SELECTED PHYSICAL FITNESS COMPONENTS OF UGANDA'S NATIONAL SOCCER TEAM – THE CRANES

BY

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DECLARATION

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

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This work is dedicated to my parents Dabie Besweri Mutumba (RIP) and Jessica Mutumba.

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LIST OF ACRONYMS

AAHPERD	American Alliance for Health, Physical Education, Recreation and Dance
ACSM	American College of Sports Medicine
CAF	Confederation of African Football
CECAFA	Confederation of East and Central African Football Association
FIFA	Federation of International Football Associations
FUFA	Federation of Uganda Football Associations
NCS	National Council of Sports (Uganda)
NSCA	National Strength and Conditioning Association (American)

ABSTRACT

The study assessed flexibility, agility, muscular strength and endurance, explosive, sprint fatigue, and aerobic endurance of the Uganda national soccer team with the purpose of establishing a baseline data to determine training of the team. It was hypothesized that there was no significant difference in the fitness levels of players of Uganda's soccer team on basis of their age, their experience or their playing position. A pre-experimental research design was used. The study used the whole population hence the sample comprised of 24 subjects. Purposive and stratified sampling were used to select defense, midfielders and attackers. Fitness tests for each of the selected fitness components were carried out and the results were then compared to the established norms published by the NSCA (2005). The data collected was analyzed using SPSS V. 16 (Chicago, IL) standard descriptive statistics and presented in tables, graphs and charts. A comparison of the different strata of players' physical fitness scores was made using analyses of variance (ANOVA) at a $P < 0.01$. The Cranes performed below the set NSCA (2005) standard in all physical fitness tests. The performance of the players was neither affected by their age, experience nor their playing positions except the flexibility and agility tests that showed a significant difference on basis of their experience. The study recommended sensitization of the Cranes players and management about the significance of physical fitness; regular physical fitness testing and a need to establish a standard for the physical fitness tests for the Ugandan soccer teams.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

A considerable difference exists as to what constitutes physical fitness (Wesson, Wiggins, Thompson and Hartigan, 2005). Wilmore and Costill (1999) that physical fitness is the ability to sustain physical activity without limiting fatigue. According to Sport-Fitness-Advisor.com (2008), Physical fitness entails basic elements such as muscular strength and endurance and aerobic endurance, yet other scholars include agility, flexibility, balance, speed, power and neuromuscular coordination as other components of fitness. The other elements such as balance, coordination are classified as motor fitness abilities which are not necessary for physical fitness (Miller and Allen, 1989). Thus, there are several elements whose assessment gives the level of fitness of an individual.

However, the level of physical fitness required depends on the demands of the activity and this in turn determines the level of performance in the activity (Sport-Fitness-Advisor.com, 2008). In this regard, elite soccer players at club, national and professional level, require a relatively high level of physical fitness. According to Kakooza (1999) training should aim at improving physical fitness level which in turn should improve physical performance.

There are various fitness tests employed by different researchers for different purposes based on the fact that there are many dimensions of physical fitness required by each

activity (Powers, Thompson, Dodd, and Condon, 2006). According to National Strength and Conditioning Association [NSCA] (2005), soccer is one of the complex and intricate games that involves a blend of aerobic and anaerobic endurance, strength, power, speed, flexibility and agility requirements. Therefore, to test for physical fitness of soccer players, one needs a test battery that measures each of these components (Howley and Franks, 2003).

Soccer is increasingly becoming a highly competitive game in which players are now expected to exhibit a high level of social, psychological, intellectual, tactical and physical skills. The sport requires players to show high levels of physical fitness in addition to the fine skills of the game (Soccerperformance.com, 2008). The skills can be perfected with improvement in the physical fitness level. Player needs to undergo and pass the fitness tests of a given club to be considered on the team line-up (soccerperformance.com, 2008). Although physical fitness is a good determinant of performance, there were hardly any records of the physical fitness levels of players in the registry of the national team at Federation of Uganda Football Associations (FUFA) Secretariat. It was against this background that the researcher assessed the level of selected physical fitness elements of the National Soccer players in order to establish such records. The sport of soccer was selected for this assessment because it was the most popular sport in the country (Kakooza, 1999).

1.2 Statement of the Problem

The Uganda National Council of Sports [NCS] Report (2005), notes that since the 1970s, there had been a general decline in the trend of performance in sports in Uganda, including performance in soccer. Kakooza (1999) had earlier linked this decline in performance in soccer to a number of factors, including reduced physical fitness levels of the players.

Following a series of success in the 2008 Confederation of African Football (CAF) qualifiers campaign and championing the Confederation of East and Central African Football Association (CECAFA) tournament in January 2009, the Cranes had greatly improved on the FIFA soccer ranking. The Cranes moved from 95th FIFA Rankings to 68th and 63rd in 2010 (Buwembo, 2007, 2009 and 2010). Though there has been improvement in this regard, the position was still not reflective of a team which once shone in the 1970s (Kakooza, 1999).

FUFA had been in position to mobilize and invest significant amount of funds towards training, transport, players' allowances and general welfare (FUFA Report, 2007). Though the report gave a detailed assessment of the level of success in regard to the amount of money invested, level of fan support and number of wins, no record of the physical fitness of the overall team or players in particular was made. Scientific researches indicate that a considerable amount of physical fitness is required for soccer players to sustain the execution of the skills with limited fatigue (Bompa, 1983, Soccerperformance, 2008). Hence determining the physical fitness levels of the players

was a worthwhile endeavor. It was upon this that the researcher assessed the physical fitness level of the Cranes.

1.3 Purpose of the Study

The purpose of the study was to assess selected physical fitness components of the players of the Uganda national soccer team so as to establish a baseline data that can be used to determine training of the national soccer team.

1.4 Objectives of the Study

The objectives of the study were:

1. To establish the current physical fitness levels of Uganda's national soccer team – the Cranes.
2. To assess the level of physical fitness of the national team according to age, experience and playing position of the players.
3. To compare the selected physical fitness components of players in the national team with the NSCA (2005) set standards regarding flexibility, agility, muscular strength and endurance, explosive power, speed and aerobic endurance.

1.5 Hypotheses

It was hypothesized that:

HO_1. There would be no significant difference in the fitness levels of players of Uganda's soccer team on basis of their age.

HO_2. There would be no significant difference in the fitness levels of players of Uganda's soccer team on basis of their experience.

HO_3. There would be no significant difference in the fitness levels of players of Uganda's soccer team on basis of their playing positions.

1.6 Research Questions

The study further sought to answer the research question:

1. What is the current status of the current physical fitness levels of Uganda's national soccer team –the Cranes?
2. How does the physical fitness levels of Uganda's national soccer team –the Cranes compare with NSCA (2005) set standards?

1.7 Scope of the Study

This study was delimited to:

The Uganda national soccer team players, the Cranes and specifically to the soccer players who were in the training camp at the time of the study.

Fitness variables that included aerobic endurance, agility, explosive power, trunk flexibility, upper body muscular strength and endurance and speed because these are the prime variables for soccer players.

1.8 Limitations of the Study

An indirect measurement was used to determine aerobic endurance, that is, maximal aerobic endurance was predicted using Leger's multi stage run test and the sprint power was as well predicted indirectly by use of 30 m sprint test. The indirect methods may have had some effect on measurement and computation.

1.9 Significance of the Study

The findings of the study may help coaches and sports managers in designing appropriate programmes that aim at developing, improving and maintaining the fitness levels necessary for the game.

The recommended test procedure may be used by FUFA to develop a data base of all elite soccer players upon which selection to the national team could be based. This could also be used at lower or developmental levels to train/test the upcoming or future players, that is, reference to track players over time.

1.10 Assumption of the Study

It was assumed that the players would use maximum effort required for all of the fitness tests and each player would be equally motivated to perform at his best.

1.11 Conceptual Framework

Research shows the essentiality of physical fitness testing in relation to the performance of soccer players (Wesson, et al, 2005). It is conceptualized that the performance of soccer players is highly dependent on their level of physical fitness (Howley and Franks, 2003; Williams, 2005; Soccerperformance, 2008). This makes it clear that soccer players ought to undergo physical fitness tests. The level of fitness is directly linked to quality of training in regard to frequency, intensity, duration and appropriateness (ACSM, 1998). The factors to be considered when training for fitness include methods used, load administered, equipment and facilities available, physical therapy and treatment, physical fitness programmes and fitness tests to assess the level of achievement (Sport-Fitness-Advisor, 2008).

Improved physical fitness outcomes associated with specifically designed training include improved aerobic endurance, increased muscular strength and endurance, improved agility and trunk flexibility, increased power and speed (Watson, 1995). Improved fitness also helps in reducing the prevalence of injuries, and hence promotes proficiency in performance (Williams, 2005). Consequently, the model indicates that improved performance creates a new standard for the physical fitness demands. This research assessed selected components of physical fitness of Uganda's national soccer team – the Cranes.

The study used concepts developed by Watson (1995) and Williams (2005) as summarized in Figure 1.

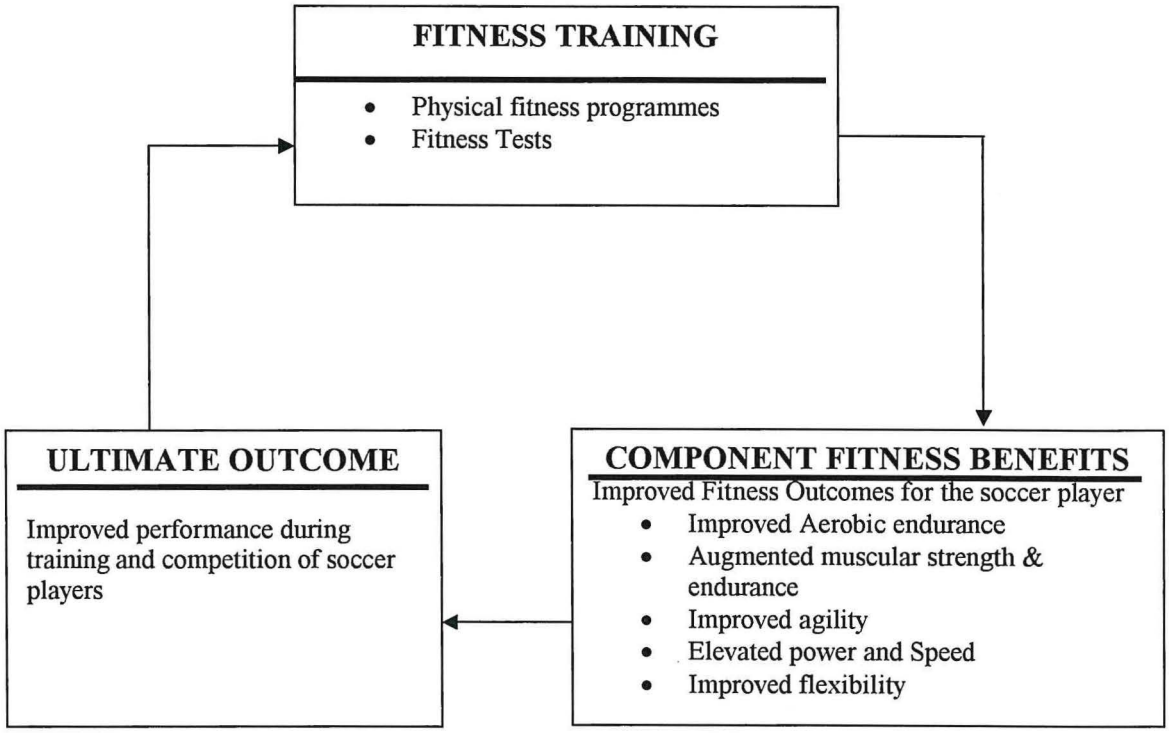

Figure 1.1: **The difference between Physical Fitness and Physical performance (Adopted from Watson (1995) and Williams (2005) and modified by the researcher**

1.12 Operational Definitions of Terms

Aerobic endurance: capacity of the heart and the lungs to supply the working muscles with the nutrients required to perform low intensity physical activities without undue fatigue. It was measured using the Leger's multi shuttle stage run.

Agility: the capacity to move and change direction and position of the body quickly and effectively while under control. It was measured using the Illinois test.

Body composition: the relative amount of fat and lean body tissue found in ones body.

Explosive power: capacity to exert a large force over a short period of time. Measured by the standing long jump and standing vertical jump tests.

Flexibility: the capacity to move joints freely through their full range of motion. It was measured the sit and reach test.

Muscular strength: the maximum amount of force one can produce during one contraction. It was measured by the push up and curl up tests.

Muscular endurance: capacity of a muscle or muscle groups to generate force over and over again. It was measured by the push up and curl up tests.

Speed: the capacity to put the body parts into motion quickly, or the maximum rate that a person can move over a specified distance.

Power Maintenance: capacity of the body to replicate several bouts of speed over a period of time with minimal rests. It was measured by the sprint fatigue test.

The Cranes: Players of the Uganda National Soccer team.

Physical fitness: A set of capabilities and abilities soccer players possess to perform types of physical activity with respect to aerobic endurance, agility, explosive power, flexibility, speed, muscular strength and endurance.

Physical fitness level: Quantifiable degree of physical fitness as measured by NCSA (2005) standard tests.

CHAPTER TWO

REVIEW OF LITERATURE

2.1 Introduction

Literature was reviewed under the following topics and subtopics: concept of physical fitness, importance of physical fitness, physical fitness testing, related studies and summary.

2.2 Concept of Physical Fitness

Wilmore and Costill (1999) and Wesson, et al (2005) define physical fitness as the ability to sustain physical activity without fatigue. AAHPERD (2005) defines physical fitness as a set of abilities individuals possess to perform specific types of physical activity. Beashel, Andy and Taylor (2005) define physical fitness as the ability to carry out every day activities with little fatigue and with enough energy left for emergencies. Furthermore, Powers, et al (2006) define physical fitness as the ability of the body to function at optimal efficiency.

Fitness may be described as a set of attributes that an individual acquires which helps him or her have the ability to perform physical activity (Sport-Fitness-Advisor, 2008). Each component is important for achieving the general performance goals of any sport (Howley and Franks, 2003).

Physical fitness is classified into two categories, namely; the health-related and the skill-related. Both categories of physical fitness affect performance in any sport. Health-related components that include aerobic endurance, muscular strength and endurance, flexibility and body composition are physiologically based and determine the ability of an individual to meet the physical demands of the activity (Powers, et al, 2006). The skill-related components that include agility, balance, coordination, reaction time, speed, power and mental capacity are based upon the neuro-muscular system and determine how successfully a person can perform a specific skill (Wesson, et al, 2005; Beashel, et al, 2005; Williams, 2005).

2.3 Importance of Physical Fitness

Historically, man acquired physical fitness through hunting, fishing, swimming through waters, moving long distances and protecting himself from attack (McIntosh, Dixon, Munrow and Willetts, 1981). In other words, the training for fitness and its measure was as well the mode of survival of the ancient man. One did not need to find time to exercise to develop physical fitness because the activities they engaged in helped in developing their fitness (McIntosh, et al, 1981). In the modern world, as work and home lives become increasingly mechanized and sedentary, there is need to make time to exercise to attain and maintain a level of fitness to ensure optimal health.

Total fitness is a condition reached through striving for optimal quality of life: social, mental, psychological, spiritual and physical. According to Powers, et al (2006), individuals must make specific actions to obtain an optimal level of physical fitness.

Furthermore, individuals training for sport must engage in specifically designed exercises to attain the level of fitness required to perform optimally. This dynamic multi-dimensional state has a positive health base and includes individual performance goals (Howley and Franks, 2003). A study by Pyne (2009) concluded that the 20-m sprint, jump, agility and shuttle run tests have a small but very important association with career progression of Australian Football League footballers.

An increase in the total amount of moderate-intensity physical activity increases the fitness level of the individual which in turn improves one's physical performance. According to Sport-Fitness-Advisor.com (2008), better performance in soccer demands high levels of agility, flexibility, muscular strength and endurance, power, speed, and aerobic endurance.

Howley and Franks (2003) state that long term benefits of improving physical fitness include reduced risk of major health problems and improvement in cardio-respiratory function, muscular endurance, flexibility and body composition. Similarly, Beashel, et al (2005) assert that different sports activities require a higher degree of some fitness elements than others though there is need to improve the overall physical fitness for optimal performance in sports. Schmidt and Craig (2000) relate the parameter values needed to produce movement variations that effectively match different sets of environmental demands, that is, appropriate fitness to produce the required movements. Powers, et al (2006) provide guidelines for the development of a safe and efficient programme to improve one's physical fitness. To cope with the physiological demands of

soccer, players must be competent across several fitness components. Fitness tests in conjunction with physiological data should be used for monitoring changes in players' fitness and for guiding their training prescription (Svensson and Drust, 2010).

Results from Junior Australian elite football teams showed that the selected players were significantly ($P<0.05$) taller and had greater upper body strength than non-selected players. This suggested that in addition to physical conditioning, anthropometric measurements do play an important part in determining selection in elite Football teams (Keogh, 2009). The aerobic capacity of soccer players substantially influences their technical performance and tactical choices. Thus, the assessment of soccer players' aerobic performance should be of interest for soccer coaches in order to evaluate and improve their endurance training sessions (Chamari, et al, 2008). Muscular tightness is postulated as an intrinsic risk factor for the development of a muscle injury. Muscle flexibility testing can identify soccer players at risk for musculoskeletal lesions (Kreckel, et al, 2009).

Findings of the study to examine the relationship between popular endurance field tests and physical match performance in elite male youth soccer players randomly chosen among a population of elite-level soccer players showed that the tests may be regarded as valuable tests to assess match fitness and subsequently guide training prescription in youth soccer players (Castagna, Manzi, Impellizzeri, Weston and Alvarez, 2008). Gall F, Carling, Williams, and Reilly (2008) suggested that anthropometric and fitness

assessments of elite youth soccer players can play a part in determining their chances of proceeding to higher achievement levels.

Gil, Ruiz, Irazusta, Gil and Irazusta. (2009) reported that around the time of puberty, parameters associated with physical maturity such as height, size, speed, VO_{2max}, or chronological age are important to determine the success of a soccer player. At older ages, other factors such as agility seem to be more important.

A study by Young et al (2009) on thirty-four elite soccer players tested for isolated quadriceps and hamstrings strength, leg extensor muscle strength and power, upper body strength, sprinting speed, vertical jump (VJ), endurance, skinfolds and hamstring flexibility with the purpose of comparing fitness test results for defenders, forwards and mid-fielders. Results indicated the fitness was position specific and therefore coaches and trainers needed to put the implications into consideration when selecting soccer players.

2.4 Physical Fitness Testing

Wesson et al (2005) note that there is need for regular physical fitness testing so that the athlete's strengths and weaknesses can be identified besides providing baseline data for monitoring training. Wesson et al (2005) add that the testing provides the basis for training prescriptions; assessment of the value of different types of training and help in modification of training programmes in addition to prediction of athletic potential for a particular sport. Little and Williams (2009) suggest that specific testing and training procedures for each component should be utilized when working with elite players.

Sport-Fitness-Advisor.com (2008) gives a sample of some reliable physical fitness tests that measure strength, muscular endurance, speed, power, aerobic endurance and flexibility. These tests require little or no equipment or certainly equipment that is readily available to most people and are easily adaptable to the soccer-testing situation. The muscular strength and endurance tests include the curl-up and press up test which gives a good indication of core muscular endurance. For Flexibility, the following tests are commonly used: the Goniometer used to measure the flexibility of most joints and the range of motion for dozens of movements, the groin flexibility test, the trunk rotation test, and the sit and reach test which measures lower back and hamstring flexibility. The 30 meter sprint test is used to measure power. The 30 meter sprint fatigue test is an excellent test for speed in multi-sprint sports such as soccer. The hexagon drill is an excellent test to measure quickness, agility and balance. The Illinois agility test is as well a great fitness test for agility in multi-sprint sports. The standing long jump and standing vertical jump tests are used to measure explosive, ultra-short term power. Aerobic endurance tests that are commonly used include the Balke 15 minute run test which measures aerobic endurance indirectly, the Cooper 12 minute run which measures aerobic endurance indirectly. Leger's multistage shuttle run test also used to estimate aerobic endurance is more appropriate for multi-sprint sports and effective for testing large groups at a time.

A study by Gil, Gil, Ruiz, Irazusta, and Irazusta (2009) indicated that among the Dutch young soccer players, forwards were the leanest, presenting the highest percentage of muscle. They were the best performers in all the physiological tests, including endurance,

velocity, agility, and power. In contrast, goalkeepers were found to be the tallest and the heaviest players. They also had the largest fat skinfolds and the highest fat percentage, but their aerobic capacity was the lowest. In the selection process, agility and the jump tests were the most discriminating for forwards. In contrast, agility, height, and endurance were the key factors for midfielders. The defenders group was characterized by a lower quantity of fat. Thus, Gil, et al (2009) concluded anthropometric and physiological differences exist among soccer players who play in different positions and these differences fit with their different workload in a game. Therefore, training programs should include specific sessions for each positional role. According to a study by Hrysomallis (2009) flexibility has usually been assessed by goniometry during maximal hip abduction. Low adductor flexibility has also been identified as a risk factor for injury in soccer players.

The study employed the NCSA (2005) fitness test battery and at least one test was selected for each of the physical fitness components measured.

2.5 The NSCA Fitness Test Battery

According to the NSCA (2005), when a number of physical fitness tests are conducted in one measurement session, they should occur in the following order: flexibility test, agility test, muscular strength and endurance test, explosive power, sprint test, and aerobic endurance test (Sport-Fitness-Advisor.com, 2008). The tests selected to measure each of the components are described in the subsections below.

2.5.1 Flexibility

According to Miller and Allen (1989), anyone with a stiff or inflexible spinal column is at a disadvantage in many physical activities and also fails to get full value from the shock-absorbing arrangement of the spine when walking, running or jumping. Safrit and Wood (1995) define flexibility as the capacity of an individual to move the body joints through a maximum range of motion without undue strain. Wesson et al (2005) also define flexibility as the range of movement possible at a joint which is determined by the elasticity of ligaments and tendons, strength and opposition of surrounding muscles and the shape of the articulating bones.

Although no single test that gives a score for overall flexibility, the trunk and shoulder flexibility are commonly evaluated (Powers, et al, 2006). Each test is specific to a particular movement or joints (Honey, Hill and Moors, 1996). Most flexibility assessments done are based on static flexibility. The sit and reach test which measures lower back and hamstring flexibility which is more crucial to football players was adopted for studies involving soccer. It is a test that is easy to administer and the equipment used can easily be obtained (Rosser, 2001; Sport-Fitness-Advisor, 2008). The test procedure is included in Appendix III.

2.5.2 Agility

Wesson et al (2005) define agility as the capacity to move and change direction and position of the body quickly and effectively while under control. This fitness component

is required in a range of sporting activities including soccer. The Illinois agility test is commonly used since the testing procedure is simple to administer with little equipment (Appendix III). It is a widely used test with easily accessible rating (Sport-Fitness-Advisor, 2008).

2.5.3 Muscular Strength and endurance

Muscular strength is defined as the maximal amount of effort that can be generated in one contraction. On the other hand, muscular endurance is the capacity of a muscle or muscle group to generate force over and over again or to sustain muscular contractions (Heywood, 1991; Wesson et al, 2005; Powers, et al, 2006). Inability to resist fatigue in the muscles leads to physical break down (Anderson and Plecas, 1999).

Different tests have been designed for testing the muscular strength and endurance of different body parts. However, calisthenics type of measurement is largely used; this involves the use of one's own body weight as resistance during the test. The Curl-Up test is used to determine the muscular endurance of the abdominal muscles (Getchell, Mikesky and Mikesky, 1998; Powers, et al, 2006). The abdomen is the fulcrum of one's body and is important in many tasks involving core strength such as running, jumping, kicking, lifting, pulling, and dragging (Howley and Franks, 2003).

2.5.4 Power

Power is the capacity to exert a large force over a short period of time which relies on the interaction of the neuro-muscular system to recruit fast twitch fibres as rapidly as possible (Wesson, et al, 2005). Though there are other tests, the long jump and vertical jump tests are normally adapted for field testing to measure explosive power because they are the most appropriate and the equipment used is easily available. Secondly, the tests are easy to administer (Sport-Fitness-Advisor.com, 2008).

2.5.5 Speed

Wesson, et al (2005) define speed as the capacity to put the body parts into motion quickly, or the maximum rate that a person can move over a specified distance. Speed is a major factor in many high intensity and explosive activities and is frequently required by soccer players during the game. The 30 meter sprint fatigue test is normally employed in field studies due to the readily available equipment and the sprint test ratings (Howley and Franks, 2003).

A study by Russell, Benton, and Kingsley (2008) on academy soccer players on change of skill performance with fatigue indicated that passing, dribbling, and shooting skill precision, success rate, and ball speed were compromised with time into the game. Shots taken after exercise were 25.5 ± 4.0% less accurate than those taken before exercise and passes in the last 15 min were 7.8 ± 4.3% slower than in the first 15 min. Shot and pass speeds were slower during the second half compared with the first half (shooting: 17.3 ±

0.3 m·s-1 vs 16.6 ± 0.3 m·s-1, P = 0.012; passing: 13.0 ± 0.5 m·s-1 vs 12.2 ± 0.5 m·s-1, P = 0.039). Dribbling performance was unaffected by exercise. Blood lactate concentrations were elevated above pre-exercise values throughout exercise. Similarly, Rampinini, Impellizzeri, Castagna, Azzalin Bravo and Wisløff (2009) showed that the fatigue developed during a match and after relatively short bouts of high-intensity intermittent activities has a detrimental effect on short-passing ability, and that the fatigue-related decline in technical proficiency for a given intensity is associated with the fitness level of the players.

2.5.6 Aerobic endurance

It is defined as the capacity to provide and sustain energy aerobically (Topendsports.com, 2009). The rationale for using oxygen uptake as a valid index of physical fitness is summarized by Astrand and Rodal (1986) who state that during prolonged low intensity physical work, the individual's performance capacity depend largely on his ability to take up, transport and deliver oxygen to working muscles. Johnson and Nelson (1988) point out that the most accurate indicator of aerobic endurance is oxygen uptake. In a laboratory setting, maximal oxygen uptake is measured using one of several exercise protocols on treadmill connected to a metabolic cart. In this way, heart rate, oxygen input and output, ventilation and respiratory exchange ratio are directly measured.

In most field studies, Leger's 20-meter shuttle run test is used to predict aerobic endurance since it can be administered to a group at once. It is simple to administer with

well established reliability and validity in addition to the simplicity of interpreting the test results (Powers, et al, 2006).

2. 6 Related Studies

Ekblom (1986) found the maximum oxygen uptake of Swedish players to be about 61ml/kg/min and the study recommended high level training for the team. Similar results were found in Danish national soccer players (Bangsbo, Norregaard and Thorso, 1991) with a mean maximal oxygen uptake of 60.6 ml/kg/min (although the value of a midfielder was higher as it was not statistical significant). It was concluded that if the team was to stand up amongst other teams in the world, it seriously needed more specialized training.

Players in a South Australian national soccer league had an aerobic endurance of 57.6 ml/kg/min compared to the 56.7ml/kg/min of a State league team and the Football federation recommended training to improve the fitness level of the players. Wisloff, Helgerud and Hoff (1998) reported 63.7ml/kg/min as the mean maximal oxygen uptake of the Norwegian soccer team and concluded that the team still needed more time to work out to improve the level. The physiological profile for the Australian National team notes their mean oxygen uptake to be 56.9ml/kg/min while the Australian Olympic Team was 59.3ml/kg/min with a conclusion that the level was much below the requirement for such high level sports (Nettesting.com, 2009). Leger and Lambert (2004) used a maximal multistage 20-meter shuttle run to predict the VO_2 max of 59

physically active males aged 24.8 +/- 5.5 years and found out mean VO_2 max (+/- SD) of 51.6 +/- 7.8 ml/kg/min. Results found the Danish national soccer players (Bangsbo, Norregaard and Thorso, 1991) with a mean maximal oxygen uptake of 60.6 ml/kg/min. Although the value of a midfielder was higher, it was not statistical significant. Players in a South Australian national soccer league had a VO_2 max of 57.6 ml/kg/min compared to the 56.7ml/kg/min of a State league team. A relatively recent study by Wisloff, Helgerud and Hoff (1998) reported 63.7ml/kg/min as the mean maximal oxygen uptake of the Norwegian soccer team. The physiological profile for the Australian National Team was found to be 56.9ml/kg/min while the Australian Olympic Team was 59.3ml/kg/min (Net-testing, 2009). Elite soccer players spend a substantial amount of time trying to improve physical capacities, including aerobic endurance and strength and the strength derivatives of speed and power. The average oxygen uptake for international soccer teams ranges from 55 to 68 ml.kg-1.min-1 (Hoff, 2008).

Among the Croatian national soccer players, a study found out that attackers were the quickest players in the team when looking at sprint values over 5, 10, and 20 meters. There were statistically significant differences between attacker and defenders when measuring vertical jump height by squat jump. Midfielders had statistically significant superior values of relative oxygen consumption, maximal heart rate, maximal running speed, and blood lactate than defenders and attackers. Defenders had more body fat than attackers and midfielders ($p < 0.05$). Coaches are able to use this information to determine which type of profile is needed for a specific position. It is obvious that players in different positions have different physical and physiologic profiles. Experienced

coaches can use this information in the process of designing a training program to maximize the fitness development of soccer players with one purpose only, to achieve success in soccer (Sporis, Jukic, Ostojic and Milanovic, 2011).

Bloomfield, Polman, Butterly, O'Donoghue (2002) assessed the quality of 2,085 professional soccer players playing in these 4 leagues (English Premier League, Spanish La Liga Division, Italian Serie A and German Bundesliga) during the 2001-2002 season. Differences were found between the age, stature, body mass and BMI of players in different positions and in the different leagues. Age had a significant influence on position with goalkeepers (years) (27.4+/-5.3) being older than midfielders (26.2+/-4.3) and forwards (25.8+/-4.2) and defenders (26.8+/-4.3) being older than forwards. Players from the Bundesliga had the greatest stature (m) (1.83+/-0.06), body mass (kg) (77.5+/-6.4) and BMI (kg x m^{-2}) (23.2+/-1.1) of the 4 leagues. In reflection, La Liga's players had the shortest stature (1.80+/-0.06) and the Serie A players had the least body mass (74.3+/-5.4) and BMI (22.8+/-1.1). Though this study did not categorize the results by nationality, the leagues are a collection of assumed best soccer players from around the world.

The cited literature giving the available records and standards of physical fitness does not include any for Ugandan soccer players. These sources present many results from the various studies done on different teams and players based in the USA, Canada, Australia and United Kingdom. Reference was made to the NSCA (2005) standards, the AAHPERD, (2005) test standards and the Canadian standards as adapted by Powers, et al, (2006).

2.7 Summary

There is a general agreement by all scholars that there is need for physical fitness testing and training among soccer players. There were various fitness tests employed for aerobic endurance, flexibility, speed, power, muscular strength and endurance as well as agility. This was based on the premise that, the fitness level of the player relates to his performance in soccer. Available literature recommends fitness testing to assess each player's fitness condition during pre-, in- and post-season to identify the training changes of the players. However, the cited literature suggests that the available records and standards of physical fitness do not include any for Ugandan soccer players, hence the need for this study.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This chapter presents the the procedure that was used for carrying out the study. It is laid out in the following subsections: research design, variables, location of the study, target population, sample techniques and sampling size, research instruments, validity and reliability of the instruments, pilot study, data collection procedure, data analysis and presentation techniques as well as specific logistical and ethical considerations.

3.1 Research Design

The study sought to assess selected physical fitness attributes of Uganda's national soccer team players using a pre-experimental research design. This method was best suited to provide baseline data about the target population since it took a single shot of data collection (Baumgartner and Hensley, 2006; Gay, 1996). The design was appropriate because the study aimed at establishing the fitness status of players without manipulation of variables.

3.2 Variables

The dependent variables used in the study were flexibility, agility, muscular strength, muscular endurance, explosive power, speed power and aerobic endurance. The independent variables included age, experience and playing positions of the players.

3.3 Location of the Study

The study was carried out in the alternative training camp of the national soccer team at Makerere University main ground based in Kampala, the capital city of Uganda.

3.4 Target Population

The study was carried out among players of the national soccer team comprising a total of 24 players, both professional (those playing in clubs outside Uganda) and home-based (those playing within Uganda).

3.5 Sampling Techniques and Sample Size

All the national soccer team players constituting 100 percent of the soccer players were used in the study. Stratified sampling was used to categorize the players into three strata namely; defence, mid-field and forward. Stratification was done because the sample consisted of units of different characteristics based on their play position and area.

3.6 Research Instruments

- A physical fitness evaluation sheet was used for recording data from tests.
- Health O-meter large floor dial bathroom scale was used to determine body weight.
- Stadiometer was used in height measurement to the nearest 0.5 centimeter using.
- Meter rule was used in the sit and reach test to determine trunk flexibility of the players. Standard timer was used in the Illinois test determine agility of the players.

- Standard timer was used in the Pull-up and Curl-up tests to determine muscular endurance.
- Meter rule was used in the Explosive power was tested using vertical jump and horizontal jump tests.
- For sprint power, the standard timer was used in the 30-meter sprint test.
- Cardio-respiratory endurance, the automated beep was generated by a computer in the Leger's 20-meter shuttle run test to predict the VO_2 max of the participants.

Details of each instrument are given in appendix III.

3.7 Pilot Study

A pilot study was carried out using the first eleven soccer players of Kyambogo University soccer team. The purpose of conducting pilot research was to ensure that the research protocol was well established, to pre-test the research tools. The pilot study was further meant to familiarise the research assistants with the testing procedure in regard to handling instruments, order of testing and recording data.

3.8 Validity and Reliability of Instruments

Instruments adapted in the tests for this study were authenticated by the NSCA (2005) standards. Similar instruments had been used by different teams in America for testing fitness of soccer players (Sport-Fitness-Advisor.com, 2008). Additionally, the research assistants were taken through an appropriate training to enable them used the instruments and to ensure consistency in measurement.

3.9 Data Collection Procedure

Preliminary arrangements included assigning identification numbers, filling of the bio-data and putting the subjects into three strata. According to the NSCA (2005) and Powers, et al, (2006), a thorough warm up was conducted before the physical fitness test battery was administered Six testing procedures which included flexibility test, agility test, muscular strength and endurance test, explosive power, sprint test, and aerobic endurance test were used for collection of the research data as elaborated in Appendix III. Players were asked to complete each physical fitness test to the best of their ability to determine their fitness level in regard to tested components. The standards for comparison as set by the American National Strength and Conditioning Association (NSCA) and Powers, et al (2006) are indicated in appendix II. Quantities of variables under each fitness test were recorded in the physical fitness evaluation sheet in Appendix III.

3.10 Data Analysis and Presentation

The data collected was analyzed using SPSS V. 16 (Chicago, IL) Descriptive statistics namely, frequencies, percentages, ranges, means and standard deviations were used to summarize data. A visual comparison of results was made using internal criteria, comparing players' test scores within the team and external criteria, comparing the teams' results against established norms. In addition to the descriptive statistics, a comparison of the different strata of players' physical fitness scores, that is, VO_2 max, number of push ups, curl ups, sit and reach scores, time for the Illinois test, score for explosive power, and the aerobic endurance score was made using a one-way analyses of

variance (ANOVA) to test the hypotheses at a $P < 0.01$. The difference between variables was established as statistically significant when found to be equal or less than 0.01. Tables, graphs and charts were used in presenting the data.

3.11 Logistical and Ethical Considerations

The researcher obtained a letter of introduction to FUFA from Department of Sport Science, Kyambogo University. The researcher then wrote letters to the Chairman FUFA and the coach of the national soccer team to seek permission and support to carry out the research. Informed consent through invitation letters was also sought from the players before asking them to undertake the tests. Research assistants were employed to help in administering tests and recording the data.

The researcher then sensitized the players about the purpose of the research, as well as the importance of continuous physical fitness testing. Since fitness level is a sensitive area amongst soccer players, the researcher did not disclose the names of the players but rather strictly used identification numbers that were assigned during preliminary stages.

CHAPTER FOUR

FINDINGS AND DISCUSSION

4.1 Introduction

The purpose of this study was to assess selected physical fitness components of the national soccer team so as to establish baseline data that can be used to determine the training goals and standards of football players in Uganda.

To achieve this goal, the following research objectives were formulated and used as a guide to the study:

1. To establish the current physical fitness levels of the national soccer players –the Cranes.
2. To compare the selected physical fitness components of players in the Cranes with the set NSCA (2005) standards namely: flexibility, agility, muscular strength and endurance, explosive power, speed and aerobic endurance.
3. To assess the level of physical fitness of the Cranes according to age, experience and playing position of the players.

For a guided attainment of the above objectives, null hypotheses were formulated and tested by use of one way analysis of variance (ANOVA). All hypotheses were either accepted or rejected at $p<0.01$ alpha level. A research question was as well formulated to establish how the physical fitness levels of the Cranes compared to the NSCA standards.

4.2 Presentation of Findings of the Study

In this section, the findings of the study were presented and analyzed.

4.2.1 Demographic Information of the Players

This section describes the demographic characteristics of the players who took part in the study and are presented in Table 4.1.

Table 4.1 Demographic Characteristics of the Players

Age (years)		Weight (Kg)		Height (cm)		Experience - Club (yrs)		Experience National Team (yrs)		Position / Play Area	
Range	F	Range	F	Range	f	Range	F	Range	F	Range	F
15–19	4	50-59	4	155-164	6	1-4	4	1-4	18	Defense	9
20–24	16	60-69	14	165-174	12	5-8	12	5-8	6	Midfield	10
25–29	4	70-79	6	175-184	6	8-12	8	8-12	0	Forward	5
Mean ± SD		**Mean ± SD**		**Mean ± SD**		**Mean ± SD**		**Mean ± SD**			
21.7± 2.2		**65.9±5.7**		**169.2±7.5**		**7.3±2.8**		**3.6±1.7**			

4.2.1.1 Age Distribution of the Members of the National Soccer Team – the Cranes

Table 4.1 shows that four (16.7%) of the national team players were between 15 and 19 years. Sixteen (66.6%) participants were between 20 and 24 years and another four (16.7%) of the total sample were between 25 and 29 years.

Though there was no written rule against the age at which a player was expected to join or leave the Uganda National Soccer Team, the lowest age of players found in the national team was 18 years and the oldest player was 25 years with an average age of

21.7 ± 2.2 years. This age distribution indicates that the Cranes relied on the services of relatively young individuals. This finding is contrary to those by Bloomfield, et al (2002) on 2,085 professional soccer players playing in these 4 leagues (English Premier League, Spanish La Liga Division, Italian Serie A and German Bundesliga) during the 2001-2002 season. Age had a significant influence on position with goalkeepers (years) (27.4+/-5.3) being older than midfielders (26.2+/-4.3) and forwards (25.8+/-4.2) and defenders (26.8+/-4.3) being older than forwards. Such leagues with a collection of assumed best soccer players from around the world relied on relatively aged players.

The findings in Table 4.1 show that players' experience with soccer averaged at 7 and 3.5 years at club and national team levels respectively which is quite high for players of such a young age. Records at FUFA secretariat indicated that players retired early to join either refereeing or coaching the game of soccer. These results also signified that the Cranes relied more on young players with a very early entry into elite soccer at an average age of 14 years and 18 years at Club and national team levels respectively. Further, there appears to be a recruitment system of players from clubs to the national team since all the players in the Cranes had played for clubs before.

The results presented in Table 4.1 further indicate the average weight and height of the Cranes players as 65.9 ± 5.7 kilograms and 169.2 ± 7.5 centimeters respectively. The majority (12) of players have a height between 165 and 174 centimeters, and another majority of 14 having a weight between 60 and 70 kilograms. Results from Junior Australian elite football teams showed that the selected players were significantly

($P<0.05$) taller and had greater upper body strength than non-selected players (Keogh, 2009). Bloomfield, Polman, Butterly, O'Donoghue (2002) assessed the quality of 2,085 professional soccer players playing in these 4 leagues (English Premier League, Spanish La Liga Division, Italian Serie A and German Bundesliga) during the 2001-2002 season. Players from the Bundesliga had the greatest stature (m) (1.83+/-0.06), body mass (kg) (77.5+/-6.4) and BMI (kg x m^{-2}) (23.2+/-1.1) of the 4 leagues. In reflection, La Liga's players had the shortest stature (1.80+/-0.06) and the Serie A players had the least body mass (74.3+/-5.4) and BMI (22.8+/-1.1). Though this study did not categorize the results by nationality, the leagues are a collection of assumed best soccer players from around the world.

4.2.1.2 Experience of Players

Findings in Table 4.1 show that more athletes played for clubs at least for 4 years longer than they had players for the national team. These findings may imply that as players grew older, they left their roles as active soccer players and got involved in other responsibilities within the sport of soccer such as coaching and federation management. However, it is not possible to explain why the players who seemed to have started soccer at a very early age decided to retire at an age where experience would have played a very important role.

4.2.1.3 Players of the Cranes by Position

Figure 4.1 shows Uganda's soccer team players by position they played during competitions.

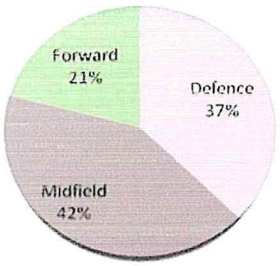

Figure 4.1: Players of the Cranes by Position

The findings presented in Figure 4.1 indicate that 42 % (10) of players of the national team were mid-field players, while the defence players comprised 37 % (9) of the sample and only 21 % (5) of the athletes were forwards. These findings also reveal that the Cranes had more defenders and mid-fielders than the forwards. In other words, the team had a narrow choice when it came to selection of who was to play the striking role for the team. It is important to point out that there is a strong difference between the strikers' ability and the likelihood of the team to win matches.

4.2.2 The Physical Fitness Status of the Players

The current status of the Cranes player

4.2.2.1 Flexibility

The sit and reach test was used for assessing flexibility. The score for each respondent was compared with the norms presented in Appendix IV and then put in Table 4.2.

Table 4.2 Flexibility Test (Sit and Reach test) Status

Zone	Frequency	Percentage
Excellent	2	8
V. Good	14	59
Good	6	25
Fair	1	4
Needs Improvement	1	4
Total	24	100
Mean ± SD	34.7 ±3.8 centimeters	

Table 4.2 shows the mean flexibility score for the team was 34.7 ± 3.8 cm which was graded as very good when compared with the standards. It is observed that only two (8%) players had an excellent result in the sit and reach test, 14 (59 %) players achieved a score of very good comprising the results of majority of the respondents; six players (25%) achieved a flexibility rating of good. The fair and the need for improvement zones had only one respondent each. These findings were well above average with 67% of the players scoring either very good or excellent. This means that the players of the Cranes had generally good flexibility. This helps in limiting the susceptibility of players to injury and hence increases the retention in training and competitive sessions of the individual players (Safrit and Wood, 1995). On the other hand, it was observed that even at such an elite level there were athletes with flexibility ratings that needed remedial programmes even though the players were training daily.

4.2.2.2 Agility

The Illinois test was used for testing agility. The score for each respondent was extracted from the data sheets and put in the Table 4.3 and later compared with the NSCA norms.

Table 4.3: Illinois Agility Status

Zone	Frequency	Percentage
Excellent	5	21
Good	11	46
Average	8	33
Total	24	100
Mean ± SD	16.5 ± 0.6 seconds	

The mean agility score for the team members was 16.5 ± 0.6 seconds. The findings presented in Table 4.3 indicate that 21 % (5) of the respondents scored an excellent zone, 46 % (11) were good and 33 % (8) had average score in the agility test. This result was not surprising given that the performance in the flexibility test was also well above the average. This is in line with Wesson, et al (2005) observation that the higher the flexibility of a player the better his/her agility. However, the 33% of the players with an average score was still so high a number in a national team which could be attributed to regular training. Since a high agility translates into a high ability to move and change direction and position of the body quickly and effectively while under control, the results indicate that 33% of the Cranes appropriately execute the agile movements required during the football games.

4.2.2.3 Muscular Strength and Endurance

The first applied assessment for this component of physical fitness was the push-up test. The subjects performed as many push-ups as they could using the correct protocol within one minute. The summary of the score for test is recorded in Table 4.4.

Table 4.4: Muscular Strength and Endurance Status

Zone	Push-up test		Curl-up test	
	Frequency	Percentage	Frequency	Percentage
Excellent	8	33	4	17
V. Good	15	63	9	37
Good	1	4	8	33
Fair	0	0	3	13
Total	24	100	24	100
Mean ± SD	33.9 ± 4.6		22.6 ± 1.9	

The mean push-up score for the team members was 33.9 ± 4.6 which was graded as very good when compared with the NSCA standards (Appendix IV).

The results from the push-up test indicated that 33 % (8) of the entire Cranes players had excellent _score for muscular strength endurance, 63% (15) of the players had very good strength endurance levels. Only one athlete or 4 % of the sample showed a good strength endurance level. No player had fair score. The other test used to measure this component was the curl-up test. The subjects performed as many curl-ups following a cadence tone as precisely as they could, using the established protocol within one minute. The summary of the scores for players was recorded in Table 4.4. The average curl-up score

for the team members was 22.6 ± 1.9 which was graded as good when compared with the NSCA standards.

The findings presented in Table 4.5 indicated that only 17 % (4) of the entire Cranes had excellent scores in the curl-up test, 37% (9) of the sample scored very good. Eight (33 %) athletes showed good strength endurance level and 13 % (3) were considered to be in the fair zone.

The ability of one's muscles to withstand fatigue, for a specified period of time during performance of a physical task is dependent on muscular strength and endurance. The performance demands of a soccer player requires above average strength endurance levels. Though the results showed that the there was little problem of the Cranes team relating to abdominal muscular endurance, the players performed so much better in push-ups than they did in curl-ups.

4.2.2.4 Explosive Power

The first fitness test that was used to obtain an indication of this component was the standing long jump test. The subjects were required to stand at a mark with feet slightly apart, taking off and landing with both feet, the athlete swung both arms and bent his knees to jump forward as far as possible.

The jump distance was measured and the summary of the scores is as recorded in Table 4.5 after comparison with the NSCA norms.

Table 4.5: Explosive Power Status– Standing Long Jump Test

Zone	Frequency	Percentage
Excellent	1	4
V. Good	0	0
Good	15	63
Average	8	33
Total	24	100
Mean ± SD	276.9 ± 13.0 cm	

The mean standing long jump score for the team members was 276.9 ± 13.0 centimeters which was graded as good when compared with the NSCA standards. The findings presented in Table 4.5 indicated that only one (4%) player of the entire Cranes team had an excellent score in the standing long jump test, and no player fell into the very good category. The majority (15) of the subjects representing 63 % of the total sample showed good standing explosive power level with 33 % (8) failing to go beyond the average zone. The second fitness test used to provide a measure of this component was the standing vertical jump test. The score for each individual was compared with the NSCA norms and the results are shown in Table 4.6.

Table 4.6: Explosive Power Status – Standing Vertical Jump Test

Zone	Frequency	Percentage
Excellent	7	29
Very Good	0	0
Good	12	50
Average	3	13
Below Average	2	8
Total	24	100
Mean ± SD	62.7 ± 6.2 cm	

The mean standing vertical jump score for the team members was 62.7 ± 6.2 centimeters which was graded as very good when compared with the standards. The findings presented in Table 4.6 indicate that only 29 % (7) of the players had an excellent score in the standing vertical jump test, and no player was included in the very good category. The majority (12) of the subjects representing 50 % showed just good standing explosive power level with 13 % (3) failing to go beyond the average zone and 8 % (2) of the subjects failing to raise an average score. Explosive power relies on the interaction of the neuro-muscular system to recruit fast twitch fibres as rapidly as possible. This implies that 21 % the players in the Cranes still had poor fibre recruitment and hence could not instantly produce good jumps when required such as during heading the ball.

4.2.2.5 Power Maintenance

The fitness test used to obtain a measure of this component was the 30 m sprint fatigue test. The subjects were required to sprint from point A to B between the cones deviating 5m sideways in the middle of the sprint. Though each subject was timed from A to B, he was required to jog slowly for 10 meters after point B and then back to the start taking 30 seconds to do so and as soon as the athlete reached the start, he made a repeat of the sprint.

The subjects were required to complete a total of 10 sprints with the average times of the first was divided by the average of the last three and computed as a percentage before comparing with the norms. The summary of the findings is presented in Table 4.7.

Table 4.7: Power Maintenance Test – 30 m Sprint Fatigue Test

Zone	Frequency	Percentage
Excellent	3	13
Very Good	0	0
Good	14	58
Average	5	21
Poor	2	8
Total	24	100
Mean ± SD	85.2 ± 12.8 %	

The average sprint fatigue score for the team members was 85.2 ± 12.8 % which was graded as very good when compared with the NSCA standards. The findings presented in Table 4.7 indicate that only 13 % (3) of the entire Cranes team had excellent score in the standing vertical jump test, and no subject fell into the very good category. The majority

(14) of the subjects representing a portion of 58 % showed good explosive power level with 21 % (5) only scoring in the average zone and 8 % (2) of the subjects had power scores in the poor zone. Wesson et al, (2005) note that speed is a major factor in many high intensity and explosive activities and is frequently required by football players during the game. Yet the findings of this study showed that only a small percentage (13 %) was within the excellent zone. Results further show that the Cranes can not sustain multiple motions quickly.

4.2.2.6 Aerobic Endurance

The fitness test used to assess the aerobic endurance of the subjects was Leger's 20-meter shuttle run test. The results are as shown in Table 4.8:

Table 4.8: Aerobic Endurance Status

VO_2 max rating	Frequency	Percentage
V. Good	4	17
Good	10	42
Average	8	33
Fair	1	4
Poor	1	4
Total	24	100
Mean ± SD	**12.9 ± 2.6 levels**	**62.2 ± 7.7 ml/kg/min**

The data presented in Table 4.8 shows that the average VO_2 max score of the subjects was 62.2 ± 7.7 ml/kg/min which is considered good when compared with the standards. The average number of levels completed by the respondents was 12.9 ± 2.6 indicating an average performance. The results indicate that 10 (42 %) players had good aerobic

efficiency. Eight (33%) players had average aerobic efficiency. Only four subjects (17%) rated very good regarding their predicted VO_2 max. Surprisingly, the fairly and the poorly rated players were 4 % each with one subject each.

The aerobic endurance of an individual is vital in determining one's ability to perform a physical task for a long period of time without necessarily getting fatigued. The results shown here indicate that 42 % of the players scored up to just an average aerobic fitness, though all the players ought to have scored at least above average because what is expected to perform well in their sport. For players who are supposed to play a minimum of 90 minutes in a game, even those in the good zone were not in a sufficient condition to take them throughout the entire game. Such players were still vulnerable to fatigue especially in the last few minutes of the game. The four subjects (17%) whose aerobic condition was very good are a very small fraction of the entire team yet soccer is a team sport.

4.2.3 The Physical Fitness Levels of the Uganda National Soccer Team –The Cranes in Relation to Age, Experience and Position

4.2.3.1 Physical Fitness Levels and the Age of Players

The age of the crane players ranged from 18 to 25 years. This was the age range as given by the players because there were no records in the FUFA registry.

Table 4.9: One Way Analysis of Variance for the Difference Between Players' Age and the Selected Physical Fitness Components

		Sum of Squares	Df	Mean Square	F	p value
Sit and reach test for flexibility	Between Groups	84.458	7	12.065	0.771	0.620
	Within Groups	250.500	16	15.656		
	Total	334.958	23			
Illinois agility test	Between Groups	4.456	7	0.637	3.318	0.022
	Within Groups	3.069	16	0.192		
	Total	7.525	23			
Push-ups for Muscular strength	Between Groups	67.708	7	9.673	0.386	0.897
	Within Groups	400.917	16	25.057		
	Total	468.625	23			
Curl-ups for muscular endurance	Between Groups	25.458	7	3.637	0.967	0.487
	Within Groups	60.167	16	3.760		
	Total	85.625	23			
Standing long jump for explosive power	Between Groups	1046.458	7	149.494	0.846	0.566
	Within Groups	2826.167	16	176.635		
	Total	3872.625	23			
Standing vertical jump for explosive power	Between Groups	232.083	7	33.155	0.810	0.592
	Within Groups	655.250	16	40.953		
	Total	887.333	23			
Sprint fatigue test for sprint power	Between Groups	184.843	7	26.406	1.166	0.374
	Within Groups	362.216	16	22.638		
	Total	547.059	23			
Legers' shuttle run test for aerobic endurance	Between Groups	341.625	7	48.804	0.757	0.630
	Within Groups	1032.000	16	64.500		
	Total	1373.625	23			

Findings showed that there was no significant difference in the fitness levels of players of Uganda's soccer team on basis of their age: flexibility ($p = 0.62$), agility ($p = 0.22$), push-up ($p = 0.897$), curl-up ($p = 0.487$), standing long jump ($p = 0.566$), standing vertical jump ($p = 0.592$), speed maintenance ($p = 0.374$), aerobic endurance ($p = 0.630$). The ANOVA test Table is shown in Table 4.9.

The result indicated that there was no significant difference in the fitness levels of players of Uganda's soccer team on basis of their age. Therefore the null hypothesis was accepted. These findings are not in agreement as Safrit and Wood (1995) and Powers et al (2006) noted. These authors reported significant differences in flexibility among soccer players with respect to age yet the players tested were within a seven (7) year age difference with an average age of 21.71 years. It would have been expected that a difference exists since the players tested fell into two categories. However, age-related declines in flexibility typically do not occur until deterioration of the muscle occurs, usually not until after the third decade in life (ACSM, 1998).

4.2.3.2 Physical Fitness Levels and the Experience of Players

Experience of the players was considered in terms of the number of years each player had spent as an elite player either at club or national team level. This ranged from less than one (1) year to twelve (12) years. Still this was a range as given by the players since there were no records in the FUFA registry for verification.

Table 4.10: One Way Analysis of Variance for the Difference Between Players' Experience and the Selected Physical Fitness Components

		Sum of Squares	Df	Mean Square	F	p value
Sit and reach test for flexibility	Between Groups	157.625	6	26.271	2.518	0.006
	Within Groups	177.333	17	10.431		
	Total	334.958	23			
Illinois agility test	Between Groups	5.215	6	0.869	6.396	0.001
	Within Groups	2.310	17	0.136		
	Total	7.525	23			
Push-ups for Muscular strength	Between Groups	130.492	6	21.749	1.093	0.405
	Within Groups	338.133	17	19.890		
	Total	468.625	23			
Curl-ups for muscular endurance	Between Groups	35.292	6	5.882	1.987	0.124
	Within Groups	50.333	17	2.961		
	Total	85.625	23			
Standing long jump for explosive power	Between Groups	358.625	6	59.771	0.289	0.934
	Within Groups	3514.000	17	206.706		
	Total	3872.625	23			
Standing vertical jump for explosive power	Between Groups	72.833	6	12.139	0.253	0.951
	Within Groups	814.500	17	47.912		
	Total	887.333	23			
Sprint fatigue test for sprint power	Between Groups	149.400	6	24.900	1.064	0.421
	Within Groups	397.659	17	23.392		
	Total	547.059	23			
Legers' shuttle run test for aerobic endurance	Between Groups	347.625	6	57.938	0.960	0.480
	Within Groups	1026.000	17	60.353		
	Total	1373.625	23			

ANOVA test showed that there was no significant difference in the fitness levels of players of Uganda's soccer team on basis of their experience: push-up ($p = 0.405$), curl-up ($p = 0.124$), standing long jump ($p = 0.934$), standing vertical jump ($p = 0.951$), speed maintenance ($p = 0.421$), aerobic endurance ($p = 0.480$). However, there was a significant difference in the fitness levels of players of Uganda's soccer team on basis of their experience in flexibility ($p = 0.006$) and agility ($p = 0.001$). The ANOVA test table is shown in Table 4.10. The results indicated that there was no significant difference

between player's experience and their performances in relation to muscular strength and muscular endurance, explosive power, speed maintenance, and aerobic endurance. Hence, in this line the null hypothesis was accepted.

On the other hand, flexibility and agility tests gave results that indicated a difference to the player's experience and physical fitness levels. Hence, the null hypothesis was rejected.

Additional findings in Table 4.1 showed that players' experiences averaged at 7.3 and 3.6 years at club and national team levels respectively, which is apparently high for such young players. Records at FUFA secretariat indicated that players retired early to join either refereeing or coaching roles in the game of soccer. These data, as well, signified that the Cranes team relied more on younger player with a very early entry into elite soccer at an average age of 14 years and 18 years at Club and national team level. There seemed to have been a recruitment system of players from clubs to the national team since results in Table 4.1 showed that most players had played for clubs than they had done for the national team. Cranes players appeared to retire so early that at the time of the study, the oldest player was 25 years and the highest experience was 7 years. However, the ability to perform soccer skills requires not only physical ability but also knowledge, and skill which are compounded in one's experience especially in a country like Uganda where there is no streamlined talent identification and development.

Since a player's fitness level depends on how physically active they are, it would have been expected that the more experienced the players were the more fit they could be. This is confirmed by Bonneau and Brown (1995) that physical activity improves one's fitness level. However, this was only true for flexibility and agility. The other attributes of physical fitness did not show a significant difference to the player's experience. Two factors can explain this phenomenon: one is there is no streamlined training which Kakooza (1999) notes should be aimed at improving physical fitness levels and in turn improve physical performance. The second is physical fitness assessment under which a player has to undergo and pass the fitness test of a given club to be considered on the team's line-up (Soccerperformance, 2008). In regard to the second factor, it would be that if player were undergoing proper training, then there was no fitness testing to assess the progress.

As noted by Borrow (1992), Getchell (1998), Howley and Franks (2003) and McGlynn (1998) in Powers, et al (2006), performing additional fitness tests as an individual's fitness level improves is important because this type of feedback provides motivation for more training. This, in turn, improves and maintains fitness. Therefore, players of the Cranes team need to adapt the culture of regular testing as training progresses.

4.2.3.3 The Comparison of Physical Fitness Levels of the Different Playing Positions of the Cranes Players

Table 4.9: One Way Analysis of Variance for Mean Scores of various Variables of Players by Positions

		Sum of Squares	Df	Mean Square	F	p value
Forwards flexibility	Between Groups	51.000	5	10.200	2.400	0.320
	Within Groups	8.500	2	4.250		
	Total	59.500	7			
Defense flexibility	Between Groups	20.875	5	4.175	0.522	0.759
	Within Groups	16.000	2	8.000		
	Total	36.875	7			
Defense pushups	Between Groups	109.500	6	18.250	0.745	0.709
	Within Groups	24.500	1	24.500		
	Total	134.000	7			
Forwards pushups	Between Groups	152.375	6	25.396	1.037	0.636
	Within Groups	24.500	1	24.500		
	Total	176.875	7			
Defense curl-ups	Between Groups	3.875	5	0.775	0.310	0.874
	Within Groups	5.000	2	2.500		
	Total	8.875	7			
Forwards curl-ups	Between Groups	6.375	5	1.275	1.020	0.563
	Within Groups	2.500	2	1.250		
	Total	8.875	7			
Defense stand long jump	Between Groups	3.875	5	0.675	0.310	0.474
	Within Groups	3.000	2	1.500		
	Total	6.875	7			
Forwards stand long jump	Between Groups	6.375	5	1.275	1.020	0.563
	Within Groups	2.500	2	1.250		
	Total	8.875	7			
Defense stand vertical jump	Between Groups	63.375	6	10.562	0.845	0.682
	Within Groups	12.500	1	12.500		
	Total	75.875	7			
Forwards stand vertical jump	Between Groups	184.375	6	30.729	1.254	0.594
	Within Groups	24.500	1	24.500		
	Total	208.875	7			
Defense sprint fatigue	Between Groups	109.500	6	18.250	0.745	0.709
	Within Groups	24.500	1	24.500		
	Total	134.000	7			
Forwards sprint fatigue	Between Groups	152.375	6	25.396	1.037	0.636
	Within Groups	24.500	1	24.500		
	Total	109.500	7			
Defense aerobic endurance	Between Groups	147.375	5	29.475	1.456	0.455
	Within Groups	40.500	2	20.250		
	Total	187.875	7			
Forwards aerobic endurance	Between Groups	219.375	5	43.875	2.167	0.345
	Within Groups	40.500	2	20.250		
	Total	259.875	7			

From the p values indicated in Table 4.9, the hypothesis that there would be no significant difference in the fitness levels of players of Uganda's soccer team on basis of their playing positions was accepted.

Flexibility results did not conform to the principle of specificity of training as advanced by Graves, et al (1989). The effect of exercise training is meant to be specific to the area of the body being trained. For example, training the legs will have little or no effect on the arms, shoulders, and trunk muscles, and vice versa (ACSM, 1998). The specificity is as well required in relation to the play position of a given player or players. For instance the defenders require different specific physical fitness from the strikers or mid-fielders. Therefore, the performance of the Cranes in the flexibility test is not in conformity with Powers, et al (2006) who state that individual needs for flexibility are varied. Though all players were expected to exhibit a high level flexibility, it would have been expected that players in different team positions would yield different flexibility levels. However, this was not the case with the Cranes, which may imply that the physical fitness training the team was undergoing was not specific.

Similarly, though there was no significant difference in the agility test results of players in the different positions of the Cranes, it would have been expected that midfielders would exhibit a higher agility compared to defenders (Graves, et al, 1989). This still points to the fact that the selection of the team was not based on the fitness requirements of the respective playing positions or there was specific training for the players' physical fitness needs. A study by Gil, et al (2009) indicated that among the Dutch young soccer

players, forwards were the leanest but were less agile compared to the midfielders. Thus, Gil, et al (2009) concluded that agility differences existed among soccer players who play in different positions.

Likewise, the results of the Cranes in push-up and curl-up tests for muscular strength and endurance did not show any significant difference amongst mid-field players, defenders and forwards. This implies that all players' strength endurance had no variation in relation to the different positions. This is as well contrary to the expectation that midfield players ought to have higher strength endurance as compared to the other player positions in a soccer team which could be explained by lack of or limited specific fitness training (Gil, et al 2009 and Sporis, et al, 2011).

The ANOVA results for both standing long jump and standing vertical jump tests as well gave no significant differences between mid-field players and those of other playing positions. Though this implies that no remarkable difference existed amongst players of different positions, it was in line with the recommendations given by Nettesting.com (2008). According to Sport-Fitness-Advisor.com (2008), better performance in soccer demands high levels of agility, balance, strength, endurance, power and speed. However the demands of different playing positions are different in relation to each of the components. Among the Croatian national soccer players, a study found out that there were statistically significant differences between attacker and defenders when measuring vertical jump height by squat jump. Defenders had more body fat than attackers and midfielders ($p < 0.05$). It is obvious that players in different positions have different

physical and physiologic profiles. Experienced coaches can use this information in the process of designing a training program to maximize the fitness development of soccer players as well as determining which type of profile is needed for a specific position. (Sporis, et al, 2011).

The sprint fatigue test indicated no remarkable difference amongst players in different play positions. Though all soccer players need to exhibit a high level of sprint fatigue, it is expected that players who play in the mid-field possess a relatively higher level since they move almost continuously during the time of play. Yet the movements call for repeated energy supply by the anaerobic alactic pathway. Sporis, et al, (2011) found out among the Croatian soccer players that attackers were the quickest players in the team when looking at sprint values over 5, 10, and 20 meters. This is because about 70 % of a well balance soccer game is played in the mid-field.

The aerobic endurance test also gave no significant difference amongst the different play positions of the Cranes players. This is contrary to what Sporis, et al, (2011) found out among the Croatian soccer players where midfielders had statistically significant superior values of relative oxygen consumption, maximal heart rate and blood lactate than defenders and attackers. It is therefore not expected that all soccer players in a team should have equally high level of aerobic endurance regardless of the position of play. The fact that most soccer games are lost in the last quota to the inability of the respective players to maintain a high aerobic endurance throughout all players should train for improvement of VO_2 max. In that line, ACSM (1998) guides that exercise prescription

should be based on the frequency, intensity, duration of training, the mode of activity and the initial level of fitness. As a result of specificity of training and the need for maintaining muscular strength and endurance, and flexibility of the major muscle groups, a well-rounded training programme including aerobic and resistance training, and flexibility exercises is recommended. The important factor is to design a programme for the individual to provide the proper amount of physical activity to attain maximal benefit at the lowest risk (ACSM Position Stand, 1998). A study by Gil, et al (2009) indicated that among the Dutch young soccer players concluded that differences in aerobic endurance exist among soccer players who play in different positions and these differences fit with their different workload in a game. Therefore, training programmes should include specific sessions for each positional role.

4.2.4 Comparison of the Selected Physical Fitness Components of Cranes Players with the Set Standards

Table 4.17: Cranes Mean Scores and NSCA Standards

Physical fitness variable	Cranes score Mean ± SD	NSCA Standard
Flexibility (cm)	34.7 ± 3.8	39
Agility (seconds)	16.5 ± 0.6	15.9
Push-ups (number)	33.9 ± 4.6	36
Curl-ups (number)	22.6 ± 1.9	25
Standing long jump (cm)	266.9 ± 13.0	300
Stand-vertical jump (cm)	62.7 ± 6.2	65
Sprint fatigue (%)	85.2 ± 12.8	90
Legers' shuttle run (ml/kg/min)	62.2 ± 7.7	92.5

The Cranes with the set standards and visual graphs shown in Figure 4.2, 4.3 and 4.4.

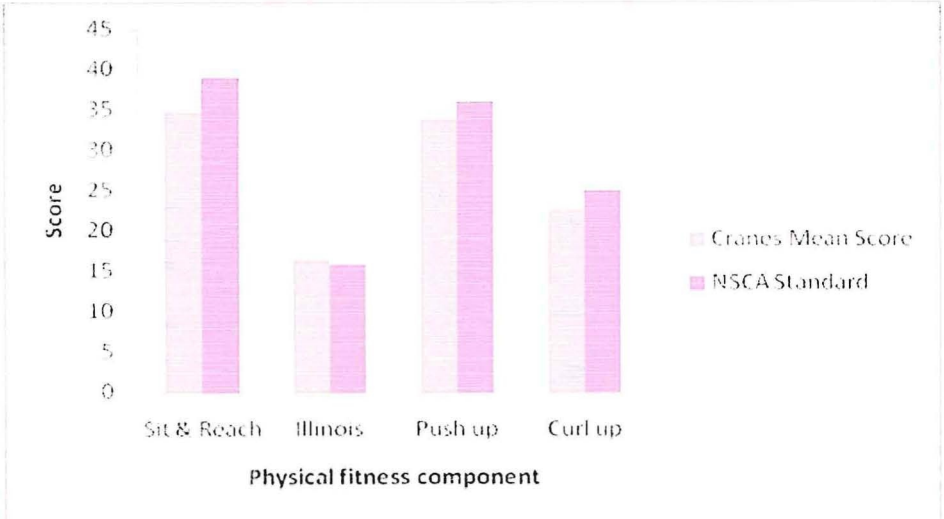

Figure 4.2: A comparison of Cranes Player's Physical Fitness Scores with the Standards

Results in Figure 4.2 indicate that the Cranes player's average score in Sit and reach test for flexibility was 34.7 ± 3.8 centimeters against the NSCA set Standard of 39 centimeters. The average score Illinois test for agility was 16.5 ± 0.6 seconds against the Standard of 15.9 seconds. push-ups was 33.9 ± 4.6 repetitions against the Standard of 36 repetitions, and curl-ups was 22.6 ± 1.9 repetitions against the Standard of 25 repetitions for muscular strength and endurance.

Figure 4.2 shows the flexibility scores of the players compared to the set NCSA (2005) standards. Flexibility scores are 34.9 + 3.8 compared to 39cm as set by the NCSA (2005) standards. The low flexibility can significantly impair an individual's ability to accomplish daily activities as well as athletic performance. Several studies have examined the impact of declining flexibility and the efficacy of exercise interventions,

further relating the declining physical performance to the loss of axial skeleton mobility (Schenkman, et al, 1996).

Barrow (1992), Corbin, et al (2003), Howley and Franks (2003) and Robergs and Keteyian (2002) in Powers, et al (2006) state that some athletes require greater flexibility in order to perform complex movements in competitions. However, as shown from the results of this study, the players scored well below the set standard. It should be noted that soccer players ought to have utmost flexibility if they are to compete with other players from different countries since flexibility reduces chances of injury (ACSM, 1998).

ACSM (1998) further adds that although the optimal level of flexibility is determined by sport-specific and individual factors, several guidelines for developing a general programme can be extracted from the available literature. The three main types of stretching exercises described are static, proprioceptive neuromuscular facilitation (PNF), and ballistic. The PNF stretching techniques consist of alternating isometric muscle contraction and passive stretching through a designated series of motions. Ballistic stretching involves repetitive bouncing motions wherein the tendon is rapidly stretched and immediately relaxed. Static exercises slowly stretch the tendon, hold them in the stretched state for a period of time, and then return to the resting length.

Figure 4.2 shows the agility scores of the players compared to the set NCSA (2005) standards. The agility was 16.5 seconds, giving a standard deviation of 0.42 from the

standard of 15.9 seconds. Agility is the ability to change the direction of the body in an efficient and effective manner and to achieve this, one requires a combination of balance, speed, strength and co-ordination. Soccer requires a high level of agility and in most cases more agile players will be better placed in performance of soccer skills especially during competitions (Soccerperformance.com, 2008).

McGlynn (1999) notes that high level of agility, enables the athlete to maintain equilibrium when stationary or moving that is not to fall over through the coordinated actions of sensory functions (eyes, ears and the proprioceptive organs in our joints). Athletes also retain the centre of mass above the base of support in a stationary position and maintain balance under changing conditions of body movement in addition to an increased ability to move all or part of the body quickly. Agility can be improved by practicing the movements in training and an agility ladder is an essential tool in a complete agility programme.

Figure 4.2 shows the muscular strength and endurance status of the players compared to the set NCSA (2005) standards. The average push-ups score of the players was 33.9 and the standard deviation of 1.48 as compared to the Standard of 36. The curl-ups score of the players as 22.6 giving a standard deviation of 1.70 from the Standard of 25. Though the performance of the Cranes players in the push-up and curl-up was good, results still indicated that their muscular strength and muscular endurance was still lower than the set standard. Excellent muscular strength and muscular endurance levels are required for a player to perform in continuous physical workouts without early onset of fatigue

(McGlynn, 1999). In addition, high levels of muscular strength and endurance limit injury occurrence to the musculo-skeletal system during physical work (Anderson and Plecas, 1999). In this way, a player will be in a good physical state with minimal injury occurrence, hence effective physical performance (Mukiibi, 2007).

According to Fleck and Kraemer (1997), muscular strength and endurance are developed by the progressive overload principle, that is, by increasing more than normal the resistance to movement or frequency and duration of activity. Muscular strength is best developed by using heavier weights that require maximum or near maximum tension development with few repetitions, and muscular endurance is best developed by using lighter weights with a greater number of repetitions. To some extent, both muscular strength and endurance are developed under each condition, but each loading scheme favors a more specific type of neuromuscular development. Thus, to elicit improvements in both muscular strength and endurance, 8-12 repetitions per set are recommended; however, a lower repetition range, with a heavier weight, for example, 6-8, repetitions may better optimize strength and power (Fleck and Kraemer, 1997).

Figure 4.3: A Comparison of the Cranes Player's Standing Long Jump Test for Explosive Power Result with the Set Standards

Results in Figure 4.3 indicated that the Cranes team average score in the standing long jump was 266.9 ± 13.0 centimeters from the Standard of 300 centimeters.

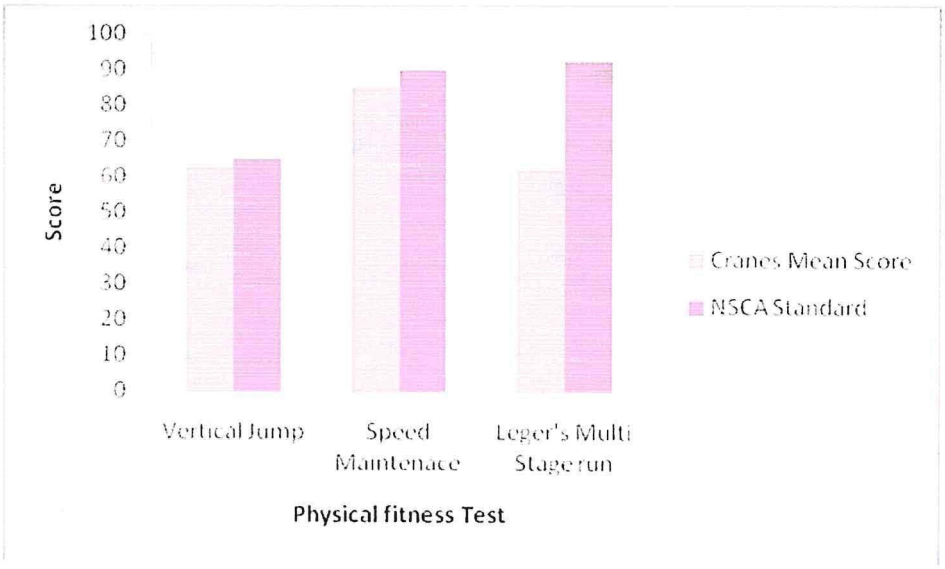

Figure 4.4: Comparison of Cranes Player's Physical Fitness Scores with the Set Standards

Results in Figure 4.4 indicated that the Cranes player's average score in standing vertical jump for explosive power was 62.7 ± 6.2 centimeters against the Standard of 65 centimeters, speed power maintenance was 85.2 ± 12.8 % against the Standard of 90 % and aerobic endurance was 62.2 ± 7.7 ml/kg/min from the Standard of 92.5 ml/kg/min.

Figure 4.3 shows the explosive power scores of the players compared to the set NCSA (2005) standards. The Cranes average score in the standing long jump as 276.9 centimeters giving a standard deviation of 16.33 from the Standard of 300 centimeters. Figure 4.4 shows that the average standing vertical jump of the Cranes players was 62.7 centimeters giving a standard deviation of 1.63 from the set standard of 65 centimeters. The two results show that the explosive power of the Cranes players was lower than the set standards. Power is the ability to exert a large force over a short period of time. Power relies on the interaction of the neuro-muscular system to recruit fast twitch fibres as rapidly as possible (Wesson, et al, 2005). Soccer involves various bouts of explosive power especially when executing skills such as heading. Therefore when a player does not possess adequate explosive power, his performance in the game may be compromised.

Figure 4.4 shows the speed maintenance score of the players compared to the set NCSA (2005) standards. The speed maintenance was 85.2 % giving a standard deviation of 3.39 from the Standard of 90 %. Wesson et al, (2005) define speed as the ability to put the body parts into motion quickly, or the maximum rate that a person can move over a specified distance. They further assert that speed is a major factor in many high intensity

and explosive activities and is frequently required by soccer players during the game. From the Cranes players' score in the sprint power test, the low score implies that the players may not compete appropriately with their counterparts with a high level of sprint power. Energy for absolute speed is supplied by the anaerobic alactic pathway. The anaerobic (without oxygen) alactic (without lactate) energy system is best challenged as an athlete approaches top speed between 30 and 60 meters while running at 95% to 100% of maximum. This is very common in soccer games of equal matching in skill and fitness and in a team with a low average sprint power.

Figure 4.4 shows the aerobic endurance scores of the players compared to the set NCSA (2005) standards. The Aerobic endurance was 62.27ml/kg/min with a standard deviation of 21.43 from the Standard of 92.57ml/kg/min. The average oxygen uptake for international soccer teams ranges from 55 to 68 ml.kg-1.min-1 (Hoff, 2008). Astrand and Rodal (1986) state that during prolonged heavy physical work, the individual's performance capacity depends largely on his ability to take up, transport and deliver oxygen to working muscles. Similarly, Johnson and Nelson (1988) note that the most accurate indicator of aerobic endurance; the key component of physical fitness is maximal oxygen uptake. Though the value seemed lower than the expected maximum level of VO_2 max set in the standard, the Cranes compared appropriately with other national soccer teams around the world. For instance, Ekblom (1986) found the maximum oxygen uptake of Swedish players to be about 61ml/kg/min. Similar results were found in Danish national soccer players (Bangsbo, Norregaard and Thorso, 1991) with a mean maximal oxygen uptake of 60.6 ml/kg/min. Although the value of a

midfielder was higher, it was not statistical significant. Players in a South Australian national soccer league had a VO_2 max of 57.6 ml/kg/min compared to the 56.7ml/kg/min of a State league team. A relatively recent study by Wisloff, Helgerud and Hoff (1998) reported 63.7ml/kg/min as the mean maximal oxygen uptake of the Norwegian soccer team. The physiological profile for the Australian National Team was found to be 56.9ml/kg/min while the Australian Olympic Team was 59.3ml/kg/min (Net-testing, 2009).

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

In this chapter the summary of findings, conclusions and recommendations of the study are covered.

5.2 Summary

The study was conducted amongst the Uganda's national soccer team players. A total of 24 players were selected for the fitness tests. A pre-experimental research design was used in the study and the following findings were established.

5.2.1 Age Distribution

The lowest age of players found at the national team was 18 years and the oldest player was 25 years with an average age of about 22 years. The result indicated that there was no significant difference in the fitness levels of players of Uganda's soccer team on basis of their age.

5.2.2 Experience

Findings show that most players had played for clubs than they had done for the national team. The findings also indicated that as players grew in age, they tended to leave active soccer and probably got involved in other responsibilities such as coaching and

management of federations. The players' average experience was at 7.3 and 3.6 years at club and national team levels respectively, which was comparatively high for such young players but so low for a game which is supposed to benefit from the experience of players. However, the result indicated that there was no significant difference in the fitness levels of players of Uganda's soccer team on basis of their experience in relation to muscular strength and muscular endurance, explosive power, speed maintenance, and aerobic endurance. On the other, flexibility and agility tests revealed significant differences in the fitness levels amongst mid fielders, defenders and forwards.

5.2.3 Findings in Relation to the NSCA Standards

The Cranes performed lower than the NSCA standards in all the physical fitness components. Findings revealed no significant difference in the fitness levels of players of Uganda's soccer team on basis of their playing positions. Remarkably however, the Cranes players' performance in aerobic endurance was higher than most of national teams whose result was available.

5.3 Conclusions

From the findings of the study it can be concluded that there are significant differences in age and playing positions of the Cranes players with respect to flexibility, agility, muscular strength and endurance, explosive power, speed maintenance and aerobic endurance. Secondly, experience does not cause significant difference in the Crane players with respect to muscular strength and endurance, explosive power, speed

maintenance and aerobic endurance. However, there were significant differences in experience of the players with respect to flexibility and agility. Furthermore, the Crane players performed below the NCSA (2005) set standards for all the physical fitness components tested.

5.4 Recommendations for Practice and Policy Change

Based on the findings of the study, the following recommendations were made.

There is need to educate the players and management of the Cranes about the significance of physical fitness in relation to physical performance.

The Cranes technical team should initiate programmes for regular physical fitness training and testing as a way of enhancing and monitoring the fitness levels of the players.

The Federation of Uganda Football Associations (FUFA) technical team should establish a standard for the physical fitness tests for the Ugandan soccer teams that should conform to the internationally agreed standards.

FUFA should create a countrywide outreach programme to popularize the physical fitness tests and their importance to performance in soccer.

Through seminars and workshops for the coaches, FUFA should come up with a general physical fitness training programme for the various components that can be used for the selection of players to different soccer teams including the national team.

There is a need for the Cranes team coach to consider the specificity of training regarding different playing positions of the Cranes players.

5.5 Recommendations for Further Research

There is need to carry out a comparative study of the physical fitness levels of the Cranes team and the super league teams, which are the major feeders of the national team.

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APPENDIX I

INTRODUCTION LETTER

KYAMBOGO UNIVERSITY

P. o Box 1 Kyambogo
KAMPALA- UGANADA

Phone: 285001/2
DIR Line: 285272
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E-mail: arkyu@kyambogo.ac.ug

Department of Sport Science

22nd July, 2009

To Whom It May Concern

Dear Sir/Madam,

INTRODUCTION OF MASTER OF SCIENCE RESEARCH STUDENT

The bearer of this letter, **Besweri Wandera,** is a Master of Science student (Reg.No. 2006/HD06/MSS) in the Department of Sport Science, Kyambogo University.

He defended and passed his research proposal entitled **"Levels of Fitness in Selected Fitness Components of Uganda's National Soccer Team –The Cranes."**

The purpose of this letter is to introduce to you the student and request you to render any possible assistance to him as he proceeds with the data collection.

Your positive response to this request will be highly appreciated.

Yours faithfully,

Nsibambi N. Constance, Ph,D.
Postgraduate Coordinator

APPENDIX II

INFORMED CONSENT FORM

"SELECTED PHYSICAL FITNESS COMPONENTS OF UGANDA'S NATIONAL SOCCER TEAM – THE CRANES"

Department of Sport Science
Kyambogo University

Researchers:
Besweri Wandera

Dr. Robinah Ddumba	Department of Biological Sciences, Kyambogo University
Dr. Vincent Onywera,	Department of Recreation Management and Exercise Science, Kenyatta University
Dr. Constance N. Nsibambi,	Department of Sport Science, Kyambogo University
Dr. Angela M. Thompson	Department of Human Kinetics,St. Francis Xavier University, Canada

I have agreed to participate in the study being conducted by the above listed researchers. I understand the focus of this study is to assess the physical fitness of the Uganda national soccer team. I understand that I will have my height and weight taken. In addition I will undergo sit and reach test for trunk flexibility, Illinois test for agility, push up and curl up tests for muscular strength and endurance, 30 m sprint fatigue test for speed, standing vertical and long jump test for power and Leger's multi stage shuttle run test for aerobic endurance.

I understand the information provided by this study may be used for research purposes, including publications in research journals. All individual information will be coded and at no time my personal identity be revealed.

.....	.....
Participant's Name (print)	Date
.....	.....
Participant's Signature	Date

APPENDIX III

FITNESS TESTING PROCEDURE

1. Weight measurement

Body weight was determined using the Health O-meter large floor dial bathroom scale (Long bang machinery co., China) to the nearest 0.5killograms. The players stood on the scale barefooted and wearing only their uniform since weight could be affected by heavy clothing. They were advised to exhibit minimal or no movements with their hands by their side and their head erect. To improve reliability, their weight was taken in the morning just before their tea break and immediately after they had emptied their bladders. This was because the body's hydration level usually affects weight.

2. Height measurement

Height was measured to the nearest 0.5 centimeter using a stadiometer. The players stood against the wall barefooted with their feet parallel to each other, head erect and the heels, buttocks and shoulders touching the wall. They stepped on the steel edge of the measuring tape from the side of the foot maintaining it on the floor. The tester held the chin of the player up to ensure that the position of the chin appeared perpendicular to the measuring tape. The tape was then extended from the side up to the topmost part of the player's head and the length reading taken and recorded on the protocol sheet.

3. Sit and reach flexibility Test

It required a box about 30cm (12 inches) high and a meter rule. Before this test was performed, the athlete was warmed up thoroughly with at least 10 minutes of light jogging or skipping.

1. The athlete sat on the floor with legs out straight ahead and knees flat against the floor.

2. The box was placed flat against the athlete's feet (no shoes). Keeping the feet against the box and legs straight, the athlete extended hands, palms down, as far as possible without jerking and held this position for 2 seconds. Lowering the head assisted in reaching the maximum potential. Knees were not to be bent, nor were they to be held in place.

3. Bouncing and jerking movements were avoided; the test involved a slow, controlled reach.

4. The athlete's score was the distance, measured to the nearest centimeter, between the edge of the sit and reach box closest to the athlete and the athlete's finger tips during the athlete's stretching.

5. The score was read and recorded (see Appendix V). The test was repeated twice and a comparison of the best score (since the body adjusts to give its best) was made with the Table in Appendix IV for the fitness category.

4. Agility Illinois Test

This test measures the athlete's ability to change direction quickly.

Requirements were 8 cones and a stop watch. Set up of cones for the test is illustrated in Appendix IV.

1. A player was required to lie flat on the ground at the start position.

2. On the command 'go', the player got to the feet, sprinted the course from start to finish and a record of time was taken.

3. He was then allowed to rest fully and then repeated the test for a total of 3 trials. The quickest time was taken and compared to the standards in Appendix IV.

5. Muscular strength and Endurance Assessment

The following two tests measured muscular strength and endurance. The standard exercises used were push-ups and curl-ups. The score was simply determined by the number of repetitions completed in one minute.

(a) The Push-Up Test

Started by positioning on the ground with hands below the shoulders pointing forward and legs extended in a straight line. The body was pushed up by straightening the elbows and using the toes as a pivot. The body was lowered until the chin touched the mat. Neither the stomach nor thighs contacted the ground. It was important to keep the back straight and to lower the entire body to the ground as a unit.

The push-up test was performed as follows:

1. The athlete was assigned an attendant who helped in counting the push-ups and monitoring the form.
2. The athlete was allowed to warm up with few push-ups and was given a 2- to 3- minute recovery period to prepare to start the test.
3. On the command "go," the athlete started performing the press-ups. The attendant counted the push-ups aloud as well as observing the body alignment. Only those push-ups performed correctly were counted towards the athlete's total. The test was terminated (before 60 seconds) when the athlete was unable to maintain proper form over 2 consecutive repetitions or when the athlete was visibly straining. Athletes were advised to exhale on effort; that is, during the upward phase of the push-up.
4. After completion of the push-up test, the health zone was determined and then data was recorded in the record sheet in Appendix V.

(b) The Curl-up Test

1. The athlete was assigned an attendant who helped in counting the curl-ups and monitoring the form.
2. The athlete laid on the back with knees bent 90 degrees. The heels were kept in contact with the mat.

3. The athlete extended the arms so that the fingertips touched a strip perpendicular to the body. A second strip of tape was located toward the feet and parallel to first (10 centimeters). The curl-up was accomplished by raising the trunk until the fingertips touch the second strip of the tape and again returning to the starting position.
4. The curl-up test was not timed and was performed at slow and controlled cadence of 25 curl-ups per minute. This cadence was guided by the aid of a metronome set at 50 beats per minute (curl up on one beat and down on the second).
5. On the command "go," the athlete started performing the curl-ups in cadence with the metronome. The athlete performed as many curl-ups as he could to a maximum of 25 in 1 minute. The test was terminated in less than 1 minute if the athlete experienced discomfort, was unable to maintain the required cadence, or if he was unable to perform the proper curl-up technique.
6. The health zone of the athlete was determined and the data was recorded in the data sheet (Appendix V).

Explosive Power tests

(a) Standing Long Jump test

Along with the vertical jump, this power test was used to measure explosive power.

1. Athlete was required to stand at a mark with feet slightly apart.
2. Taking off and landing with both feet, the athlete swung both arms and bent the knees to jump forward as far as possible.
3. The Jump distance was measured, the athlete was allowed to rest fully and the exercise was repeated a total of 3 times.
4. The longest of the 3 trials was taken as the athlete's score and recorded in the data sheet (Appendix V).
5. Then the results were compared with the Table in Appendix IV.

(b) Standing Vertical Jump test

This was a classic test for short-term explosive power and was particularly useful for any athlete that is required to jump.

1. Athlete was required to chalk up one of their hands and stand sideways next to a wall. Then reached up with the hand closest to the wall and made a mark. The athlete was to keep the feet flat on the floor.

2. From a standing position, the athlete started a dip down quickly until the thighs were roughly parallel to the ground and then jumped up as high as possible, making a mark on the wall with the hand at the highest point. When dipping down prior to the jump, athlete was advised not to pause in a bent knee position. This would reduce the amount of power generated reducing the overall score.

3. The distance between the two chalk marks was measured as the score for the athlete.

4. Athlete was required to complete three trials and the best score to the nearest 1cm was taken and recorded in the data sheet in Appendix V.

5. A compared of the results to the Table in Appendix IV was made and the jump height was converted into a power using the following formula:

Power = body mass (kg) x (4.9 x height jumped in meters)^2

7. 30m sprint fatigue - power maintenance test

Football being a multi-sprint sports, it require players to reproduce sprints in quick succession. The ability to recover between sprints and produce the same level of power over and over is a measure of sprint fatigue (Forenbach, et al, 1986).

This test required 12 cones or markers and a stopwatch. The diagram in Appendix IV, gives the set up of the cones:

1. Athlete was required to sprint from A to B between the cones deviating 5m sideways in the middle of the sprint. The athlete was timed from A to B.

2. Athlete then jogged slowly for 10 meters after point B and then back to the start taking 30 seconds to do so.

3. As soon as the athlete reached the start, he made a repeat of the sprint.

4. Athlete was required to complete a total of 10 sprints and had all the times recorded.

5. The results were used to find the average speed of the first three trials and divided it by the average speed of the last three trials to enable computation of the top speed maintained.

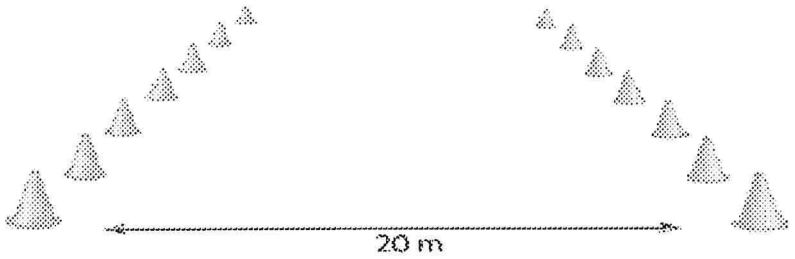
Finally, the athlete's score was compared with the standards in Appendix IV.

8. Cardio-respiratory endurance test

The Leger test was used to predict the VO_2 max of the footballers/participants. For this test, a 20-meter distance was established and marked off using pilons. The multistage fitness test, also known as the 20 meter shuttle run test, beep or bleep test among others, was the most common test of aerobic fitness. The test involved continuous running between two lines 20m apart in time to recorded beeps.

Equipment required: Flat, non-slip surface, marking cones, 20m measuring tape, pre-recorded audio tape, tape recorder, recording sheets.

Diagram



Description:

Participants were asked to run together between the pilons keeping in time with a programmed tape/CD which increases the speed of the run by 0.5 km/hr required from 8.5 km/hr in the first stage to 18.5 km/hr in the final stage. The time between recorded beeps decrease each minute (level). Participants stop running when they can no longer maintain the required speed. At this point, the stage the participant reached is recorded and their heart rate is taken. VO_2max was then predicted using the following formula ... $VO_2max = - 24.4 + (6.0 \times MAS)$. MAS was the maximum aerobic speed obtained from the running speed of the stage the athlete last completed. The Leger test was chosen since the researcher collected data in the field. The scores obtained were compared to the standards in Appendix IV.

APPENDIX IV

STANDARDS

Standards for the trunk flexibility

Zone	15- 19 years		20-29 years		30-39 years		40-49 years	
	Males (#)	Females (#)	Males (#)	Females (#)	Males (#)	Females (#)	Males (#)	Females (#)
Excellent	>=39	43	>=40	>=41	>=38	>=41	>=35	>=38
V. Good	34-38	38-42	34-39	37-40	33-37	36-40	29-34	34-37
Good	29-33	34-37	30-33	33-36	28-32	32-35	24-28	30-33
Fair	24-28	29-33	25-29	28-32	23-27	27-31	18-23	25-29
N I	=<23	=<28	=<24	=<27	=<22	=<26	=<17	=<24

*NI (Needs Improvement) *# (Number)

From Powers S. K, et al: Total Fitness and Wellness. Pearson, Toronto, 2006.

Illinois test standards		
Classification	**Males**	**Females**
Excellent	<15.9 secs	<17.5 secs
Good	15.9 - 16.7 secs	17.5 - 18.6 secs
Average	16.8 - 17.6 secs	18.7 - 22.4 secs
below Average	17.7 - 18.8 secs	22.5 - 23.4 secs
Poor	>18.8 secs	>23.4 secs

Standards for curl-ups and push-ups

Zone	15- 19 years		20-29 years		30-39 years		40-49 years	
	Push-Ups (#)	Curl-ups (#)	Push-Ups (#)	Curl-ups (#)	Push-Ups (#)	Curl-ups (#)	Push-Ups (#)	Curl-ups (#)
Excellent	>=39	25	>=36	25	>=30	25	>=22	25
V. Good	29-38	23-24	26-35	23-24	22-29	23-24	17-21	22-24
Good	23-28	21-22	22-27	21-22	17-21	21-22	13-16	16-21
Fair	18-22	16-20	17-21	13-20	12-16	13-20	10-12	11-15
N I	=<17	=<15	=<16	=<12	=<11	=<12	=<11	=<10

*NI (Needs Improvement) *# (Number): From Powers S. K, et al: Total Fitness and Wellness. Pearson, Toronto, 2006.

Standing long jump test standards

	Poor	Below average	Average	Good	Excellent
Males	<230cm	230cm-249cm	250cm-269cm	270cm-299cm	>300cm
Females	<190cm	190m-219cm	220m-249cm	250cm-279cm	>280cm

Vertical jump test standards

	Poor	Below average	Average	Good	Excellent
Males	<50cm	50-54cm	55-59cm	60-64cm	>65cm
Females	<40cm	40-44cm	45-49cm	50-54cm	>55cm

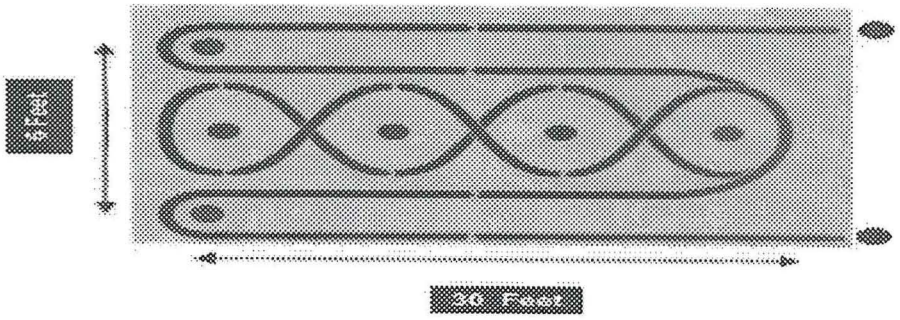
Power Maintenance standards		
Level	**Category**	**% Top Speed Maintained**
1	Excellent	+90%
2	Good	85-89%
3	Average	80-84%
4	Poor	<79%

Standards for Aerobic Endurance

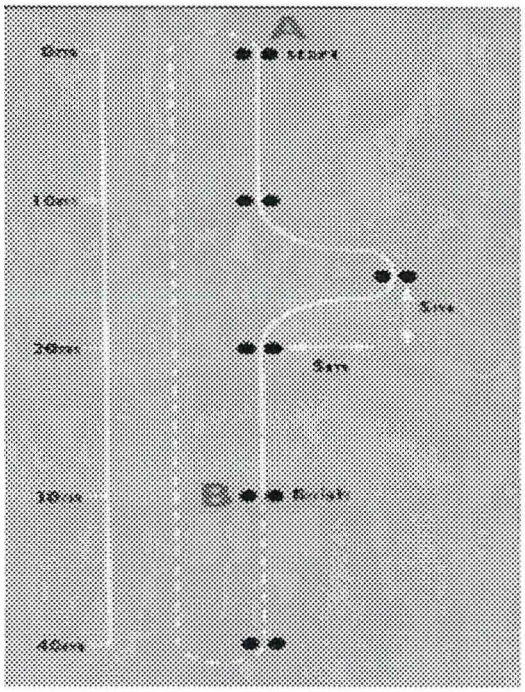
Fitness Category	Age (years)					
	13-19	20-29	30-39	40-49	50-59	60+
Very poor	>15:30	>16:00	>16:30	>17:30	>19:00	>20:00
Poor	12:11-15:30	14:01-16:00	14:46-16:30	15:36-17:30	17:01-19:00	19:01-20:00
Average	10:49-12:10	12:01-14:00	12:31-14:45	13:01-15:35	14:31-17:00	16:16-19:00
Good	9:41-10:48	10:46-12:00	11:01-12:30	11:31-13:00	12:31-14:30	14:00-16:15
Excellent	8:37-9:40	9:45-10:45	10:00-11:00	10:30-11-30	11:00-12:30	11:15-13:59
Superior	<8:37	<9:45	<10:00	<10:30	<11:00	<11:15

From Powers S. K, et al: Total Fitness and Wellness. Pearson, Toronto, 2006.

Set up for Illinois test



Set up for the power maintenance test



APPENDIX V
PHYSICAL FITNESS EVALUATION SHEET

Biodata

Id No: ..... Age (yrs): .....

Weight (kg): ..... Height (cm): .....

Experience (yrs): Local club(s)____ Foreign club(s)_____ National Team_____

Area of Specialty: Defense Mid-field Forward

No(s) Played: 1 2 3 4 5 6 7 8 9 10 11

(a) Low Back Flexibility test

Sit and reach test

Trial (cm)			Best Score (cm)
1st	2nd	3rd	

(b) Agility Test

Illinois Test

Trial (seconds)			Best Time (Seconds)
1st	2nd	3rd	

(c) Muscular strength Tests

Push-ups and Curl-ups

	Trial (Number per 60 Seconds)			Personal Best(Number per 60 seconds)
	1st	2nd	3rd	
Push-ups				
Curl-ups				

(d) Explosive Power Tests

(i) Standing Long Jump Test

Trial (cm)			Best Jump Distance (cm)
1st	2nd	3rd	

(ii) Standing Vertical Jump Test

Trial (cm)			Best Jump Distance (cm)
1st	2nd	3rd	

(e) Power Maintenance Test

30 m Sprint fatigue test

Trial (Seconds)									
1	2	3	4	5	6	7	8	9	10

(f) Aerobic endurance

Lager's Multi Stage Run test

Trial	**Level Reached**
1	
2	

Research Assistant

Name: .....

Signature: .....

Date: .....

APPENDIX VI

TABLES

Table X.1 Demographic Description: Age, Weight, Height, Experience and Position

Id No.	Age (years)	Weight (Kg)	Height (cm)	Experience - Club (yrs)	Experience National Team (yrs)	Position / Play Area
1	25	64	163	12	7	Defense
2	23	66	170	7	4	Defense
3	22	73	180	6	3	Defense
4	20	58	158	3	1	Defense
5	20	65.5	167	2	1	Defense
6	19	69	172	6	4	Defense
7	21	75	178	7	3	Defense
8	18	62	167	4	2	Defense
9	23	59	157	11	4	Defense
10	20	68	163.5	6	3	Mid-field
11	25	61	166	9	6	Mid-field
12	21	64	158	8	3	Mid-field
13	25	55	158	12	5	Mid-field
14	25	58	169	11	7	Mid-field
15	23	66	171	9	4	Mid-field
16	24	71	178	7	2	Mid-field
17	22	69	182	8	4	Mid-field
18	23	76	177	9	2	Mid-field
19	20	62	165	5	4	Mid-field
20	22	64	171	10	5	Forward
21	22	63	165	8	5	Forward
22	18	72	174	4	2	Forward
23	19	67	171	5	3	Forward
24	21	73	180	6	2	Forward
Mean ± SD	**21.7± 2.2**	**65.9±5.7**	**169.2±7.5**	**7.3±2.8**	**3.6±1.7**	

Table X.2 Low back flexibility test (Sit and Reach test) results

Id No.	Age (years)	Best Score (cm)	Zone
1	25	36	Very Good
2	23	31	Good
3	22	37	Very Good
4	20	35	Very Good
5	20	33	Good
6	19	37	Very Good
7	21	33	Good
8	18	37	Very Good
9	23	32	Good
10	20	27	Fair
11	25	24	Needs Improvement
12	21	37	Very Good
13	25	41	Excellent
14	25	37	Very Good
15	23	36	Very Good
16	24	36	Very Good
17	22	38	Very Good
18	23	35	Very Good
19	20	31	Good
20	22	35	Very Good
21	22	32	Good
22	18	39	Excellent
23	19	36	Very Good
24	21	38	Very Good
Mean ± SD		34.7 ±3.8	

Table X.3: Illinois Agility Test Results

Id No.	Age (years)	Best Score (seconds)	Zone
1	25	17.1	Average
2	23	16.6	Good
3	22	15.8	Excellent
4	20	17.5	Average
5	20	16.8	Average
6	19	16.3	Good
7	21	15.6	Excellent
8	18	16	Good
9	23	17.3	Average
10	20	16.3	Good
11	25	16.3	Good
12	21	15.8	Excellent
13	25	17.3	Average
14	25	17.4	Average
15	23	16.9	Average
16	24	16.1	Good
17	22	16.4	Good
18	23	16.1	Good
19	20	16.5	Good
20	22	16.9	Average
21	22	16.3	Good
22	18	15.7	Excellent
23	19	16.6	Good
24	21	15.8	Excellent
Mean ± SD		16.5 ± 0.6	

Table X.4: Muscular endurance test – Push-ups test results

Id No.	Age (years)	Score (Number per min)	Zone
1	25	43	Excellent
2	23	41	Excellent
3	22	38	Excellent
4	20	34	Very Good
5	20	29	Very Good
6	19	36	Excellent
7	21	37	Excellent
8	18	34	Very Good
9	23	28	Very Good
10	20	31	Very Good
11	25	32	Very Good
12	21	31	Very Good
13	25	33	Very Good
14	25	35	Very Good
15	23	38	Excellent
16	24	36	Excellent
17	22	31	Very Good
18	23	26	Very Good
19	20	37	Excellent
20	22	33	Very Good
21	22	24	Good
22	18	37	Very Good
23	19	37	Very Good
24	21	32	Very Good
Mean ± SD		33.9 ± 4.6	

Table X.5 Muscular strength test – Curl-ups

Id No.	Age (years)	Score (Number per min)	Zone
1	25	25	Excellent
2	23	25	Excellent
3	22	24	Very Good
4	20	24	Very Good
5	20	25	Excellent
6	19	25	Excellent
7	21	22	Good
8	18	23	Very Good
9	23	21	Good
10	20	22	Good
11	25	18	Fair
12	21	21	Good
13	25	19	Fair
14	25	20	Fair
15	23	22	Good
16	24	24	Very Good
17	22	22	Good
18	23	23	Very Good
19	20	21	Good
20	22	24	Very Good
21	22	23	Very Good
22	18	24	Very Good
23	19	22	Good
24	21	24	Very Good
Mean ± SD		22.6 ± 1.9	

Table X.6: Explosive Power test – Standing long jump test

Id No.	Age (years)	Score (cm)	Zone
1	25	253	Average
2	23	272	Good
3	22	293	Good
4	20	281	Good
5	20	280	Good
6	19	296	Good
7	21	260	Average
8	18	271	Good
9	23	277	Good
10	20	261	Average
11	25	288	Good
12	21	268	Average
13	25	263	Average
14	25	293	Good
15	23	289	Good
16	24	282	Good
17	22	266	Average
18	23	269	Average
19	20	261	Average
20	22	275	Good
21	22	279	Good
22	18	303	Excellent
23	19	287	Good
24	21	278	Good
Mean ± SD		276.9 ± 13.0	

Table X.7: Explosive Power test – Standing vertical jump test

Id No.	Age (years)	Score (cm)	Zone
1	25	58	Average
2	23	63	Good
3	22	69	Excellent
4	20	62	Good
5	20	64	Good
6	19	67	Excellent
7	21	63	Good
8	18	63	Good
9	23	56	Average
10	20	44	Below Average
11	25	66	Excellent
12	21	63	Good
13	25	52	Below Average
14	25	63	Good
15	23	68	Excellent
16	24	62	Good
17	22	57	Average
18	23	63	Good
19	20	63	Good
20	22	66	Excellent
21	22	73	Excellent
22	18	73	Excellent
23	19	63	Good
24	21	63	Good
Mean ± SD		62.7 ± 6.2	

Table X.8: Power Maintenance Test – 30 m Sprint Fatigue test

Id No.	Age (years)	A=Av of first three (seconds)	B=Av of last three (seconds)	Power = A/B x 100 %	Zone
1	25	5.24	5.98	87.63	Good
2	23	5.16	5.86	88.05	Good
3	22	4.77	5.57	85.64	Good
4	20	5.43	6.11	88.87	Good
5	20	4.94	5.82	84.88	Good
6	19	4.81	5.34	90.07	Excellent
7	21	4.84	5.38	89.96	Good
8	18	5.03	5.96	84.40	Good
9	23	5.31	6.48	81.94	Average
10	20	5.91	7.2	82.08	Average
11	25	4.87	5.24	92.94	Excellent
12	21	5.26	6.16	85.39	Good
13	25	6.36	7.24	87.85	Good
14	25	5.98	6.92	86.42	Good
15	23	5.63	6.66	84.53	Good
16	24	5.24	6.36	82.39	Average
17	22	4.53	5.2	87.12	Good
18	23	4.75	5.6	84.82	Good
19	20	5.47	6.7	81.64	Average
20	22	5.08	6.54	77.68	Poor
21	22	6.38	8.04	79.35	Average
22	18	6.92	7.76	89.18	Good
23	19	5.14	7.28	70.60	Poor
24	21	4.8	5.25	91.43	Excellent
Mean ± SD		5.3 ± 0.6	6.3 ± 0.8	85.2 ± 12.8	