cm respectively.

Sports Performance and Agility

Agility is probably the most suitable indicator of overall soccer performance and it is important for all sports that require swift and accurate directional change because, it relies on the components of speed, balance, coordination, endurance, visual processing, anticipation, skills, perception, power and strength (Groppe, & Roetert, 1992; Mirkov, Nedeljkovic, Kukolj, Ugarkovic, & Jaric, 2008). During performance, successful soccer players make use of agility which constitutes around 11% of the total movement on the field and up to an average of 50 turns in a match (Stolen, Chamari, Castagna, & Wisloff, 2005; Wisloff, Helgerud, & Hoff, 1998). Agility is crucial to good field movement and correct positioning on the pitch (Groppel, & Roetert, 1992). All of the above suggest that, agility is one of the most important variables that can make or unmake a player's total performance in a game.

Fit Force Inc. (2010) provided a mean range of time in seconds for Illinois agility test as 17.8s to 20.4s. Raven et al. (1976) also reported the following mean performance for Illinois agility test in seconds for soccer players with an age range of 19 to 32 years as 15.73 with a range of 14.20 to 16.60.

Davis et al. (2000) also stated the norms for Illinois agility test for male and female with a mean age of 19 years as below;

Table 6: *Norms for Illinios Agility test*

Gender	Excellent	Above Ave.	Average	Below Ave.	Poor
Male	<15.2secs	15.2-16.1 sees	16.2-18.lsecs	18.2-19.3secs	>19.3secs
Female	<17.0secs	17.0-17.9secs	18.0-21.7secs	21.8-23.0secs	>23.0secs

15.37 seconds was also the mean reported by Chileh et al. (2012) for Illinois agility test for male.

Muscular Endurance and Sport Performance

Physical activity in general makes use of various elements of ' strength. But strength usage also depends on the type of activity. Strength has to do with overcoming resistances and this manifest in how swift or easily an individual execute a physical task (McArdle, Katch, & Katch, 2007).

Athletes in general vary in their ability to perform certain repeated strength task in their chosen sport. This may be due to the fact that some of them inherited their strength which makes them dominant (Bompa, & Haff, 2009). This condition affects their speed, kick, throw and charge which are some of the ingredients that play important role for players to reach high levels of performance. Soccer players are expected exhibit repeated strength throughout the entire span of the game and this plays important roles in players' contribution towards a team's total output (Bompa, & Haff, 2009). The following are some mean body strengths that were reported by some author:

Table 7: *Reports on some Abdominal and Upper Body tests*

Variables	Male	Female
Sit-ups (reps/30 secs)	34.7 (Jalakas, &Jarvelaid, 2004) 22.3 (Kilgore, 2015)	28.7 (Jalakas, &Jarvelaid, 2004) 18.6 (Kilgore, 2015)
Push-ups (reps/30 secs)	42.3 (Jalakas, &Jarvelaid, 2004) 26.5 (Fitforce, 2010) 18.8 (Kilgore, 2015)	29.0 (Jalakas, &Jarvelaid, 2004) 8.0 (Kilgore, 2015)

Sports Performance and Leg Power

The vertical jump is a test for leg power. This is a non-resistant exercise used to measure jumping ability. This test is very important because the ability to jump is a measure of power. In many sports, such as soccer, volleyball, handball and basketball, power is a very important component for the athletes. The athletes in these sports rely on power to succeed (Hedrick, 1996). Power cleans and jerks are exercises that can be used to measure total body power. These indicators of power are a different measure than the vertical jump since a resistance is being used by the two Olympic-style lifts. The snatch and the clean and jerk have been widely accepted as a viable means for increasing leg power (Hedrick, 1996). The clean and jerk are two Olympic-style lifts that can be used to increase vertical jump ability. The Olympic-style lifts involve speed. This speed is transferred from the body to the bar. In performing these lifts power is produced in much the same way as an athlete jumping in the air as high as they can. Coaches would often give cues to their athletes when performing Olympic-style lifts. One of the most common cues is to perform vertical jump with the bar in your hands (Garhammer, & Gregor, 1992).

The vertical jump test, the power clean, and the push jerk are all tests of power. The difference is that the power clean and the push jerk are exercises that can increase vertical jumping ability. But performing the vertical jump cannot increase the power clean and the push jerk (Hedrick, 1996). The vertical jump is a non-resistance test of lower body power while the power clean and the push jerk are weight-bearing tests of total body power. However, all of these enhance the soccer player's aerial ability during play. Some authors reported the following vertical jumps for soccer players in some universities:

Table 8: *Reports on Vertical Jump tests for Soccer Players in some Universities*

Male (cm)	Female (cm)
62.93 (Abidin, & Adam, 2013)	42.71(Abidin, & Adam, 2013)
54.63 (Thomas, & Reilly, 1979)	35.05 (Wells, & Reilly, 2002)
49.42 Raven et al., 1976)	
46.25 (Saha, & Bhomwick, 2014)	

Brief History of Ghana University Sports Association Games

The Ghana University Sports Association (GUSA) was established in 1966. It started with only three public universities namely the University of Cape Coast (UCC), the University of Ghana (UG) and Kwame Nkrumah University of Science and Technology (KNUST). The first GUSA games were hosted by KNUST in 1966 at Kumasi. It is a biennial games which is hosted on rotational basis with the last one before this study hosted by UCC (23rd GUSA Games, from 11th to 22nd June, 2014). Currently, the membership of GUSA stands at seven public tertiary institutions. The other members who include University of Education, Winneba (UEW), University for Development Studies (UDS), University of Mines and Technology (UMaT) and University of Professional Studies, Accra (UPSA). These games apart from other objectives,afford GUSA the opportunity to see the performance of students from various universities for onward selection to represent Ghana at FASU

Games. For fallow years, a Mini GUSA games for some selected events are organized to give students the chance to justify themselves for onward selection to represent Ghana at FISU Games. Soccer always features at Mini and Main GUSA Games because Ghana is perceived to be a soccer nation and as such the students are always expected to do well at bigger competitions. The results of the 6th Mini GUSA games can be found in Appendix A.

The Game of Soccer

Soccer, also known as Association Football has metamorphosed with time through many cultures. According to Reilly, Cabri and Araujo (2005) some peculiar features that has phased out include;

1. large number of players at a time (500-a-side) with a goal post of 5 to 10km apart.
2. kicking of human skulls as balls after defeat in war.
3. the use of all parts of the body was permitted.
4. kicking or striking of opponents.

In 1863, the playing of soccer was restricted to the legs and separated from rugby (Reilly, Cabri, & Araujo, 2005).

Modern soccer pitch has dimensions with lengths ranging from 90m to 120m and breadths from 45m to 90m. Modern soccer as it is known is a form of football played between two teams of 11 players, in which a spherical ball with a circumference of 71cm is advanced by kicking or bouncing it off any part of the body but the arms and hands, except in the case of goalkeeping, where the hands may be used to deflect, catch, carry, throw, or stop the ball within the goalkeepers' goal area, and throw-in by all players from the side lines (Reilly et al., 2005). The objective of the game is to score by getting the ball into the opposing goal. Outfield players mostly use their feet to strike or pass the ball, and may also use their head or torso to strike the ball depending on the situation. The team that scores the most goals by the end of the match wins. If the score is levelled at the end of the game, either a draw is declared or the game goes into extra-time and/or a penalty shootout depending on the format of the competition.

Dunning (1999) submitted that soccer is played by 250 million players in over 200 countries, making it the world's most popular sport. This implies that soccer can be played by almost everybody either for recreation or for competitive reasons. Everybody is acceptable for the choice of players when soccer is being played for fun such as ball joggling and normal health or recreational field play. This is totally contrary to competitive soccer where players engage themselves to confirm their supremacy.

Summary

From all the above review, it is suggestible that soccer players in the universities and all over the world are becoming taller, stronger, agile, bigger, faster and more powerful in their play. These variables are determined by the anthropometric and motor performance characteristics which play an important role in many sports and serves as a guide for coaches, team managers, physiotherapists and even the players themselves for strategies. As such anthropometry which is a systematic quantitative description of the dimensions of the human body parts through measurements can only be said to be valid and reliable if the following guidelines are followed;

1. precise standardization of the equipment and techniques
2. identification of uniform landmarks

3. establishing conditions for the measurements.

Motor performance is the observable attempt to produce a voluntary action as a result of temporary factors such as drive, fatigue, physical conditioning and excitement. Motor performances which include speed, agility, strength, power and flexibility were established as some few parameters that impact soccer playing ability.

Reports of many studies on anthropometry and motor performance of various university soccer players and other soccer players of similar ages as the participants as in how tall, bulky, heavy, strong, fast, agile, powerful and accurate they were have been established in this study for onward comparison.

CHAPTER THREE

RESEARCH METHODS

The purpose of this study was to analyze the anthropometric variables in relation to motor performance of soccer players of the public universities in Ghana. This chapter concentrated on the methods and materials that were used. It contains the research design, population, sampling procedures, data collection instruments, validity and reliability of the instruments, pilot study, data collection procedure and data processing and analysis.

Research Design

Cross-sectional descriptive research design was employed for this study. The design allowed the investigator to measure and described the anthropometric and motor performance variables of the soccer players who participated in the 6^{th} Mini GUSA Games. Thus, the design guided the researcher to assess and take a snap shot of the quality of the participants in terms of their anthropometric variables in relation to their motor performance at a point in time (Ogah, 2013).

Population

The total participant pool for this study consisted of all soccer players who represented their universities at the 6^{th} mini GUSA games which was hosted by KNUST with all the seven member institutions partaking. Institutions were allowed to present up to 20 players each for both the male and female categories. However, only UG, KNUST, UCC, UEW and UPSA presented teams for both gender whilst UDS and UENR presented only male teams. Thus, a total of 100 female and 140 male soccer players were involved in the 6^{th} Mini GUSA competitions.

Sampling Procedures

Four out of the seven public universities in Ghana namely UG, KNUST, UCC and UEW who participated in the 6^{th} Mini GUSA games were purposively sampled for the study. The reasons for these selections and procedure were that, these four institutions always present teams for both gender and have always played in the Semi-finals in soccer in GUSA games since its inception. The 11 players that made the first teams, which included 1 or 2 attacker(s), 5 or 4 midfielders (depending on the strategies of the coaches), 4 defenders (2 laterals and 2 centrals) and 1 goalkeeper were again purposively selected from each institution for the study. Once again these selections and procedure were based on the fact that, some of the reserved players did not get the chance to play at all at the games and therefore the possibility of chancing on those players were eliminated. Consequently, a total of 44 female and 44 male soccer players were involved in the study.

Data Collection Instruments

In conducting this research, the following research instruments were used:

1. **Weighing scale:** Camry ISO 9001 Model digital portable self-zeroing weighing scale (made in Japan) was used to measure the body weight in kilograms. The range of graduation was 0 to 120kg. Weights were recorded to the nearest 0.1kg.
2. **Stop watch:** The Quantum stop watch graduated to 1/100 of a second with a memory of 100 was used for all timings in this study including speed, abdominal strength, agility, upper body strength and dribbling.

3. **Measuring tape:** The butterfly trade mark, non-elastic tape, graduated in inches and millimeters was used for measurements of all distances relevant to the study. These included; leg length, thigh girth, calf girth, upper arm length, fore arm length, upper arm girth, chest girth and finger span. The others are leg power and distant kick.
4. **Sit and Reach Box:** This was used to measure the flexibility of the players. The extents of reach in centimeter (cm) were recorded as the scores.
5. **Stadiometer:** A calibrated stadiometer from 5.0 centimeters to 2.5 meters was used to obtain the height measurements.

   The following are all the variables for the study and the detailed descriptions of how the instruments were used to obtain the data for the study:

A. Anthropometric variables: height (stature), weight, leg length (full), mid- thigh girth, calf girth, upper arm length, fore arm length, upper arm girth, chest girth, finger span.
B. Motor performances variables: speed, leg power, abdominal strength, arm power, agility, flexibility.
C. Kicking ability: distant kick, dribbling, accuracy.

For the body measurements, the techniques of International Standards for Anthropometric Assessment (2001) were adopted for the study as follows:

1. Height of the soccer players were measured with the stadiometer. **Procedure:** The critical feature of the technique was to acquire the maximum distance from the floor to the participants' pinnacle (the most superior point on the skull). Thus, the participants were asked to stand

erect on the stadiometer barefooted, feet together and arms hanging naturally by the sides, the heels, buttocks and upper part of the back touching the scale, the head placed in the Frankfort plane and not touching the scale. The participants held a deep breath while keeping the head in the Frankfort plane. The recorder then placed the head board down on the vertex. The researcher ensured that the heels were not elevated from the floor. The stature was measured and recorded to the nearest 0.1cm.

2. Body weights of the players were also taken with the digital weighing scale. **Procedure:** Each participant was made to be in a very light weight t-shirt and a shorts or sports skirt for female, barefooted on the platform of the scale. The scale was adjusted to read zero before the participants were allowed to mount it for their weights to be obtained. The body weights were measured in kilogram (Kg) to the nearest 0.1 kg.
3. Calf girth was taken with a flexible steel tape. **Procedure:** The participant was directed to be in the anatomical position and with the tape measure, the broadest part of the calf was horizontally measured round. The tape measure was snug but not too tight or too loose in order to provide a more accurate measurement. The tape measure was moved up and down the calf to ensure that the biggest part of the calf was located for the best measurement. Measurement was taken to the nearest 0.1cm.
4. Chest girth was taken with a flexible steel tape. **Procedure:** The chest girth was taken at the level of the mesosternale. The participant assumed a relaxed standing position with the arms hanging by the sides and

slightly abducted. The researcher or his assistants stood on the right side and instruct the participant to abduct the arm to the horizontal position allowing the tape to pass around the thorax. The end of the tape and the case were both held in the right hand while the researcher used the left hand to adjust the level of the tape at the back to the adjudged level of the marked mesosternale. The investigator then resumed control of the stub with the left hand and used the cross-hand technique to position the tape in front at the marked mesosternale. The participants were instructed to lower their arms to the relaxed position with the arms slightly abducted. The tape was then readjusted as necessary to ensure that it had not slipped and did not excessively indent the skin. Measurement was taken to the nearest 0.1cm.

5. Thigh girth was also taken with a flexible steel tape. **Procedure:** This measurement was taken at the right thigh at the marked mid trochanterion-tibiale-laterale site. The participant assumed a relaxed standing position with the arms folded across the thorax. Feet were separated with the weight evenly distributed. The researcher or his assistant passed the tape measure between the lower thighs and then slid it up to the correct plane. The snub of the tape and the housing were both held in the right hand while the researcher resumed control of the stub with the left hand using the cross-hand technique and positions the tape so that it was held in a perpendicular plane. The tape was then readjusted to ensure it did not slip and not excessively denting the skin. Measurement was taken to the nearest 0.1cm.

6. Upper arm girth was taken with a flexible steel tape. **Procedure:** The measurement was taken at the level of the mid- acromiale-radiale. The participant assumed a relaxed standing position with the arms hanging by the sides. The right arm was abducted slightly to allow the tape to be positioned perpendicular to the long axis of the arm. The measurement was read to the nearest 0.1cm.
7. Upper arm length was measured with a flexible steel tape from the distance between the acromiale and radiale landmarks. **Procedure:** The participant stood erect with the palms slightly off the thighs. Measurement was taken with one arm of the tape held on the acromiale while the other is placed on the radiale. The right arm of the participant was measured. Measurement was taken to the nearest 0.1cm.
8. Forearm length was measured with a flexible steel tape from the distance between the radiale and stylion landmarks. **Procedure:** The participants assumed the anatomical position. Measurement was taken with one end of the tape held against the radiale and the other placed on the stylion landmark. The right arm of the participant was measured. Three measurements were taken, and the mean recorded to the nearest 0.1cm.
9. Finger span was measured with a flexible steel tape. **Procedure:** The participant was seated comfortably and spread stretched out the dominant hand onto the paper on the table. The outline of the hand was drawn on the paper. The contour of the hand was drawn with maximal active voluntary adduction of thumb and the other fingers. The outlines of the dominant hand of the participant were used for measuring specific hand anthropometric parameters. The dimensions of the hand were

measured with an accuracy of 0.1cm. The following parameters of fingers span were measured (Fl) from the tip of the thumb to the index finger (Finger span 1-FS1); from the tip of the thumb to the tip of the middle finger (Finger span 2-FS2); from the tip of the thumb to the tip of the ring finger (Finger span 3-FS3); from the tip of the thumb to the tip of the little finger (Finger span 4-FS4); from the tip of the thumb to the tips of all fingers (Fingers span 5-FS5). The addition of the finger span was used as the measurement into the nearest 0.1cm.

10. Leg length was also measured with a flexible steel tape. **Procedure:** The participant was made to stand erect with body weight equally distributed on the legs. The distance between trochanterion to pternion or garn was measured from the iliac crest of the hip to the ankle and recorded to the nearest 0.1cm.
11. Speed was measured with the stop watch in seconds. **Procedure:** The standing start method was employed for this test on the athletics track. The participant stood behind a line and with a signal go, he/she ran the 36.58 meter as quickly as possible through to the finishing line. The time used to complete the race was measured to the nearest 0.01 second.
12. Leg power was conducted with the vertical jump test on a tall wall with measurements. **Procedure:** The participant was made to put his/her hands on the hip. From a semi-squat position, arms placed on the hips, he/she would perform three jumps with recovery time of 30 seconds between each jump. The participant was encouraged to jump as high as possible. Three trials were allowed each participant and the best jump was recorded to the nearest 0.1 cm.

13. Dribbling was measured with a stop watch in seconds. **Procedure:** With a whistle and concurrently starting the stop watch the participant started a zigzag dribbling with a ball in between six cones, then move forward 3 meters, took a right turn, dribbled straight for 5 meters through 4 cones and again took another right turn and dribbled the ball 5 meters through 5 cones back to the restraining line The time taken to the nearest 0.1 second was recorded and the average of three trails considered as the score (Ghosh, & Goon, 2014).
14. Distant kick was calculated with a tape measure. **Procedure:** The participant was allowed three trials to kick aerial balls as far as possible from the goal line. The distance from the goal line to the spot where the ball landed first was measured. The average to the nearest 0.1m was taken as the score.
15. Shooting for accuracy was measured in points. **Procedure:** The goal post was divided into 5 equal parts and labeled with a point system of 5 for the extremes which reduced towards the centre to 3points. The participant kicked the ball from the penalty spot and scored points according to the target they hit (Ghosh, & Goon, 2014).The total points of all the three trials were recorded and the average used as the score.
16. Flexibility was measured with the sit and reach test in centimeters. **Procedure:** Participants were made to sit on the floor with legs extended to the front, place the back and head against wall and feet against the flex box. The hands were put on each other and reached forward while keeping the extended legs in position. The distance between the fingertips to box edge is the starting point. The participant was directed

to slowly bend the hip and reach forward as far as possible. He/she moved the fingers along the ruler to reach the final position. Four trials were allowed and at the fourth time he/she kept the final position for two seconds and the measured distance between the starting point and the reached point was recorded in centimeters as the score.

17. Agility was measure through the Illinois run test and a stop watch in seconds. **Procedure:** This test required the participants to run a course in the shortest possible time. A standard Illinois run course was constructed with four (4) cones placed at the corners of a rectangle (10.0m by 5.0m), with four more cones placed across the length of the rectangle through the center at equal intervals of 3.3m. The cones were labeled 1 to 8 from the start through to the finish. Participants began the test from 1, then to 2, 3, 4, 5, 6, 7 then finished at 8. The participant was prone on the belly so that his/her face and hands were located behind the starting line (first cone). Then by the 'Go' command and simultaneously starting the stop watch, he/she performed the test according to figure 21 (Davis et al., 2000).
18. Abdominal Strength was measured through repetitions in timed sit ups (reps). **Procedure:** As adapted from Jalakas and Jarvelaid (2004), the participants performed timed sit-ups. Lying flat on the back, knees bent (90 degree angle), feet held by assistant, fingers interlaced behind the head, participants flexed their trunk to sit upright. Repetitions during a period of 30 seconds were counted and used for the study.
19. Upper body strength was measured through timed push-ups (reps). **Procedure:** As adapted from Jalakas and Jarvelaid (2004), the

participants performed timed push-ups. The hands were placed on the ground just under and slightly outside of the shoulders. With the arms extended, fingers pointed forward and keeping the body straight, participants bent their elbows until the upper arms were parallel to the ground and returned to the original position. Repetitions during a period of 30 seconds were counted and the score used for the study.

Validity of the Instruments

The instruments for this study were already clinically validated, standardized, commonly used in the Ghanaian environment. However, the researcher, his supervisors and 4 research assistants tested them to ensure that they were in proper working conditions before usage.

Reliability of the Instruments

The research instruments were all standardized with their respective psychometric properties. Some of these included the weighing scale which had a reliability coefficient of 0.96 (Watson, 1993) and 0.95 (Safrit and Wood, 1995). Index Medicus for South-East Asia Region (2010) gave 0.96 and Safrit and Wood (1995) reported 0.99 as reliability coefficient for the height measuring stadiometer. Furthermore, measurements for this study were taken as directed by International Standards for Anthropometric Assessment (2001) and Baumgartner et al.(2003), in order to further establish the reliability.

Pilot study

The tests were administered by the researcher with the help of four research assistants one of who was a female. Two days training was given to the research assistants on what and how to measure the parts of the body needed after which a pilot was conducted before the actual research. Soccer players from the University of Professional Studies, Accra (UPSA) who did not make it to the 6th Mini GUSA competition participated in the pilot. The aim of the pilot study was to enable the researcher to:

1. Check the working conditions of the instruments.
2. Become familiarized with the requirements of the instruments for the study.
3. Get the research assistants acquainted with all the standardized tests, equipment and procedure for the main study.

Data Collection Procedures

The researcher took an introductory letter from the Head of Department of Health, Physical Education and Recreation (HPER) (Appendix E) and a permission letter from the Institutional Review Board (IRB) of UCC (Appendix E) to the various Sports Units of the universities involved in the study. Dates were fixed for the researcher to meet with the participants prior to the collection of data.

Discussions with participants: The researcher had extensive discussions with the participants which include confidentiality of the study, benefits to participants, institutions, GUSA and the nation as a whole. The researcher also sufficiently enlightened all participants about the nature and purpose of the test and what was expected of them during the administration of test. Thereafter, informed consent forms were issued to the participants before the commencement of the tests. Instructions and adequate demonstrations of the measurements were given prior to the beginning of the tests.

Measurements: To ensure that the participants recorded their best performance at each test, five minutes intervals were allowed between the tests.

All the tests were arranged in such a way that the preceding test cannot interfere with the next. The following were the order of the arrangements;

Measurement 1: Height, weight, leg length (fall), mid-thigh girth (flexed and tensed), calf girth.

Measurement 2: Upper arm length, fore arm length, upper arm girth, chest girth, finger span.

Measurement 3: Speed (36.58m dash), leg power (vertical jumps), kicking ability (distant kick, dribbling and accuracy), upper body strength (push-ups).

Measurement 4: Agility (Illinois run), abdominal strength (sit ups), and flexibility test (sit and reach test).

Test locations and dates: All the anthropometric measurements, agility test, body strength tests, flexibility and vertical jump were carried out at the gymnasia and fitness hubs of the various universities whilst the rest of the physical performance tests which included throwing, kicking, dribbling and sprint tests took place on the soccer fields and athletics ovals respectively. The data collection started with UCC on the 23^{rd} February, 2016 which was followed by UEW on the 24^{th} of February, 2016. UG was the next which was followed by KNUST on the 25^{th} and 27^{th} of February, 2016 respectively. The players were all gathered at each institution before the start of the data collection because of how cumbersome the procedures were.

Data Processing and Analysis

The data collected were imputed and analyzed using IBM SPSS Statistics Data Editor. Both descriptive and inferential statistics were employed to analyze the data collected. The following statistical tools were used to analyze each research hypothesis;

1. Descriptive statistics was used to compile the means and standard deviations (SD) of the players for demographic analysis in all the variables.
2. One Way Analysis of Variance (ANOVA) was employed to test research hypothesis 1, 2, and 3 because the researcher compared the various institutional means of the independent variables within these hypotheses.
3. The Bonferroni post-hoc multiple comparison tests was applied when the ANOVA indicated significant differences in hypotheses 1, 2, and 3 to ascertain the exact differences that existed between the means.
4. Multiple regression analysis was used to analyze the influence of the anthropometric and motor performance variables on the kicking ability in research hypothesis 4.

The alpha level for the decision to reject or fail to reject the hypotheses was set at 0.05.

Summary

Cross-sectional descriptive research design was used for this study. The total participant pools for the 6th Mini GUSA games were 100 females and 140 male soccer players with samples of 44 females and 44 males. The data were collected at the various institutions involved in the study. Thus, possibly the differing surfaces of the athletics tracks might have had a marginal effect on the speed of the players.

CHAPTER FOUR

RESULTS AND DISCUSSION

The purpose of this study was to analyze the anthropometric and motor performance variables of soccer players in GUSA games. This chapter deals with data analysis, the results and the discussion of findings. 44 females and 44 male soccer players were involved in the study. The analysis of the female soccer players was done differently from the males but on the same hypotheses.

Female:

Research Hypothesis 1: There will be no significant difference in the Anthropometric Variables of Soccer Players in GUSA games by institutions.

Table 9: *Mean, Standard Deviation and ANOVA test for Height of female Soccer Players in GUSA games*

Institutions	Mean	SD		
UG	159.03	8.76		
KNUST	159.12	3.36		
UCC	161.76	5.46		
UEW	162.20	2.64		
Total	160.53	5.59		
Source of Variance	SS	df	MS	F Sig.
Between Groups	93.937	3	31.312	1.002.402
Within Groups	1249.662	40	31.242	
Total	1343.599	43		

Source: Field survey, Mensah (2016)

The mean height for the female soccer players was 160.53±5.59cm as displayed in Table 9. Since $F(3,40)=1.00$, $p>.05$ was not significant at 0.05with the ANOVA analysis, the null hypothesis fails to reject, indicating that, all the female soccer players in the 6th Mini GUSA games had relatively the same height.

This probably is an indication that, apart from other parameters, this equality in height might have given the teams equal standing aerial advantage and probably explains why there was only one (1) goal emanating out of an aerial header in the 6th Mini GUSA games female soccer. This suggests that, that goal came out of chance. This is in consonance with the view point of Carter et al. (2005) who said tallness is an advantage while taller and more powerfully built players have an advantage in handball, rugby and soccer. However, the mean height in this study is similar to female soccer players in Chilean universities (162.60cm) (Almagia´ et al., 2008) but less than their counterparts in American universities (165.60cm) (Green et al., 2013).This implies that, the female soccer players in the 6 Mini GUSA games were relatively within the range for height for female soccer players.

Table 10: *Mean, Standard Deviation and ANOVA test for Weight of female Soccer Players in GUSA games*

Institutions	Mean	SD			
UG	55.16	7.43			
KNUST	56.42	5.47			
UCC	56.42	6.45			
UEW	61.82	2.47			
Total	57.20	6.12			
Source of Variance	SS	df	MS	F	Sig.
Between Groups	278.530	3	92.843	2.790	.053
Within Groups	1331.158	40	33.279		
Total	1609.688	43			

Source: Field survey, Mensah (2016)

Table 10 exhibits the means the weights of university female soccer players in GUSA games as 57.20±6.12kg. The ANOVA computation churned out $F(3,40)=2.79$, $p>.05$, indicating that the weights of the female soccer players were not statistically significantly different at 0.05. Thus, the null hypothesis fails to reject.

Perhaps, this explains why these teams did not have too much advantage over each other in absolute strength and power to charge for the ball. Coaches had to probably resort to tactical discipline to win or draw their matches. This is sounding harmonious with the viewpoints of Bale, Colley, Mayhew, Piper and Ware (1994) and Domfeh, (1996) who stated that, typically larger and heavier athletes produce greater absolute strength and power than smaller athletes. Again, the mean weight in this study is less than the values reported by Wells and Reilly (2002) (60.7kg); Martinez and Coyle (2006)(63.9kg); Vescovi et al. (2006) (64.8kg); Almagia et al. (2008) (62.1kg); Vescovi and McGuigan (2008) (64.8kg); McCurdy et al. (2010) (61.7kg); Sjo´kvist et al. (2011) (61.9kg) and 62.8kg for Green et al. (2013) for university students in various countries, suggesting that, the players in this study may be challenged with weight related soccer activities at international competitions.

Table 11: *Mean, Standard Deviation and ANOVA test for Leg length of female Soccer Players in GUSA games*

Institutions	Mean	SD			
UG	78.27	4.00			
KNUST	78.02	8.75			
UCC	80.98	3.10			
UEW	80.23	.87			
Total	79.38	5.06			
Source of Variance	SS	df	MS	F	Sig.
Between Groups	69.906	3	23.302	.904	.448
Within Groups	1031.405	40	25.785		
Total	1101.312	43			

Source: Field survey, Mensah (2016)

Table 11 displayed 79.38cm±5.06cm as the mean for leg length of the female soccer players in GUSA games. The ANOVA statistics established $F(3,40)=.90$, $p>.05$ which was not statistically significant at 0.05. Thus, the null hypothesis fails to reject, indicating that, the female soccer players in this study were not significantly different in leg length.

With this equality in leg length, the players were expected to kick the ball for distant equally with no undue advantage but this was not the case. This occurrence is contrary to the viewpoint of Malekar (2015) who said, one of the determinants of distant kick is leg length. Meanwhile, the mean leg length in this study is less than the values reported by Sporis, Canaki and Barasic (2007) (94.93cm) and Idrizovic (2014) (81.77cm) for female soccer players in some international universities. This suggest that, GUSA female soccer players could have a shorter stride length and reach which may affect the angular velocity of the leg swing during running and kicking as explained above.

Table 12: *Mean, Standard Deviation and ANOVA test for Thigh girth of female Soccer Players in GUSA games*

Institutions	Mean	SD		
UG*	50.01	3.10		
KNUST*	57.22	3.33		
UCC	54.19	5.29		
UEW	54.51	4.90		
Total	53.99	4.87		
Source of Variance	SS	df	MS	F Sig.
Between Groups	292.321	3	97.440	5.353 .003
Within Groups	728.084	40	18.202	
Total	1020.404	43		

Source: Field survey, Mensah (2016)

The thigh girth of the female soccer players in GUSA games produced a mean of 53.99±4.87cm in Table 12. The ANOVA analysis displayed $F(3,40)=5.35$, $p<.05$ which was statistically significant at 0.05. Thus the null hypothesis is rejected, indicating that, the players in this study had very different thigh girths.

The Bonferroni post hoc test further showed that, the significant difference occurred between KNUST and UG players with the former having the biggest thighs. It also showed a greater similarity between UCC and UEW. The possible inference from these results could be that, UG lost to the other three institutions under this study because the three could probably kick farther and dribble the ball fluently since thigh girth is correlated with dribbling and distant kick according to Gosh and Goon (2014) and Nuhmani and Akthar (2014). However, the mean thigh girth in this study is less than the value reported by Sporis, Canaki and Barasic (2007) (56.65cm) and more than that of

Idrizovic (2014) (51.60cm) for female soccer players in some international university federations suggesting that, the players in this study were within the limits of kicking and dribbling the ball as explained above.

Table 13: *Mean, Standard Deviation and ANOVA test for Calf girth of female Soccer Players in GUSA games*

Institutions	Mean	SD			
UG*	34.40	1.70			
KNUST*	38.20	1.84			
UCC	37.25	2.89			
UEW*	38.14	2.94			
Total	37.00	2.81			
Source of Variance	SS	df	MS	F	Sig.
Between Groups	105.586	3	35.195	6.032	.002
Within Groups	233.384	40	5.835		
Total	338.970	43			

Source: Field survey, Mensah (2016)

Table 13 displayed the mean calf girths of university female soccer players in GUSA games as 37.00±2.81cm. The F-ratio from the ANOVA analysis established $F(3,40)=6.03$, $p<.05$ which was statistically significant at 0.05. An indication that, there were significant differences in the calf girths of the players. Therefore, the null hypothesis is rejected.

The Bonferroni post-hoc test further showed that, the differences occurred between UG and KNUST; UG and UEW with UG having the smallest calves. It is suggestible from these results that, UG once again lost to the other three institutions under this study probably because they were the least in calf girth and as such may not have been able to kick the ball farther. This finding supported by the Manilal (1985); Nuhmani and Akthar (2014) and Prem and

Ramesh (2015) who said that, calf girth is highly correlated with and predicts kicking ability. Meanwhile, the mean calf girth in this study is more than the values reported by Idrizovic (2014) (35.19cm) and Sporis, Canaki and Barasic (2007) (35.45cm) for female soccer players in some international university federations suggesting that, the players in this study could have been advantaged with kicking and dribbling the ball at international competitions as explained earlier above.

Table 14: *Mean, Standard Deviation and ANOVA test for Upper arm length of female Soccer Players in GUSA games*

Institutions	Mean	SD		
UG	32.97	2.32		
KNUST	33.40	1.15		
UCC	33.40	1.20		
UEW	32.80	1.19		
Total	33.15	1.52		
Source of Variance	SS	df	MS	F Sig.
Between Groups	3.118	3	1.039	.432 .731
Within Groups	96.151	40	2.404	
Total	99.269	43		

Source: Field survey, Mensah (2016)

The mean mark for the upper arm length of the female soccer players was 33.15±1.52cm as exhibited in Table 14. The F value in the ANOVA churned out $F(3,40)=.43$, $p>.05$ which was not statistically significant at 0.05. Thus, the null hypothesis fails to reject.

These results probably suggest that, all the soccer players may have had an equal advantage of throwing-in balls with the same speed and distance as explained by Marshall (2007). Meanwhile, the mean upper arm length in this study is similar to the value reported by Dawal et al. (2012) (33.02cm) for female soccer players in an international university federation suggesting that, the players in this study could have been within limits of throwing-in balls with the same speed and distance at international competitions.

Table 15: *Mean, Standard Deviation and ANOVA test for Fore arm length of female Soccer Players in GUSA games*

Institutions	Mean	SD		
UG	28.86	1.27		
KNUST	28.84	1.30		
UCC	29.33	1.33		
UEW	28.94	1.18		
Total	28.83	1.56		
Source of Variance	SS	df	MS	FSig.
Between Groups	1.624	3	.541	.210 .889
Within Groups	103.067	40	2.577	
Total	104.692	43		

Source: Field survey, Mensah (2016)

The mean forearm length for the female soccer players was 28.83±1.56cm as shown in Table 15. The ANOVA statistics churned out F(3,40)=.21, p>.05 which was not statistically significant at 0.05. This implies there was no significant difference in the fore arm lengths of the female soccer players. Therefore, the null hypothesis fails to reject.

These results probably showed an equal advantage for all the soccer players throwing-in balls with the same speed and distance as explained by Marshall (2007). However, the mean obtained in this study is similar to the value reported by Bakinde (2014) (28.91cm). This suggests that, the players in this study could have been within limits of throwing-in balls with the same speed and distance at international competitions.

Table 16: *Mean, Standard Deviation and ANOVA test for Upper arm girth of female Soccer Players in GUSA games*

Institution	Mean	SD	
UG	27.63	1.52	
KNUST	27.52	1.80	
UCC	28.07	1.56	
UEW	27.45	1.62	
Total	27.67	1.59	
Source of Variance	**SS**	**df**	**MS F Sig.**
Between Groups	2.531	3	.844 .317 .813
Within Groups	106.476	40	2.662
Total	109.007	43	

Source: Field survey, Mensah (2016)

Table 16 displayed mean upper arm girth for the female soccer players as 27.67±1.59cm. The ANOVA produced $F(3,40)=.32$, $p>.05$which was not significant at 0.05. This means the soccer players were not significantly different in the upper arm girth. Hence, the null hypothesis fails to reject.

The results probably suggest that, the players may not have had any advantage over each other with activities related to the upper arm girth. However, Tibayan and Vasquez (2011) have concluded that, the upper arm girth has no relation with throwing in soccer. Meanwhile, the mean obtained in this study is more than average female soccer players as reported by Sporis, Canaki and Barasic (2007) (26.58cm) and Idrizovic (2014) (24.42cm).

Table 17: *Mean, Standard Deviation and ANOVA test for Chest girth of female Soccer Players in GUSA games*

Institution	Mean	SD			
UG	86.27	3.23			
KNUST	85.44	3.26			
UCC	85.29	3.59			
UEW	88.11	2.88			
Total	86.28	3.34			
Source of Variance	SS	df	MS	F	Sig.
Between Groups	55.591	3	18.530	1.748	.173
Within Groups	423.975	40	10.599		
Total	479.565	43			

Source: Field survey, Mensah (2016)

The mean chest girth for the female soccer players was 86.28±3.34cm as exhibited in Table 17. The ANOVA table churned out $F(3,40)=1.75$, $p>.05$which was not statistically significant at 0.05. This inferred that, the female soccer players in this study had very similar chest girth. Thus, the null hypothesis fails to reject.

The probable implication for this equality could be that, the players had identical advantage in activities related to chest girth in soccer playing such as trapping the ball with the chest, blocking the opponent, and front charging. Even though Manilal (1985) concluded that chest girth has nothing to do with soccer playing, this finding consonates with the conclusions of Bale, Colley, Mayhew, Piper and Ware(1994) and Domfeh (1996) who said, powerfully built players have an advantage in handball, rugby and soccer. However, the mean obtained in this study is less than the values reported for university female sports personalities by Richards (2004) (89.28cm) and Bakinde (2014)

(89.18cm). This suggests that, the players in this study could have been disadvantaged with activities related to chest girth at international competitions.

Table 18: *Mean, Standard Deviation and ANOVA test for Finger span of female Soccer Players in GUSA games*

Institution	Mean	SD			
UG	51.08	2.96			
KNUST	52.82	1.92			
UCC	53.47	2.81			
UEW	52.59	3.03			
Total	52.49	2.77			
Source of Variance	SS	df	MS	F	Sig.
Between Groups	33.799	3	11.266	1.520	.224
Within Groups	296.429	40	7.411		
Total	330.228	43			

Source: Field survey, Mensah (2016)

Table 18 displayed the mean finger span for the female soccer players as 52.49± 2.77cm. The F-statistics in the ANOVA produced $F(3,40)=1.52$, $p>.05$which was not statistically significant at 0.05. This implies the female soccer players in this study were not significantly different in finger span. Thus, the null hypothesis fails to reject.

The results also suggest that, the players may have had almost equal prehension of the ball during throw-in and goalkeeping. This sounds harmonious with the findings of Ramakrishnan et al. (1994) who reported a high correlation between basic hand dimensions and grasp. Again, the mean fingerspan in this study is less than the value reported by Bakinde (2014) (56.85cm).

Research Hypothesis2: There will be no significant difference in the Motor Performance Variables of Soccer Players in GUSA games by institutions

Table 19: *Mean, Standard Deviation and ANOVA test for Speed of female Soccer Players in GUSA games*

Institutions	Mean	SD		
UG	6.32	.57		
KNUST	6.15	.44		
UCC	5.97	.18		
UEW	6.14	.27		
Total	6.15	.40		
Source of Variance	SS	df	MS	F Sig.
Between Groups	.661	3	.220	1.408 .255
Within Groups	6.259	40	.156	
Total	6.920	43		

Source: Field survey, Mensah (2016)

Table 19 portrayed the mean speed for the female soccer players as 6.15 ±.40sec. The ANOVA analysis fashioned out $F(3,40)=1.41$, $p>.05$ which was not statistically significant at 0.05. This implies there was no statistically significant difference in the speed of the female soccer players in the universities in Ghana. Therefore, the null hypothesis fails to reject.

This probably explains why averagely, there were not many goals scored between these institutions because the players had equal sprinting advantage and as such could not out-sprint each other to attack or defend. This finding is supported by Murphy et al. (2003) and Little and Williams (2005) who said, the ability to accelerate in soccer underlies successful game play. Again, the mean for speed in this study is slower than the values reported by Wood (2008) (5.35s) and Haugen and Seiler (2014) (5.19s) suggesting that, the players in this study could have been challenged with sprinting for the ball to attack or defend at international competitions.

Table 20: *Mean, Standard Deviation and ANOVA test for Leg power of female Soccer Players in GUSA games*

Institution	Mean	SD			
UG	38.25	3.95			
KNUST	39.65	3.63			
UCC	39.14	1.99			
UEW	41.47	3.00			
Total	39.63	3.33			
Source of Variance	SS	df	MS	F	Sig.
Between Groups	61.121	3	20.374	1.954	.136
Within Groups	416.962	40	10.424		
Total	478.083	43			

Source: Field survey, Mensah (2016)

The mean leg power for the female soccer players was 39.63±3.33cm as displayed in Table 20. The ANOVA results produced $F(3,40)=1.95$, $p>.05$which was not statistically significant at 0.05. This suggests that, there was no significant difference in the vertical jumps of the female soccer players in GUSA games. Thus, the null hypothesis fails to reject.

With this result, the players were expected to kick the ball for distance equally according to Malekar (2015), which was not the case probably due to other reasons. Meanwhile, the mean vertical jump in this study is more than value reported by Wells and Reilly (2002) (35.05cm) but less than that of Abidin and Adam (2013) (42.71cm) for female soccer players in some international university federations suggesting that, the players in this study could have been within limits of kicking the ball for distance at international competitions.

Table 21: *Mean, Standard Deviation and ANOVA test for Abdominal strength of female Soccer Players in GUSA games*

Institution	Mean	SD			
UG*	21.91	1.81			
KNUST*	24.73	1.68			
UCC*	25.82	1.08			
UEW*	24.27	2.24			
Total	24.18	2.22			
Source of Variance	SS	df	MS	F	Sig.
Between Groups	89.636	3	29.879	9.724	.001
Within Groups	122.909	40	3.073		
Total	212.545	43			

Source: Field survey, Mensah (2016)

The mean abdominal strength for the female soccer players was24.18±2.22 repetitions as displayed in Table 21. Since $F(3,40)=9.72$, $p<.05$ was statistically significant at 0.05 with the ANOVA analysis, the null hypothesis is rejected. Implying that, the female soccer players in GUSA games had different abdominal strengths.

Further analysis with the Bonferroni post-hoc test revealed that, the exact differences existed between UG and UCC; UG and KNUST; UG and UEW players with UG having the weakest abdominal muscles. This probably could be one of the major reasons that accounted for UG's lost to the other institutions because their relatively weak abdominal muscles made them unable to kick the ball farther as explained by Malekar (2015) who said kicking for distance is highly correlated with abdominal strength. However, the mean abdominal strength in this study is less than the value as reported by Jalakas and Jarvelaid (2004) (28.7reps) suggesting that, the players in study could have been disadvantaged at the international level with distant kicks.

Table 22: *Mean, Standard Deviation and ANOVA test for Agility of female Soccer Players in GUSA games*

Institution	Mean	SD			
UG	16.94	.85			
KNUST	17.06	.95			
UCC	16.98	.58			
UEW	16.71	.35			
Total	16.92	.71			
Source of Variance	SS	df	MS	F	Sig.
Between Groups	.746	3	.249	.475	.701
Within Groups	20.921	40	.523		
Total	21.667	43			

Source: Field survey, Mensah (2016)

The mean agility for the female soccer players was 16.92±0.71secs as displayed in Table 22. The ANOVA analysis revealed $F(3,40)=.48$, $p>.05$ which was not statistically significant at 0.05. This suggested that, there was no significant difference in the agility of the female soccer players in GUSA games. Thus, the null hypothesis fails to reject.

This result is probably informed by the similarities in the players' heights, weights, leg length and speed as explained by Hoeger and Hoeger (2011) who said, these parameters have an impact on agility. Thus, the insignificant differences in them in this study are probably what informed the results in the agility.

Again, this similarity in directional changes suggests that, probably the players were equally matched in acting and reacting to swerves in attack and defence as explained by McNair and Marshall (2003). They also might have had an equally good field movement and correct positioning on the pitch to either attack or defend (Groppel, & Roetert, 1992). Again, the mean for agility in this study is within the excellent range as reported by Davis et al. (2000) (17s) suggesting that, the players in this study could have been advantaged with agility related activities at international competitions.

Table 23: *Mean, Standard Deviation and ANOVA test for Flexibility of female Soccer Players in GUSA games*

Institution	Mean	SD			
UG	25.83	2.64			
KNUST	25.42	1.68			
UCC	27.07	1.13			
UEW	26.24	1.47			
Total	26.14	1.86			
Source of Variance	SS	df	MS	F	Sig.
Between Groups	16.479	3	5.493	1.659	.191
Within Groups	132.425	40	3.311		
Total	148.904	43			

Source: Field survey, Mensah (2016)

The mean flexibility for the female soccer players was 26.14+1.86cm as exhibited in Table 23. The ANOVA displayed F(3,40)=1.66, p>.05 which was not statistically significant at 0.05. Thus, the null hypothesis fails to reject. This suggests that, there was no significant difference in the flexibility of the female soccer players in GUSA games.

This possibly explains why there were just minor injuries emanating from over-stretched muscles during play. Hargrove (2012) supported this finding when he said one common rationale for increasing range of motion at a joint is to prevent injury from overextension of the joint and to increase performance. Meanwhile, the mean flexibility in this study is within the excellent range as reported by Wood (2012) (25.5cm) suggesting that, the players in this study could have been advantaged with flexibility related activities at international competitions.

Table 24: *Mean, Standard Deviation and ANOVA test for Upper body strength of female Soccer Players in GUSA games*

Institutions	Mean	SD			
UG	23.09	3.53			
KNUST	25.46	2.66			
UCC	25.09	3.42			
UEW	25.27	2.49			
Total	24.73	3.11			
Source of Variance	SS	df	MS	F	Sig.
Between Groups	40.000	3	13.333	1.423	.250
Within Groups	374.727	40	9.368		
Total	414.727	43			

Source: Field survey, Mensah (2016)

The mean score for upper body strength of the female soccer players was 24.73±3.11reps as exhibited in Table 24. The ANOVA revealed $F(3,40)=1.42$, $p>.05$ which was not statistically significant at 0.05. This suggests that, there was no significant difference in the upper body strengths of the female soccer players in GUSA games. Thus, the null hypothesis fails to reject.

This implies the players had equal advantage with power and strength to throw-in, sprint and charge in the games. These are supported by Bompa and Haff (2009) and Domfeh (1996) when they said strength affects speed, kicking, throwing and charging which are some of the ingredients for successful performance in soccer. However, the mean upper body strength in this study is less than the value reported by Jalakas and Jarvelaid (2004) (29.0reps) indicating that, the players in this study could have been disadvantaged with flexibility related activities at international competitions.

Research Hypothesis3: There will be no significant difference in the kicking ability of soccer players in GUSA games by institutions

Table 25: *Mean, Standard Deviation and ANOVA test for Distant kick of female Soccer Players in GUSA games*

Institutions	Mean	SD			
UG*	37.07	1.87			
KNUST*	43.54	4.32			
UCC	40.50	5.35			
UEW*	43.81	6.87			
Total	41.23	5.51			
Source of Variance	SS	df	MS	F	Sig.
Between Groups	327.655	3	109.22	4.461	.009
Within Groups	979.416	40	24.485		
Total	1307.072	43			

Source: Field survey, Mensah (2016)

The mean score for distant kick for the female soccer players was 41.23±5.51m as exhibited in Table 25. The ANOVA analysis revealed $F(3,40)=4.46$, $p<.05$ which was statistically significant at 0.05. This suggests there were significant differences in the distant kicks of the female soccer players in GUSA games. Hence, the null hypothesis is rejected.

A further enquiry with the Bonferroni post-hoc test indicated that, indeed the significant differences existed between UG and KNUST; UG and UEW with UG having the shortest distance. This possibly explains why UG lost to the other three institutions who probably might have relied on long balls to outwit UG players. Conversely, UG probably could not have kicked balls farther out of danger or to score as has been established by Manilal (1985); Gosh and Goon (2014); Prem and Ramesh (2015) when reported that, thigh girth, calf girth and strong abdomen correlates with distant kick. Meanwhile, the mean for distant kick in this study is more than the value reported by Mengesh (2014) (22.95m) indicating that, the players in this study could have been advantaged with kicking the ball for distance at international competitions.

Table 26: *Mean, Standard Deviation and ANOVA test for Dribbling of female Soccer Players in GUSA games*

Institutions	Mean	SD		
UG	16.60	.95		
KNUST	15.78	.71		
UCC	15.72	1.04		
UEW	16.01	.76		
Total	16.03	.92		
Source of Variance	SS	df	MS	F Sig.
Between Groups	5.415	3	1.805	2.355 .086
Within Groups	30.659	40	.766	
Total	36.075	43		

Source: Field survey, Mensah (2016)

Table 26 exhibited the mean mark for dribbling of the female soccer players in GUSA games as 16.03±.92 sec. The ANOVA revealed F(3,40)=2.36,

$p > .05$ which was not statistically significant at 0.05. This suggests that, there was no significant difference in the dribbling of the female soccer players in GUSA games. Thus, the null hypothesis fails to reject.

This suggests that, the players might have relied on dribbling skills equally to outwit their opponents or advance the ball forward and backwards. This insignificant difference in dribbling probably may have been informed by the equality in speed and agility which is in consonance with the conclusions of Raschka and Wolthausen (2007) who said, a combination of some specific motor and skill related fitness are needed to perform tasks in most sports especially soccer. Again, the mean for dribbling in this study is faster than the value reported by Mengesh (2014) (18.04s) signifying that, the players in this study could have been advantaged with dribbling at international competitions.

Table 27: *Mean, Standard Deviation and ANOVA test for Accuracy of female Soccer Players in GUSA games*

Institution	Mean	SD			
UG	3.77	1.04			
KNUST	4.18	1.11			
UCC	4.43	1.04			
UEW	3.79	1.56			
Total	4.05	1.20			
Source of Variance	SS	df	MS	F	Sig.
Between Groups	3.247	3	1.082	.744	.532
Within Groups	58.220	40	1.456		
Total	61.467	43			

Source: Field survey, Mensah (2016)

The mean score for accuracy of the female soccer players was 4.05±1.20pts as shown in Table 27. The ANOVA displayed $F(3,40)=.74$, p>.05which was not statistically significant at 0.05. This suggests that, there was no significant difference in the kicking for accuracy of the female soccer players in GUSA games. Thus, the null hypothesis fails to reject.

This implies the players were successful and evenly advantaged with accurate passing of the ball (short and long) and shooting on target at the 6th Mini GUSA games. This is supported by the findings of Haaland and Hoff (2003) who said, accurately passing the ball to a team mate is an essential ability required for success. However, the mean for accuracy in this study is more than the value reported by Ali (2011) (3.33pts) indicating that, the players in this study could have been advantaged with accurately kicking the ball to pass or on target at international competitions.

Research Hypothesis 4: There will be no significant influence of Anthropometric and Motor Performance Variables on the Kicking ability of Soccer Players in GUSA games

Table 28: *Influence of Anthropometric Variables on Distant Kick of female Soccer Players in GUSA games*

Variables		*b*	β	*R*	R^2	F	t	Sig.
Anthro.		7.212		.488	.238	4.16	.617	.012
	Weight	341	.424				2.554	.015
	TG	-.014	-.011				-.047	.963
	CaG	.263	.119				.538	.594

Source: Field survey, Mensah (2016)

Table 29: *Influence of Anthropometric Variables on Dribbling of female Soccer Players in GUSA games*

Variables		*b*	β	*R*	R^2	F	t	Sig.
Anthro.		24.039		.362	.131	3.10	5.167	.056
	Height	-.044	-.267				-.1.173	.247
	Weight	-.017	-.114				-.502	.619
Motor Perf.		7.306		.444	.197	5.04	2.374	.011
	Speed	.663	.291				1.737	..090
	Agility	.274	.213				1.271	.211

Source: Field survey, Mensah (2016)

To determine whether the anthropometric and motor performance variables influenced the kicking ability of the female soccer players in GUSA games, Multiple Regressions were run. Prior to that, initial correlations were also run between these variables mentioned above. The results showed that, distant kick correlated from medium to low with some of the anthropometric variables (Weight, Thigh girth and Calf girth) but not with any of the motor performance variables. However, dribbling correlated with height, weight, speed and agility. Meanwhile, the Tolerance and Variance Inflation Factor (VIF) values in the collinearity diagnosis indicated allowable levels of multicollinearity between the correlated independent variables. However, the third dependent variable of the kicking ability (Accuracy) did not correlate with any of the independent variables and as such was not included in the Multiple Regression.

A multiple linear regression was calculated to predict;

distant kick from weight, thigh girth and calf girth in Table 28,

dribbling from height and weight and

dribbling from speed and agility in Table 29.

In Table 28, a significant regression was found (F(3,40)=4.16, p<.05), with an R^2 of .238 that translates into 23.8% of variance as anthropometric variables model in the kicking for distance of the female soccer players. This results showed that, indeed thigh and calf girths predict distant kick as explained by Gosh and Goon (2014); Manilal (1985) and Prem and Ramesh (2,015). It was also found that, individually only the weight significantly predicted distant kick (β = .42, p<.05).

However, the anthropometric variables (height and weight) as a model did not significantly predict dribbling in Table 29 (F(3,40)=3.10, p>.05), but the motor performance variables (speed and agility) did (F(3,40)=5.04, p<.05), with an R^2 of .197 that translates into 19.7% of variance as a model. Silassie and Demena (2016) supported this when they said dribbling depends on good speed and agility.

Male:

Research Hypothesis 1: There will be no significant difference in the Anthropometric Variables of Soccer Players in GUSA games by institutions

Table 30: *Mean, Standard Deviation and ANOVA test for Height of male Soccer Players in GUSA games*

Institutions	Mean	SD			
UG	177.86	3.82			
KNUST	172.99	6.32			
UCC	172.75	5.83			
UEW	174.16	4.33			
Total	174.44	5.40			
Source of Variance	SS	df	MS	F	Sig.
Between Groups	183.831	3	61.277	2.287	.093
Within Groups	1071.711	40	26.793		
Total	1255.542	43			

Source: Field survey, Mensah (2016)

The mean height for the male soccer players in GUSA games was 174.44±5.40cm as displayed Table 30. Since FF(3,40)=2.29, p>.05 was not significant at 0.05 with the ANOVA analysis, the null hypothesis fails to reject, indicating that, all the male soccer players in the 6th Mini GUSA games had relatively the same height.

Apart from other parameters, this equality in height probably explains why there were very few goals emanating out of an aerial header in the 6th Mini GUSA games male soccer. This suggests that, the aerial goals came out of chance. This is in consonance with the view point of Carter et al. (2005) who said tallness is an advantage while taller and more powerfully built players have an advantage in handball, rugby and soccer. However, the mean height in this study is less than the value reported by Coelho et al. (2007) (178.26cm) for university male soccer players indicating that, the players in this study could have been disadvantaged with height related activities at international competitions.

Table 31: *Mean, Standard Deviation and ANOVA test for Weight of male Soccer Players in GUSA games*

Institutions	Mean	SD		
UG	75.60	5.32		
KNUST	72.99	5.59		
UCC	72.38	6.44		
UEW	72.58	5.13		
Total	73.39	5.60		
Source of Variance	SS	df	MS	F Sig.
Between Groups	73.843	3	24.614	.774.516
Within Groups	1272.442	40	31.811	
Total	1346.284	43		

Source: Field survey, Mensah (2016)

With a mean weight score of 73.39±5.60kg as shown in Table 31, the ANOVA revealed $F(3,40)=.77$, $p>.05$, indicating that the weights of the male soccer players were not statistically significantly different at 0.05. Thus, the null hypothesis fails to reject.

Perhaps, this explains why these teams may not have had too much advantage over each other in activities such as charging for the ball. Coaches probably had to resort to tactical discipline to marginally win or draw their matches. This sound harmonious with the viewpoints of Bale et al. (1994) and Domfeh (1996) who stated that, typically larger and heavier athletes produce greater absolute strength and power than smaller athletes. Meanwhile, the mean weight in this study is more than the value reported by Saha et al. (2014) (60.58kg) but similar to that of Burdukiewicz et al. (2014) (74.9kg) for male soccer players signifying that, the players in this study could have been within limits with weight related activities at international competitions.

Table 32: *Mean, Standard Deviation and ANOVA test for Leg length of male Soccer Players in GUSA games*

Institutions	Mean	SD		
UG	87.72	2.48		
KNUST	83.34	9.87		
UCC	87.22	2.91		
UEW	87.78	2.33		
Total	86.51	5.55		
Source of Variance	SS	df	MS	F Sig.
Between Groups	150.157	3	50.052	1.707 .181
Within Groups	1173.175	40	29.329	
Total	1323.332	43		

Source: Field survey, Mensah (2016)

The mean leg length for the male soccer players was 86.51±5.55cm as exhibited in Table 32. The ANOVA established that, $F(3,40)=1.71$, $p>.05$ was not statistically significant at 0.05. The null hypothesis therefore fails to reject. That is, the male players in this study did not significantly differ in leg length.

With this equality in leg length, the players probably may have kicked the ball for distance equally with no undue advantage. This occurrence is supported by Malekar (2015) who said, one of the determinants of distant kick is leg length. Again, the mean leg length in this study is similar to the value reported by Saha and Bhowmick (2014) (87.38cm) for male soccer players signifying that, the players in this study could have been equally advantaged with leg length related activities such as the angular velocity of the legs to impact kicking the ball for distance at international competitions.

Table 33: *Mean, Standard Deviation and ANOVA test for Thigh girth of male Soccer Players in GUSA games*

Institutions	Mean	SD		
UG	60.55	4.08		
KNUST	58.53	3.38		
UCC	57.99	3.11		
UEW	57.13	2.40		
Total	58.55	3.42		
Source of Variance	SS	df	MS	F Sig.
Between Groups	69.510	3	23.170	2.132.111
Within Groups	434.720	40	10.868	
Total	504.230	43		

Source: Field survey, Mensah (2016)

Table 33 displayed the mean thigh girth for the male soccer players as 58.55±3.42cm. The ANOVA displayed $F(3,40)=2.13$, $p<.05$ which was not statistically significant at 0.05. Thus, the null hypothesis fails to reject, indicating that, the players in this study did not significantly differ in thigh girth.

This could possibly be one of the reasons why there were not many goals scored between these institutions at the 6th Mini GUSA games because, all the players could probably kick and dribble the ball equally, since thigh girth is correlated with dribbling and distant kick according to Gosh and Goon (2014) and Nuhmani and Akthar (2014). Meanwhile, the mean thigh girth in this study is similar to the value reported by Burdukiewicz et al. (2014)(59.50cm) for male soccer players signifying that, the players in this study could have been within limitsof thigh girth related activities such as kicking at international competitions.

Table 34: *Mean, Standard Deviation and ANOVA test for Calf girth of male Soccer Players in GUSA games*

Institutions	Mean	SD			
UG	39.78	1.26			
KNUST	38.66	1.92			
UCC	38.59	1.68			
UEW	38.00	1.79			
Total	38.76	1.75			
Source of Variance	SS	df	MS	F	Sig.
Between Groups	18.052	3	6.017	2.127	.112
Within Groups	113.176	40	2.829		
Total	131.228	43			

Source: Field survey, Mensah (2016)

The mean score for calf girth of the male soccer players was 38.76±1.75cm as displayed in the Table 34. The F-ratio from the ANOVA analysis established $F(3,40)=2.13$, $p<.05$ which was not statistically significant at 0.05. This is an indication that the players did not significantly differ in calf girth. Therefore, the null hypothesis fails to reject.

This is again probably one of the reasons why there were not many goals scored between these institutions because they could all equally kick and dribble the ball. This study is supported by the findings of Manilal (1985); Nuhmani and Akthar (2014) and Prem and Ramesh (2015) who stated that,calf girth is highly correlated with playing ability. However, the mean calf girth in this study is similar to the value reported by Burdukiewicz et al. (2014)(38.10cm) for male soccer players signifying that, the players in this study could have been equally advantaged with calf related activities at international competitions.

Table 35: *Mean, Standard Deviation and ANOVA test for Upper arm length of male Soccer Players in GUSA games*

Institutions	Mean	SD			
UG	39.29	2.45			
KNUST	38.28	2.68			
UCC	37.69	3.28			
UEW	37.66	2.00			
Total	38.23	2.64			
Source of Variance	SS	df	MS	F	Sig.
Between Groups	19.135	3	6.378	.913	.443
Within Groups	279.500	40	6.988		
Total	298.635	43			

Source: Field survey, Mensah (2016)

The mean mark for the upper arm length of the male soccer players was 38.23±2.64 as displayed in Table 35. The F statistics in the ANOVA churned out$F(3,40)=.91$, $p>.05$ which was not statistically significant at 0.05. Thus, the null hypothesis fails to reject.

These results probably suggest that, all the soccer players may have had an equal advantage of throwing-in balls with the same speed as explained by Marshall (2007). Again, the mean upper arm length in this study is more than the value reported by Dawal et al. (2012) (35.31cm) for male soccer players signifying that, the players in this study could have been advantaged with upper arm length related activities at international competitions.

Table 36: *Mean, Standard Deviation and ANOVA test for Fore arm length of male Soccer Players in GUSA games*

Institutions	Mean	SD			
UG*	34.36	2.83			
KNUST*	30.40	2.38			
UCC*	30.50	1.93			
UEW*	31.74	1.09			
Total	31.71	2.69			
Source of Variance	SS	df	MS	F	Sig.
Between Groups	116.546	3	38.849	8.032	.001
Within Groups	193.465	40	4.837		
Total	310.012	43			

Source: Field survey, Mensah (2016)

Table 36 displayed the mean forearm length for the male soccer players as 31.71±2.69cm. The F-ratio within the ANOVA summary churned out $F(3,40)=8.03$, $p<.05$which was statistically significant at 0.05. This implied there was significant difference in the fore arm lengths of the male soccer, players. Therefore, the null hypothesis is rejected.

The Bonferroni post hoc test further showed that, indeed, the differences existed between UG and UEW; UG and UCC; UG and KNUST with UG having the longest fore arms. This result probably is an indication that, UG had an advantage over the other three institutions in throwing-in balls for distance as explained by Marshall (2007). However, the mean forearm length in this study is more than the value reported by Moghadam et al. (2012) (28.78cm) for soccer players suggesting that, the players in this study could have been advantaged with fore arm length related activities at international competitions.

Table 37: *Mean, Standard Deviation and ANOVA test for Upper arm girth of male Soccer Players in GUSA games*

Institutions	Mean	SD			
UG	31.00	1.80			
KNUST	29.85	1.29			
UCC	30.49	1.37			
UEW	30.57	1.30			
Total	30.48	1.46			
Source of Variance	SS	df	MS	F	Sig.
Between Groups	7.499	3	2.500	1.183	.328
Within Groups	84.498	40	2.112		
Total	91.997	43			

Source: Field survey, Mensah (2016)

The mean upper arm girth for the male soccer players as displayed in Table 37 is 30.48±1.46cm. The ANOVA analysis produced $F(3,40)=1.18$, $p>.05$ which was not statistically significant at 0.05, implying the soccer players were not significantly different in the upper arm girth. Hence, the null hypothesis fails to reject.

These results suggest that, all the soccer players may not have had any advantage over each other in any activity related to the upper arm girth. However, Tibayan and Vasquez (2011) have concluded that, the upper arm girth has no relation with throwing in soccer. Meanwhile, the mean forearm length in this study is similar to the value reported by Reeves et al. (1999) (31.55cm) for male soccer players indicating that, the players in this study could have been equally advantaged with upper arm length related activities if there is any at international competitions.

Table 38: *Mean, Standard Deviation and ANOVA test for Chest girth of male Soccer Players in GUSA games*

Institutions	Mean	SD			
UG	88.66	1.33			
KNUST	87.44	3.52			
UCC	90.53	3.04			
UEW	88.39	2.98			
Total	88.76	2.97			
Source of Variance	SS	df	MS	F	Sig.
Between Groups	55.227	3	18.409	2.279	.094
Within Groups	323.062	40	8.077		
Total	378.289	43			

Source: Field survey, Mensah (2016)

The mean chest girth for the male soccer players was 88.75±1.33cm as exhibited in Table 30. The ANOVA analysis churned out $F(3,40)=2.28$, $p>.05$which was not statistically significant at 0.05. This inferred that, the male soccer players in this study had very similar chest girth. Thus, the null hypothesis fails to reject.

The results probably inferred that, the players had equal advantage in activities related to chest girth in soccer playing such as trapping the ball with the chest, block the opponent, and front charging. This finding consonates with the conclusions of Bale et al. (1994) and Domfeh (1996) who said, powerfully built players have an advantage in handball, rugby and soccer. Again, the mean chest girth in this study is similar to the values reported by Thomas and Reilly (1979) (91.00cm) and Bakinde (2014) (88.51cm) for male soccer players indicating that, the players in this study could have been equally advantaged with chest girth related activities at international competitions.

Table 39: *Mean, Standard Deviation and ANOVA test for Finger span of male Soccer Players in GUSA games*

Institutions	Mean	SD		
UG	57.63	5.85		
KNUST	58.28	3.83		
UCC	57.56	4.74		
UEW	58.66	4.10		
Total	58.03	4.55		
Source of Variance	SS	df	MS	F Sig.
Between Groups	9.165	3	3.055	.139 .936
Within Groups	881.811	40	22.045	
Total	890.975	43		

Source: Field survey, Mensah (2016)

Table 39 displayed the mean finger span for the male soccer players as 58.03± 4.55cm. The ANOVA produced $F(3,40)=.14$, $p>.05$ which was not statistically significant at 0.05. This means, the male soccer players in this study did not significantly differ in finger span. Thus, the null hypothesis fails to reject.

These results also suggest that, the players may have had almost equal prehension of the ball during throw-in and goalkeeping. Ramakrishnan et al. (1994) agrees with this finding when they reported a high correlation between basic hand dimensions and grasp. Meanwhile, the mean finger span in this study is similar to the value reported by Bakinde (2014) (58.94cm) for male soccer players indicating an equal prehension of the ball at international competitions.

Research Hypothesis 2: There will be no significant difference in the Motor Performance Variables of Soccer Players in GUSA games by institutions

Table 40: *Mean, Standard Deviation and ANOVA test for Speed of male Soccer Players in GUSA games*

Institutions	Mean	SD		
UG	5.14	.11		
KNUST	5.30	.25		
UCC	5.33	.23		
UEW	5.37	.23		
Total	5.28	.22		
Source of Variance	SS	df	MS	F Sig.
Between Groups	.346	3	.115	2.601 .065
Within Groups	1.773	40	.044	
Total	2.119	43		

Source: Field survey, Mensah (2016)

The mean speed for the male soccer players was 5.28±.22sec as displayed in Table 40. The ANOVA fashioned out $F(3,40)=2.60$, $p>.05$ from the data which was not statistically significant at 0.05. This implies there was no significant difference in the speed of the male soccer players. Therefore, the null hypothesis fails to reject.

These results probably explain why there were not many goals scored between these institutions because the players had equal sprinting advantage and as such could not out-sprint each other to defend or attack. This finding is supported by Murphy et al. (2003) and Little and Williams (2005) when they said, the ability to accelerate in soccer underlies successful game play. Again, the mean speed in this study is slower than the value reported by Johnson (2001) (4.74s) and Wood (2008) (4.75s) for male soccer players. This suggests that, the players in this study could have been disadvantaged with sprinting related activities at international competitions.

Table 41: *Mean, Standard Deviation and ANOVA test for Leg power of male Soccer Players in GUSA games*

Institutions	Mean	SD			
UG*	47.86	5.37			
KNUST*	55.88	5.79			
UCC	52.96	8.22			
UEW	50.09	6.80			
Total	51.70	7.09			
Source of Variance	SS	df	MS	F	Sig.
Between Groups	400.819	3	133.61	3.032	.040
Within Groups	1762.540	40	44.064		
Total	2163.359	43			

Source: Field survey, Mensah (2016)

The mean leg power for the male soccer players was 51.70±7.09cm as displayed in Table 41. The ANOVA produced $F(3,40)=1.95$, $p<.05$ from the data which was statistically significant at 0.05. This suggests there was significant difference in the vertical jump of the male soccer players in GUSA games. Thus, the null hypothesis is rejected.

The Bonferroni post hoc analysis further showed that the significant difference existed between UG and KNUST with KNUST being the strongest in the lower body strength. With these results, probably KNUST was expected to have kicked the ball farther but this may have not been the case since they lost to all the institutions. The viewpoint of Malekar (2015) which established a highcorrelation between leg power and distant kick may probably be contrary to this finding. However, the mean leg power in this study is less than the value reported by Abidin and Adam (2011) (62.93cm) for male soccer players indicating that, the players in this study could have been disadvantaged with leg power related activities at international competitions.

Table 42: *Mean, Standard Deviation and ANOVA test for Abdominal strength of male Soccer Players in GUSA games*

Institutions	Mean	SD			
UG*	27.64	1.86			
KNUST	26.09	2.12			
UCC*	27.55	2.77			
UEW*	24.55	1.75			
Total	26.46	2.44			
Source of Variance	SS	df	MS	F	Sig.
Between Groups	70.000	3	23.333	4.994	.005
Within Groups	186.909	40	4.673		
Total	256.909	43			

Source: Field survey, Mensah (2016)

The mean abdominal strength for the male soccer players as displayed in Table 42 is 26.46±2.44. Since $F(3,40)=4.99$, $p<.05$ was significant at 0.05 from the ANOVA results, the null hypothesis is rejected. Implying that, the male soccer players in GUSA games had different abdominal strengths.

There was a further analysis with the Bonferroni post-hoc test. The test however, revealed the exact institutions were the differences occurred; UEW and UG; UEW and UCC with the players of UEW having the weakest abdominal muscles. This probably accounted for UEW's lost to UCC in the deciding match because their relatively weak abdominal muscles made them unable to kick the ball farther as explained by Malekar (2015). Meanwhile, the mean abdominal strengths in this study is less than the value reported by Jalakas and Jarvelaid (2004) (34.7reps) indicating that, the players in this study could have been disadvantaged with abdominal strength related activities at international competitions.

Table 43: *Mean, Standard Deviation and ANOVA test for Agility of male Soccer Players in GUSA games*

Institutions	Mean	SD			
UG*	16.59	.41			
KNUST*	16.35	.32			
UCC*	15.68	.84			
UEW*	16.65	.32			
Total	16.32	.63			
Source of Variance	SS	df	MS	F	Sig.
Between Groups	6.479	3	2.160	8.063	.001
Within Groups	10.714	40	.268		
Total	17.193	43			

Source: Field survey, Mensah (2016)

The mean agility for the male soccer players was 16.32±.63sec as exhibited in Table 43. The ANOVA analysis created $F(3,40)=8.06$, $p<.05$ from the data which was statistically significant at 0.05. This suggests there was significant difference in the agility of the male soccer players in GUSA games. Thus, the null hypothesis is rejected.

There was a further scrutiny with the Bonferroni post-hoc test. The values churned out indicated that, the differences existed between UCC and UG; UCC and KNUST; UCC and UEW players with UCC being the quickest. This result is probably one of the major reasons why UCC won the competition because they may have easily outwitted their opponents to either attack or defend and had good field movement and correct positioning as explained by

Groppel and Roetert (1992); McNair and Marshall (2003). However, the mean agility in this study is slower than the value reported by Chileh et al. (2012) (15.37s) suggesting that, the players in this study could have been disadvantaged with agility related activities at international competitions.

Table 44: *Mean, Standard Deviation and ANOVA test for Flexibility of male Soccer Players in GUSA games*

Institutions	Mean	SD			
UG*	28.16	2.71			
KNUST*	24.13	2.12			
UCC	25.16	3.25			
UEW	25.24	2.74			
Total	25.67	3.04			
Source of Variance	SS	df	MS	F	Sig.
Between Groups	99.281	3	33.094	4.429	.009
Within Groups	298.895	40	7.472		
Total	398.175	43			

Source: Field survey, Mensah (2016)

Table 44 showed the mean flexibility for the male soccer players as 25.67+3.04cm. The ANOVA displayed $F(3,40)=4.43$, $p<.05$ which was statistically significant at 0.05. This suggests there was significant difference in the flexibility of the male soccer players in GUSA games. Thus, the null hypothesis is rejected.

There was a further scrutiny with the Bonferroni post-hoc test which showed that, the difference really occurred between UG and KNUST with the former being more flexible. This possibly explains why KNUST lost to the other institutions because their tight muscles may have made them prone to injuries and prevented them from performing optimally. Hargrove (2012) supported this finding when he said one common rationale for increasing range of motion at a joint is to prevent injury from overextension of the joint and to enhance performance. Again, the mean flexibility in this study is more than the value reported by Saha and Bhowmick (2014) (20.72cm) signifying that, the players in this study could have been advantaged with flexibility related activities at international competitions.

Table 45: *Mean, Standard Deviation and ANOVA test for Upper body strength of male Soccer Players in GUSA games*

Institutions	Mean	SD		
UG	30.64	1.80		
KNUST	29.55	2.16		
UCC*	33.09	5.68		
UEW*	28.46	2.91		
Total	30.43	3.79		
Source of Variance	SS	df	MS	F Sig.
Between Groups	129.886	3	43.295	3.557 .023
Within Groups	486.909	40	12.173	
Total	616.795	43		

Source: Field survey, Mensah (2016)

Table 45 exhibited the mean score for upper body strength of the male soccer players as 30.43±3.79reps. The ANOVA revealed $F(3,40)=3.56$, $p<.05$ which was statistically significant at 0.05. This suggests there was significant difference in the upper body strength of the male soccer players in GUSA games. Thus, the null hypothesis is rejected.

This was further scrutinized with the Bonferroni post-hoc test which showed that, there was indeed a significant difference which existed between UCC and UEW with the former being the stronger. This implies the UCC players may have had an advantage with power to throw-in, run and charge in the games than UEW as explained by Bompa and Haff (2009) and Domfeh (1996) respectively. However, the mean upper body strength in this study is less than the value reported by Jalakas and Jarvelaid (2004) (42.3reps) signifying that, the playersin this study could have been disadvantaged with upper body strength relatedactivities at international competitions.

Research Hypothesis3: There will be no significant difference in the Kicking Ability of Soccer Players in GUSA games by institutions.

Table 46: *Mean, Standard Deviation and ANOVA test for Distant kick of male Soccer Players in GUSA games*

Institutions	Mean	SD			
UG	56.82	8.91			
KNUST	55.32	6.42			
UCC	60.32	6.36			
UEW	55.32	7.66			
Total	56.94	7.44			
Source of Variance	SS	df	MS	F	Sig.
Between Groups	183.765	3	61.255	1.115	.354
Within Groups	2197.329	40	54.933		
Total	2381.094	43			

Source: Field survey, Mensah (2016)

The mean score for distant kick for the male soccer players was 56.94±7.44m as showed in Table 46. The ANOVA produced $F(3,40)=1.12$, $p>.05$ which was not statistically significant at 0.05. This suggests there was no significant difference in the distant kick of the male soccer players in GUSA games. Hence, the null hypothesis fails to reject.

This phenomenon is possibly accounted for by the similar thigh and calf girths of the players under this study which according to by Gosh and Goon

(2014); Manilal (1985); Prem and Ramesh (2015) correlate with distant kick as explained earlier on. Thus, probably the effect of long balls at the competition might have been the same with none of them having undue advantage as has explained by Gosh and Goon (2014); Manilal (1985); Prem and Ramesh (2015). However, the mean distant kick in this study is more than the value reported by Malekar (2015) (44.21m) signifying that, the players in this study could have been advantaged with distant kick related activities at international competitions.

Table 47: *Mean, Standard Deviation and ANOVA test for Dribbling of male Soccer Players in GUSA games*

Institutions	Mean	SD			
UG	14.96	1.37			
KNUST	14.72	.94			
UCC	14.46	.85			
UEW	14.71	1.01			
Total	14.71	1.04			
Source of Variance	SS	df	MS	F	Sig.
Between Groups	1.396	3	.465	.414	.744
Within Groups	45.004	40	1.125		
Total	46.400	43			

Source: Field survey, Mensah (2016)

The mean mark for dribbling of the male soccer players was 14.71±1.04sec as in Table 47. The ANOVA displayed $F(3,40)=.41$, $p>.05$ which was not statistically significant at 0.05. This suggests there was no significant difference in the dribbling of the male soccer players in GUSA games. Thus, the null hypothesis fails to reject.

This suggests that, the players might have relied on dribbling skills equally to outwit their opponents or advance the ball forward and backwards.

This insignificant differences in the soccer players' dribbling probably may have been informed by the equality in their speed which is in consonance with the conclusions of Raschka and Wolthausen (2007) who said, a combination of some specific motor and skill related fitness are needed to perform tasks in most sports especially soccer. However, the mean for dribbling in this study is similar to the value reported by Ali (2011) (14.83s) signifying that, the players in this study could have matched up to the challenge with dribbling related activities at international competitions.

Table 48: *Mean, Standard Deviation and ANOVA test for Accuracy of male Soccer Players in GUSA games*

Institutions	Mean	SD			
UG	1.37	.73			
KNUST	.94	1.54			
UCC	.85	1.24			
UEW	1.01	1.55			
Total	1.04	1.29			
Source of Variance	SS	df	MS	F	Sig.
Between Groups	2.520	3	.840	.490	.691
Within Groups	68.525	40	1.713		
Total	71.045	43			

Source: Field survey, Mensah (2016)

The mean score for accuracy of the male soccer players was 4.09±1.29pts as revealed in Table 48. The ANOVA revealed $F(3,40)=.49$, $p>.05$which was not statistically significant at 0.05. This suggests there was no significant difference in the kicking for accuracy of the male soccer players in GUSA games. Thus, the null hypothesis fails to reject.

This implies the soccer players were equally successful and evenly advantaged with accurate passing of the ball (short and long) and shooting on target at the 6th Mini GUSA games. This is supported by the findings of Haaland and Hoff (2003) who said, accurately passing the ball to at eam mate is an essential ability required for success. Meanwhile, the mean for accuracy in this study is more than the value reported by Gosh and Goon (2014) (3.36pts) suggesting that, the players in this study could have been advantaged with accuracy related activities at international competitions.

Research Hypothesis 4: There will be no significant influence of anthropometric and motor performance variables on the playing ability of male soccer players in GUSA games

Table 49: *Influence of Anthropometric Variables on Distant Kick of male Soccer Players in GUSA games*

Variables		*b*	β	*R*	R^2	F	t	Sig.
Anthro.		7.212		.723	.523	3.623	-.820	.002
	Height	-.652	-.473				-1.385	.175"
	Weight	.084	.063				.268	.791
	LL	.162	.121				.783	.439
	TG	1.407	.647				2.598	.014
	CaG	-.329	-.077				-.346	.731
	UAL	-1.090	-.386				-1.518	.138
	FAL	.649	.234				1.188	.243
	UAG	-.233	-.046				-.264	.793
	CG	1.231	.491				2.606	.014
	FS	.613	.375				2.649	.012

Source: Field survey, Mensah (2016)

Table 50: *Influence of Anthropometric Variables on Dribbling of female Soccer Players in GUSA games*

Variables		*b*	β	*R*	R^2	F	t	Sig.
Motor Perf.		1.231		.536	.287	8.27	.344	.001
	Agility	.676	.411				3.074	.004
	Flexibility	.095	.281				2.099	.042

Source: Field survey, Mensah (2016)

To determine whether the anthropometric and motor performance variables influenced the kicking ability of the male soccer players in GUSA games, Multiple Regressions were run. Prior to that, initial correlations were also run between these variables mentioned above. The results showed that, distant kick correlated from medium to low with all of the anthropometric variables but insignificantly with all the motor performance variables. Dribbling also correlated low with some of the motor performance variables (agility and flexibility) but not with any of the anthropometric variables. Meanwhile, the Tolerance and Variance Inflation Factor (VIF) values in the collinearity diagnosis indicated allowable levels of multicollinearity between the independent variables. However, the third dependent variable of the kicking ability (Accuracy) did not correlate with any of the independent variables and as such was not included in the Multiple Regression.

A multiple linear regression was run to predict;

distant kick from all the anthropometric variables as exhibited in Table 49

and dribbling from agility and flexibility as shown in Table 50.

In Table 49, a significant regression was found $F(3,40)=3.62$, $p<.05$with a R^2 of .523 that translates into 52.3% of variance as anthropometric variables model in the kicking for distance of the male soccer players in GUSA games. This results indicate that, a combination of some anthropometric variables predict distant kick as explained by Gosh and Goon (2014); Malekar (2015); Manilal (1985) and Prem and Ramesh (2015) who found thigh girth, calf girth and leg length as major predictors of distant kick. It was also found that, thigh girth ($\beta = .65$, $p<.05$), chest girth ($\beta = .49$, $p<.05$) as well as finger span ($\beta =.38$, $p<.05$) individually significantly predicted distant kick.

The trends in Table 50 indicate that, the motor performance variables (agility and flexibility) as a model significantly predicted dribbling $F(3,40)=8.27$, $p<.05$ with a R^2 of .287 that translates into 28.7% of variance as motor performance variables model. Silassie and Demena (2016) supported this when they said dribbling depends on agility whiles Raschka and Wolthausen (2007) said a combination or all or some of the specific motor and skill related fitness are needed to perform tasks in most sports especially soccer. The table also showed that, both agility (β =.41, $p<05$) and flexibility (β =.28, $p<.05$) individually significantly predicted dribbling.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

The purpose of this study was to analyze the anthropometric and motor performance variables of soccer players in GUSA games. This chapter is composed of the summary, conclusions and recommendation gathered based on the findings of the study and suggestions for further research.

Summary

Knowing the anthropometric and motor performance variables of soccer players and putting them into practice is lacking in GUSA as far as modern soccer is concerned. This has culminated into the nonexistence of literature in these aspects of the game. This scientific part of soccer which is not being used has made players quite ineffective in GUSA. Therefore, this study bridged the gap by producing some literature for reference and also established the platform for coaches to tap into.

The study was organized and summarized into five chapters. Chapter one delineated a brief background to the study and established the need to undertake the anthropometric and motor performance profiles of the soccer players and compare them institutionally.

The allied literature was reviewed in chapter two under the following sub-headings; concept of anthropometry, anthropometry variables versus some motor performance in sports, anthropometric, physical performance and kicking ability and the arm versus catching and throwing. Others include sports performance and stature, sports performance and body weight sports performance and speed, sports performance and flexibility, sports performance and agility, muscular endurance and sport performance, sports performance and leg power, brief history of Ghana University Sports Association games and the game of soccer. Cross-sectional descriptive research design was used for this study. The institutions involved in the study as well as the participants were purposively sampled. Thus, 11 players each from UG, KNUST, UCC, and UEW adding up to 44 females and 44 male soccer players were in involved in the study. Four hypotheses were formulated for the study with 10 Anthropometric, 6 Motor Performance and 3 Kicking Ability parameters measured with standardized equipment and procedures under the guidance of International Standards for Anthropometric Assessment (2001).Descriptive statistics of mean and standard deviation were used to compile the demographic data of the participants whilst inferential statistics of one way analysis of variance (ANOVA) and multiple linear regression were used to test the formulated hypotheses. The Bonferroni post hoc test was applied to further establish the exact difference(s) that existed between the groups of means where applicable (when the ANOVA showed significant difference).

The researcher and four (4) trained assistants took the measurements at the various universities' fitness centers and soccer fields after all the participants had signed an inform consent form. In research hypothesis 1, significant differences were found in the thigh and calf girths of the female soccer players whereas that of the males occurred in their fore arm lengths. There were also significant differences in the abdominal strength of the female soccer players and the leg power, abdominal strength, agility, flexibility and the upper body strength of the male soccer players in research hypothesis 2. In research hypothesis 3, only the distant kick of the female soccer players showed significant difference. There were also, significant influences of the anthropometric and motor performance variables on the distant kicks and dribbling of both the female and male soccer players.

Key Findings

The following were exposed in this study:

Anthropometric variables: There were significant differences in the thigh and calf girths of the university female soccer players which were in favour of KNUST and the fore arm length of their male counterparts which was also in favour of UG.

Motor Performance variables: There were also significant differences in the abdominal strength of the university female soccer players which was in favour of UCC, KNUST and UEW whilst that of their male counterparts occurred in the leg power, abdominal strength, agility, flexibility and upper body strength which were generally in favour of UCC and UG.

Kicking Ability: There was a significant difference in the distant kick of the university female soccer players which was also in favour of KNUST and UEW.

Kicking Ability prediction: There were significant influences of the anthropometric and motor performance variables on the kicking ability (distant kick and dribbling) of both male and female soccer players in GUSA games.

Conclusions

Based on the expose in this study, the following conclusions were drawn:

1. The differences in the thighs, calves and abdominal muscles were the reasons for the differences in performances which led to the supremacy

of KNUST and UCC female soccer players in the 6th Mini GUSA games (see medal table in Appendix A).

2. The fore arm length, leg power, abdominal strength, agility, flexibility and upper body strength of the male soccer players were also the basis for the disparities in performances and majority of which guided the players of UCC to win the competition (see medal table in Appendix A).
3. The weight, thigh girth, calf girth, speed and agility of the female soccer players influenced how they kicked the ball.
4. All the anthropometric variables, agility and flexibility of the male soccer players also influenced their kicking.

To finally wind up, all of the above mentioned significant variables may have culminated into the production more force by KNUST female and UCC male and female soccer players to manipulate the ball better than their opponents.

Recommendations

Based on the conclusions of the study, it is recommended that soccer coaches in GUSA should;

1. Develop and concentrate on a combination of some anthropometric variables (Female; Weight, Thigh girth and Calf girth: Male; Fore arm length) and some of the motor performance variables (Female; Abdominal strength: Male; Leg power, Abdominal strength, Agility, Flexibility and Upper body strength) when practicing kicking.
2. Build anthropometric and motor performance data base of the soccer players for reference for their institutions.

3. Use these players' anthropometric and motor performance profiles as part of the criteria to select them for placements to maximize their efforts.

Suggestions for Further Research

The researcher did not come across any document in this area on Ghana football. It is therefore suggested that, the study should be replicated at the national levels and to cover the Ghana Football Association Premier League in order to make recommendations for the National Teams in these departments of the game.

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APPENDICES

APPENDIX A

6TH MINI GUSA GAMES SOCCER FIXTURES AND LEAGUE TABLES

KNUST, KUMASI

SOCCER (MEN)

INSTITUTIONS

1. KNUST
2. UG
3. UCC
4. UEW
5. UPSA

HOW THEY STAND

TEAM	P	W	D	L	F	A	GD	PTS
UCC	4	3	1	0	6	2	+4	11
UEW	4	3	0	1	5	4	+1	9
UG	4	1	1	2	4	5	-1	5
UPSA	4	1	1	2	3	4	-1	4
KNUST	4	0	1	3	1	4	-3	1

SOCCER (WOMEN)

INSTITUTIONS

1. UG
2. UCC
3. UEW
4. KNUST
5. UPSA

HOW THEY STAND

TEAM	P	W	D	L	F	A	GD	PTS
KNUST	4	3	1	0	9	2	+7	10
UCC	4	2	2	0	15	1	+14	10
UEW	4	2	1	1	7	2	+5	7
UG	4	0	1	3	5	12	-7	2
UPSA	4	0	1	3	1	20	-20	1

APPENDIX B

Anthropometric and Motor Performance measurements form

1. Name:
2. Age:
3. Gender:
4. Institution:
5. Role/Position:
6. Soccer playing experience:
7. Highest level played:

Variables	Measurements			
1. Height (stature) (cm)				
2. Weight (kg)				
3. Leg length (full) (cm)				
4. Calf girth (cm)				
5. Upper leg length (cm)				
6. Mid-thigh girth (cm)				
7. Fore arm length (cm)				
8. Upper arm girth (cm)				
9. Chest girth (cm)				
10. Finger span (cm)				
11. Speed (sec)	1st Trial	2 Trial	Ave.	
12. Leg power (Vertical jump) (cm)	1st Trial	2nd Trial	3rd Trial	Ave.
13. Kicking ability	1st Trial	2nd Trial	Ave.	
a. distant kick (m)				
b. dribbling (sec)	1st Trial	2nd Trial	3rd Trial	Ave.
c. accuracy(pts)				
14. Abdominal strength (reps/30sec)	1st Trial	2nd Trial	3rd Trial	Ave.
15. Agility (sec)				
16. Flexibility (cm)				
17. Push-ups (reps/30sec)				

APPENDIX C

INFORMED CONSENT

I, the undersigned, confirm that:

I. I have read and understood the information about the project, as explained to me by the researcher on (date) ____________________.

II. I have been given the opportunity to ask questions about the project and my participation.

III. I voluntarily agree to participate in the project. I understand I can withdraw at any time without giving reasons and that I will not be penalised for withdrawing nor will I be questioned on why I have withdrawn.

IV. The procedures regarding confidentiality have been clearly explained (e.g. use of names, pseudonyms, anonymisation of data, etc.) to me.

V. The use of the data in research, publications, sharing and archiving has been explained to me. I understand that other researchers will have access to this data only if they agree to preserve the confidentiality of the data and if they agree to the terms I have specified in this form.

VI. I would **like/not like** (underline any one) my name used and understand what I have said or written as part of this study will be used in reports, publications and other research outputs so that anything I have contributed to this project can be recognised.

VII. I, along with the Researcher, agree to sign and date this informed consent form.

Participant: ……………………..… **…………………..** **……………….**

Name of Participant Signature Date

Researcher:……………………..… **…………………..** **……………….**

Name of Researcher Signature Date

APPENDIX D

Descriptive statistics on Age and Playing Experience of University Soccer Players in GUSA Games

	Gender	Mean	SD	Range
Age	F	21.54	1.79	19.00-26.00
	M	22.61	1.87	19.00-26.00
Play Experience	F	6.75	1.51	4.00-11.00
	M	9.31	2.32	6.00-16.00

APPENDIX E

ETHICAL CLEARANCE AND INTRODUCTORY LETTERS

UNIVERSITY OF CAPE COAST

INSTITUTIONAL REVIEW BOARD SECRETARIAT

TEL: 03321-33172/3 / 0207355653/ 0244207814
C/O Directorate of Research, Innovation and Consultancy

E-MAIL: irb@ucc.edu.gh
OUR REF: UCC/IRB/3/38
YOUR REF:

10TH DECEMBER, 2015

Mr. Timothy Kwabena Mensah
Department of Health Physical Education and Recreation
University of Cape Coast
Cape Coast

Dear Mr. Mensah,

ETHICAL CLEARANCE –ID NO: (UCCIRB/CES/2015/03)

The University of Cape Coast Institutional Review Board (UCCIRB) has granted **Provisional Approval** for implementation of your research protocol titled **"Analysis of anthropometric and motor performance variables of soccer players in Ghana University Sports Association games."**

This approval requires that you submit periodic review of the protocol to the Board and a final full review to the UCCIRB on completion of the research. The UCCIRB may observe or cause to be observed procedures and records of the research during and after implementation.

Please note that any modification of the project must be submitted to the UCCIRB for review and approval before its implementation.

You are also required to report all serious adverse events related to this study to the UCCIRB within seven days verbally and fourteen days in writing.

Always quote the protocol identification number in all future correspondence with us in relation to this protocol

Yours faithfully,

Samuel Asiedu Owusu
Administrator

ADMINISTRATOR
INSTITUTIONAL REVIEW BOARD
UNIVERSITY OF CAPE COAST
Date: 10-12-15

cc: The Chairman, UCCIRB

UNIVERSITY OF CAPE COAST
CAPE COAST, GHANA
COLLEGE OF EDUCATION STUDIES
Department of Health, Physical Education & Recreation

TELEPHONE: 233 –0206610931, 0543021384, 0268392819
32480-9 Ext.253

Cables & Telegrams:
UNIVERSITY, CAPE COAST

Ref. No. ED/MPE/14/0004/4

21st October, 2015

The Chairman,
Institutional Review Board,
University of Cape Coast,
Cape Coast.

Dear Sir

INTRODUCTORY LETTER

The bearer of this letter, Mr Timothy K. Mensah with Registration number **(ED/MPE/14/0004)** is a level 850 student of the above-named Department. In partial fulfilment of the requirements for the programme, he is conducting a study on **"INFLUENCE OF ANTHROPOMETRIC VARIABLES ON MOTOR PERFORMANCE OF SOCCER PLAYERS IN GHANA UNIVERSITY SPORTS ASSOCIATION GAMES"** and would need ethical clearance from your outfit.

We count on your usual co-operation.

Thank you.

Yours faithfully,

Prof. Joseph K. Mintah
HEAD

UNIVERSITY OF CAPE COAST
CAPE COAST, GHANA
COLLEGE OF EDUCATION STUDIES
Department of Health, Physical Education & Recreation

TELEPHONE: **233 –0206610931, 0543021384, 0268392819**
32480-9 Ext.253

Cables & Telegrams:
UNIVERSITY, CAPE COAST

Ref. No. **ED/MPE/14/0004/5**

21st October, 2015

The Sports Coach,
Sports Section,
University of Cape Coast,
Cape Coast.

Dear Sir

INTRODUCTORY LETTER

The bearer of this letter, Mr Timothy K. Mensah with Registration number **(ED/MPE/14/0004)** is a level 850 student of the above-named Department. In partial fulfilment of the requirements for the programme, he is conducting a study on **"INFLUENCE OF ANTHROPOMETRIC VARIABLES ON MOTOR PERFORMANCE OF SOCCER PLAYERS IN GHANA UNIVERSITY SPORTS ASSOCIATION GAMES".**

We would therefore be most grateful if permission could be given to him to carry out with Data Collection on his topic.

We count on your usual co-operation.

Thank you.

Yours faithfully,

Prof. Joseph K. Mintah
HEAD

UNIVERSITY OF CAPE COAST
CAPE COAST, GHANA
COLLEGE OF EDUCATION STUDIES
Department of Health, Physical Education & Recreation

TELEPHONE: 233 –0206610931, 0543021384, 0268392819
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Cables & Telegrams:
UNIVERSITY, CAPE COAST

Ref. No. ED/MPE/14/0004/6

21st October, 2015

The Head Coach,
Amalgamated Sports Unit,
University of Education,
Winneba.

Dear Sir,

INTRODUCTORY LETTER

The bearer of this letter, Mr Timothy K. Mensah with Registration number **(ED/MPE/14/0004)** is a level 850 student of the above-named Department. In partial fulfilment of the requirements for the programme, he is conducting a study on **"INFLUENCE OF ANTHROPOMETRIC VARIABLES ON MOTOR PERFORMANCE OF SOCCER PLAYERS IN GHANA UNIVERSITY SPORTS ASSOCIATION GAMES.**

We would therefore be most grateful if permission could be given to him to carry out with Data Collection on his topic.

We count on your usual co-operation.

Thank you.

Yours faithfully,

Prof. Joseph K. Mintah
HEAD

UNIVERSITY OF CAPE COAST
CAPE COAST, GHANA
COLLEGE OF EDUCATION STUDIES
Department of Health, Physical Education & Recreation

TELEPHONE: **233 –0206610931, 0543021384, 0268392819**
32480-9 Ext.253

Cables & Telegrams:
UNIVERSITY, CAPE COAST

Ref. No. **ED/MPE/14/0004/8**

21st October, 2015

The Director of Sports,
Sports Directorate,
Kwame Nkrumah University of Science &
Technology,
Kumasi.

Dear Sir

INTRODUCTORY LETTER

The bearer of this letter, Mr Timothy K. Mensah with Registration number (**ED/MPE/14/0004**) is a level 850 student of the above-named Department. In partial fulfilment of the requirements for the programme, he is conducting a study on **"INFLUENCE OF ANTHROPOMETRIC VARIABLES ON MOTOR PERFORMANCE OF SOCCER PLAYERS IN GHANA UNIVERSITY SPORTS ASSOCIATION GAMES".**

We would therefore be most grateful if permission could be given to him to carry out with Data Collection on his topic.

We count on your usual co-operation.

Thank you.

Yours faithfully,

Prof. Joseph K. Mintah
HEAD

UNIVERSITY OF CAPE COAST
CAPE COAST, GHANA
COLLEGE OF EDUCATION STUDIES
Department of Health, Physical Education & Recreation

TELEPHONE: 233 –0206610931, 0543021384, 0268392819
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Cables & Telegrams:
UNIVERSITY, CAPE COAST

Ref. No. **ED/MPE/14/0004/7**

21st October, 2015

The Director of Sports,
Sports Directorate,
University of Ghana,
Legon.

Dear Sir

INTRODUCTORY LETTER

The bearer of this letter, Mr Timothy K. Mensah with Registration number **(ED/MPE/14/0004)** is a level 850 student of the above-named Department. In partial fulfilment of the requirements for the programme, he is conducting a study on **"INFLUENCE OF ANTHROPOMETRIC VARIABLES ON MOTOR PERFORMANCE OF SOCCER PLAYERS IN GHANA UNIVERSITY SPORTS ASSOCIATION GAMES".**

We would therefore be most grateful if permission could be given to him to carry out with Data Collection on his topic.

We count on your usual co-operation.

Thank you.

Yours faithfully,

Prof. Joseph K. Mintah
HEAD

UNIVERSITY OF CAPE COAST
CAPE COAST, GHANA
COLLEGE OF EDUCATION STUDIES
Department of Health, Physical Education & Recreation

TELEPHONE: 233 –0206610931, 0543021384, 0268392819
32480-9 Ext.253

Cables & Telegrams:
UNIVERSITY, CAPE COAST

Ref. No. ED/MPE/14/0004/9

21st October, 2015

The Head Coach,
Sports Unit,
Sports Directorate,
University of Professional Studies

Dear Sir

INTRODUCTORY LETTER

The bearer of this letter, Mr Timothy K. Mensah with Registration number **(ED/MPE/14/0004)** is a level 850 student of the above-named Department. In partial fulfilment of the requirements for the programme, he is conducting a study on **"INFLUENCE OF ANTHROPOMETRIC VARIABLES ON MOTOR PERFORMANCE OF SOCCER PLAYERS IN GHANA UNIVERSITY SPORTS ASSOCIATION GAMES".**

We would therefore be most grateful if permission could be given to him to carry out with Data Collection on his topic.

We count on your usual co-operation.

Thank you.

Yours faithfully,

Prof. Joseph K. Mintah
HEAD