

**COMPARING PHYSICAL FITNESS LEVELS BETWEEN SMALL SIDED FOOTBALL
GAME AND LARGE SIDED FOOTBALL GAMES PLAYERS AT DAVID
LIVINGSTONE COLLEGE OF EDUCATION, LIVINGSTONE, ZAMBIA**

By

MWAANGA OBRAIN

SUPERVISORS: Dr.ROBINSON MAMBWE

Dr.HIKABWA CHIPANDE

MR. BRIAN CHANDA CHILUBA

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DECLARATION

I, MWAANGA OBRAIN do hereby declare that the works contained in this dissertation are my own, except where acknowledgements have been duly made through citations and references. I further declare that this work has not previously been submitted for the award of any degree at the University of Zambia or any other university.

CERTIFICATE OF APPROVAL

This dissertation by MWAANGA OBRAIN is approved as fulfilling part of the requirements for the award of a Master of Education in Physical Education and Sport degree by the University of Zambia.

Examiner 1

Name:..... Date:.....

Signature:

Examiner 2

Name:..... Date:.....

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Examiner 3

Name:..... Date:

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Chairperson Board of examiners:Date:

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ABSTRACT

This study sought to compare agility, cardiovascular endurance and body composition components of physical fitness between 4 v 4 small sided football game players and 11 v 11 large sided football games players at David Livingstone College of Education in Zambia. A Quasi-experimental design using pre-test and post-test approach was employed. The study enrolled 30 female student footballers who were randomly selected into two groups of 4 v 4 small-sided games (N= 8) and 11 v 11 large sided games (N=22). The pre-test and post-test designs were used to compare the physical fitness level. The illinois agility test was used to measure agility, yo-yo intermittent test level 1 was used to measure cardiovascular endurance and body mass index was calculated to measure body composition. The duration of the training in this study was five weeks. The researcher used SPSS version 20 in analysing data and the Wilcoxon rank size test was used to compare the pre-test and post-test scores from the Illinois agility test, yo-yo test and BMI to see if there was a significant difference between the 4 v 4 and the 11 v 11 in pre-test and post-test scores. The results of the study were accepted as significant at $P < 0.05$. To find the significant difference in the gain scores between the two groups (4 versus 4 and the 11 versus 11) Mann Whitney talysed data shows that football training under 4 v 4 small sided games improves agility of female football players than training under 11 v 11 large sided games while training under 11 v 11 large sided games improves cardiovascular endurance of female player than training under 4 v 4 small sided games. Analysed data also shows that football training under both 4 v 4 small sided games and under 11 v 11 large sided games improves body composition of female footballers.

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DEDICATION

This dissertation is dedicated to my family whose support has never wavered. To my children Luyando, Lushomo, and Favor, I pray that my model of hard work and determination will be a Godly example for you to follow as you grow older, and as you begin your own journey and discovery of God's will for your lives. I thought of you often during the times I was working or away from you, and kept you in mind when I felt discouraged. The thoughts of each of you encouraged me to continue down a difficult road.

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ABBREVIATIONS

COD Change of direction

LSG Large -sided games

RAT Reactive agility test

SSG Small sided games

SSGT Small sided games training

CHAPTER ONE

INTRODUCTION

1.1 Background

The performance of a sports person in any game or sporting event is the result of a multitude of factors, which include the physical fitness or amount of training performed, the body's adaptation to the training, motivation level, nutritional status and weather conditions to name a few (American College of Sports Medicine, 1998). Dellal, Owen, Wong, Krusturp, van Exsel and Mallo, (2012) argue that physically superior players feel less fatigued during the game played with the same intensity and, therefore, those players experience less decrement in technical performance. Players in competitive soccer games want high levels of agility, endurance, body composition, power, and speed to perform explosive movements such as shooting, heading, dribbling and sprinting (Stolen et al., 2005).

There are probably hundreds of standard fitness tests used and hundreds of variations of these. They can range from elaborate and expensive laboratory tests to simple and inexpensive field tests. Each test also has many advantages and disadvantages that can ultimately determine which is the most appropriate test to perform. Furthermore, physical fitness measurement tools have been utilized in three different arenas: the laboratory setting, epidemiological studies and individual assessment. Tests in these areas measure the components of physical fitness separately with different mechanisms or machines (Caspersen et al., 1985). To test physical fitness, Illinois agility test is used to measure agility, yo-yo intermittent test level 1 measures cardiovascular endurance while body composition is measured by calculating body mass index (Manmeet, Singh & Ramanjit; 2010).

Football is one among the most wide played and complicated sports in the world, wherever players want technical, tactical, and physical skills to succeed. Soccer and football are interchangeably used in this study. Without good physical fitness, players are rarely able to play the game with good technique (Chapman, Peiffer, Abbiss, and Laursen, 2007). Sevansson and Drust (2005) contend that physical fitness as well as technical and tactical skills is vital for a player to achieve top results in this sport of soccer. While football teams have same tactics and

skill abilities, a team with higher general fitness is superior team and act more powerful when the game gains cardiovascular endurance, and agility (Science and Soccer, 2003). One of the commended training methods in football is employing large sided games. Large sided games training are necessary in improving team coordination and development of physical fitness in players.

In contrast many researchers believe that soccer specific trainings like the small-side games training improve physical fitness levels more than other trainings (Bangsbo, 1998; Drust et al., 2000; Reilly and Gilbourne, 2003). Moreover they recommend performance of a series of simulated trainings than intermittent trainings and believe that this training increase fitness and better performance in exercise (Hoff et al., 2002)

The level and types of fitness is different according to the demand and nature of game. The physical fitness quality required in 11 v 11 large sided football games might differ from that of the 4 v 4 small-sided football games. Though the games are different from the stand point of playing area such as ground size required for laying out the fields, the movements executed by the players in each game require high degree of physical potentialities (Práxedes et al., 2018). If female football players are subjected to 4 v 4 small-sided games, then their physical fitness will improve differently as compared to those playing 11 v 11 large sided games.

According to Davids et al. (2013) a major interest in sports sciences has been the development of training programs that provide team sports coaches with reliable strategies for improving training and enhancing player fitness. This means even the most talented or skilled player needs physical fitness to play the game and average level skills can never assure victory. Since players commonly use the large sided games and small side games training programs, but a paucity of literature exists to review the effect of this training on physical fitness factors especially in female student footballers in Zambia. Therefore this study is going to answer this question that which method of training, 4 v 4 small-side games or 11 v 11 large sided games has more effect on improvement of the athletes' agility, cardiovascular endurance and body composition.

1.2 Statements of the Problem

Players in any game are expected to be physically fit. In order for a team to perform better to win matches, players are encouraged to adopt training strategies that incorporate physical fitness variables in their training to cement team performance as success is primarily determined by physical prowess. Physical fitness improvement in sport such as football remains primarily a male endeavour (Guttmann, 1991, 2004b; McComb, 2004). The consequence of this is having not physically fit players who feel fatigued during the game played with the same intensity and, therefore, experience decrement in technical and tactical performance. However, physical fitness levels among female football players' impact physical and physiological responses from small-sided games and large-sided games as female players respond differently to physical fitness activities than their male counterparts (Katis, Amiridis, Kellis, & Lees 2014). Hence the researcher conducted this study on female football players to compare which one between small-sided games and large-sided games can best improve physical fitness.

1.3. Purpose of the study

The purpose of this study was to compare physical fitness levels between 4 v 4 small sided football games players and 11 v 11 large sided football games players at David Livingstone College of Education in Livingstone, Zambia.

1.3.1 Specific objectives

1. To examine if agility score is significantly different between female student footballers training to improve agility under 4 v 4 small sided games football training and under 11 v 11 large sided games football training.
2. To examine if cardiovascular endurance score is significantly different between female student footballers training to improve cardiovascular endurance under 4 v 4 small sided games football training and under 11 v 11 large sided games football training.
3. To examine if body composition score is significantly different between female student footballers training to improve body composition under 4 v 4 small sided games football training and under 11 v 11 large sided games football training.

1.4 Research questions

1. Are there statistically significant differences in agility in female football players between the two conditions (small versus large sided versions) at David Livingstone College of Education as measured by the Illinois agility test?
2. Are there statistically significant differences in cardiovascular endurance in female football players between the two conditions (small versus large sided versions) at David Livingstone College of Education as measured by the yo-yo intermittent test level 1?
3. Are there statistically significant differences in body composition agility in female football players between the two conditions (small versus large sided versions) at David Livingstone College of Education as measured by the body mass index?

1.5 Hypothesis

Alternative Hypothesis: The agility test score will be statistically significant different between female student footballers training to improve agility under 4 v 4 small sided football games training and under 11 v 11 large sided football games training.

Alternative Hypothesis: The cardiovascular endurance score will be statistically significant different between female student footballers training to improve cardiovascular endurance under 4 v 4 small sided games football training and under 11 v 11 large sided games football training.

Alternative Hypothesis: The body composition score will be statistically significant different between female student footballers training to improve body composition under 4 v 4 small sided games football training and under 11 v 11 large sided games football training.

1.6 Significance of the Study

The findings of this study may be helpful to football coaches, physical education teachers and physical education lecturers in helping selecting training strategies that can incorporate physical fitness variables in their training to cement team performance. The study is also expected to contribute to the research base for areas promoting better outcomes for games and sports in

physical education and coaching environments through enhanced understanding, coaching and learning of physical activities.

1.7 Theoretical framework

The research was based on ecological dynamic theoretical approach, which proposes how individual players and sports teams can be modelled as complex social systems, which are inherently nondeterministic (not completely predictable). Ecological dynamic theory considers athletes and sports teams as complex adaptive systems and examines the emergence of sports performance at the level of the performer-environment relationship and is distinguished by constraints of each individual performer and physical characteristics of participation locations for athletes' activities, but also by social and cultural factors surrounding performance (Araujo, Davids & Hristovski, 2006). From ecological dynamic perspective skilled behaviour is viewed as the emergence of functionally adaptable performance solutions (Araújo et al., 2020). In this framework, behaviour is a self-organizing phenomenon that emerges from the continuously dynamic interplay of an organism's characteristics and the affordances (Gibson, (1979) offered in a specific competitive performance environment (Araújo et al., 2006). Thus, skilled behaviour evolves over timescales of performance, learning, and development (Button et al., 2020). The social biological science systems show patterns of interdependency at a global system level (movement patterns in people and social interactions at a team level within the context of sport performance). These coordination dispositions continuously occur from on-going interactions between system components (within and between individual players). Principles governing component interactions in complicated systems are based on use of local data, without reference to global system patterns (Práxedes et al., 2018). Coadaptive interactions between individuals in invasion team games can lead to emergence of spontaneous pattern-forming dynamics and contextual dependency of decisions, which can constrain (and be constrained by) behaviours of teammates and opponents during performance (Vilar et al., 2014). These theoretical insights provide a theoretical justification for implementation of training programs for team games performance because they help players to develop specific physical fitness variables inherent in game situation and in acquiring skill in coupling actions and decisions to changing informational constraints of competitive performance environments (Frencken et al., 2013).

The researcher used 4 v 4 small sided games and 11 v 11 large sided games format to compare physical fitness levels that emerged from the interaction of task, environment and individual constraints. The environmental constraints used in the study was 30m by 20m size of the pitch for small sided games and 110m by 75m size of the pitch for large sided games. The task constraints was achieved by constraining number of players of which 4 v 4 small sided games had 8 players of 4 players per team while 11 v 11 large sided games had 11 players per team. Individual constraints are typically manipulated over longer time scales as physically, physiologically, morphologically and psychologically changes typically take time. In the study, the researcher was interested on how agility, cardiovascular endurance and body composition emerges from the 4 v 4 small sided games and 11 v 11 large sided games trainings. From ecological dynamic perspective skilled behaviour is viewed as the emergence of functionally adaptable performance solutions (Araújo et al., 2020). In this theoretical framework behaviour is a self-organizing phenomenon that emerges from the continuously dynamic interplay of an organism's characteristics and the affordances (Gibson, 1979) offered in a specific competitive performance environment (Araújo et al., 2006). Information in the environment is directly perceived, which contains affordances. Information specifies affordances, those properties of the environment whose perceived meaning is the actions they both allow and invite organism to perform (Araujo & Davids, 2011).

The 4 v 4 small sided games allowed players to make more agility manoeuvre and decreased body composition while 11 v 11 large sided games affordances were large space for running thereby improved cardiovascular endurance as players continued running to cover spaces during defence and create spaces during attack. The coaches and physical education teachers might use insights from ecological dynamics to ensure that practice and training task constraints are representative of a particular sport performance context toward which they are intended to generalize (Chow et al., 2011; Pinder et al., 2011). When designing learning tasks and performance simulations, the manipulation of key task constraints by practitioners (particularly perception-action constraints) should allow functional movement behaviours to emerge during learning in specific sports and physical activities. Representative Environment is a framework for assessing the degree to which experimental or practice tasks simulate key aspects of specific performance environments (i.e. competition). A representative training environment will

maintain functionality and action fidelity of sport. The key premise being that when practice replicates the performance environment, skills are more likely to transfer (Krause et al., 2018).

During a match, there exists a constant stream of “information” that is available to be perceived by the player (in the form of the ball, teammates, opponents, goals, pitch markings, surfaces etc.). Learning is the process of becoming attuned to key sources of information that can be used to complete a task, and coupling with functional movement/action. When the sources of information players are using to select and control their actions (on or off the ball) varies from those used in a match, we may only see limited transfer and gains in the match environment. A most obvious example of this rarely in a football match will a cone or marker is present on the field of play that specifies where a player should place themselves yet this is popular in many training sessions.

Players are complex systems whose movements and actions emerge under constraints. Learning and performance is continuously shaped by interacting task, environmental and player constraints. These constraints vary at different timescales and their interactional nature can see relatively skilful changes catalysing significant shifts in learning and performance. The ability of the coach to identify and expertly manipulate constraints is a key in effective learning design and pedagogy. The interactional nature also explains why certain components of performance practiced in isolation, i.e. “technique”, may collapse when task constraints (inclusion of opposing players) and/or individual constraints (emotions) change. There is no need to impose a technique. Instead players must learn to adapt their movements to the various situations encountered on the pitch. Being adaptable means players will have a certain degree of functional variability in their movements or, in other words, have a number of ways to solve the problems they are faced with in a match. Therefore, whilst training can still focus on repetition of a particular skill or tactical concept, it must inject sufficient amounts of variability elegantly termed.

Ecological dynamics research has shown that expert performance in sport is predicated on an athlete’s capacity to functionally adapt his or her movements to the dynamics of complex performance environments by continuously perceiving information to regulate goal-directed actions.

The study compared physical fitness variables where the training environment and the number of players at 4 v 4 small sided soccer games and 11 v 11 sub phase influenced the development of agility, cardiovascular endurance and body composition in female football players. The results revealed that manipulation of task constraints seems to be an effective strategy for creating practice environments that facilitate the acquisition of specific tactical principles, as much for individual soccer players as for athletes performing collectively. In this context, a greater understanding on the part of the coaches as to which task constraints should be manipulated seems to be necessary for a better implementation and progression of the training sessions. Another important factor for coaches to understand concerns which constraints should be manipulated to allow for the emergence of specific tactical principles according to the tactical learning objectives in a particular training session.

In relation to the results of the study ecological dynamics provides explanation of performance analysis that develops understanding of the emergence of successful and unsuccessful patterns of play in team sports. Data from analyses of interpersonal spatial and temporal interactions have revealed how performance of individuals emerged from self-organized processes under the constraining influence of the locations of their opponents and the ball. Ecological dynamics research has shown how 4 v 4 small sided games environment afforded emergence of agility skills than 11 v 11 large sided games environment .The 11 v 11 large sided games environment provided opportunities for improvement of cardiovascular endurance as players were able to run longer distances as attackers try to break symmetry with their nearest opponents, as defenders seek to maintain system symmetry by remaining between their own goal and the immediate attacker. The results show that both small sided and large side games provide opportunities for the improvement of body composition. These theoretical ideas from ecological dynamics suggest how skill acquisition in football can be interpreted relative to successful performance outcomes.

1.8 Delimitations of the study

The study was delimited to the female student footballers studying in third year at David Livingstone College of Education in Livingstone district of southern province of Zambia. Their age range was from 20 years to 22 years. The study considered 8 female students for small sided

games and 22 female students for large sided games at David Livingstone College of Education. The experimental treatment was restricted for a period of 5 weeks.

1.9 Operational definitions

Affordances Opportunities for action (Araujo, & Davids, 2011).

Body Mass Index (BMI) is defined as a reliable indicator of body fat as a value calculated from a person's weight and height (Lemos & Gallagher, 2017).

Constraints Internal or external boundaries, limitations, or design features that restrict the number of possible configurations that the many degrees of freedom of a complex system can adapt (Glazier, 2015)

Constraints Led Approach Framework to explain how coordination emerges under constraints (Individual, task, and environment) that operate under differing time scales (Newell, 1986).

Individual (Organismic) Constraints reside in the individual movement system including those of physically, physiologically, morphologically and psychologically (Glazier, 2015).

Environmental Constraints External to the movement system. They tend to be non-specific that pertain to the spatial and temporal layout of the surrounding world that continually act on the movement system i.e. Playing surface, weather, ambient light, crowd noise, temperature (Glazier, 2015).

Individual (Organismic) Constraints reside in the individual movement system including those of physically, physiologically, morphologically and psychologically (Glazier, 2015).

Large sided games are traditional or ancient soccer games played with 11 players per team (Hill-Haas et al., 2011; Silva et al., 2014).

Obesity is defined as an adult having a body mass index (BMI) greater than or equal to 30.16 (Ayvaz & Rıza, 2011).

Overweight is defined as an adult having a body mass index (BMI) from 25 to 29.9 (Ayvaz & Rıza, 2011).

Representative environment is a framework for assessing the degree to which experimental or practice tasks simulate key aspects of specific performance environments (Krause et al., 2018).

Small-sided games are modified games played on small fields with changed rules and that involve a fewer players (Davids et al., 2013)

Task Constraints They are related to the goal of the task and the rules governing the task. They are not physical; rather they are implied constraints or requirements which must be met within some tolerance range in order for the movement to produce a successful action (Glazier, 2015)

CHAPTER TWO

LITERATURE REVIEW

2.1 Physical fitness

Training strategies in soccer have evolved over the years (Selmi et al., 2018). Football training evolved from privileged exercises without a ball which develop physical capacities to new strategies and exercises that at the same time improve physical capacities along with technical and tactical skills in accordance with the modern demands of the game (Marzouki et al., 2018).

2.1.1. Agility

The traditional definition of agility is the ability to change direction rapidly and accurately (Alricsson et al. 2001; Baechle, 1994; Barrow & McGee 1971). The first edition of *Physiological Tests for Elite Athletes* emphasized this definition by only including protocols for the assessment of pre-planned change of direction speed (e.g., zig-zag running). Consequently, agility has historically been viewed as a top quality influenced preponderantly by physical (e.g., leg muscular strength, reactive strength, and power) and biomechanical (e.g., running technique) qualities, and coaching programs designed to enhance agility performance generally specialise in enhancing these individual qualities.

In their study, Sheppard and Young (2006) define agility as ‘a rapid whole body movement with change of velocity or direction in response to a stimulus’. As agility involves reacting to a stimulus, agility is a skill that utilizes the information-processing model (Gabbett & Abernathy, 2013). Before athletes can execute a movement, they need to find relevant environmental information and process it in relation to previous knowledge. After the athlete has processed the information, they can execute the correct movement (Broadbent et al., 2015). The more sport-specific experience an athlete has, the better anticipation skill they have (Gabbett & Abernathy, 2013). In their study, Gabbett and Abernathy (2013) showed that higher-level athletes were better at anticipating movement than lower-level athletes. Higher-level players also made a greater number of correct decisions than lower-level players did. They argued that this difference was due to the ability of higher-level rugby players to recognized rugby specific cues better

compared to lower-level rugby players. This finding demonstrates the importance of developing sport-specific experiences, in order to improve sport specific information processing (Gabbett & Abernathy, 2013).

Small-sided games (SSGs), also known to as skill-based learning games (Gabbett, 2006), game-based coaching (Gabbett et al., 2009) or small-sided and conditioned games (Davids et al., 2013) are modified games played on small fields with changed rules and that involve a fewer players than ancient soccer games referred to as 11 v 11 large side games (Hill-Haas et al., 2011; Silva et al., 2014). SSGs integrate all the specific needs of football and represent a helpful answer to enhance the potency of the coaching method (Beato, Jamil & Devereux, 2018).

Small Sided Games (SSG) just like large sided games are used to develop agility as they potentially develop various physical fitness components, skills, tactics and game awareness. A study by Davies, Young, Farrow, & Bahnert, (2013) investigated the effect of playing area size and number of players. In their study Davies et al. (2013) found that reducing player numbers increases the total number of agility manoeuvres as compared with a large number of players.

Young & Rogers (2014) conducted a study with Elite junior Australian Rules football players. Players were selected into two groups of SSG and a Change of direction. Players completed 11x15min sessions over 7 weeks during the season of either just SSGs or just change of direction drills depending on the group they were randomly selected for. The change of direction group did not improve on the planned agility test. Furthermore, they failed to improve their total agility time and only slightly improved their agility response time (decision time) by 4%. Similarly, the small sided games group did not improve on the planned agility test. However, total agility time improved by 4% while agility response time showed a large improvement of 31% post intervention. The SSGs group total agility time improvement was entirely because of high improvement in response time. This is an impressive change from just 11x15min SSGs training sessions over 7 weeks.

One of the commended training methods in soccer is employing interval training. Interval training with the incorporated changes of directions are different from large sided games as it incorporates a 40 m shuttle run however these are believed to replicate the agility demand of the full games and result in greater amount of acceleration (Varillette et al., 2012). The comparisons

between small-sided games and agility interval training over 6 weeks generated similar responses in adult players with regards to performance in the 30 - 15 intermittent fitness test and a continuous aerobic test. Similar findings are displayed by (Chouachi et al.,2014) for youth players age = 14 ± 0.9) where a small sided group was compared for a 6 weeks training intervention, revealing superior effects from small sided games for agility improvements.

From the literature reviewed, contradictory results have been given about different kinds of training and effectiveness of each one. Furthermore, scant or no literatures have referred both small sided games and large sided games together. Regarding the importance of training method that would cause a suitable adaption with the simulation of match condition, paucity of literature has been conducted to compare the effect of this training on physical fitness components especially in female students in Zambia. Therefore this study is going to answer this question that which method of training, 4 v 4 small sided football games or 11 v 11 large-side football games has more effect on improvement of the athletes agility skills.

2.1.2. Cardio-vascular endurance

This is the ability of the cardiorespiratory system to supply the exercising muscles with oxygen to maintain the exercise for a long period (Aguiar et al., 2012). Aerobic fitness is a well-established physical component for soccer players and interval training using small-sided games (SSG) has been shown to be effective for improving aerobic fitness and soccer specific endurance (Köklü, 2012). A good level of aerobic endurance can allow the individual to maintain an activity for a long period of time without becoming fatigued.

In their study, Cheng, Chiu, and Su (2019) defined cardiovascular endurance as the ability of the heart and lungs to take in and to transport adequate amounts of oxygen to the working muscles for activities to be performed over long periods. The synonyms of cardiovascular endurance include aerobic capacity, aerobic fitness, cardiovascular fitness, cardiorespiratory fitness, cardio-respiratory endurance, circulatory-respiratory endurance, cardio-pulmonary endurance and aerobic power. The cardiovascular endurance involves moderate contraction of huge muscle groups for long periods of your time during which maximum changes of circulatory -respiratory system are necessary as in unceasing brisk walking and running (Akyol & Sögüt, 2018).

Cardiovascular endurance performance depends on three important elements: maximal oxygen uptake (VO₂MAX), anaerobic threshold, and work economy. Maximal oxygen uptake is defined as the highest oxygen uptake that can be achieved during dynamic exercise with large muscle groups (Smirmaul et al., 2013). Higher maximal oxygen uptake allows the players to run longer and faster and to be more involved in various actions of the game (Stølen et al., 2005). Anaerobic threshold has been defined by Ghosh (2004) as the highest exercise intensity, heart rate, or oxygen uptake, working enthusiastically. Barnes and Kilding (2015) defined work economy (CR) as oxygen cost at submaximal exercise intensity.

Cardiovascular endurance allows the players to run longer and faster and to be more involved in various actions of the game (Stølen et al., 2005). According to Helgerud et al., (2001) cardiovascular endurance affects the match performance of soccer players. High aerobic capacity also helps the players to recover better from high intensity actions and intermittent exercise, typically observed in a football match (Lehto, 2009).

While the improvement in physical capacity is a highly desired outcome from small-sided games the ceiling effects of the VO₂max may occur in players already close to their maximal level (Buchheit & Laursen, 2013) thus a smaller increase in VO₂max may be observed for fitter players (Mc Millan et al., 2005). Consequently players with the lower fitness level may be prone to reduce the intensity level in small sided games resulting in sub-optimal conditions for after players and large discrepancies in fitness improvements between players (Buchheit & Laursen, 2013).

Additionally, superior fitness among certain players may reduce the aerobic enhancement capacity of small sided games as players with advanced technical or combination of enhanced fitness and technical capabilities may experience insufficient training stimulus from small sided games as their superior understanding of the game may allow for less effort exerted (Hill- Haas et al., 2011). Studies to date remain equivocal on the aerobic improvements derived from SSGs. Early SSG studies by Reilly and White (2005) revealed insignificant improvements in both maximal oxygen uptake(VO₂ max) as well as lactate threshold for SSG training for 6 weeks thus allowing the authors to conclude that small sided games may constitute a valid replacement for maintenance of fitness levels during trainings.

Stolen et al. (2005) in their research on competitive matches of women's soccer show less covered distance by players (almost 33%) at higher level of intensity (speed more than 15 kmh-1) than in the men's game (Krustrup et al., 2005). The study conducted by Krustrup et al., (2005) found that Yo-yo intermittent recovery test level 1 is a good predictor of elite female soccer player's ability to perform high-intensity running throughout competitive matches and it can be used as an indicator of physical match performance. While teams have same tactics and skill abilities, a team with higher general fitness is superior team and act more powerful when the game gains speed (Science and Soccer, 2003). One of the commended training methods in soccer is employing interval training. Interval training can increase the speed or the ability of keeping speed in long term periods in addition to improvement of aerobic ability resulting from the rest periods between the activities. Helgerud, et al. (2001) showed that Vo₂max, lactate threshold and running economy improved by 11, 16 and 7% respectively after the interval training two times a week for 8 weeks (4 bouts of 4 min at 90-95% of maximum heart rate with 3 min active rest periods).

The soccer specific training like the small-side games training improves Vo₂max more than other trainings (Bangsbo, 1998; Drust et al., 2000; Reilly and Gilbourne, 2003). Moreover they recommend performance of a series of simulated trainings than intermittent trainings and believe that this trainings increase aerobic fitness and better performance in exercise (Hoff et al., 2002). The technique and tactics skills must be planned similar to actual condition and the athlete has a suitable performance when being under match condition (Reilly and Gilbourne, 2003).

Haff, et al. (2002) reported that soccer players with higher Vo₂max tend to show a lower Vo₂max in time of trainings and small-side games and this problem was usually associated with teams in which the training program of most athletes was similar. Then using this training like small-side games would not lead to enough stimulate for the physiologic adaption in all members.

From the reviewed literature, contradictory results have been given about different kinds of training and effectiveness of each one. Furthermore, scant or no literature have referred both 4 v 4 small sided games and 11 v 11 large sided game players together. Regarding the importance of preparatory programs and the fact that soccer needs players with cardiovascular endurance and high explosive speed and low fatigue index, training programs that would cause a suitable

adaption with the simulation of match condition should be encouraged and examined. Since players commonly use the large sided games and small side games training programs, but not a sufficient literature exist to review the effect of this training on physical fitness factors especially in female football players in Zambia. Therefore the researcher conducted comparison of cardiovascular endurance improvement between 4 v 4 small sided football games players and 11 v 11 large sided football games players.

2.1.3 Body composition

Ayvaz and Rıza (2011) define body composition as the amount of body fat and lean tissue in an individual. Water, blood, skin, muscle and bone make up lean tissue in an individual. The high levels of body fat can increase the risk of certain diseases such as heart disease, obesity and can also reduce endurance, speed and limit flexibility, therefore leading to a sports performance decrease (Ayvaz and Rıza, 2011).

Body composition measurement provides data for monitoring changes in the body that are precursors to the development of certain diseases and helps to estimate ideal body weight (Marfell-Jones et al., 2006). According to Goon et al., (2006), females tend to possess higher body fat percentage than their male peers. Children and adolescents, who have a body fat percentage higher than 25% and 30% for boys and girls respectively, are at a higher risk of developing different types of hypokinetic diseases (Goon et al., 2006). Furthermore, the sex differences in body fat may be physiological, metabolic or social while too much body fat during childhood could have a negative influence on the quality of life. Therefore, body composition can be used to assess total body fat and regional distribution of body fat in order to evaluate one's health risk and wellbeing (Norman et al., 2005; Goon et al., 2010).

When interpreting body mass index, Gallagher (2010) argues that age, sex, race and body structure should be considered. Gallagher et al (2010) in their article, "Relationship of BMI with body fat percentage" examined the influence of age, race and sex on the relationship of BMI with body fat percentage. Their study findings reveal that the relation of BMI with body fat was influenced by age and sex, but no relation was found with ethnicity (Duda et al., 2019).

According to Ranasinghe et al., (2013) body mass index is used as the same for both sexes and for all ages of adults. Ranasinghe et al. (2013) further argue that BMI is not used for muscle builders, long distance athletes, and pregnant women, the aged or young children. This is as a result of BMI does not take under consideration whether or not the weight is carried as muscle or fat, simply the quantity. Those with a higher muscle mass, like athletes, may have a high BMI but not be at greater health risk. Those with a lower muscle mass, like youngsters who have not completed their growth or the aged who may be losing some muscle mass might have a lower BMI. During pregnancy and lactation, an adult female body composition changes, therefore using BMI is not applicable.

The body composition of football players is associated with playing positions (Dengel et al., 2014; Kraemer et al., 2005; Melvin et al., 2014; Pryor et al., 2014) linemen being reported as having the biggest body size. Reilly and Secher (1990) argue that body composition play an important role in fitness of a soccer player. It is important to emphasize that male soccer players tend to have a better ratio of lean body mass to body fat than female players (Matković et al., 2003), which eventually affects the endurance of female players. Overall female professional soccer players were more mesomorphic than endomorphic non players, but less also less ectomorphic (Martens, 2004). The female soccer players had significantly different body fat percentages and lean body weights, but the differences in overall absolute fat were not significantly different from non-athletes (Can et al., 2004). Body weight and fat percentage are part of the physiological makeup of a soccer player, but this is less apparent in women than it is with men, specifically in regard to body fat.

Body composition in athletes is associated with athletic performance (Stewart, 2001) as the proportions of low body fat and high lean body mass provide a good basis for the locomotor activities and specific technical skills required by the sport (Reilly et al., 1996). Thus, the assessment of body composition in athletes by valid and reliable methods is of great importance for planning and evaluation of training programs and nutrient intake over time.

The scant literature has been conducted with female soccer players evaluating the effects of football training on body composition in female student footballers in Zambia. Physical fitness level among female soccer players may impact physical and physiological responses from small sided games and large sided games as female players may respond differently to physical fitness

activities than their male counterparts (Katis et al., 2014). Therefore, the aim of this study was to compare physical fitness levels between 4 v 4 small sided football game players and 11 v 11 large sided football game players. The reviewed literature has demonstrated that team performance for any sport can be affected by physical fitness of players. For any team to perform better to win the game, it is encouraged to adopt training strategies that incorporate physical fitness variables in their training to cement team performance. Therefore no research has been conducted to compare physical fitness variables between 4 v 4 small sided games and 11 v 11 large sided games hence the need for this study. It is hypothesised that physical fitness variables in 4 v 4 small sided games is significantly different

CHAPTER THREE

METHODOLOGY

3.1 Research Design

The researcher conducted quantitative study with quasi-experimental design. According to Selvam (2019), the appropriate design for a comparative question is quasi-experimental design. The researcher agrees with selvam (2019) and therefore quasi-experimental study with pre-test post-test alternative design was conducted to compare physical fitness variable between small sided and large sided games. The purpose of the pre-test was to ensure the comparability of the two groups before the treatment; whereas the post-test was conducted to allow the researcher to determine the immediate effects of the treatment on the outcome variables as argued by (Cook & Wong, 2008). The researcher randomly selected the participants. Gay, Mills, & Airasian, (2009) argue that quasi experimental design has random selection only. This means the study randomly selected the participants. Random selection involves choosing in random fashion individuals for participation in a research study such that every member of the population has an equal chance of being selected to be a member of the sample (Gay et al., 2009). After participants were randomly selected to participate in a study, pre-test were administered to each participant before the commencement of the study. All tests were performed under the supervision of the principal investigator at the college football grounds and all groups were given football training intervention as experimental groups. This was done to find out which one between the two best improved physical fitness of female football players. After pre-test was done, both 4 v 4 small sided game and 11 v 11 large sided game groups were given training intervention program for five weeks. At the end of five weeks, the researcher conducted post-test to both groups. Participants were requested to follow strict protocols for a day before test day including maintaining a normal diet provided by the college.

3.2 The Study Population

A population refers to a well-defined group of individuals that have something in common and is under consideration or study (Ngoma, 2005). Therefore, study population included all the 52

female student footballers at David Livingstone College of Education in Livingstone District of Southern province of Zambia. The desired populations of the study were female boarding student footballers at David Livingstone College of Education in the 2020 academic year. The David Livingstone College was chosen because it has a well-developed female soccer team which has been outstanding.

3.3 The Study Sample

The study sample comprised thirty (30) participants who were distributed as follows; eight (8) 4 v 4 small sided game and twenty two (22) 11 v 11 large sided game from the college team. The researcher used natural groups or assigned participants to groups using a random selection (Handley, Lyles, McCulloch & Cattamanchi, 2018). Therefore, the natural group sample size for a 4 v 4 small-sided games is eight (8) and the natural group sample size for 11 v 11 large sided game is 22. This sample size is expofacto as it cannot be manipulated since it is a natural group sample size for 4 v 4 small sided football games and 11 v 11 large sided football games. This means that each small-sided team comprised 4 participants to make 4 v 4 small-sided game total number to eight (8) and each large-sided game comprised of 11 participants to make 11 v 11 large sided game total number of participants to twenty two (22).

3.4 Sampling techniques

This study used simple random procedure, a kind of random selection to select the 30 participants of both 4 v 4 small-sided game and 11 v 11 large sided games among third year female footballers. Simple random selection was used to select the students because it provides each participant in the population an equal chance to be selected as a study sample. From the total of 30 selected female football players, 8 players were for 4 v 4 small sided games and the remains 22 players were for 11 v 11 large sided games. This sample size is expofacto as it cannot be manipulated since it is a natural group sample size for 4 v 4 small sided football games and 11 v 11 large sided football games.

3.5 Sample description

Participants in this study ranged from 20 to 22 years of age. Figure 1 shows the number of participants by age for 4 v 4 small sided games. The total number of participants for 4 v 4 small sided games was 8. The participants' aged 20 represented 25% of the sample for 4 v 4 small sided games while participants aged 21 also represented 25% of the sample. From the Figure 1 it is clear that the majority of participant for 4 v 4 small sided games aged 22 accounted for 50% of the study sample. Both participants aged 20 and 21 represented the lowest number at 25% of the sample each for 4 v 4 small sided games.

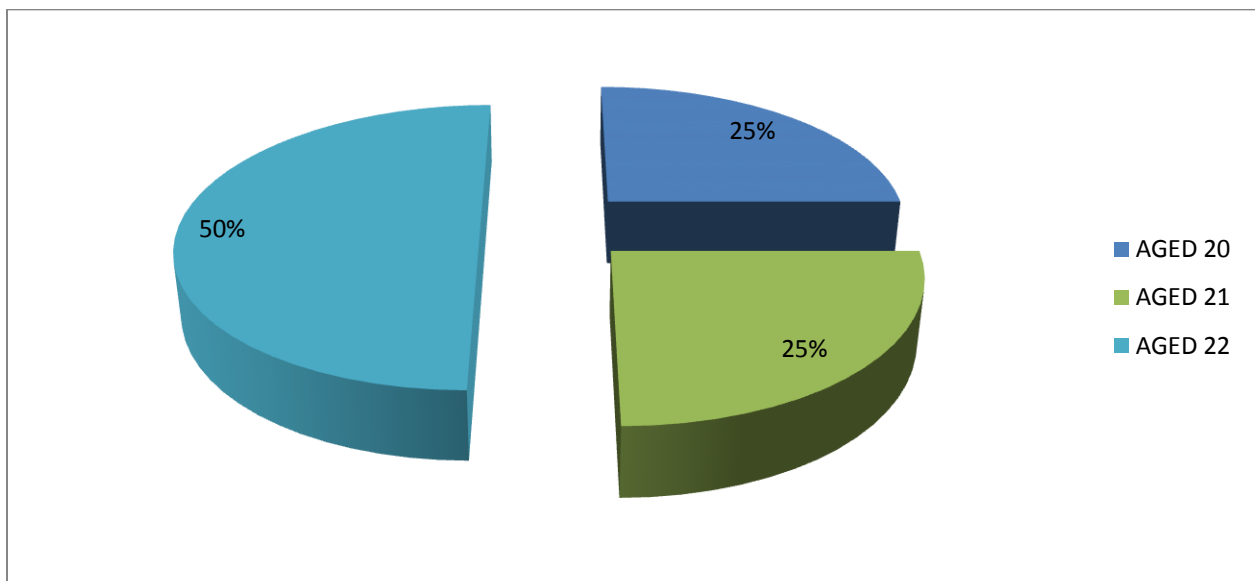


Figure 1: Age data for 4 v 4 small sided games players

Figure 2 shows the number of participants by age for 11 v 11 large sided games. The total number of participant for 11 v 11 large sided games was 22. The participants aged 20 represented 27% of the sample for 11 v 11 large sided games while those aged 21 represented 32% of the sample. From the Figure 2, it is clear that the majority of participants for 11 v 11 large sided games were 22 years accounting for 41% of the sample. The minority number for 11 v 11 large sided games were aged 20 representing 27% of the sample.

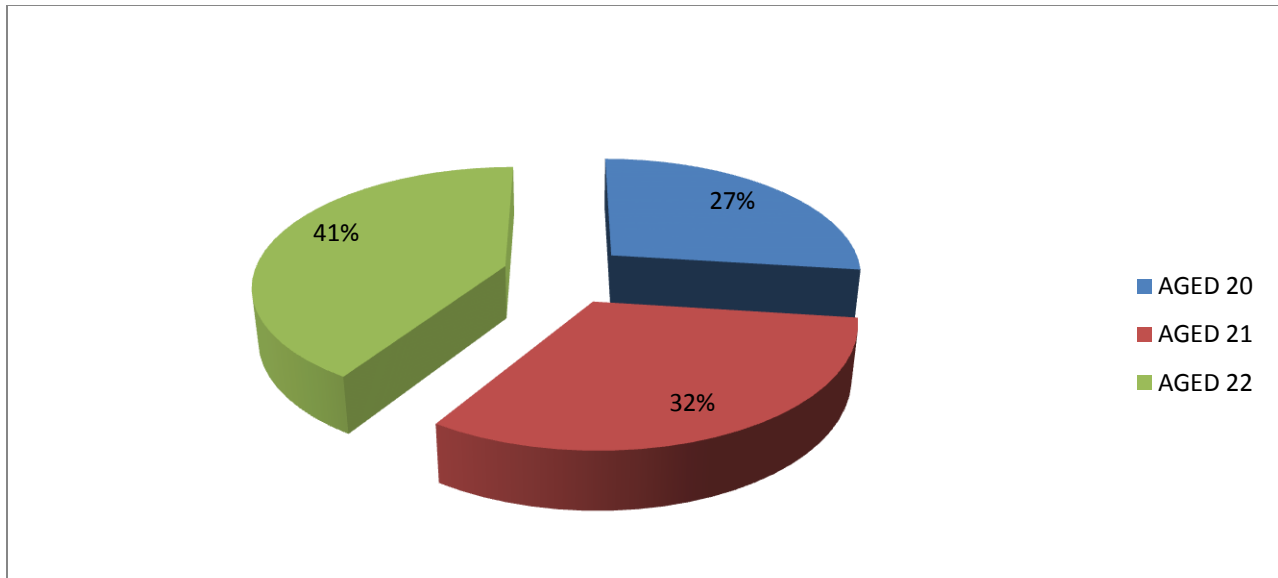


Figure 2: Age data for 11 v 11 large sided games players

Both the 4 v 4 small sided games and 11 v 11 large sided games groups had higher percentage participation from the female footballers aged 22 years while lower percentage participation was recorded from footballers aged 20 years. This shows that female footballers aged 22 years were predominant in all the training groups.

3.6 Instruments for Data Collection

To test physical fitness in this study Illinois agility test, yo-yo intermittent test and body mass index were used. The selected components were cardiovascular endurance, agility and body composition that were measured by different means and methods: Cardiovascular endurance was measured by yo-yo intermittent test while agility was measured by Illinois test as recommended by (Manmeet, Singh & Ramanjit, 2010) and body composition was measured by calculating body mass index (BMI).

3.7 Validity and Reliability

3.7.1 Validity of the Study

A pre-test was carried out to ensure the instrument elicited the required information. Additionally, the physical fitness instruments used were standardised instruments and measured what it intended to measure.

3.7.2 Reliability of the Study

Internal consistency technique was used to measure reliability level of the instrument. The scores obtained from items in the physical fitness levels were correlated with scores obtained from other items. Cronbach's Coefficient Alpha was then computed to determine the correlation. The coefficient of 0.7 for agility, 0.905 for body composition and 0.987 for cardiovascular endurance values indicated that there was consistency among the items assessing physical fitness levels in female student footballers.

3.8 Procedure for Data Collection

The Illinois agility test was used to collect data on the level of agility, yo-yo intermittent test level I was used to collect data on cardiovascular endurance and body mass index were calculated to measure body composition.

3.8.1 Illinois Agility test

The Illinois agility test is a fitness test designed to test one's sport agility. It is a simple test which is easy to administer and requires little equipment. It tests the ability to turn in different directions and at different angles (Morteza, et al., 2011). Agility was assessed using 10 meter Illinois agility test. The researcher marked 2 lines ten meters apart using marking tape and cones. The two blocks were placed on the line opposite the line they were starting at. On the signal "ready", the participant placed their front foot behind the starting line. On the signal, "go" the participant sprinted to the other line, picked up a block of wood, ran back and placed it on or beyond the starting line. Then turning without a rest, they ran back to retrieve the second block and carried it back across the finish line. Two trials were recorded in line with (Morteza et al.,

2011). Before test day, students were allowed to listen to several minutes of the tape so that they know what to expect. Students were allowed a minimum of 2 practice sessions.

3.8.2 The Yo-Yo Intermittent Recovery Test Level 1

The Yo-Yo intermittent Recovery Test level 1 (YYIRL1) is one of the six official versions of the yo-yo test, and is the most commonly used version to measure cardiovascular endurance (Bangsbo, Iaia & Krstrup, 2008). Bangsbo, Iaia & Krstrup (2008) argues that the level one test was originally designed for recreational level athletes, while the level 2 test was designed for highly-trained athletes, though most sports tend to use the level one test for athletes of all fitness levels. The Yo-Yo Intermittent Recovery Test level 1 is a 20 meter shuttle test with progressively increasing pace as dictated by audio beeps from the test CD (Krustrup et al, 2003; Bangsbo, 1994). Athletes start out shuttling from one end to the opposite at a comparatively slow pace then quickly ramp their speed consistent with the pace set by the beeps. Each bout of intense running (2x20m shuttle) is followed by 10 seconds of recovery before the athlete resuming a sprint. The intermittent nature of the test taxes the energy system, both aerobic and anaerobic, in similar way that relates to the intermittent nature of football.

The participants were assessed using yo-yo intermittent test level 1 by completing pairs of 20m sprints paced by audio cues which were recorded on a flash disk. One pair of sprints was equal to one 40m shuttle. Beeps came in sets of three called speed levels. Each speed level consisted of two 20m sprints followed by a 10 seconds recovery. Athletes stood with one foot on the start line. At the first beep from the CD, they sprinted 20m to the 20m marker. The participants were expected to reach the 20m marker before the second beep. Each participant waited at the 20m marker for the second beep. At the second beep from the CD, participants' sprinted 20m back to the front line and reached the front line before the third cue. At the third beep, each participant must have broken the plane of the starting line. Each then had 10 seconds to jog from the start line/finish line to and back from the 5m marker line of cones. Once they returned to the start /finish line, participants waited for the next beep and the start of the next speed level. This pattern continued for each participant until each received his second warning. On the second warning for each participant, the test ends. The audio cues for the Yo-Yo IR1 were recorded on a flash disc. The test was completed when the participant stopped voluntarily or failed twice to

reach the front line in time with the beep. The complete distance covered during the Yo-Yo IR1 was taken as the testing result.

3.8.3 Body Mass Index (BMI)

There are various tests for body composition including bioelectrical impedance, hydrostatic weighing, skin-fold measurements, and calculating body mass index (Wells & Fewtrell, 2006). The researcher chose to calculate BMI as opposed to the other methods because limited equipment is needed, and the test is less invasive to students. Each of the body composition testing methods has a measurement error of 2% to 3% when estimating body fat (Meredith and Welk, 2007). BMI is calculated by measuring a person's weight (kilograms) and dividing it by their height squared (meters). Body Mass Index is an easy calculation using a person's height and weight. The formula is $BMI = \frac{kg}{m^2}$ where kg is a person's weight in kilograms and m² is their height in metres square (Lemos & Gallagher, 2017). A BMI of 25.0 or greater is overweight, while the healthy or normal range is 18.5 to 24.9 as indicated in appendix VII. BMI applies to most adults 18-65 years (Ranasinghe et al., 2013).

Pre- test was administered to each participant before the commencement of the study period. The Illinois agility test was administered to measure agility to each participant, yo-yo intermittent test was administered to measure cardiovascular endurance and body mass index was used to measure body composition.

The participants belonging to both 4 v 4 small sided game and 11 v 11 large sided game were put under five week's football training intervention programme as a form of treatment to find out where physical fitness variables can best be improved between the two games. The study was conducted during the first term of 2020 school calendar in Zambia. Both the 4 v 4 small sided games and 11 v 11 large sided game group participants were put under five week's football training intervention for 4 days per week. The 80 minute training programme consisted of 10 minutes of warm up, 70 minutes of training. During the football training intervention period, the 4 v 4 small sided games had small goals without goal keepers, there was no offside and if the ball leaves the field of play, it was restarted with a throw in. A throw in was taken by opponents of the player who last touched the ball when the whole ball crossed the touch line, either in the air or on the ground. After 35 minutes of play teams changed ends. The 11 v 11 large sided games

were played on a natural surface. It was played in accordance with 2019/2020 FIFA laws of the game except that, after 35 minutes of play, teams changed ends. All the remaining training days were similar for both 4 v 4 small sided games and 11 v 11 large sided game groups. During the training period no extra football training were performed by participants apart from the experimental protocol and they were instructed to consume their normal pre-training diet a day before the testing session. After the completion of five weeks, post-test was conducted using Illinois agility test, yo-yo intermittent test level 1 and BMI was again administered to each participant.

3.9. Statistical Analysis of the Study

To compare the significant differences of physical fitness level between the two groups, the data was analysed and compared by the use of Statistical Package for the Social Sciences (SPSS; version 20). The Wilcoxon Signed Rank Test and Mann Whitney test was used to compare the data. Pre-test and post-test data were measured on cardiovascular endurance, agility and body composition. The Wilcoxon Signed Rank test was used to compare the pre-test and post test scores from the Illinois agility test, yo-yo test and body mass index (BMI) to see if there was a significant difference between the 4 v 4 small sided games players and the 11 v 11 large sided games players. The Wilcoxon signed rank sum test is a version of the dependent samples t-Test that can be performed on ordinal (ranked) and continuous data. As for the sign test, the Wilcoxon signed rank sum test is used to test the null hypothesis that is the median of a distribution is equal to some value. It can be used in place of a one-sample t-test, in place of a paired t-test or, for ordered categorical data where a numerical scale is inappropriate but where it is possible to rank the observations. In this study, Wilcoxon Signed Rank Test was used as an alternative to dependent t test or paired test because the sample size used was small. The results of the study were accepted as significant at $P < 0.05$. To find the significance difference in the gain scores between the two groups (4 v 4 small sided games and the 11 v 11 large sided games) the Mann Whitney test was used. The Mann-Whitney U-test is a non-parametric statistical method for comparing two groups of sampled data which are independent. Its purpose is to test the null hypothesis that the two samples have similar median or, conversely, whether observations in one sample are likely to have larger values than those in the other sample. The t-test of unrelated samples is a parametric equivalent to the Mann-Whitney U-test .Wilcoxon and Mann Whitney

test are non-parametric tests. Non-parametric tests as alternatives to parametric tests are most often used when there is evidence of non-normality. In their capacity as alternatives to t-tests, non-parametric tests are thereby most useful when the sample size is small (Fagerland, 2012). They are also less restrictive and therefore the conclusions based on non-parametric inference are more general.

CHAPTER FOUR

RESULTS

4.1 Introduction

The purpose of this study was to compare the physical fitness levels between 4 v 4 small sided game players and 11 v 11 large sided game players. The researcher used the Illinois agility test to test agility, yo-yo intermittent test level 1 to test cardiovascular endurance while body composition was measured by calculating body mass index (BMI).

4.2 Agility

To find out if there was a difference in agility between pre-test and post-test scores of female football players belonging to 4 v 4 small sided games, Wilcoxon Signed Rank Test was used as presented in table 1a.

Table 1a: Characteristics variables mean difference in agility between pre-test and post test scores of female players belonging to 4 v 4 small sided games

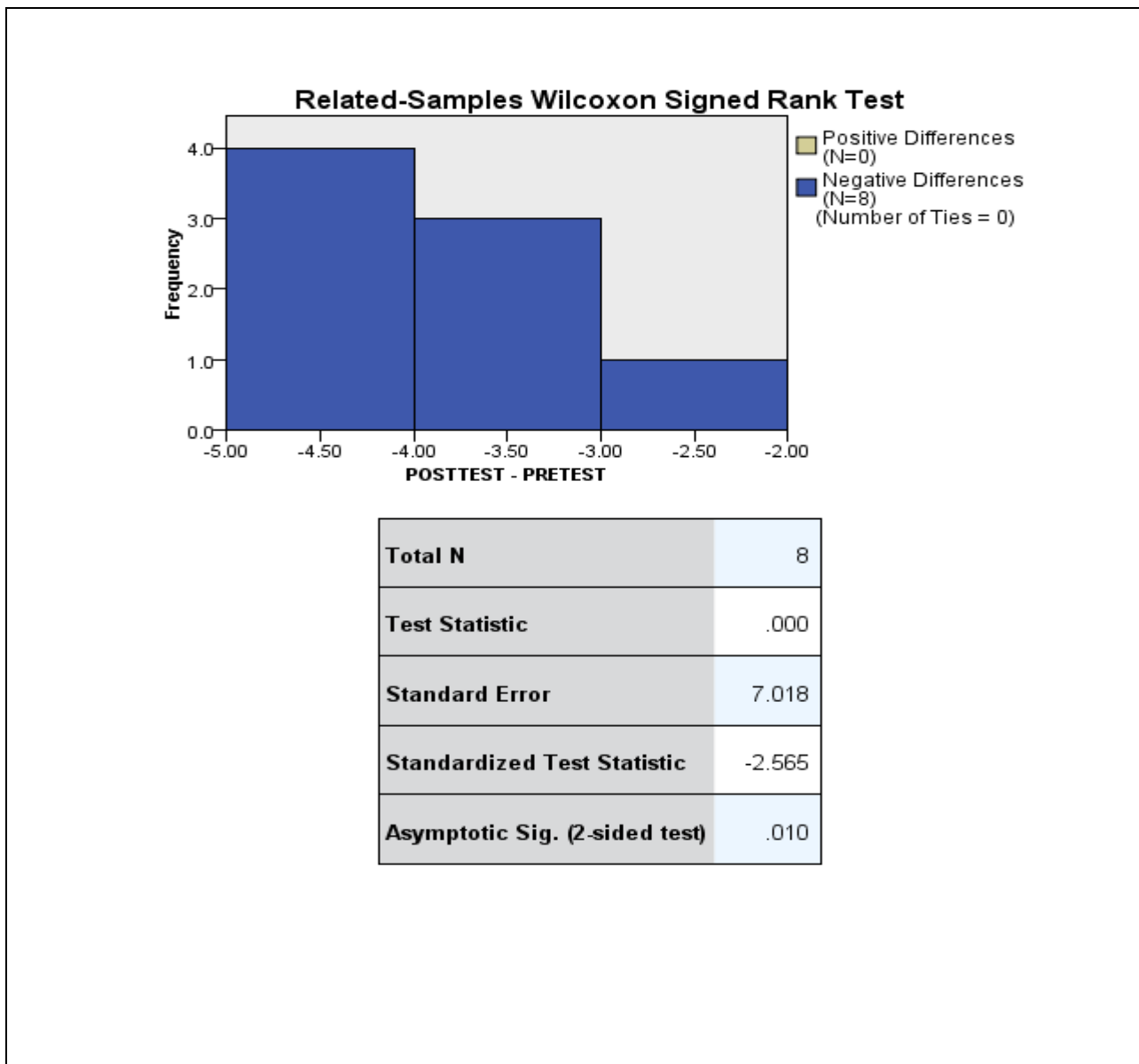
Descriptive Statistics								
	N	Mean	Std. Deviation	Minimum	Maximum	Percentiles		
						25 th	50 th (Median)	75 th
Agility pre-test	8	24.6250	1.06066	23.00	26.00	24.0000	24.5000	25.7500
Agility post-test	8	20.2500	1.03510	18.00	21.00	20.0000	20.5000	21.0000

A Wilcoxon signed Rank Test in table 1a indicated that median post-test ranks, Mdn =20.50 were lower than median pre-test ranks, Mdn, 24.50 ranks. Table 1a shows that female players improved in agility with post-test scores (Mdn = 20.50) than with pre-test (Mdn= 24.50) under 4 v 4 small sided games training after five weeks study period. The post-test mean score (Mdn = 20.50) is lower than the pre-test, Mdn=20.50) mean score of female players under 4 v 4 small sided games training. The lower median post-test Ranks means that there was decrease in the

number of seconds taken to complete Illinois agility test after post-test than in pre-test scores after five weeks football training intervention. This suggests that football training under 4 v 4 small sided games improve agility of female football players.

To find out if this difference was statistically significant, we consult the Wilcoxon Signed Ranks Test as presented in Table 1b.

Table 1b: Characteristics variables mean difference in agility between pre-test and post test scores of female players belonging to 4 v 4 small sided games.



A Wilcoxon signed Rank Test indicated that post test scores were statistically significantly lower than pre-test scores $z = .000$, $p = .010 < 0.05$. The reported $z = -.000$ ($p = 0.10 < .05$) in table 1b reveals that there was statistically significant difference in agility between pre-test and post-test scores of female football players who trained under 4 v 4 small sided games. Therefore, there is enough evidence to conclude that there was a significant improvement in agility of female players' who trained under 4 v 4 small sided games after completing the five weeks training programme. This means that training under 4 v 4 small sided games improved agility of female players during the study period.

To find out if there was a difference in agility between pre-test and post-test scores of female football players belonging to 11 v 11 large sided games, the Wilcoxon Signed Ranks Test was used as presented in table 2a.

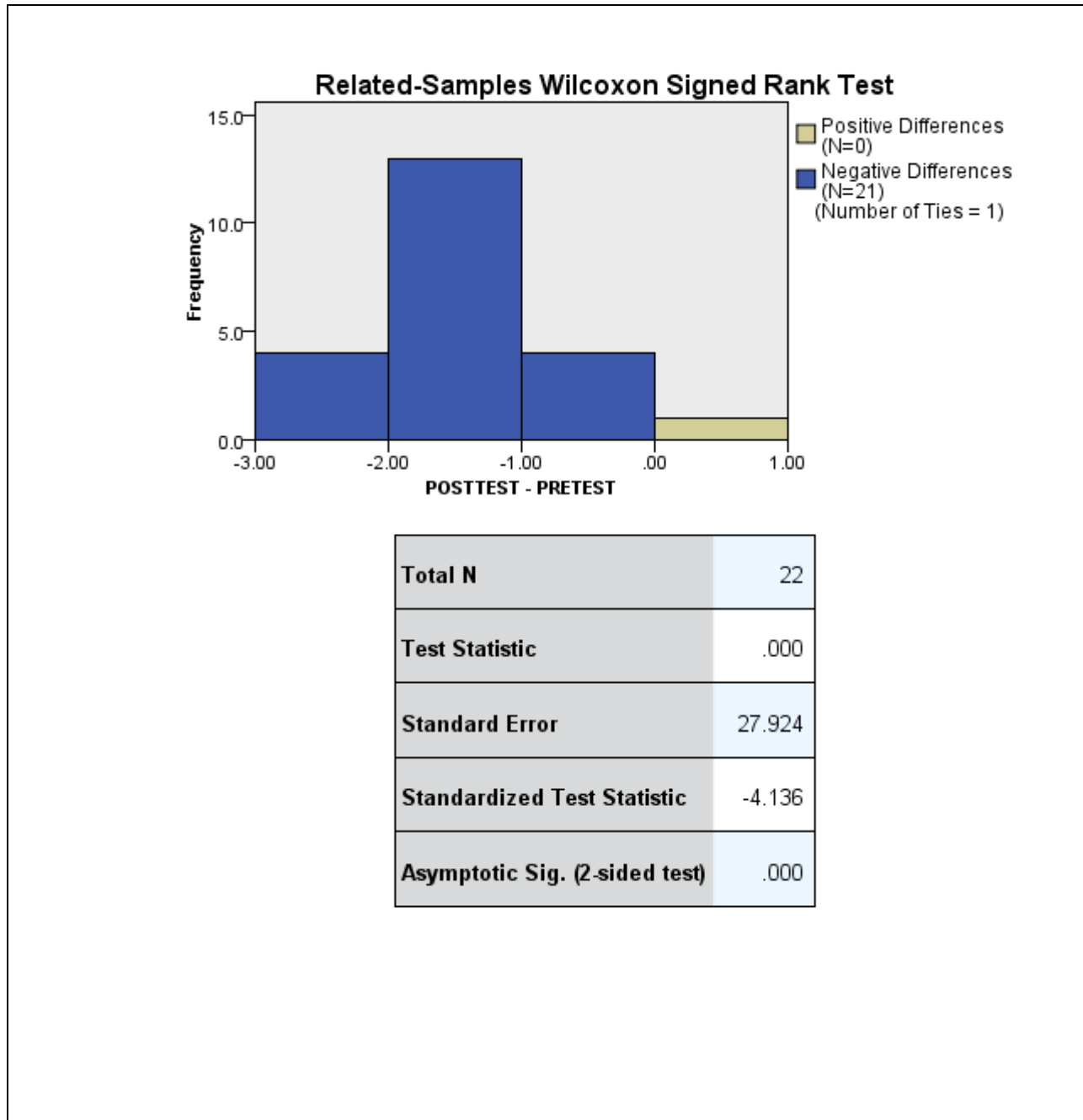
Table 2a: Characteristics variables mean difference in agility between pre-test and post test scores of female players belonging to 11 v 11 large sided games.

Descriptive Statistics								
	N	Mean	Std. Deviation	Minimum	Maximum	Percentiles		
						25th	50th (Median)	75th
PRETEST	22	24.8636	.83355	24.00	26.00	24.0000	25.0000	26.0000
POSTTEST	22	22.9545	.84387	22.00	24.00	22.0000	23.0000	24.0000

A Wilcoxon signed Rank Test indicated that post test scores (Mdn=23.00) were statistically significantly lower than pre-test scores (25.00). Table 2a shows that female players who were training under 11 v 11 large sided games improved in agility for post-test scores (Mdn = 23.00) than for pre-test (Mdn= 25.00) after five weeks of study period. The median post test score (Mdn=23.00) is lower than the median pre-test (Mdn= 24.00) score for female players under 11 v 11 large sided games training. This means that there was decrease in the number of seconds taken to complete Illinois agility test after post-test than in pre-test scores after five weeks football training intervention.

To find out if this difference was statistically significant, we consult the Test statistics for Wilcoxon Signed Ranks Test as presented in Table 2b.

Table 2b: Characteristics variables mean difference in agility between pre-test and post test scores of female players belonging to 11 v 11 large sided games.



A Wilcoxon signed Rank Test indicated that post test scores were statistically significantly lower than pre-test scores $z = .000, p = .000 < 0.05$. The reported $z = 0.00 (p = 0.00 < .05)$ in table 2b reveals that there was a statistically significant difference in agility between pre-test and post-test scores of female football players who trained under 11 v 11 large sided games. This means that the median post test score (Mdn = 23.00) was significantly lower than median pre-test (Mdn=25.00) after five weeks of training. This suggests that training under 11 v 11 large sided games improved agility of female players after five weeks football training intervention period. Therefore, based on the results it can be concluded that the intervention was a success.

To find out if Illinois agility mean gain score was statistically significant different between female student footballers training to improve agility under 4 v 4 small sided football games training and under 11 v 11 large sided football games training, the Mann Whitney test was used as presented in table 3a.

Table 3a shows gain score between 4 v 4 small sided games and 11 v 11 large sided game players.

Ranks				
GROUP		N	Mean Rank	Sum of Ranks
AGILITYSCORES	4 V 4	8	4.75	38.00
	SSG			
	11 V	22	19.41	427.00
	11 LSG			
	Total	30		

A Mann Whitney test indicated that the agility score was lower for 4 v 4 small sided game players (M = 4.75) than for 11 v 11 large sided game players (M =19.41). A Mann Whitney test was conducted to compare agility mean score between 4 V 4 small sided game players and 11 v 11 large sided game players. Table 3a shows that 11 v 11 large sided game players had a higher mean score (M= 19.41) in agility than 4 v 4 small sided game players (M = 4.75) after five weeks study period. This means that 4 v 4 small sided game players took less seconds to complete Illinois agility test than football players who trained under 11 v 11 large sided games.

This suggests that football training under 4 v 4 small sided games improved agility skills of female football players better than training under 11 v 11 large sided games.

To find out if this difference was statistically significant, we consult the Mann Whitney test presented in table 3b.

Table 3b: Characteristics variables mean difference in agility between 4 v 4 small sided games and 11 v 11 large side game players.

Test Statistics ^a	
	AGILITYSCORES
Mann-Whitney U	2.000
Wilcoxon W	38.000
Z	-4.230
Asymp. Sig. (2-tailed)	.000
Exact Sig. [2*(1-tailed Sig.)]	.000 ^b

a. Grouping Variable: GROUP
 b. Not corrected for ties.

A Mann Whitney test indicated that the agility score was significantly lower for 4 v 4 small sided game players (M = 4.75) than for 11 v 11 large sided game players (M = 19.41), $u = 2.00, p = .000$. Table 3b indicate that there was statistically significant difference in mean gain scores between female football players who trained under 4 v 4 small sided football games (M = 4.75) and under 11 v 11 large sided football games (M= 19.41), $u = 2, (p = .00 < 0.05)$. This means that there was a significant difference in agility scores between female players who trained under 4 v 4 small sided games and female players who trained under 11 v 11 large sided games after the 5 weeks training programme. This suggests that football training under 4 v 4 small sided football games improved the agility of female football players better than training under 11 v 11 large sided games.

1. There was statistically significant difference in agility between pre-test and post-test scores of female football players belonging to 4 v 4 small sided games and 11 v 11 large sided games.

2. There was statistically significant difference in agility mean gain score between 4 v 4 small sided games and 11 v 11 large sided games players after five weeks training programmes.

4. 3 cardiovascular endurance

To find out if there was a difference in cardiovascular endurance between pre-test and post-test scores of female football players belonging to 4 v 4 small sided games, Wilcoxon Signed Rank Test was used as presented in table 4a.

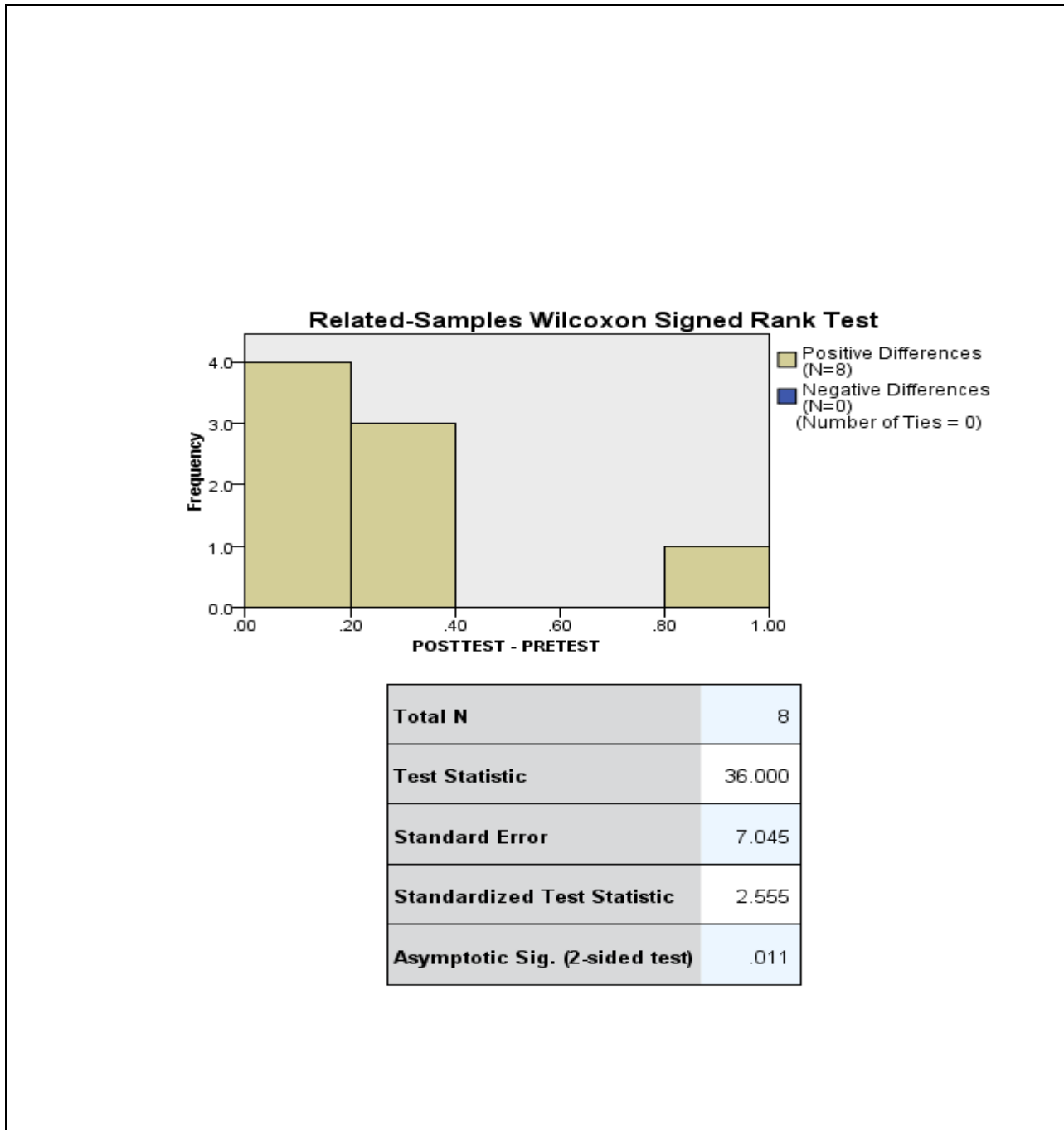
Table 4a: Characteristics variables mean difference in cardiovascular endurance between pre-test and post test scores of female players belonging to 4 v 4 small sided games.

Descriptive Statistics								
	N	Mean	Std. Deviation	Minimum	Maximum	Percentiles		
						25th	50th (Median)	75 th
PRETEST	8	14.6000	.68661	13.30	15.50	14.2000	14.6500	15.1750
POSTTEST	8	14.8375	.51530	14.10	15.60	14.3750	14.8000	15.3250

A Wilcoxon signed Rank Test in table 4a indicated that median post-test ranks, Mdn = 14.80 were higher than median pre-test ranks, Mdn, 14.65 ranks. Table 4a shows that female players who trained under 4 v 4 small sided games improved in cardiovascular endurance for post-test ranks, Mdn = 14.80 than for pre-test ranks, Mdn = 14.65 after five weeks study period. The median post-test ranks (Mdn = 14.80) were higher than the median pre-test Mdn = 14.65 ranks for female players under 4 v 4 small sided games training. This means that there was improvement in cardiovascular endurance after five weeks football training intervention.

To find out if this difference was statistically significant, we consult the Wilcoxon Signed Ranks Test as presented in Table 4b.

Table 4b: Characteristics variables mean difference in cardiovascular endurance between pre-test and post test scores of female players belonging to 4 v 4 small sided games.



A Wilcoxon Signed Rank Test indicated that post-test ranks, Mdn = 14.80, were statistically significantly higher than the median pre-test ranks $z = 36$, $p < .011$ for female football players belonging to 4 v 4 small sided games. Therefore, there is enough evidence to conclude that there

was a significant improvement in cardiovascular endurance of female players' who trained under 4 v 4 small sided games after completing the five weeks training programme. This means that football training under 4 v 4 small sided games improved cardiovascular endurance of female players during the study period.

To find out if there was a statistically significant difference in cardiovascular endurance between pre-test and post-test scores of female football players belonging to 11 v 11 large sided games, the Wilcoxon Sign Rank Test was used as presented in table 5a.

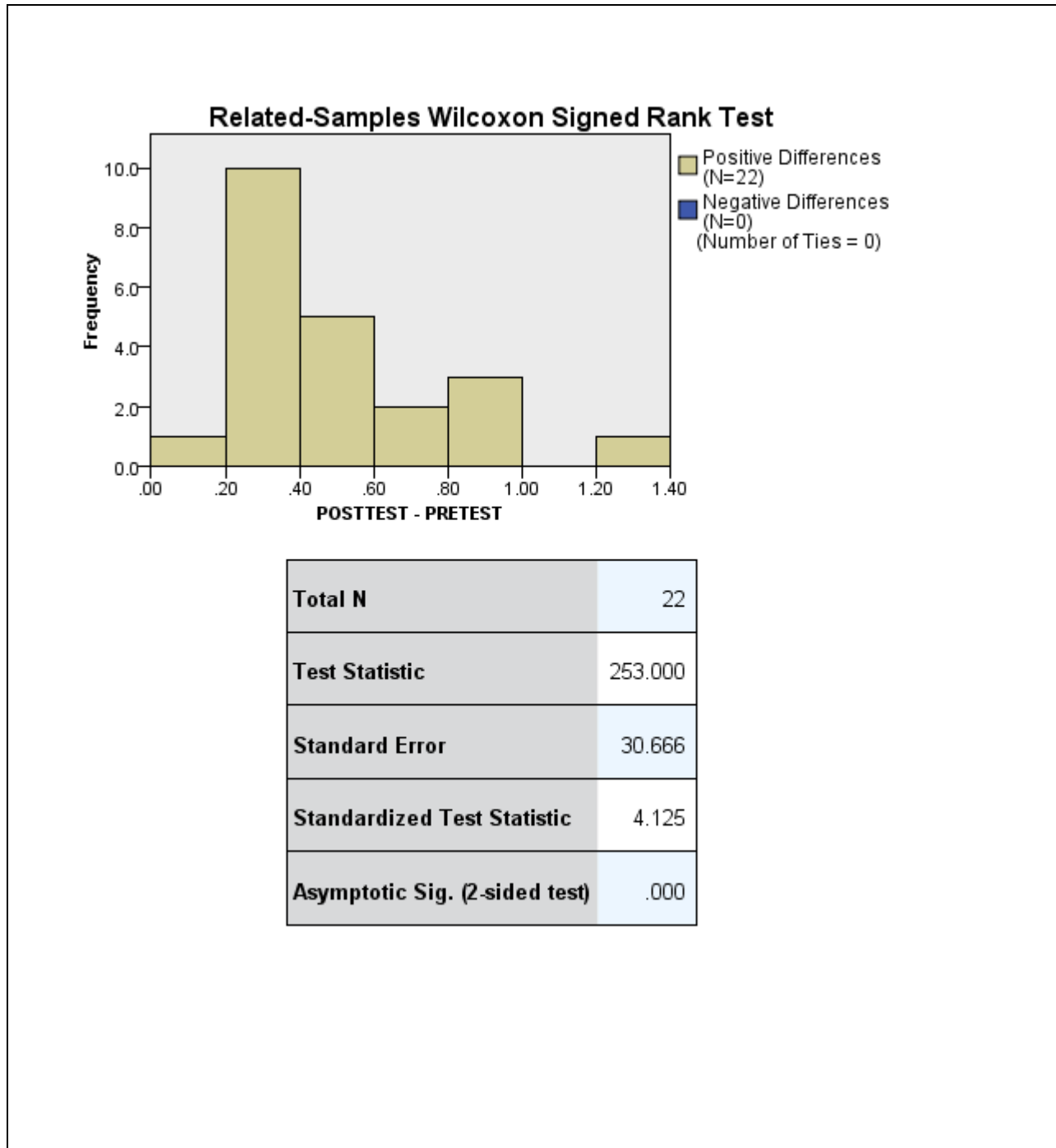
Table 5a: Characteristics variables mean difference in cardiovascular endurance between pre-test and post test scores of female players belonging to 11 v 11 large sided games.

Descriptive Statistics								
	N	Mean	Std. Deviation	Minimum	Maximum	Percentiles		
						25th	50th (Median)	75th
PRETEST	22	14.3727	.49491	13.10	15.40	14.2000	14.400	14.6250
POSTTEST	22	14.8045	.40057	14.30	15.70	14.5000	14.700	14.8750

A Wilcoxon signed Rank Test in table 5a indicated that median post-test ranks, Mdn =14.70 were higher than median pre-test ranks, Mdn= 14.40 ranks. Table 5a shows that female players who trained under 11 v 11 large sided games improved in cardiovascular endurance for post-test ranks, Mdn= 14.70 than for pre-test ranks, Mdn= 14.40 after five weeks study period. The median post-test ranks (Mdn= 14.70 were higher than the median pre-test Mdn= 14.40 ranks for female players under 11 v 11 large sided games training. This means that there was improvement in cardiovascular endurance after five weeks football training intervention

To find out if this difference was statistically significant, we consult the Wilcoxon Signed Ranks Tests as presented in Table 5b.

Table 5b: Characteristics variables mean difference in cardiovascular endurance between pre-test and post test scores of female players belonging to 11 v 11 large sided games.



A Wilcoxon Signed Rank Test indicated that post-test ranks, Mdn = 14.70, were statistically significantly higher than the median pre-test ranks $z = 253$, $p < .001$ for female football players

belonging to 11 v 11 large sided games. Therefore, there is enough evidence to conclude that there was a significant improvement in cardiovascular endurance of female players' who trained under 11 v 11 large sided games after completing the five weeks training programme. This means that football training under 11 v 11 large sided games improved cardiovascular endurance of female players during the study period. This suggests that training under 11 v 11 large sided games improved cardiovascular endurance of female players after five weeks football training intervention period. Therefore, based on the results it can be concluded that the intervention was a success.

To find out if cardiovascular endurance gain score as measured by yo-yo intermittent test was statistically significantly different between female student footballers training to improve cardiovascular endurance under 4 v 4 small sided football games training and under 11 v 11 large sided football games training, the Mann Whitney test was used as presented in table 6a.

Table 6a: Gain score between 4 v 4 small sided games and 11 v 11 large sided game players.

Ranks				
	Group	N	Mean Rank	Sum of Ranks
Cardiovascular endurance gain scores	4 v 4 small sided games	8	9.13	73.00
	11 v 11 large sided games	22	17.82	392.00
	Total	30		

A Mann Whitney test indicated that the cardiovascular endurance gain score was significantly greater for 11 v 11 large sided game players ($M = 17.82$) than for 4 v 4 small sided game players ($M = 9.13$). A Mann Whitney test conducted to compare cardiovascular endurance mean gain score between 4 V 4 small sided game players and 11 v 11 large sided game players. Table 6a shows that 11 v 11 large sided game players had a higher mean gain score ($M=17.82$) in cardiovascular endurance than 4 v 4 small sided game players ($M = 9.13$) after five weeks study period. This means that 11 v 11 large sided game players increased in the number of levels completed when performing yo-yo intermittent test after training intervention period than 4 v 4

small sided games players. This suggests that football training under 11 v 11 large sided games improved cardiovascular endurance skills of female football players better than training under 4 v 4 small sided games.

To find out if this difference was statistically significant, we consult the Test statistics presented in table 6b.

Table 6b: Characteristics variables mean gain difference in cardiovascular endurance between 4 v 4 small sided games and 11 v 11 large sided games.

Test Statistics ^a	
	Cardiogains
Mann-Whitney U	37.000
Wilcoxon W	73.000
Z	-2.431
Asymp. Sig. (2-tailed)	.015
Exact Sig. [2*(1-tailed Sig.)]	.016 ^b

a. Grouping Variable: cardio
b. Not corrected for ties.

A Mann Whitney test indicated that the cardiovascular endurance gain score was significantly greater for 11 v 11 large sided game players (M = 17.82 than for 4 v 4 small sided game players (M =9.13), u = 37, p = .015. This means that football training under 4 v 4 small sided games and 11 v 11 large sided games improves cardiovascular endurance of female football players.

1. There was statistically significant difference in cardiovascular endurance between pre-test and post test score of female football players belonging to 4 v 4 small sided games and 11 v 11 large sided games.

2. There was statistically significant difference in cardiovascular endurance mean gain score between 4 v 4 small sided games and 11 v 11 large sided games players after five weeks training programmes.

4. 4 Body composition

To find out the mean difference in body composition between pre-test and post-test scores of female football players belonging to 4 v 4 small sided games, the dependent t-test was used as presented in table 7a.

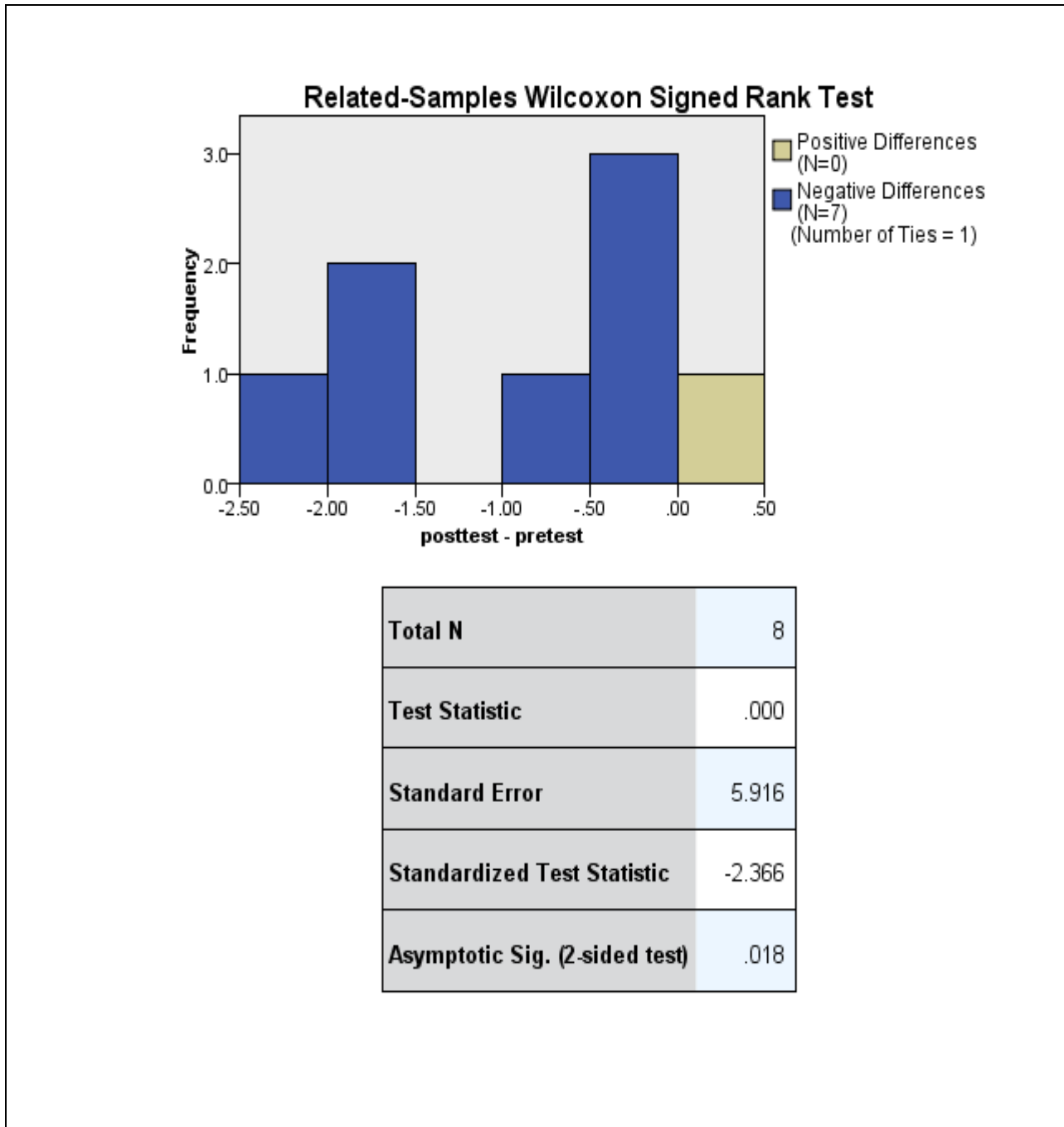
Table 7a: Characteristics variables mean difference in body composition for 4 v 4 small sided game players.

Descriptive Statistics								
	N	Mean	Std. Deviation	Minimum	Maximum	Percentiles		
						25th	50th (Median)	75th
pretest	8	24.0763	3.63338	19.40	29.90	20.9725	23.8150	26.9725
posttest	8	23.1425	2.93836	18.97	27.77	20.6000	23.4300	25.1850

A Wilcoxon signed Rank Test in table 7a indicated that median post-test ranks, Mdn = 23.43 were lower than median pre-test ranks, Mdn, 23.82 ranks. This means that there was decrease in body composition of female players who trained under 4 v 4 small sided games after five weeks football training intervention. This suggests that body composition of female football players who trained under 4 v 4 small sided games improved after five weeks of study period

To find out if this difference was statistically significant, we consult the Wilcoxon Signed Ranks Test as presented in Table 7b.

Table 7b: Characteristics variables mean difference in body composition between pre-test and post test scores of female players belonging to 4 v 4 small sided games.



A Wilcoxon Signed Rank Test indicated that post-test ranks, Mdn = 23.43, were statistically significantly lower than the median pre-test ranks Mdn = 23.82, $z = .00$, $p < .018$ for female football players belonging to 4 v 4 small sided games. Therefore, there is enough evidence to

conclude that there was a significant improvement in body composition of female players' who trained under 4 v 4 small sided football games after completing the five weeks training programme. This means that training under 4 v 4 small sided football games improved body composition of female players during the study period.

To find out mean difference in body composition between pre-test and post-test scores of female football players belonging to 11 v 11 large sided games, the Wilcoxon Signed Rank Test was used as presented in table 8a.

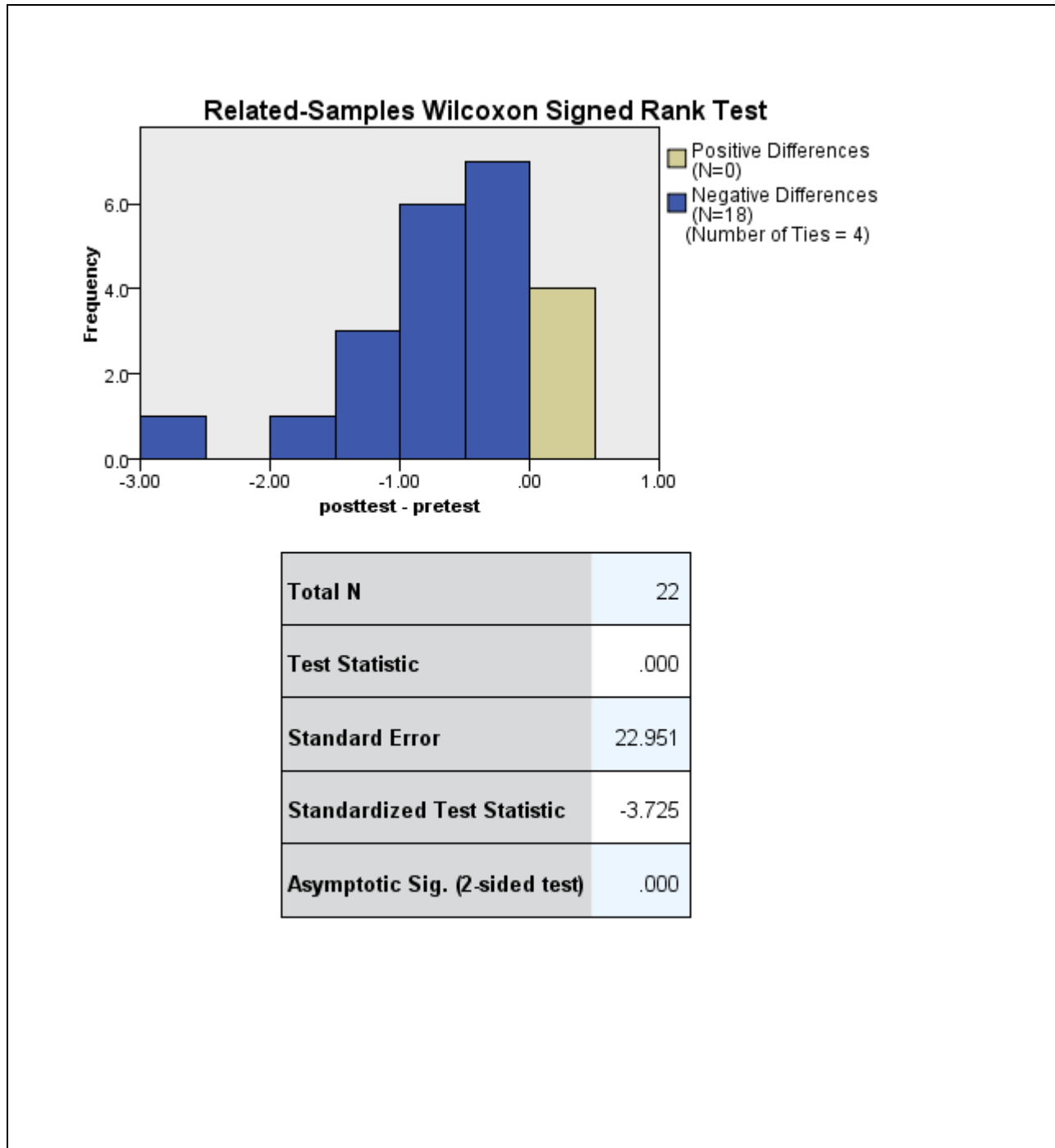
Table 8a: Characteristics variables mean difference in body composition between pre-test and post test scores of female players belonging to 11 v 11 large sided games

Descriptive Statistics								
	N	Mean	Std. Deviation	Minimum	Maximum	Percentiles		
						25th	50th (Median)	75th
pretest	22	23.4250	3.04669	18.37	30.48	21.7250	23.1900	25.7950
posttest	22	22.7100	2.86520	17.51	28.58	20.7275	22.5300	24.3225

A Wilcoxon signed Rank Test in table 8a indicated that median post-test ranks, Mdn = 22.53 were lower than median pre-test ranks, Mdn= 23.19 ranks after five weeks football training intervention for female football players who trained under 11 v 11 large sided games. This means that there was decrease in body composition for female players after post-test than in pre-test scores after five weeks football training intervention. This decrease suggests that there was improvement in body composition after five weeks of study period.

To find out if this difference was statistically significant, we consult the Wilcoxon Signed Ranks Tests as presented in Table 8b.

Table 8b: Characteristics variables mean difference in body composition between pre-test and post test scores of female players belonging to 11 v 11 large sided games.



A Wilcoxon signed Rank Test indicated that post test scores were statistically significantly lower than pre-test scores $z = .000, p < .001$ for female football players belonging to 11 v 11 large sided

games. Therefore, there is enough evidence to conclude that there was a significant improvement in cardiovascular endurance of female players' who trained under 11 v 11 large sided games after completing the five weeks training programme. This means that football training under 11 v 11 large sided games improved body composition of female players during the study period. This suggests that training under 11 v 11 large sided games improved cardiovascular endurance of female players after five weeks football training intervention period. Therefore, based on the results it can be concluded that the intervention was a success.

To find out if body composition means decrease score was different between female student footballers training to improve body composition under 4 v 4 small sided football games training and 11 v 11 large sided football games training, the Mann Whitney Test was used as presented in table 9a.

Table 9a: Gain score between 4 v 4 small sided games and 11 v 11 large sided game players

Ranks				
Group		N	Mean Rank	Sum of Ranks
Body composition	4 v 4 small sided games	8	14.56	116.50
	11 v 11 large sided games	22	15.84	348.50
	Total	30		

A Mann Whitney test indicated that the body composition score was significantly lower for 4 v 4 small sided game players (M = 14.56) than for 11 v 11 large sided game players (M = 15.84) after five weeks study period. This means that 4 v 4 small sided football game players decreased their body composition more than 11 v 11 large sided game players after five weeks study period. The lower negative mean gain score means wider margin of decrease from pre-test to post test score for 4 v 4 small sided games training. These results suggest that football training under 4 v 4 small sided games improved body composition of female players better than training under 11 v 11 large sided games training.

To find out if this difference was statistically significant, we consult the Mann Whitney Test presented in table 9b.

Table 9b: Characteristics variables mean gain difference in cardiovascular endurance between 4 v 4 small sided games and 11 v 11 large sided games

Test Statistics ^a	
	GAINSCORES
Mann-Whitney U	80.500
Wilcoxon W	116.500
Z	-.353
Asymp. Sig. (2-tailed)	.724
Exact Sig. [2*(1-tailed Sig.)]	.730 ^b

a. Grouping Variable: group
b. Not corrected for ties.

A Mann Whitney test indicated that the body composition score was not significantly different between 4 v 4 small sided game players (M =14.56 and 11 v 11 large sided game players (M =15.84), u = 80.50,p = .724. Table 9b indicate that there was no statistically significant difference in mean scores between female football players who trained under 4 v 4 small sided football games (n=8, mean score = 14.56) and under 11 v 11 large sided football games (n=22, M = 15.84),u = 80.50, (p= .724 > 0.05). Therefore, there is enough evidence to conclude that there was no significant difference in body composition between players' who trained under 4 v 4 small sided and 11 v 11 large sided football games after the five weeks training programme. This suggests that football training under both 4 v 4 small sided football games and 11 v 11 large sided football games improved the body composition of female football players.

1. There was statistically significant difference in body composition between pre-test and post-test scores of female soccer players belonging to 4 v 4 small sided games and 11 v 11 large sided games.
2. There was no statistically significant difference in body composition mean gain score between 4 v 4 small sided games and 11 v 11 large sided games after five weeks training programmes.

CHAPTER FIVE

DISCUSSION

5.1 Introduction

The purpose of the study was to compare selected physical fitness variables between 4 v 4 small-sided games and 11 v 11 large sided games. The variables of study were the agility, cardiovascular endurance and body composition. Fitness levels were determined by assessing participants on Illinois agility test to examine agility, yo-yo intermittent test to measure cardiovascular endurance while body composition was measured by calculating body mass index (BMI). The main findings of the study are that 4 v 4 small sided games and 11 v 11 large-sided games demand different physical efforts from players in terms of running, sprinting, loading, and positional roles; and large-sided games (11 v 11 large sided games) simulate the official full match more accurately than other sided games in terms of sprinting and loading demands.

The difference in physical fitness levels achieved through small-sided games and large-sided games training is related to the theories surrounding the framework of ecological dynamics. The researcher used the theoretical framework to demonstrate that with changing task constraints (4 v 4 small sided games and 11 v 11 large sided games) and altering pitch dimensions at the same time, we can manipulate the small sided games intensities in female soccer players. From ecological dynamic perspective skilled behaviour is viewed as the emergence of functionally adaptable performance solutions (Araújo et al., 2020). In this theoretical framework behaviour is a self-organizing phenomenon that emerges from the continuously dynamic interplay of an organism's characteristics and the affordances (Gibson, 1979) offered in a specific competitive performance environment (Araújo et al., 2006). Information in the environment is directly perceived, which contains affordances (opportunities for action). Information specifies affordances, those properties of the environment whose perceived meaning is the actions they both allow and invite organism to perform (Araujo & Davids, 2011).

In this study, 4 v 4 small sided games allowed players to make more agility manoeuvre and decreased body composition while 11 v 11 large sided games affordances were large space for running thereby improved cardiovascular endurance as players continued running to cover

spaces during defence and create spaces during attack. This study used insights from ecological dynamics to ensure that practice and training task constraints are representative of a particular sport performance context toward which they are intended to generalize in agreement with the arguments of (Chow et al., 2011; Pinder et al., 2011). When designing learning tasks and performance simulations, the manipulation of key task constraints by practitioners (particularly perception-action constraints) should allow functional movement behaviours to emerge during learning in specific sports and physical activities in a representative environment. A representative training environment will maintain functionality and action fidelity of sport. The key premise being that when practice replicates the performance environment, skills are more likely to transfer (Krause et al., 2018).

Learning is the process of becoming attuned to key sources of information that can be used to complete a task, and coupling with functional movement/action. When the sources of information players are using to select and control their actions (on or off the ball) varies from those used in a match, we may only see limited transfer and gains in the match environment. A most obvious example of this rarely in a team sport will a cone or marker is present on the field of play that specifies where a player should place themselves yet this is popular in many training sessions.

Coaches around the world require athletes who are faster, quicker and more powerful, which makes a difference between winners and losers. The coaches formulate and implement various training methods to maximize players' performance. Success in soccer requires high levels of technical, tactical, psychological and physical skills including aerobic and anaerobic power, muscle strength, flexibility and agility as well as BMI. During a soccer game, players perform repeated bouts of low-level activity such as walking, jogging or cruising in conjunction with high-intensity actions such as sprinting, jumping and directional changes. The ability to sprint, accelerate and decelerate alongside change of direction is commonly known as agility. Agility has been, indeed, defined as a rapid whole-body movement with change of velocity or direction in response to a "stimulus" (Sheppard & Young, 2006). Adhering to this definition, it is well recognized that agility is composed of perceptual and decision making factors, as well as change of direction (COD) components. Agility is often seen in the game, which requires technical, tactical, psychological, and physical and change of direction performances.

5. 2 Effects of intervention on agility

To find out the efficacy of five weeks training programme on agility skill, the Wilcoxon Signed Rank Test was used to compare the pre-test and post test scores from the Illinois agility test to see if there was a statistical significant difference in football players who trained under 4 v 4 small sided games. The results reveal that there was statistical significant difference between pre-test and post test scores of female football players who trained under 4 v 4 small sided games to improve agility. The 4 v 4 small sided game players had statistically significantly lower agility score than 11 v 11 large sided game players. This suggests that female football players who were trained under 4 versus 4 small sided games improved in agility skill.

To find out the efficacy of five weeks training programme on agility skill, the Wilcoxon Signed Rank Test was used to compare the pre-test and post test scores from the Illinois agility test to see if there was a statistical significant difference in football players who trained under 11 v 11 large sided games. The results reveal that there was also statistical significant difference between pre-test and post test scores of female football players who trained under 11 v 11 large sided games to improve agility. This suggests that female football players who trained under 11 v 11 large sided games improved in agility skill.

To find the significance difference in the gain scores between the two groups (4 v 4 small sided games and the 11 v 11 large sided games) the Mann Whitney test was used. The results show that there was statistical significance difference in agility gain scores between the 4 v 4 small sided games and 11 v 11 large sided game players. The 4 v 4 small sided football game players had statistically significant lower agility gain score as compared to the 11 v 11 large sided games. This suggests that female footballers who trained under 4 v 4 small sided games improved in agility skills than those who trained under 11 v 11 large sided games. The sign is negative because there is decreasing of seconds taken to complete the Illinois agility test from pre-test mean score to post-test mean score. According to David et al. (2000), pre-test mean score is rated poor while post-test mean score is average (normal) on Illinois agility test norms shown in Appendix IV. This finding is in agreement with the studies of Young and Roger (2014) who found that small-sided games improved agility performance in Australian football players although their study compared agility between change of direction training group and small sided

games group and not between 4 v 4 small sided games group and 11 v 11 large sided games group. Likewise, Chaouachi et al. (2014) also reported that agility could be improved using small-sided games or change of direction sprints in young male soccer players. The findings are in agreement with Young and Rogers (2014) who argued that small-sided games (SSGs) have emerged, since they represent typical exercises for soccer players as they mimic the specific actions of soccer games.

There have been four main interventions used to improve agility, which include speed, agility, and quickness training; strength training; plyometric training; and small-sided games (SSG) and evasion drills. Commonly speed, agility and quickness training is used to improve the technical aspect of agility, whereas plyometric and strength training is aimed at the physical aspect (Milanović et al., 2013). To improve the cognitive aspect of agility, researchers have used small-sided games training and evasion drills (Young & Rogers, 2014; Chaouachi et al., 2014; Trecroci et al., 2016) but this study contradicts (Milanovic et al., 2013),s findings as it shows that 11 v 11 large sided games also improves agility of players. The 11 v 11 large sided games training group shows -1.81 mean gain or improvement from pre-to post-test. It is clear from this study that agility performance can be improved by using both 4 v 4 small-sided games training group and 11 v 11 large sided games training group. Therefore the researcher establishes 11 v 11 large sided games as intervention five in addition to the four main ones.

The researcher observes that training under both 4 v 4 small sided games and 11 v 11 large sided games improves physical fitness of female football players. The findings of this study contradicts the findings of (Paul et al., 2016) who argues that 4 v 4 small-sided games training could be an excellent training method to improve agility performance in athletes. Paul et al. (2016) also argues that small sided games include sport specific stimuli, and the athlete must make decisions according to the stimuli, before change of direction. The researcher establishes that 11 v 11 large sided games also include sport specific stimuli and the athlete make decisions according to the stimuli before change of direction. The researcher also establishes that the total number of agility manoeuvres in 4 v 4 small sided games training group are more than in 11 v 11 large sided games. The findings of this study shows that the 4 v4 small sided games training group took less time to complete the Illinois agility test as compared with the 11 v 11 large sided games group during post-test.

Young and Rogers (2014) in their study found that SSG's, specifically planned for Australian Rules football, produced significantly better results in an Australian rules football specific reactive agility test (RAT) than change of direction training. Rules for the small sided games were modified so that they encourage players to evade their opponent and to improve agility. They show that the small sided games group improved their total and decision time significantly more when compared to the change of direction group (Young & Rogers, 2014). This study establishes that Young and Rogers (2014) findings are flawed as change of direction training that was compared with the small sided games does not represent or simulate game situation and hence having insignificant effect on agility improvement.

In another study, Chaouchi et al. (2014) shows that small-sided games improved agility time more in U-15 football players than the change of direction sprint group. In contradiction (Chaouchi et al., (2014), found that the change of direction (COD) sprint group improved linear sprinting speed and COD speed more than the small sided games (SSG) group as could be expected based on the specificity principle. The researcher in this study observes that (Young and Rogers, 2014; Chaouchi et al., 2014) compared small sided games training groups with change of direction (COD) training groups. The change of direction training is a closed skill which rarely occurs in football where change of direction is pre-planned around cones while agility is an open skill due to its reactivity in nature. If there is no reaction, it's not agility. Agility is defined as 'a rapid whole-body movement with change of velocity or direction in response to a stimulus' (Sheppard & Young, 2006). In this study both 4 v 4 small sided games and 11 v 11 large sided games training group involves open skills where change of direction is not planned which makes it different from the study conducted by (Young and Rogers, 2014; Chaouchi et al., 2014).

The Chaalali et al. (2016) study demonstrates similar results to (Chaouchi et al., 2014). In their study, the agility training group improved agility time more than the COD group. Similar to (Chaouchi et al., 2014; Chaalali et al., 2016) shows that COD training improved linear sprint and COD speed more than the agility training group. These bring up the question if a combination of SSG/agility training and COD speed training, could improve agility performance even more than just SSG/agility training. These two studies show that SSG and COD training methods improve different aspects of physical performance, so combining these two methods could improve RAT

time and agility more than SSG/agility training alone. Chaalali et al. (2016) study compared COD training group with agility training group but this current study compares 4 v 4 small sided games with 11 v 11 large sided games to establish which game between the two improves the agility of players better. The results of the study reveals that while 4 v 4 small sided games improved the agility of female players better than the 11 v 11 large sided game players, there is trivial differences between the two.

Both Chaouchi et al. (2014) and Chaalali et al. (2016) found that SSG training was more advantageous in developing agility when compared to COD training. Both groups also show that COD training was more beneficial in improving COD speed when compared to SSG training (Chaouchi et al., 2014; Chaalali et al., 2016). This supports the fact that agility and COD are separate skills and different training methods are needed to improve these skills. If these training methods are combined, athletes should improve the cognitive, technical, and physical aspects of agility at the same time. This combination should improve the athletes' agility performance more than either of these methods separately.

The study conducted by (Chaouchi et al., 2014; Chaalali et al., 2016) are enigmatical since COD is a subset of small sided games and change of direction training was pre-planned. The change of direction training movement indicates that movement was directed towards the intended direction changes which rarely occur in soccer since there is lack of reactive stimulus. The small sided games training have unpredictable nature of the unplanned making movement in either direction easier. Therefore the results of their findings were expected to favour small sided games because COD trainings do not replicate the technical aspects of agility as each of these technical aspects are preparing for a sharp rapid change in velocity in response to a sport specific stimulus. However, the researcher in this study compared 4 v 4 small sided games and 11 v 11 large sided games of which both involves unplanned movement in improving agility. The results of this study demonstrates that 4 v 4 small sided games and 11 v 11 large sided games distinctions is in the frequency of agility manoeuvre. The post test results show that the mean time to complete Illinois agility test decreased in 4 v 4 small sided games than in 11 v 11 large sided games.

5. 3 Effects of intervention on cardiovascular endurance

Cardiovascular endurance levels were determined by assessing participants on, yo-yo intermittent test level 1 to measure cardiovascular endurance. The main findings of the study are that football trainings under 11 v 11 large side football games improved cardiovascular endurance of female football players than 4 v 4 small sided games after five weeks study period. The study reveals that 11 V 11 large sided football game players had statistically significantly higher cardiovascular endurance score than 4 v 4 small sided football games.

The effects of five weeks training programmes schedule have shown slightly higher improvements in cardiovascular endurance of the football players who trained under 11 v 11 large sided games than for the players under 4 v 4 small sided games. The study reveals that football training under 11 v 11 large sided games players show higher cardiovascular endurance gain score from pre-to post-test than for 4 v 4 small sided game players. This study establishes that there was statistically significant difference between 4 v 4 small sided games and 11 v 11 large sided games in cardiovascular endurance despite having higher mean gain score. The 11 v 11 large sided game players had statistically significantly higher cardiovascular endurance score than 4 v 4 small sided football games players.

To find out the efficacy of five weeks training programme on cardiovascular endurance skill, the Wilcoxon Signed Rank Test was used to compare the pre-test and post test scores from the yo-yo test to see if there was a statistical significant difference in football players who trained under 4 v 4 small sided games. The results reveal that there was statistical significant difference in cardiovascular endurance between pre-test and post test scores of female players who trained under 4 v 4 small sided games. This suggests that female football players who trained under 4 versus 4 small sided games improved in cardiovascular endurance. This finding is in agreement with (Köklü, 2012) who argues that aerobic fitness is a well-established physical component for soccer players and interval training using small sided games (SSG) has been shown to be effective for enhancing cardiovascular fitness and soccer specific endurance.

Dellal et al. (2012) in their study reveals a moderate beneficial effect of SSG on intermittent endurance measured by the 30–15 Intermittent Fitness Test (30-15 IFT). It is well recognised that repeated high and low intensity actions are of great interest to football and fitness coaches in many team sports. This suggests that, repeated high and low intensity action under 4 versus 4 small sided games enhances the cardiovascular fitness of female football players. Dellal et al. (2012) show that 6 weeks of both SSG and HIT interventions were equally effective in developing the ability to perform intermittent exercises with changes of direction in male amateur soccer players though he did not specify the kind of small sided games.

The current results are in conjunction with the results of (Dellal et al., 2012) to demonstrates that small sided games seems to be slightly more physically strenuous than 11 v 11 large sided games which is also known as traditional training approaches as demonstrated by the elevated HR responses, which may potentially evoke greater improvements in cardiovascular function and subsequently aerobic fitness adaptations.

To find out the efficacy of five weeks training programme on cardiovascular endurance skill, for players who trained under 11 versus 11 large sided games, the Wilcoxon Signed Rank Test was used to compare the pre-test and post test scores from the yo-yo test to see if there was a statistical significant difference. There was statistical significant difference between pre-test and post test scores for players who trained under 11 versus 11 large sided games. This suggests that 11 v 11 large sided football games training improve cardiovascular endurance of female football players. Owen, Wong, McKenna, & Dellal (2011) argue that when the size of the playing area increases, players have less ball possession and need to run more in defensive to close gaps and apply pressure and offensive to open spaces and build up moments of the game. The 11 v 11 large sided games players have an element of running more in defensive to close gaps and apply pressure but also in offensive to open spaces and build up moments of the game.

According to Owen et al. (2014) football players who train under large sided games cover long distances during matches. The pitch dimensions under large sided games could be possible influential factor in enhancing player performance. Indeed, covering a greater distance during a match has been highlighted as a distinguishing factor between players with different skill levels (Mohr et al., 2003). However, the results of this study suggest that while covering greater distance is vital, it is apparent that greater sprint or greater speed is vital in improving cardiovascular endurance of female soccer players. It is not about the distance one covers but how long is the player covering that distance because the running speed increased at regular intervals during yo-yo intermittent test.

To find the significance difference in the gain scores between the two groups (4 v 4 small side game players and the 11 v 11 large sided game players) the Mann Whitney test was used. The results show that there was statistical significance difference in the gain scores between the 4 v 4 small sided games and 11 v 11 large sided game players. The 11 v 11 large sided football game players had statistically significantly higher cardiovascular endurance gain scores than for 4 v 4 small sided football game players. This suggests that female players who are trained under 11 v 11 large sided games improve in cardiovascular endurance better than 4 v 4 small sided football games training. The results, however, are in disagreement with those of (Casamichana et al., 2012), who did not report statistically significant differences between small to large sided game formats in terms of the amount of running activity required. The size of the playing area used in the study of (Casamichana et al., 2012) for sided games was (210 m²). The present study used 30m by 20m in size of the playing area for 4 v 4 small sided games while the 11 v 11 large sided games used 110m by 75m.

The results of this study show that, in terms of running at a speed, football trainings under both 11 v 11 large sided games and 4 v 4 small sided games format are most indistinguishable to an official match with minutest difference. The efficacy of the training programme, in this study establishes that trainings under both 4 v 4 small sided games and 11 v 11 large sided games improve cardiovascular endurance. The significance of speed is well recognized by the findings of Casamichana et al. (2012), which reveal that higher level competitions demand greater running performance in elite soccer players.

There was statistically significant difference in mean gain score between 4 v 4 small sided games and 11 v 11 large sided game players. The training under large sided games recorded higher mean gain score than 4 v 4 small sided games. This suggests that players who were training under 11 v 11 large sided games improved in cardiovascular endurance better than female players' who trained under 4 v 4 small sided games.

The results of this study reveals that 4 v 4 small sided games does involve more sprints of shorter distances while 11 v 11 large sided games involves sprints covering long distances replicating the game situations. The fact that trainings under 4 v 4 small sided games recorded slightly lower mean gain score in yo-yo intermittent test level 1 is probably because of the lack of speed sprints endurance required to have a complete successful shuttle while 11 v 11 large sided games involves speed sprints which are longer.

The finding of the study reveals that, 11 v 11 large sided games also demand greater sprint performance than the 4 versus 4 small sided formats. These results suggest that 11 v 11 large sided games simulate a full match while 4 v 4 small sided games cannot completely simulate a full match as it lacks coordination aspect. However, as the number of players and pitch size increase, the conditions become more similar to those of a real match scenario in terms of sprint performance. These results are in agreement with the findings of (Casamichana et al., 2012; Gabbett & Mulvey, 2008) who reported higher number of sprints and greater sprint distance (Casamichana et al., 2012; Owen et al., 2014) in full matches than in small or medium sided games. The results of the study contradict the findings of (Casamichana et al, 2012; Gabbett & Mulvey, 2008) on reported higher number of sprints for large sided games compared with the small sided games. This study establishes that 4 v 4 small sided games have higher frequency of sprints and shorter sprint distances while 11 v 11 large sided games have less number of sprints and greater sprint distances.

The sprint performances are vital as players in international level competitions shows greater sprint performances than players in domestic and national level games (Gabbett & Mulvey, 2008). Because players are more involved with the ball and because space is limited in smaller rectangles (Owen et al., 2011), high speed thresholds are not usually reached, and so lower sprint performance and greater speeding up or slowing down would be expected on smaller pitches.

Hill-Haas et al. (2009) argues that medium to large sided games and official matches put different demands on players in terms of running, sprinting, loading, and positional characters. The 11 v 11 large sided games mimic official full matches more precisely than the 4 v 4 small sided games and that the Yo-Yo IR1 performance was improved by five weeks of training. The lack of significant improvements in soccer specific endurance performance after 4 v 4 small sided games training intervention in the present study is confirmed by Impellizzeri (2006) who used the Ekblom's circuit test to measure soccer specific endurance of players after various small sided games training interventions.

This study compared physical fitness between 4 v 4 small sided games and 11 v 11 large sided game players. After five weeks of training intervention, the post test results shows that training under 11 v 11 large- sided game and under 4 v 4 improved players cardiovascular endurance. To find out the efficacy of five weeks training programme on cardiovascular endurance skill, gain score (Post-test mean score – Pre-test mean score) was calculated for 4 v 4 small sided games and 11 v 11 large sided games and compared. There was statistically significant difference in cardiovascular endurance gain scores between 4 v 4 small sided games and 11 v 11 large sided game players. The cardiovascular endurance score were statistically significantly higher for 11 v 11 larger sided football game players than for 4 v 4 small sided football game players.

5. 4 Effect of intervention on body composition

Body composition reflects the individual's energy balance and is a health-related component of physical fitness. It is also vital aspect of fitness for football as excess adipose tissue acts as dead weight in activities where body mass must be lifted repeatedly against gravity. This situation applies to locomotion during play and in jumping for the ball. Whilst the amount of adipose tissue is not necessarily correlated with work-rate across a squad of players, players losing body

fat are likely to increase their work-rate and endurance performance as a direct result (Reilly, 2006).

The present study compared the effect of five weeks of football training in body composition between 4 v 4 small-sided games and 11 v 11 large sided game groups. The results show that female players who were trained under 4 v 4 small sided games improved in body composition for post-test scores than for pre-test score after five weeks study period. The results show that there was statistically significant decrease in the post test scores than for pre-test. These results suggest that football training under 4 v 4 small sided games improve body composition of female football players.

The results also show that female players who were trained under 11 v 11 large sided games improved in body composition for post-test scores than for pre-test score after five weeks of study period. The result shows that there was statistically significant decrease in body composition for post test score than for pre-test scores. These results suggest that football training under 11 v 11 large sided games improve improved body composition of female players after five weeks football training intervention..

To find the significance difference in the gain scores between the two groups (4 versus 4 and the 11 versus 11) the Mann Whitney test was used. The results show that there was no statistical significant difference between the 4 v 4 small sided games and 11 v 11 large sided game players. This suggests that female players who were trained under both 4 v 4 small sided games and 11 v 11 large sided games decreased their body composition. The findings in this study show that football training is effective to improved body composition by decreasing of BMI and total body weight in female footballers. The researcher observed a higher decrease in body mass index in small sided games while trivial changes was recorded in 11 v 11 large sided games players. The result shows that the difference between the training under 4 v 4 small sided games and 11 v 11 large sided games was not statistically significant.

The study findings are similar to (Krustrup et al, 2003) who found a significant decline in body fat in a recreational football group and comparable running group, with no significant changes in HIIT, short-term strength training, and control groups. In addition, intermittent low to moderate-intensity activities during recreational football might increase fat oxidation compared to HIIT.

The present data demonstrate that both 4 v 4 small sided game and 11 v 11 large sided game football training interventions lasting five weeks (4×80 -minute sessions/week) can promote a decrease in body composition as measured in BMI, which is clinically significant for overweight and obese children. In agreement, marked improvement were observed for a group of middle-aged men performing regular football training consisting of small-sided games, but in that study most of the participants had prior experience with football. Regular recreational football training influences body composition. Loss of body fat in middle-aged men was in the range of 1–3 kg following 3 months of training, corresponding to a reduction in fat percentage of 1–3% (Krustrup et al., 2003). However, this study compared 4 v 4 small sided games with 11 v 11 large sided games and specifies the kind of sided games that decreased body composition of players.

The findings are in agreement with (Khadije et al., 2018) who studied a 12-week of recreational football on 25-45 year-old men although this study critiques them for lacking comparison of training groups. The findings of the study they conducted reveal that football practice has decreased body mass ($-1/6 \pm 1/8$ to $1/5 \pm 2/1$), adipose tissue ($2/0 \pm 1/5$ to $1/5 \pm 1/6$), and has increased pulse variable, which matches the results of this research. This study shows that football training under both 4 v 4 small sided games and 11 v 11 large sided games are effective in decreasing body mass index throughout the 5-week training period. Although there was no statistically significant difference between the two groups, the higher decrease was observed on players who trained under 4 v 4 small sided games than for 11 v 11 large sided games. The results suggest that 4 v 4 small sided games consisted of multiple intense actions with runs of backwards and sideways, shots and turns interspersed by low-intensity recovery periods than 11 v 11 large sided games. However, both 4 v 4 small sided games and 11 v 11 large sided game football training group appears, to be effective in stimulating to performance development throughout a 5-week training period and to cause decreasing significant body composition including BMI.

Burke et al. (1986) and Reilly (2003) suggest that football players can accumulate body fat in the off-season and lose weight more during pre-season training time than in other periods. However, despite the fact that preseason conditioning phase is the most intensive (Reilly, 2003), both 4 v 4 small sided game and 11 v 11 large sided games football players in this study received training intervention during same time period. This study refutes the assertion by (Burke et al, 1986;

Reilly, 2003) who claim that football players can accumulate body fat in the off-season and lose weight more during pre-season training time than in other periods. The study reveals that the five weeks intervention training programme had an effect regardless of the season the study was conducted. After five week training intervention, the post test results show that training under both 4 v 4 small sided games and 11 v 11 large sided games decreased body composition of female football players. It is apparent that the results were due to the training intervention. The findings of the study are in line with Ostojic (2008) who argues that body fat of professional soccer players significantly drop during competitive periods.

Ostojic (2008) in his study concentrated on professional players while this study constitute or compare 4 v 4 small sided games and 11 v 11 large sided games of unprofessional female student footballers. According to Ostojic, (2008) body fat percent continued to decrease toward the end of the season for professional soccer players due to the change in the way of conditioning. The researcher in this study agrees with the conditioning justification but disagree with uniformity of conditions. The professional players, size of the pitch might have been same contradicting 4 v 4 small sided games which used small pitch size and less number of players and 11 v 11 large sided games which used larger pitch size and more number of players in this study. The football training under 4 v 4 small sided games decreased body composition of players than 11 v 11 large sided game groups although the difference was not statistically significant. The results of the study suggest that training under 4 v 4 small sided games help to improve body mass index of overweight and obese players than 11 v 11 large sided games. The body composition of players who were trained under 4 v 4 small sided games decreased more than for 11 v 11 large sided games as evidenced in the results for body mass index due to continuous running during training, which could have influenced the body weight status of players towards the end of the intervention. There was no statistically significant difference in body composition mean gain score between 4 v 4 small sided games and 11 v 11 large sided game players.

CHAPTER SIX

CONCLUSION, STRENGTHS AND LIMITATIONS AND RECOMMENDATIONS

6.1 Conclusion

The purpose of this study was to compare selected physical fitness variables between 4 v 4 small sided football games and 11 v 11 large sided football games in female student footballers at David Livingstone College of Education. The main finding was that there were statistically significant differences between 4 v 4 small sided games and 11 v 11 large sided games for the variable of agility but there was no statistically significant difference between the two groups on the basis of cardiovascular endurance and body composition. Football training under 4 v 4 small sided games improves agility skills of female players than training under 11 v 11 large sided football games training. Football training under both 4 v 4 and 11 v 11 large sided games improves cardiovascular endurance and decrease body composition of female football players. The differences in the selected physical fitness variables between two groups may be due to nature of games. The 4 v 4 small sided football games require, small spaces leading to more agility manoeuvres than 11 v 11 large sided games. The 11 v 11 large sided football games players require more running distances to close and open spaces during the game and increase team coordination. Therefore, both the small-sided games and large sided games trainings have extensive benefits and may be suggested as they complement each other.

6.2 Strengths and limitations

This study has several strengths and weaknesses. This was the first study, to this author's knowledge, to compare physical fitness between 4 v 4 small-sided games and 11 v 11 large sided games in female football players. The findings of the study show that 4 v 4 small-sided games improve agility of female players. The results from the study can be used to improve understanding of agility performance. The 11 v 11 large sided games and 4 v 4 small sided games training can be used by coaches, physical educator to improve cardiovascular endurance, and decreasing of body composition in female players especially overweight and obese players.

Despite the potential benefit of small sided games and large sided games for improving agility, cardiovascular endurance and body mass index in female footballers, some limitations in the study should be acknowledged. Firstly, the intervention programme was supposed to take six weeks but it was reduced to five weeks due to coronavirus where learning institutions were closed by the government. As a result of this closure of learning institutions, which shortened intervention period, the effect of the interventions might have been smaller than it would have been with a longer period. However, this has not affected the findings of the study in a significant way as similar study by Owen et al. (2012) used four (4) weeks to examine effects of a periodized small-sided game training intervention on physical performance in elite professional soccer and there was improvement in elite-level soccer players' physical fitness characteristics. Other similar studies that used five weeks intervention period or less includes Tomljanović et al. (2011), Herman, et al. (2008) and Zein, (2020).

6.3 Recommendations

When aiming to improve physical fitness levels in female footballers, coaches, physical education lecturers, physical education and sports teachers, football administrators, sports practitioners should use 4 v 4 small sided football games training method to improve agility component of physical fitness. The 4 v 4 small sided games training incorporate representative learning which simulates game situations. This could be done by introducing players to representative trainings environment to that of a real match or competition. The best training option is where the players need to read and react to the athletes' movements correctly to the affordances provided by the training environment. This resonates well with the perspectives of ecological dynamic theory that skilled behaviour is viewed as the emergence of functionally adaptable performance solutions (Araújo et al., 2020).

Coaches are encouraged to use 11 v 11 large sided games to improve cardiovascular endurance of female football players and not just concentrate on small sided games training.

Training to improve body composition, both 4 v 4 small sided football games training and 11 v 11 large sided football games training are recommended.

Coaches should know the physical fitness of athletes, to be able to prescribe training and track development of athletes. As both training formats play crucial roles in developing physical fitness qualities, coaches should avoid training players using one type of training format to improve their soccer specific physical skills. Female football have received little attention from researchers, therefore, more research is needed on how female players can improve their physical fitness which is vital in football matches or competition.

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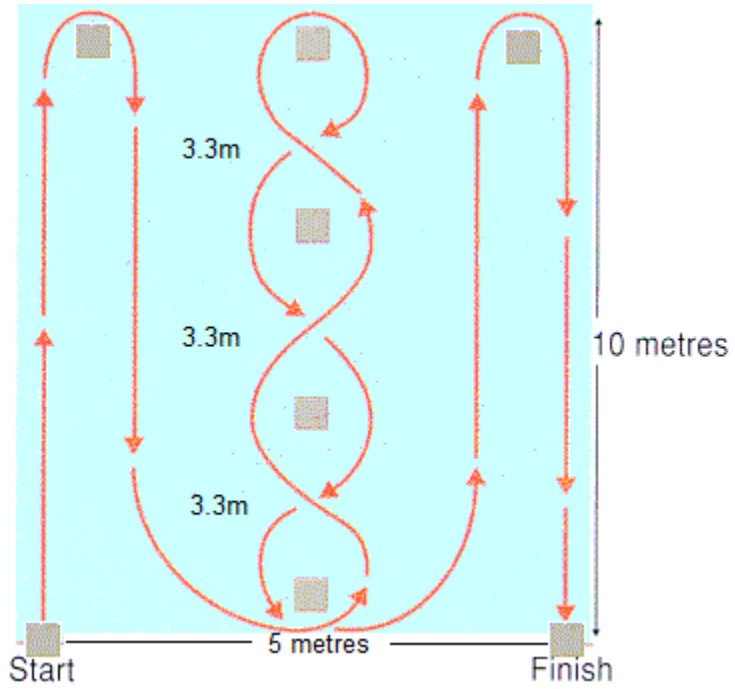
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APPENDICES

APPENDIX I: ILLINOIS AGILITY TEST



Davis et al.(2000)

APPENDIX II: ILLINOIS AGILITY TEST NORMS

Gender	Excellent	Above Average	Average	Below Average	Poor
Male	<15.2 secs	15.2 - 16.1 secs	16.2 - 18.1 secs	18.2 - 19.3 secs	>19.3 secs
Female	<17.0 secs	17.0 - 17.9 secs	18.0 - 21.7 secs	21.8 - 23.0 secs	>23.0 secs

Davis et al. (2000)

APPENDIX III: YO-YO INTERMITTENT TEST LEVEL 1



Bangsbo, Iaia, and Krstrup, (2008).

APPENDIX IV: YO-YO INTERMITTENT RECOVERY TEST LEVEL 1 NORMS FOR ADULT MEN AND WOMEN

Rating	Males		Females	
	Meters	Level	Meters	Level
Elite	> 2400	> 20.1	> 1600	> 17.5
Excellent	2000-2400	18.7-20.1	1320-1600	16.6-17.5
Good	1520-1960	17.3-18.6	1000-1280	15.6-16.5
Average	1040-1480	15.7-17.2	680-960	14.6-15.5
below average	520-1000	14.2-15.6	320-640	13.1-14.5
very poor	< 520	< 14.2	< 320	< 13.1

Bangsbo, Iaia, and Krstrup, (2008).

APPENDIX VI: BODY MASS INDEX (BMI) RANGE

The following table shows the standard weight status categories associated with BMI ranges for adults:

BMI	Weight status
Below 18.5	Underweight
18.5–24.9	Healthy
25.0–29.9	Overweight
30.0 and above	Obese

Ayvaz &, Rıza,(2011).