UNDERGRADUATE PROGRAMME

The Extent To Which Body Composition Measurements Are Used To Identify Sprinters For High-Performance Athletics In Zimbabwe

A dissertation by:

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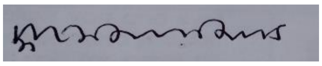
DECLARATION

I Malton Auther Matavire do hereby declare that this dissertation is the result of my own investigation and research, except to the extent indicated in the Acknowledgements, References and by comments included in the body of the report and that it has not been submitted in part or in full for any other degree to any university.

Student Signature ………….Date....16/10/2024

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DEDICATION

I dedicate this research project to my family members, wife and kids for their unwavering, profound support and inspiration throughout my studies. God bless them all!!

ACKNOWLEDGEMENTS

This dissertation would not have been a success were it not for the overwhelming effort made by my supervisor in giving guidance, marking and making the necessary corrections upon completion of each chapter. I also appreciate the support I received from my fellow students during the conduct of this research proposal. They urged me to soldier on even if the pressure seemed insurmountable.

Many thanks

ABSTRACT

The study was the extent to which body composition measurements are used to identify sprinters for high performance athletics in Zimbabwe. The study anchored on ascertaining the extent to which body composition can be used to identify high performance sprinters in Zimbabwe. The challenges were encountered and recommending ways of improving was stated. Related literature was reviewed through theoretical framework and thematic literature review. SPSS version 20 data analysis software was used to analyse the quantitative data. The study found that stretch stature height was seen as a characteristic that influenced athletes' performance to a larger degree. Given that there were notable variations in the athletes' BMIs according to their distance and pace, BMI was applied successfully. Athletes that specialised in short sprints like the 100- and 200-meter races had higher BMIs. Since the results are low in comparison to the demand profiles of sprint athletes, the biceps, Illiac crest, and supraspinale were not frequently employed to determine talent for sprinters. That is similar to the study. Shorter sprinting athletes were mesomorphic, while longer sprinting athletes were ectomorphic. This indicates that as race distance rose, ectomorphy increased and mesomorphy decreased. The study found that sprint athletes who scored highly on the front thigh were efficient in the first part of their sprint (the drive), indicating that the higher the score on the thigh, the higher the performance. As a result, coaches used body composition measurements to identify talent for high performance to a lesser extent.

TABLE OF CONTENTS

CHAPTER 1: INTRODUCTION

1.1 Introduction

This study aims to determine the degree to which Zimbabwean high-performance athletes use body composition data to identify sprinters. This chapter establishes the framework for the entire study by outlining the background, problem statement, research objectives, and research questions. It also highlights the assumptions, boundaries, ethical considerations, definitions of important terms and acronyms, study significance, project structure, and conclusion.

1.2 Background of the study

The relative amounts of fat and non-fat tissue in the body are known as body composition Gallagher et al., (2012). Fat storage and fat-free tissue make up the two components of body composition (Eka Widyawati etal., 2017). When we talk about body composition, we usually mean the measurement of muscle mass and body fat (Lee et al., 2019). At every level of competition, season-long conditioning programmes provide careful consideration to an athlete's body composition, which is a crucial factor (Dettlaff-Dunowska et al., 2022). Over the course of a season, the physical strain that comes with competitions and training sessions can have an impact on body composition. Strength and conditioning experts are particularly interested in the connection between alterations in physical performance and body composition (Tsukahara et al., 2020). Thus, during the competition season, from the start of training to the finish, there may be changes in body composition and physical performance (Eklund et al., 2021).

When the anthropometric characteristics of elite sprint athletes were examined over a ten-year period, it was found that adult professional athletes had increased in height and body mass by about 2 cm and 1.5 kg, respectively (Carling etal, 2023) which may indicate that anthropometric features have an impact on performance in this sport. More anthropometric factors and an ideal body composition were thought to be advantageous since they may contribute to the development of muscle force and power, which results in more effective movement (Lloyd etal, 2015). In fact, anthropometric characteristics were found to be significant determinants of both sprint performance and aerobic fitness in a sample of young, top sprint athletes in the study by Bongiovanni et al. (2021).

Sports scientists who are knowledgeable about the benefits of body composition for high performance in sprint athletes have assisted a few athletes in identifying sprint athletes using body composition, despite the fact that this method is used less frequently in Zimbabwe. Thanks to the expertise of a few sports scientists both domestically and elsewhere, several athletes, like Ngoni Makusha and Tapiwa Makarau, have prospered. If the National Athletics Association of Zimbabwe, which is thought to have experts who can use body composition as a critical tool or strategy in identifying sprint athletes in Zimbabwe, uses body composition in high performance, Zimbabwean sprinters could perform better, possibly even making it to or qualifying for the Olympics. As a result, there is a discrepancy in Zimbabwe's usage of body composition data to designate sprinters for high-performance athletes. It's a reality that it makes the nation less successful in turning out athletes who meet the standards to compete in the Olympics and win medals in major sporting events. The athletes who are qualified for support, according to Eyseck (2019), must be chosen from the crowd using body composition measurements. Talent identification (TI) programmes are used to accomplish this selection process based on predetermined criteria. Based on these analyses, talent identification tests evaluate anthropometric variables like stature, weight, limb circumferences, body composition, or bone density; physiologically relevant measures like maximum oxygen uptake, aerobic or anaerobic endurance, strength, flexibility, and sport-specific skills like running and jumping performance or ball control. These criteria are intended to reflect key skills that project a young person's potential on his athletic performance in adulthood (Douda etal 2018).

The current state of the economy has also made it more difficult for sporting associations and the government to provide coaches and sports science experts with the necessary training and exposure to obtain the necessary credentials, such as ISAK Anthropometric certificates and workshops with other nations that use body composition measurements to identify sprint athletes for high performance. Economic considerations dictate that a nation's resources should be directed towards systematic initiatives that allow coaches and athletes to reach their full potential in competition, Davids (2016). The researcher's motivation to investigate the extent to which body composition measurements are used to identify sprinters for high performance athletes in Zimbabwe stems from the nation's persistent inability to produce sprint athletes who qualify for the Olympics and win medals in elite competitions.

1.3 Statement of the Problem

The primary goal of the study is to determine the extent to which body composition measurements are used to identify sprinters for high performance athletes in Zimbabwe. It also aims to support Zimbabwean athletics clubs, academies, high performance centres, and national teams in their efforts to identify high performance athletes in Zimbabwe and to develop podium performers who qualify for elite competitions like the Olympics and win medals in them. Measurements of body composition are criteria used in athlete selection, training monitoring, and training planning. They are also helpful in assessing changes in nutritional status. An essential first step in determining someone's health status is determining their body composition (Komici et al., 2023). The percentage of fat and non-fat tissue in the body is known as body composition. Total body fat tissue, fat-free mass, bone mineral, and body water make up the four primary components of body composition (Kuriyan, 2018). Total body fat tissue and fat-free tissue are the two aspects of body composition that are most frequently measured (Lukaski et al., 2017). A major factor in the nation's inability to create podium performers who qualify for big competitions is the failure of coaches and sports science expectations to use Body Composition metrics to find talent. In addition to physical condition, body composition should always be taken into account because, in general, an athlete's range of motion will increase with the degree of optimum body composition.

According to Lukaski and Raymond-Pope (2021) the body composition under consideration consists of bone density, muscle, water, protein, fat, and basal metabolism. You can examine an athlete's body composition with the goal of helping them perform better by being aware of some of these body compositions. Coaches and sports scientists' inadequate knowledge hinders their ability to identify high-performance sprinters through Body Composition assessments. Coaches must be able to organise talent identification systems and all types of training portions physical, technical, tactical, and mental in order to form a strong team. While some are trained through universities, they lack the necessary experience and exposure to current trends with new approaches to anthropometry. In developing sports performance, support from other supporting knowledge is needed because athlete performance is determined by the quality of training given to the athlete.

The project will present methods, approaches, and best practices for using body composition data to pinpoint sprinters for high-performance athletes in Zimbabwe. The goal is to develop podium performers who will be eligible to compete in major elite championships.

1.4 Research Questions

1.4.1 Primary Research Question

To what extent do Body Composition measurements are used in the identification of Sprinters for high performance Athletes in Zimbabwe?

1.4.2 Subsidiary Questions

1.4.2.1 What metrics of body composition are now employed in Zimbabwe to identify sprinters for high performance athletes?

1.4.2.2 What connection exists between body composition and performance when it comes to selecting sprinters for Zimbabwe's high-performance athletes?

1.4.2.3 How can the use of Body Composition measurements to identify sprinters for high performance athletes in Zimbabwe can be implemented?

1.5 Research Objectives

1.5.1Main Objective

To establish the extent to which Body Composition measurements are used to the identification of Sprinters for high performance Athletes in Zimbabwe?

1.5.2 Subsidiary Objectives

1.5.2.1 To determine which body composition metrics are currently being utilised in Zimbabwe to select sprinters for high-performance athletes.

1.5.2.2 To ascertain the correlation between body composition and performance in order to choose sprinters for Zimbabwe's high-performance athletes.

1.5.2.3 To put into practice the use of body composition data to pinpoint sprinters for Zimbabwe's elite athletes.

1.6 Significance of the Study

The study that is being suggested holds great importance as it has the potential to revolutionise the identification of sprinters for high-performance athletes in Zimbabwe through the use of body composition data. The Zimbabwe National Association, Academies, High Performance Centres, and Tertiary Institutions will be able to access literature on the use of body composition measurements in identifying sprinters for high performance athletes for Zimbabwe and Africa as a whole. This study aims to close this knowledge gap. By employing body composition data to identify high-performing sprinters in Zimbabwe, they can better apply their scientific method and shape athletes to perform on the podium. In Zimbabwe, coaches would gain more confidence in their ability to carry out their tasks by being more knowledgeable about the application of body composition to identify sprinters for high performance.

In addition to meeting Ministry of Sports and Recreation sport delivery goals, the government will be able to create athletes who qualify for elite tournaments like the Olympics. Although there aren't many published studies in this field, the material this study accesses will help expand our understanding of academic research that uses body composition measurements to identify sprinters for high-performance athletes in Zimbabwe.

1.7 Delimitations of the Study

The study, which is limited to the high performance centres, academies, and Zimbabwe Athletics Sports Association, focuses on how well body composition measurements identify sprinters for high performance athletes in Zimbabwe.

1.8 Chapter Summary

The study's background, problem statement, research questions, objectives, significance to various individuals, definitions of words, and study delimitations were the main topics of this chapter. We also talked about terms of reference. A review of related literature is the topic of the upcoming chapter.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

The relative amounts of fat and non-fat tissue in the body are known as body composition Gallagher et al., (2012). According to Widyawati et al. (2017), body composition is divided into two categories: fat-free tissue and fat stores. When we talk about body composition, we usually mean the measurement of muscle mass and body fat (Lee et al., 2019). Anthropometry is a significant factor in achieving peak performance, according to research. According to Wylleman et al. (2016), a high-performance athlete is someone who not only has talent but also possesses the will, confidence, and excitement for a sport in order to make a positive impression and achieve more success in their profession. The process of dissecting the body into its fundamental parts is referred to as body composition. These measurements precisely distinguish between fat-free mass (which is made up of protein, minerals, and water in the body) and body fat (which includes both stored and necessary fat).

The most varied part of your body is called body fat, which is divided into two categories: stored fat and essential fat. Stored fat is the fat tissue that is around your organs and directly beneath the skin, called subcutaneous fat, and essential fat is the fatty acids that your body cannot synthesise, so it must come from food. Essential fat is defined as the fatty acids that you need to maintain normal bodily functions, such as hormone regulation and cell regeneration. Visceral fat excess can have serious detrimental impacts on health, even while stored fat serves as an energy storage and insulation for the body.

All of the non-fat tissue in your body is referred to as fat-free mass. This covers the body's fluids as well as the skin, bones, muscles, and organs. Additionally metabolically active, fat-free tissue needs energy to maintain itself. While "lean body mass" and "the term fat-free mass" are sometimes used synonymously, they have different meanings. This is due to the fact that bone marrow and internal organs contain some necessary fats that are also included in lean body mass. The success of athletes in all spheres is inextricably linked to coaching (Abdurachman etal, 2016).

The coaching process is implemented in phases, such as the Long-Term Athlete Development (LTAD) coaching process, in practice (Dowling & Washington, 2021). According to Balyi et al. (2020), long-term athlete development (LTAD) is a multi-phase training, competition, and training programme that is implemented from childhood through adulthood. Athletes in LTAD receive assistance from competent coaches, competent administrators, accurate sports information, and sponsors who create periodization plans that suit their age (Dowling and Washington, 2021). (Balyi et al., 2020).

Research on kinanthropometry has revealed that, depending on the discipline being practiced, certain anthropometric traits are necessary for maximum performance.(Norton and others, 2017) Several researchers, like Zaccagni et al. (2019), were interested in analysing and measuring the anthropometric characteristics of elite athletes and their somatotype because this information can be utilised to better understand human performance and identify early promise. Whenever they put forth brief but extremely intensive efforts, elite sprinters demonstrate remarkable muscular strength and power. Body mass index (BMI) and running distance were found to be inversely correlated by Wey and Davis (2022) when they compared athletes racing in distances ranging from 100 to 10,000 metres. Having a somewhat big body mass seems to increase sprinting performances among runners of equal stature and body fat percentage, indicating that running has a structural basis.

In a research done by Dialet 2021, in his research research findings he stated that Saudi Arabian elite athletes have similar physiological aspects, namely average body mass index 21.9 (ideal body), average body fat 8.9% (low body fat), and average skeletal muscle 62% (high muscle mass). In essence, athletes have a combination of high muscle mass with low muscle mass (Badawy and Muaidi, 2021).

2.2 Theoretical review

In an investigation by Stachon et al. (2023), middle-distance runners had somewhat greater height and length measurements. The study groups' athletes had similar body heights that fluctuated about the national population's 50th percentile value of 178.7 cm (Kulaga etal 2011). This implies that this parameter is not significant when choosing between different running distances. As other researchers have shown, the body shape measured by BMI was found to be slimmer in the groups of middle- and long-distance runners than in sprinters. Sedeaud (2019) reports that variations in body weight were seen based on the runners' performance. In comparison with the finalists and other competitors, the 100, 200, and 400 m Olympic medalists were heavier. Conversely, the 5,000-, 10,000-, and marathon medal winners as well as the other competitors competing in these distances were heavier than them. In the currently presented research, a high level of sprinters' mesomorphism was demonstrated. This leads to high body weight and BMI values in sprinters. The study to be conducted will measure BMI in sprint athletes to ascertain its effect to talent identification for high performance athletes.

Strong deep muscles of the trunk, such as the pictorial major, transversus abdominis, and multifidus muscle, are essential for effective sprinting, according to Fujita et al. (2017). These muscles act first, determine limb strength, and ultimately impact an athlete's performance in sports. Tottori etal (2021) compared the cross-sectional areas of the trunk and lower limb muscles in sprinters and discovered that the pictorial major and gluteus maximus muscles were significantly larger than those of non-runners. Furthermore, they not only showed a strong correlation with sprint performance over 100 metres, but they also proved to be reliable indicators of the best performance over that distance.

In the upcoming study there will be no physical examinations, but there will be a data collection gap because sprint athletes' anthropometric measures and physical motor abilities are related. Tottori (2021) confirms that sprinters have significantly larger skeletal mass and limb circumferences. However, no such differentiation was found between long- and middle-distance runners, confirming previous observations. The upper body and arms also play an important role in running, providing balance and promoting efficient movement of the transverse dimensions of the trunk (shoulder width, hip width). To determine their usefulness in identifying potential for sprint athletes in Zimbabwe, body measurements in line with ISAK 2023 level 1 (20 measurements) will be taken.

With its morphology, the torso's shape influences the respiratory mechanics and limb biomechanics, contributing to the locomotor efficiency and energetics of running. Bastir and associates (2023). Trunk shape and running performance have been linked, according to variations in trunk morphology in the context of locomotor capacity. These findings suggest that faster running is possible for those with narrower torsos. Furthermore, a flatter chest and decreased thoracic kyphosis have a good impact on chest mobility and respiratory mechanics, according to a study by Castillo (2018).

However, increased lordosis improves lower limb biomechanics and is crucial in reducing the impact of shocks that are transmitted through the spine during dynamic activities like running. The width of the pelvis also influences the function of the pictorial major muscle, influencing hip flexors and rotation capacity (Copaver 2022). There is no discernible difference in the length proportions between the athletes in the studied groups. Long-distance runners have slightly higher values for both the upper and lower limb length indices, according to Laumets et al. (2017).The absence of a lower limbs and upper limbs index among the study's measurements, however, indicates a gap because both the lower and upper limbs are factors that affect performance. It was demonstrated that, in comparison to other sports, sprinters have somewhat shorter lower limbs. According to Mooses et al. (2019), sprinters benefit from lengthy legs, but only to the extent that it is ideal for their height. Lower limbs that are longer than ideal may cause issues in generating the high stride frequency necessary for satisfactory performance.

Black et al. (2020) observed that the middle-distance runners exhibited slightly longer lower limbs and their segments. Macala (2017) points out that shorter distance runs necessitate longer strides, which may be reflected in the proportions between the lower limb segments to some extent. Bereket (2019) pointed out that the body's size and proportions affect the energy of locomotion and the speed of movement.

The significance of the distal section length in heat dissipation is one reason why taller persons with wider pelvises and longer lower legs walk at a significantly greater optimal walking speed at a lower energy cost.Interesting findings were obtained from the current study's investigation of intergroup disparities in the lower limb proportions of runners at different distances. Similar to the research that will be conducted, measurements of the body that establish body size will also be collected to demonstrate the impact of these measurements on athletes' performance. Notable is the connection between the lower limb's proximal and distal segments. Long-distance runners were discovered to have shins that are comparatively longer than their thighs, which may indicate that sustained high-intensity exercise may encourage anatomical changes that facilitate more effective heat dissipation in the lower leg. Conversely, compared to other competitor groups, sprinters have a noticeably shorter shin relative to the length of the thigh (crural index). According to Tomita et al. (2020), there is a substantial correlation between sprinters' running performance and the length of their tibia and femur. This suggests that a specific morphological feature may be vital in helping specialised 400-meter sprinters achieve greater running performance.

The relative slenderness of the lower leg and thigh also has a major role in running economy. According to the research that has been provided, long-distance runners have a noticeably more massive skeleton, as measured by the breadth of the epiphyses. This can be explained by the impact of diverse effort. The limbs' musculature has distinct shapes. Sprinters' limb segment circumferences were found to be significantly bigger than those of other running groups. Muscle thickness was found to be a significant predictor of the braking forces produced during sprinting by Korhonen et al. (2019). According to prior research, sprinters with greater lower limb lean body mass demonstrated better mean power in the Wingate test.

As to Kolnes et al. (2019), runners who run long and medium distances have limb segments that are thinner than those of sprinters. Running over specific distances has a diverse energy cost that influences the growth of muscle mass and body fatness. Furthermore, as variations in the location of subcutaneous adipose tissue are linked to variations in running performance, the quantity of this tissue in various body regions may be practically significant (Abe etal 2020). As a result, skinfolds can be effectively utilised to forecast running performance.

2.4 Thematic literature review

Satrianingsih et al. (2023) conducted a study to examine the body composition of exceptional athletes during National Sports Week in West Nusa Tenggara. The research that bears similarities to the study that will be conducted was conducted using the descriptive quantitative research approach. The body composition analyzer tool, which measures weight, height, fat, whole fat, and muscle, was used to gather data (Lorena, 2016). The statistical programme Jamovi 2.3.2.8 will be utilised to analyse all of the data collected for this study. The research to be undertaken differs in that data will be collected using anthropometric body measurements in accordance with ISAK standards and analysed by SPSS 12.0 Data analysis software. At first, the analysis is carried out to find the mean standard deviation, maximum and minimum values. Secondly, in this study the percentage of each variable is presented.

A research on the body composition of female collegiate track & field athletes was conducted by Cook (2020). Thirty-one female track and field athletes were requested to participate in the study by providing information about their height, weight, muscle mass and percentage of body fat. A questionnaire regarding their experiences, including person best and most recent performance, was also given to them to complete. Next, using this data, a comparison of muscle mass and percent fat was made for each of the event groups (distance, multis, sprints, leaps, and throws). For all but the multi event group, there was a linear association between the two.

A one-way ANOVA analysis was conducted using SPSS version 22.0 data analysis software. The study is similar to the research to be conducted in that the analysis was conducted using SPSS 22.0. The difference is in the data collection methods of which the questionnaire was used to collect data on their performance of which there is a data collection instruments gap which may affect the reliability of the research instruments. Percentage fat and muscle were also looked at in terms of performance, in which there was no relationship.

Barbieri et al. conducted a study to evaluate the body composition and size of elite sprinters and to ascertain the effect on performance (2017). In this cross-sectional study, 98 male competitors competed in the 100-meter sprint. Weight (kg), height (cm), humerus and femur breadths (cm), mid-thigh, calf, relaxed and contracted upper arm girths (cm), and skinfold thicknesses (mm) at triceps, thorax, sub-scapula, supra-iliac, and calf sites were among the numerous measurements that were directly taken.

The stature was calculated to the nearest 0.1 cm using a portable stadiometer (free-standing Magnimeter, Raven Equipment Ltd., UK); the weight was measured to the nearest 0.1 kg using a high precision mechanical scale; the widths and girths were measured to the nearest 0.1 cm using a large sliding calliper and a tape measure, respectively; the skinfold thicknesses were measured to the nearest 1 mm using a Lange calliper (Beta Technology Inc., CA, USA).Using the Jackson and Pollock16 equation and three skinfolds (the triceps, thorax, and sub-scapula), body density (BD, g/ml) was determined.

Using the Siri equation, body fat percentage (%F) was determined from BD.17 We calculated the fat free mass (FFM, kg) as weight – FM and the fat mass (FM, kg) as (%F·Weight)/100. Anthropometric indices calculated were as follows: The body mass index (BMI) and the results of tests measuring physical strength and power were self-reported. The Skinfold method was utilised to evaluate body composition, whereas the Heath-Carter anthropometric approach was employed to compute somatotype. Using their personal best time as a guide, sprinters were divided into three groups, and the top and bottom tertile athletes were compared. Pearson's correlation coefficients were used to evaluate the relationships between performance and anthropometric traits. Only 20 anthropometric measures were obtained for the planned study, which is restricted to ISAK level 1 accreditation and may jeopardise the validity of the study's findings. In fact, only SPSS was utilised for data analysis, demonstrating the differences in data analysis techniques. The technique of the studies is similar because they all use the descriptive-quantitative approach.

Castillo et al.'s (2022) examination examines the link between female futsal players' performance profile features and body composition. A total of twelve professional female futsal players (aged 25.17 ± 4.75) who participated in the First Division Spanish League served as the study's subjects. During the three days of the competition, an ISAK level III anthropometrist performed an anthropometric examination. Using anthropometric data, the sum of 4, 6, and 8 skinfolds as well as body composition were determined. (1) Basic measurements (body mass and stretch stature); (2) Skinfolds (biceps, triceps, subscapular, iliac crest, supraspinal, abdominal, thigh, and calf); (3) Girths (waist, abdominal, hips, thigh middle, and calf); (4) Breadths (humerus, bi-styloid, and femur) were among the measurements used to determine body composition. The four-component model (muscle mass (MM), fat mass (FM), bone mass (BM), and residual mass (RM)) was followed in determining the body composition using the formulas provided by the Spanish Kinanthropometry Group (GREC) (Cruiz etal 2010). Over the course of two days in the same week as the anthropometric assessments, performance tests were carried out to assess lower extremity explosive power, agility, repeatability of sprints, velocity, and specific warm-up. The t-test, Yo-Yo test, speed test, jump test (JS, CMJ, and ABK), and repeat-sprint ability (RSA) were the tests employed for that goal.2018 Gorostiaga et al.Similar to the research that will be conducted, a certified athropometrist will do anthropometric measures; however, the research will involve measuring a greater number of skinfolds.

The descriptive approach of the experimental research method is comparable to the research design that will be used. According to the research, explosive power and the capacity for repeated sprints were also assessed using performance tests. The data was analysed using the Statistical Package for Social Sciences version 22, and the study that will be conducted will also be conducted using a different version of the software.

CHAPTER THREE: MATERIALS AND METHODS

3.1 Introduction

The chapter concentrated on the research methodology used to determine the extent that body composition measurements are used in Zimbabwe to identify sprint athletes for high performance. It also covered the research approach, time horizons, research design, population and sampling, data collection procedures, data analysis and presentation, validity, reliability, and ethical considerations.

3.2 Research Approach

According to Meadows (2017), research methodologies can be broadly categorised as qualitative, quantitative, or a combination of the two. The quantitative research approach will be used for this investigation. The quantitative approach, on the other hand, places more emphasis on precise measurements and the statistical or numerical analysis of information gathered via polls, surveys, and other methods, as well as through the manipulation of previously obtained statistical information. Israel, 2019). The choice to use a descriptive quantitative research approach was motivated by the need to reduce the impact of positivism and phenomenology's flaws on the reliability and quality of the study. The study will collect data from selected athletes using anthropometric tests with ISAK standards, and the resulting data will be analysed using the Statistical Package for Social Sciences (SPSS) tool. This approach has the potential to strengthen the validity of the results (Edwards & Skinner, 2019).

3.3 Time Horizons

According to Grey (2017), the majority of research investigations are cross-sectional due to time and resource constraints. Cause and effect linkages are not well understood by cross-sectional studies. The time-bound and static results do not indicate a progression of events or societal development. Cross-sectional studies may overlook the possibility that the results would have been different if a different time period had been selected because they merely offer a snapshot of the analysis. Nonetheless, the cross-sectional time horizon was used by the researcher in this investigation. The results of the research will be used for future research, and the findings will be recommended to the Zimbabwean Athletics Association, high performance centres, schools, and athletics academies for implementation. This was made necessary by the research's strict deadlines and the researcher's limited resources, which made longitudinal study difficult and inapplicable in this study because longitudinal studies "often take more time and effort and cost more" (Sekaran, 2017).

3.4 Research Design

Research design is defined by Creswell and Plano Clark (2019) as the methods used in research studies for data collection, analysis, interpretation, and reporting. Research designs are various models for conducting research; these models have different names and procedures attached to them. These models are helpful because they set the foundation for the decisions researchers must make about their methods and the logic by which they will interpret their findings after their studies are complete. The study will be anchored on Descriptive-quantitative research design.

The descriptive survey design, which is predicated on the idea that whatever is observed at one point in time is normal and could theoretically be observed at any other point in the future under the same conditions, was employed in this study to collect data from a large number of samples at a specific time in order to describe the nature of the problem being investigated Tuckman (2020)

3.5 Population and Sampling

3.5.1 Population

The population is the researcher's interest group, or the group to whom the researcher hopes to generalise the study's findings (Fraenkel, 2020). Everyone who has a particular set of traits is always included in the population. The 94 sprinters in athletics (50 men and 44 women) who train at Zimbabwe Athletics high performance centres made up the study's population.

3.5.2 Sampling

3.5.2.1 Purposive Sampling

Using a common non-probability technique called judgmental or purposeful sampling, 94 sprint athletes were selected for the sample. These athletes are well-positioned in high-performance areas across Zimbabwe's ten geographical provinces, making them the most qualified to provide pertinent and necessary data based on their measurements of body composition in the study area. The sample size and participant base were established using theoretical sampling techniques. The sample was chosen using a judgmental selection process from examples that will best allow research questions to be answered and study objectives to be met, in accordance with suggestions from Neumann (2018), Bush and & Burns (2017), and Saunders et al (2020).

3.5.3 Sample Size

3.5.3.1 Quantitative Sample Size

According to Israel (2019), assuming a normal distribution for a large population, a representative sample is a function of the confidence level, the desired level of precision and the estimated proportion of an attribute in the population as illustrated in the equation below.

$$n_0 = \frac{Z^2 pq}{e^2}$$

$$q = 1 - p$$

Where n_0 is the representative sample

Z^2 Represents the confidence level

p is the estimated proportion of an attribute in the population

This model was used by the researcher in determining the research sample for sprint athletes taking into consideration the expansiveness of the target population. The researcher assumed a normal distribution of the population and will use 95% confidence level as prescribed by the central limit theory. A sampling error of 5% will be used and the estimated proportion of attributes in the population will be 93% of Athletes. As an example, the sample size for retail is calculated as follows:

$$NSAs = \frac{1.96^2 x 0.93 x 0.08}{0,05^2} = 100$$

Sample Size =84

3.6 Data Collection Procedures

Permission to conduct the study was requested from the National Athletics Association of Zimbabwe. After receiving permission, the researcher introduced herself to the participants and showed them the Student Identity Card and the introductory letter from the university. Ethical appointments were made, and participants signed Consent and Indemnity forms attesting to the researcher's commitment to maintaining participant anonymity and confidentiality as well as providing a brief explanation of the study's purpose.

Anthropometric body composition measurements were the primary data source employed in the study, and secondary data sources included journals, periodicals, textbooks, newspapers, and websites.

3.6.1 Pilot Study/Pre test

In order to test the validity, reliability, and clarity of the tests/measurements and to guard against the above challenge, the researcher conducted a pre-test with respondents in the main study population. The instruments were calibrated in line with ISAK Anthropometric standards of 2023, and the researcher worked with two competent ISAK Level 1 Certified anthropometrists (Zimbabwe 2023). Wegner (2017) defines bias as the propensity of a pattern of errors to distort data in an unrepresentative manner; test procedures or recording may be to blame for this.

3.6.2 Main study

The degree to which body composition measurements were utilised to identify talent for high-performance athletes will be determined by measurements of body composition. Ninety-four participants, both male and female, were measured from Zimbabwe's ten high-performance athletic provinces. One of the study's limitations was that the data were restricted to 20 ISAK assessments for level 1. An accurate and useful evaluation of the amount to which body composition measurements were utilised to identify talent for high-performance athletes will be provided by the anthropometric measurements.

3.6.2.1 Anthropometric Body measurements

- BMI, sitting height, stretch stature, and body mass

3.6.2.2 Skinfolds

- Mid-axilla, Subscapular, Triceps, Front thigh, medial calf, supraspinal, iliac crest, biceps, and abdomen

3.6.2.3 Girths

- Arm girth, tightened and flexed, Minimum waist, maximum calf circumference, gluteal (hips)

3.6.2.4 Breadth

- Humerus breadth (epicondylar)
- Femur breadth (epicondylar)

3.7 Data Analysis and Presentation

Anthropometric measurements were utilised to gather data, which was then analysed using the Statistical Package for Social Sciences (SPSS) version 20 tool. One Sample T-tests were the focus of the descriptive analysis, and the Profoma software 2023 for descriptive statistics will be used to somatotype sprint athletes in Zimbabwe. Data was displayed using frequency tables, graphs, and figures.

3.8 Validity and Reliability

Like all studies, this one has flaws that arise from several angles. Nevertheless, the researcher made every effort to minimise these flaws and seal off any potential sources of bias. The validity of several statistical analytical tools, including the standard deviation and the median, in evaluating and interpreting data to draw reliable conclusions is diminished because they are arbitrary and theoretical in nature. The mean and the mode, two more succinct and useful statistical tools, were employed as standard equipment to examine and evaluate data in order to draw specific conclusions in an attempt to lessen this difficulty.

3.9 Ethical Considerations

This study's approach and commitment to obtaining valid results, acceptance and access, informed consent, confidentiality and anonymity, honesty, openness, and beneficence were all followed in order to assure ethical research. Jones and Bartlett (2017) define ethical considerations as conducting research in a way that is both morally and legally correct. Building a trustworthy relationship between the subjects of the research and the researcher is the focus of ethics as it relates to social science (Schutt, 2019). According to Saunders et al. (2019), maintaining the participants' anonymity is crucial because it protects their interests and keeps them safe from victimisation and harm if their names are revealed. In research, anonymity is crucial because it protects participant identities, which could be harmful to them in one way or another if revealed. The researcher kept the participants' names, professional and personal profiles, photos, and any other personal information private during the whole research procedure in order to preserve their anonymity.

The researcher did not keep track of participant names, employee numbers, identifying information, or any other personal details during the study. Following data collection, the data was stored in a secure location that was only accessible by the researcher. The following steps were taken to address potential reliability threats: Using a multi-method approach to enable clarification on unclear issues; conducting pilot tests and making corrections to some unclear and misunderstood test results; and providing particiapants with assurances that their information would be kept confidential and used only for academic purposes.

3.10 Conclusions

The chapter covered the research methodology used to determine the usefulness of body composition measurements in identifying high-performing athletes in Zimbabwe. It went on to discuss the research methodology, time horizons, population and sampling, research design, data collection, data analysis, and validity. Ethical considerations and dependability/trustworthiness. The presentation of data, interpretation, analysis, and discussion of the study's conclusions will be the main topics of the upcoming chapter.

CHAPTER 4: DATA ANALYSIS AND PRESENTATION

4.0 Introductions

The chapter concentrated on facts and analysis about the degree to which body composition In Zimbabwe, high performance athletes employ measurements to identify their sprinters. There are six sections in this chapter. The study's response rate is described in the first part. The demographic data of the study subjects is the main topic of the second section. Anthropometric measurement-derived data is presented and analysed in the third section. It will also cover a description of the data analysis. The entire chapter is summed up in the fourth part.

4.1 Response rate

The table 4.1 shows the response rate of participants

Table 4.1 Response rate analysis

Instruments	Targeted athletes for body composition measurements	Successful athletes measured body composition	Percentage of successful body composition measurements
Body composition measurements	84	84	100%

Source: Researcher's data

The 20 ISAK anthropometric measurements—body mass, stretch stature, sitting height, BMI, triceps, subscapular, midaxilla, biceps, iliac crest, supraspinal, abdominal, front thigh, and medial calf—were performed on 84 people in total. Waist (minimum), Gluteal (hips), Calf girth (maximum), Humerus breadth (epicondylar), and Femur breadth (epicondylar) are the measurements of the arms. Since there was a 100% response rate, a sizable sample size was necessary. SPSS version 20 was used to examine the data. According to Denscombe's (2018) theory, the response rate is influenced by the subject's sensitivity or interest, with a low response rate for humiliating topics and a high response rate for relevant ones.

4.2 Demographic information of participants

4.2.1 Gender of Participants

Table 4.2 Gender of participants

Sex	Number of Participants	%
Females	40	48%
Males	44	52%
Total	84	100%

Source: Researcher's data

Based on information provided by respondents, 48% of those involved in Zimbabwe's high-performance centres are female. Of those involved in Zimbabwe's high performance centres, 52% were men. The gender distribution and percentages are displayed in Table 4.2. According to Mugari & Bulaliya (2018), men have dominated Zimbabwean sport in recent years as women have prioritised taking care of the home rather than finding time for sports and leisure.

4.3 Age distribution of participants

Table 4.3 Age distribution of participants

Age	Participants	Percentage
17-20	34	40%
21-23	36	43%
24-26	14	17%
Total	84	100%

Source: Researcher's data

Table 4.3 displays that 40% of the individuals whose body composition measures were used to obtain data were between the ages of 17 and 20.Of them, 43% were between the ages of 21 and 23.Among them, 17% were between the ages of 24 and 26.

4.4 Body composition measurements used to identify sprinters for high performance athletes in Zimbabwe

Figure 4.1 Body composition used to identify sprinters

Source: Researcher's data

The parameters of body composition that are frequently utilised in Zimbabwe to identify sprint athletes are shown in Figure 4.1 and presented below.

Age

The sample size of 84 athletes provides a more comprehensive representation. The mean age of 1.7619 indicates that the average age of the sprinters falls between the first and second category (17-23). This suggests that the majority of the athletes are relatively young, aligning with the typical age range for sprinters. The median age of 2.0000 also falls within the second category (21-23), reinforcing the presence of sprinters in their physical prime within the dataset. The mode of 2.00 indicates that the most frequently occurring age category is again the second category (21-23), which further emphasizes the prevalence of athletes in their optimal sprinting age range. The standard deviation of 0.72176 signifies a moderate amount of dispersion in the age distribution. This indicates that while the majority of the athletes are concentrated around the mean and median ages, there is still some variability with athletes falling outside those central values. From this analysis, it appears that the majority of the sprinters in the sample are within the age range associated with optimal sprinting performance (21-23). However, the inclusion of athletes from the younger and older age ranges (17-20 and 24-26) demonstrates that exceptional talents can emerge at different stages of development.

Body mass

Considering the given age categorization for body mass, where 1 represents the range of 45-50, 2 represents 51-55, 3 represents 56-60, 4 represents 61-65, and 5 represents 66-70, the mean body mass of 3.5 indicates an average body mass value for the sample of athletes. This indicates that the majority of the athletes in the sample have a body mass falling within the 61-65 kg range, as the mean represents the central tendency of the data. The median body mass of 4 suggests that the central tendency of body mass falls in the higher end of the range, indicating that a significant portion of the athletes has a body mass in the 61-65 range. The mode of 5 suggests that the most frequently occurring body mass category is the highest one (66-70). This indicates that a notable proportion of the athletes in the sample has a body mass within this range. The standard deviation of 1.40995 indicates some dispersion in the body mass distribution, suggesting that there is variability in the body mass values among the sprinters. This implies that while some athletes may fall within the average range, there are others who deviate from the mean, potentially having higher or lower body mass values.

Stretch stature

Some general guidelines often used as benchmarks for stretch stature in sprinting are as follows:

- Male Sprinters:
  - *Elite Level*- Taller male sprinters often fall within the range of 1.85-1.95 meters (6'1" to 6'5")
  - *Competitive Level*- Male sprinters typically have stretch statures ranging from 1.75-1.85 meters (5'9" to 6'1").
- Female Sprinters:
  - *Elite Level*: Taller female sprinters generally have stretch statures ranging from 1.75-1.85 meters (5'9" to 6'1")
  - *Competitive Level*: Female sprinters typically have stretch statures ranging from 1.65-1.75 meters (5'5" to 5'9").

Considering the provided benchmark for stretch stature in sprinters, the available data shows that the mean stretch stature of 4.5595 falls within the range of the provided stretch stature categories. Specifically, it falls within the 1.41-1.50 meter category. This suggests that the average stretch stature of the sprinters in the sample aligns with this category range, which is commonly associated with competitive male and female sprinters. The median stretch stature of 5.0000 falls within the 1.51-1.60 meter category, indicating that the central tendency of stretch stature among the sprinters aligns with this range. This further reinforces the presence of sprinters with stretch statures within this category in the dataset. The mode of 6.00 suggests that the most frequently occurring stretch stature category is the highest one (1.61-1.70 meters). While this mode falls outside the provided benchmark, it indicates that a notable proportion of the sprinters in the sample have a stretch stature falling within this range. The standard deviation of 1.56275 indicates some dispersion in the stretch stature distribution among the sprinters. This suggests that there is variability in the stretch stature values, with some individuals deviating from the mean. It's worth noting that this variation is expected, as athletes can have different body proportions and physiological characteristics that contribute to their sprinting performance.

BMI

Based on the provided data on BMI and the given categories, the establish a benchmark for BMI in sprinters are:

- Category 1: 20-25 (Normal Weight)
- Category 2: 26-30 (Overweight)
- Category 3: 31-35 (Obese Class I)
- Category 4: 36-40 (Obese Class II)

Considering the provided benchmark for BMI in sprinters, the mean BMI of 1.6548 indicates an average BMI value for the sample of sprinters falling within the normal weight range (20-25). This range is generally associated with good overall health and may be beneficial for sprinting performance. The median BMI of 1.0000 suggests that the central tendency of BMI falls within the range of the first category (20-25), which corresponds to the normal weight range. This indicates that a significant portion of the sprinters in the sample have BMIs within this range. The mode of 1.00 indicates that the most frequently occurring BMI category is the first category (20-25), further emphasizing that a notable proportion of the sprinters have BMIs within the normal weight range. The standard deviation of 0.76826 suggests some dispersion in the BMI distribution among the sprinters. This indicates that there is variability in BMI values, with some individuals deviating from the mean. It's important to interpret BMI alongside other factors and consider individual variations when assessing an athlete's fitness and performance potential.

Triceps

When determining body composition metrics for selecting sprinters or high-performance athletes, triceps measurements can be one of the factors considered. Mean of 1.6786 (average measurement) shows the mean triceps measurement for an average value for the sample. In the context of body composition assessment, it suggests the overall thickness of the triceps skinfold among the individuals in the dataset. Median: 2.0000 (middle value of the distribution): The median triceps measurement of 2 represents the value that falls exactly in the middle of the dataset. It provides insight into the central tendency of the triceps skinfold thickness among the individuals assessed. The mode triceps measurement of 2 indicates the value that occurs most frequently in the dataset. It gives an idea of the dominant triceps skinfold thickness within the group. The standard deviation of 0.46983 reflects the spread or variability of the triceps measurements around the mean. A lower standard deviation suggests that the triceps skinfold thickness data points are relatively close to the mean, indicating less variability within the sample. Based on the provided data, it appears that the triceps measurements are generally within an acceptable range defined by Category 1 (5-10), with the mean, median, and mode falling within this range. This suggests that, on average, the individuals in the dataset have relatively low triceps skinfold thickness, which is often desirable for sprinters due to the need for high power-to-weight ratio and lower body fat levels.

Biceps

Based on the provided data for biceps measurements and the given benchmark categories (1=4-10 and 2=11-15), the mean biceps measurement (1.5357) falls below the benchmark range for Category 1 (4-10) and is closer to the lower end of the range. This suggests that, on average, the biceps measurements in the dataset are relatively low. The median biceps measurement (2) falls within Category 1 (11-15), indicating that the middle value of the distribution is within an acceptable range. The mode biceps measurement (2) also falls within Category 1 (11-15), indicating that this value is the most frequently occurring value within the acceptable range. The standard deviation (0.50172) provides a measure of variability in the data. A relatively low standard deviation suggests that the biceps measurements in the dataset are relatively close to the mean, indicating less variability. This suggests that, on average, the individuals in the dataset have biceps measurements within the acceptable range for selecting sprinters or high-performance athletes.

Subscapular

Based on the provided data for the subscapular skinfold measurement and the given benchmark categories (1=5-8 and 2=9-11), the mean subscapular measurement (1.5595) falls below the benchmark range for Category 1 (5-8) and is closer to the lower end of the range. This suggests that, on average, the subscapular measurements in the dataset are relatively low. The median subscapular measurement (2) falls within Category 1 (9-11), indicating that the middle value of the distribution is within an acceptable range. The mode subscapular measurement (2) also falls within Category 1 (9-11), indicating that this value is the most frequently occurring value within the acceptable range. The standard deviation (0.49943) provides a measure of variability in the data. A relatively low standard deviation suggests that the subscapular measurements in the dataset are relatively close to the mean, indicating less variability.

Illiac Crest

Based on the provided data for the Iliac crest measurement and the given benchmark categories (1=5-10; 2=11-18; 3=16-20), the mean Iliac crest measurement (1.9762) falls within the range of Category 2 (11-18). This suggests that, on average, the Iliac crest measurements in the dataset are relatively higher and fall within the specified benchmark range. The median Iliac crest measurement (2) also falls within Category 2 (11-18), indicating that the middle value of the distribution is within the specified range. The mode Iliac crest measurement (1.00) falls within Category 1 (5-10), indicating that this value is the most frequently occurring value within the lower benchmark range. The standard deviation (0.83560) indicates a moderate level of variability in the data. This suggests that the Iliac crest measurements in the dataset are somewhat spread out from the mean but still fall within the specified benchmark ranges. Based on the provided data and the given benchmark categories, it appears that the majority of the Iliac crest measurements fall within or close to the acceptable ranges defined by Category 2 (11-18).

Supraspinal

Based on the provided data for the Supraspinal measurement and the given benchmark categories (1=5-10 and 2=11-15), the mean Supraspinal measurement (1.5595) falls within the range of Category 1 (5-10). This suggests that, on average, the Supraspinal measurements in the dataset are relatively low and fall within the specified benchmark range. The median Supraspinal measurement (2) falls within Category 2 (11-15), indicating that the middle value of the distribution is within the specified range. The mode Supraspinal measurement (2.00) also falls within Category 2 (11-15), indicating that this value is the most frequently occurring value within the higher benchmark range. The standard deviation (0.49943) indicates a relatively low level of variability in the data. This suggests that the Supraspinal measurements in the dataset are relatively close to the mean, indicating less variability. Based on the provided data and the given benchmark categories, it appears that the majority of the Supraspinal measurements fall within or close to the acceptable range defined by Category (11-15). This suggests that, on average, the participants in the dataset have relatively low Supraspinal measurements.

Abdominal

Based on the provided data for the Abdominal measurement and the given benchmark categories (1=5-10 and 2=11-15), the mean Abdominal measurement (1.5595) falls within the range of Category 2 (11-15). This suggests that, on average, the Abdominal measurements in the dataset are relatively high. The median Abdominal measurement (2) falls within Category 2 (11-15), indicating that the middle value of the distribution is within the specified range. The mode Abdominal measurement (2) also falls within Category 2 (11-15), indicating that this value is the most frequently occurring value within the higher benchmark range. The standard deviation (0.49943) indicates a relatively low level of variability in the data. This suggests that the abdominal measurements in the dataset are relatively close to the mean, indicating less variability. Based on the provided data and the given benchmark categories, it appears that the majority of the abdominal measurements fall within or close to the range defined by Category 2 (11-15). This suggests that, on average, the participants in the dataset have relatively high abdominal measurements.

Front thigh

Based on the provided data for the Front Thigh measurement and the given benchmark categories (1=5-10, 2=11-15, 3=16-20, 4=21-25), the mean Front Thigh measurement (2.9286) falls within the range of Category 3 (16-20). This suggests that, on average, the Front Thigh measurements in the dataset are relatively high and fall within the specified benchmark range. The median Front Thigh measurement (3) falls within Category 3 (16-20), indicating that the middle value of the distribution is within the specified range. The mode Front Thigh measurement (4.00) falls within Category 4 (21-25), indicating that this value is the most frequently occurring value within the higher benchmark range. The standard deviation (1.14897) indicates a moderate level of variability in the data. This suggests that the Front Thigh measurements in the dataset are somewhat spread out from the mean but still fall within the specified benchmark ranges. Based on the provided data and the given benchmark categories, it appears that the majority of the Front Thigh measurements fall within or close to the acceptable ranges defined by Categories 3 (16-20) and 4 (21-25). This suggests that, on average, the participants in the dataset have relatively high Front Thigh measurements.

Medial calf

Based on the provided data for the Medial Calf measurement and the given benchmark categories (1=5-10, 2=11-15, 3=16-20), the mean Medial Calf measurement (2.2381) falls within the range of Category 2 (11-15). This suggests that, on average, the Medial Calf measurements in the dataset are relatively moderate and fall within the specified benchmark range. The median Medial Calf measurement (2.0000) falls within Category 2 (11-15), indicating that the middle value of the distribution is within the specified range. The mode Medial Calf measurement (3.00) falls within Category 3 (16-20), indicating that this value is the most frequently occurring value within the higher benchmark range. The standard deviation (0.73827) indicates a moderate level of variability in the data. This suggests that the Medial Calf measurements in the dataset are somewhat spread out from the mean but still fall within the specified benchmark ranges. Based on the provided data and the given benchmark categories, it appears that the majority of the Medial Calf measurements fall within or close to the acceptable ranges defined by Categories 2 (11-15) and 3 (16-20). This suggests that, on average, the participants in the dataset have Medial Calf measurements that fall within the moderate to higher range.

Arm Girth relaxed

Based on the provided data for the Arm Girth (Relaxed) measurement and the given benchmark categories (1=10-15, 2=16-20, 3=21-25, 4=26-30), the mean Arm Girth (Relaxed) measurement (2.5000) falls within the range of Category 2 (16-20). This suggests that, on average, the Arm Girth (Relaxed) measurements in the dataset are relatively moderate and fall within the specified benchmark range. The median Arm Girth (Relaxed) measurement (3.0000) falls within Category 3 (21-25), indicating that the middle value of the distribution is within the higher benchmark range. The mode Arm Girth (Relaxed) measurement (3.00) also falls within Category 3 (21-25), indicating that this value is the most frequently occurring value within the higher benchmark range. The standard deviation (0.98788) indicates a moderate level of variability in the data. This suggests that the Arm Girth (Relaxed) measurements in the dataset are somewhat spread out from the mean but still fall within the specified benchmark ranges. Based on the provided data and the given benchmark categories, it appears that the majority of the Arm Girth (Relaxed) measurements fall within or close to the acceptable range defined by Categories 2 (16-20) and 3 (21-25). This suggests that, on average, the participants in the dataset have Arm Girth (Relaxed) measurements that fall within the moderate to higher range.

Arm Girth (Flexed and Tensed)

Based on the provided data for the Arm Girth (Flexed and Tensed) measurement and the given benchmark categories (1=10-15, 2=16-20, 3=21-25, 4=26-30, 5=31-35), the mean Arm Girth (Flexed and Tensed) measurement (4.4643) falls within the range of Category 4 (26-30). This suggests that, on average, the Arm Girth (Flexed and Tensed) measurements in the dataset are relatively high and fall within the specified benchmark range. The median Arm Girth (Flexed and Tensed) measurement (4.0000) falls within Category 4 (26-30), indicating that the middle value of the distribution is within the specified range. The mode Arm Girth (Flexed and Tensed) measurement (5.00) falls within Category 5 (31-35), indicating that this value is the most frequently occurring value within the higher benchmark range. The standard deviation (5.69177) indicates a relatively high level of variability in the data. This suggests that the Arm Girth (Flexed and Tensed) measurements in the dataset are widely spread out from the mean and exhibit a significant range within the specified benchmark ranges. Based on the provided data and the given benchmark categories, it appears that the majority of the Arm Girth (Flexed and Tensed) measurements fall within or close to the acceptable ranges defined by Categories 4 (26-30) and 5 (31-35). This suggests that, on average, the participants in the dataset have Arm Girth (Flexed and Tensed) measurements that fall within the higher range.

Waist Minimum

Based on the provided data for the Waist Minimum measurement and the given benchmark categories (1=40-50, 2=51-60, 3=61-70, 4=71-80), the mean Waist Minimum measurement (2.9643) falls within the range of Category 3 (61-70). This suggests that, on average, the Waist Minimum measurements in the dataset are relatively high and fall within the specified benchmark range. The median Waist Minimum measurement (3.0000) falls within Category 3 (61-70), indicating that the middle value of the distribution is within the specified range. The mode Waist Minimum measurement (4.00) falls within Category 4 (71-80), indicating that this value is the most frequently occurring value within the higher benchmark range. The standard deviation (1.02318) indicates a moderate level of variability in the data. This suggests that the Waist Minimum measurements in the dataset are somewhat spread out from the mean but still fall within the specified benchmark ranges. Based on the provided data and the given benchmark categories, it appears that the majority of the Waist Minimum measurements fall within or close to the acceptable ranges defined by Categories 3 (61-70) and 4 (71-80). This suggests that, on average, the participants in the dataset have Waist Minimum measurements that fall within the higher range.

Gluteal hips

Based on the provided data for the Gluteal Hips measurement and the given benchmark categories (1=50-60, 2=61-70, 3=71-80, 4=81-90, 5=91-100), the mean Gluteal Hips measurement (3.1786) falls within the range of Category 3 (71-80). This suggests that, on average, the Gluteal Hips measurements in the dataset are relatively high and fall within the specified benchmark range. The median Gluteal Hips measurement (3.0000) falls within Category 3 (71-80), indicating that the middle value of the distribution is within the specified range. The mode Gluteal Hips measurement (3.00) also falls within Category 3 (71-80), indicating that this value is the most frequently occurring value within the benchmark range. The standard deviation (3.52328) indicates a moderate level of variability in the data. This suggests that the Gluteal Hips measurements in the dataset are somewhat spread out from the mean but still fall within the specified benchmark ranges. Based on the provided data and the given benchmark categories, it appears that the majority of the Gluteal Hips measurements fall within or close to the acceptable range defined by Category 3 (71-80). This suggests that, on average, the participants in the dataset have Gluteal Hips measurements that fall within the moderate to higher range.

Calf girth maximum

Based on the provided data for the Calf Girth Maximum measurement and the given benchmark categories (1=20-30, 2=31-40, 3=41-50), the mean Calf Girth Maximum measurement (4.1310) falls within the range of Category 3 (41-50). This suggests that, on average, the Calf Girth Maximum measurements in the dataset are relatively high and fall within the specified benchmark range. The median Calf Girth Maximum measurement (4.0000) falls within Category 3 (41-50), indicating that the middle value of the distribution is within the specified range. The mode Calf Girth Maximum measurement (5.00) falls within Category 3 (41-50), indicating that this value is the most frequently occurring value within the benchmark range. The standard deviation (1.01530) indicates a moderate level of variability in the data. This suggests that the Calf Girth Maximum measurements in the dataset are somewhat spread out from the mean but still fall within the specified benchmark range. Based on the provided data and the given benchmark categories, it appears that the majority of the Calf Girth Maximum measurements fall within or close to the acceptable range defined by Category 3 (41-50). This suggests that, on average, the participants in the dataset have Calf Girth Maximum measurements that fall within the moderate to higher range.

Humerus Breath

Based on the provided data for the Humerus Breath measurement and the given benchmark categories (1=1-5, 2=6-10), the mean Humerus Breath measurement (2.2976) falls within the range of Category 2 (6-10). This suggests that, on average, the Humerus Breath measurements in the dataset are relatively low and fall within the specified benchmark range. The median Humerus Breath measurement (3.0000) falls within Category 2 (6-10), indicating that the middle value of the distribution is within the specified range. The mode Humerus Breath measurement (3.00) also falls within Category 2 (6-10), indicating that this value is the most frequently occurring value within the benchmark range. The standard deviation (0.83276) is relatively low, indicating that the Humerus Breath measurements in the dataset are quite close to the mean and there is less variability in the data. Based on the provided data and the given benchmark categories, it appears that the majority of the Humerus Breath measurements fall within or close to the acceptable range defined by Category 2 (6-10). This suggests that, on average, the participants in the dataset have Humerus Breath measurements that fall within the lower range.

Femur Breath

Based on the provided data for the Femur Breath measurement and the given benchmark categories (1=5-10, 2=11-15), the mean Femur Breath measurement (1.5595) falls within the range of Category 1 (5-10). This suggests that, on average, the Femur Breath measurements in the dataset are relatively low and fall within the specified benchmark range. The median Femur Breath measurement (2.0000) falls within Category 2 (11-15), indicating that the middle value of the distribution is within the specified range. The mode Femur Breath measurement (2.00) also falls within Category 2 (11-15), indicating that this value is the most frequently occurring value within the benchmark range. The standard deviation (0.49943) is relatively low, indicating that the Femur Breath measurements in the dataset are quite close to the mean and there is less variability in the data. Based on the provided data and the given benchmark categories, it appears that the majority of the Femur Breath measurements fall within or close to the acceptable range defined by Category 1 (5-10) and Category 2 (11-15). This suggests that, on average, the participants in the dataset have Femur Breath measurements that fall within the lower to moderate range.

Bistylod

Based on the provided data for the Bistylod measurement and the given benchmark categories (1=1-5, 2=6-10), the mean Bistylod measurement (1.5595) falls within the range of Category 2 (6-10). This suggests that, on average, the Bistylod measurements in the dataset are relatively high and fall within the specified benchmark range. The median Bistylod measurement (2.0000) also falls within Category 2 (6-10), indicating that the middle value of the distribution is within the specified range. The mode Bistylod measurement (2.00) falls within Category 2 (6-10), indicating that this value is the most frequently occurring value within the benchmark range. The standard deviation (0.49943) is relatively low, indicating that the Bistylod measurements in the dataset are quite close to the mean and there is less variability in the data. Based on the provided data and the given benchmark categories, it appears that the majority of the Bistylod measurements fall within or close to the range defined by Category 2 (6-10). This suggests that, on average, the participants in the dataset have Bistylod measurements that fall within the higher range.

One factor that affected an athlete's success was their stretch stature. Given that there were notable variations in the athletes' BMIs according to their distance and pace, MI was applied successfully. Athletes that specialised in short sprints like the 100- and 200-meter races had higher BMIs. In 400 metres, those with lower BMI were experts. Because the results were poor in comparison to the demand profiles of sprint athletes, the triceps, biceps, iliac crest, and supraspinal were not frequently employed to detect talent for sprinters. It was customary to use all of the breaths and girths, such as the front thigh, triceps, biceps, and humerus, to identify sprint athletes at peak performance. The findings of a study conducted by Barberi et al. (2017) demonstrated that top sprinters had lower ectomorph, relaxed and constricted upper arm girths, thigh and calf girths, fat free mass, and fat free mass index compared to the lowest tertile.

4.5 Relationship between performance and body composition in identifying sprinters for high performance athletes

Figure 4.2 Relationship between performance and body composition in identifying sprinters for high performance athletes (Correlations)

	Age	Body_mass	Stretch_stature	BMI	Triceps	Biceps	Subscapular	Iliac_crest	Supraspinale	Abdominal	Front_Thigh	Medial_calf	Arm_Girth relaxed	Arm_girthflex_tens	Waist_minimum	Gluetal_hips	Calf_girth_maximum	Humerus_Breath	Femur_Breath	Bistylod
Age	1	0.154	0.055	-0.1	-.2	0.0	-0.027	0.210	-0.027	-0.027	0.110	0.040	0.169	0.203	0.200	.296**	-0.138	-0.141	-0.027	-0.

				93	64*	24														027
Body_mass	0.154	1	-.221*	-.295**	-0.191	0.060	0.111	.276*	0.111	0.111	0.082	.787**	0.138	-0.167	.380**	-0.108	-0.029	0.128	0.111	0.111
Stretch_stature	0.055	-.221*	1	-.399**	.412**	.627**	.675**	0.176	.675**	.675**	.532**	-0.190	0.121	0.205	-.357**	.242*	0.204	0.213	.675**	.675**
BMI	-0.193	-.295**	-.399**	1	-.244*	-.702**	-.684**	-.426**	-.684**	-.684**	-.683**	-.299**	-.325**	0.191	0.122	-0.053	-.219*	-0.139	-.684**	-.684**
Triceps	-.264*	-0.191	.412**	-.244*	1	.688**	.622**	.655**	.622**	.622**	.560**	0.050	.428**	-0.034	0.051	-0.038	.594**	.740**	.622**	.622**
Biceps	0.024	0.060	.627**	-.702**	.688**	1	.953**	.577**	.953**	.953**	.861**	.237*	.255*	-0.025	-.291**	0.068	.334**	.421**	.953**	.953**
Subscapular	-0.027	0.111	.675**	-.684**	.622**	.953**	1	.523**	1.000**	1.000**	.868**	.255*	0.183	-0.037	-.291**	0.052	.305**	.406**	1.000**	1.000**
Iliac_crest	0.210	.276*	0.176	-.426**	.655**	.577**	.523**	1	.523**	.523**	.563**	.341**	.628**	-0.046	.464**	0.014	.515**	.789**	.523**	.523**
Supraspinale	-0.027	0.111	.675**	-.684**	.622**	.953**	1.000**	.523**	1	1.000**	.868**	.255*	0.183	-0.037	-.291**	0.052	.305**	.406**	1.000**	1.000**
Abdominal	-0.027	0.111	.675**	-.684**	.622**	.953**	1.000**	.523**	1.000**	1	.868**	.255*	0.183	-0.037	-.291**	0.052	.305**	.406**	1.000**	1.000**
Front_Thigh	0.110	0.082	.532**	-.683**	.560**	.861**	.868**	.563**	.868**	.868**	1	0.191	.287**	-0.111	-0.135	0.188	0.204	.300**	.868**	.868**
Medial_calf	0.040	.787**	-0.190	-.299**	0.050	.237*	.255*	.341**	.255*	.255*	0.191	1	0.182	-0.196	.298**	-0.128	0.103	0.177	.255*	.255*
Arm_Girthrelaxed	0.169	0.138	0.121	-.325**	.428**	.255*	0.183	.628**	0.183	0.183	.287**	0.182	1	-0.117	.530**	0.005	.523**	.505**	0.183	0.183
Arm_girthflex_tens	0.203	-0.167	0.205	0.191	-0.034	-0.025	-0.037	-0.046	-0.037	-0.037	-0.111	-0.196	-0.117	1	-0.185	0.078	-0.152	-0.073	-0.037	-0.037
Waist_minimum	0.200	.380**	-.357**	0.122	0.051	-.291**	-.291**	.464**	-.291**	-.291**	-0.135	.298**	.530**	-0.185	1	0.002	.352**	.437**	-.291**	-.291**
Gluteal_hips	.296**	-0.108	.242*	-0.053	-0.038	0.068	0.052	0.014	0.052	0.052	0.188	-0.128	0.005	0.078	0.002	1	-0.077	-0.100	0.052	0.052
Calf_girth_maximum	-0.138	-0.029	0.204	-.219*	.594**	.334**	.305**	.515**	.305**	.305**	0.204	0.103	.523**	-0.152	.352**	-0.077	1	.666**	.305**	.305**
Humerus_Breath	-0.141	0.128	0.213	-0.139	.740**	.421**	.406**	.789**	.406**	.406**	.300**	0.177	.505**	-0.073	.437**	-0.100	.666**	1	.406**	.406**
Femur_Breath	-0.027	0.111	.675**	-.684**	.622**	.953**	1.000**	.523**	1.000**	1.000**	.868**	.255*	0.183	-0.037	-.291**	0.052	.305**	.406**	1	1.000**
Bistylod	-0.027	0.111	.675**	-.684**	.622**	.953**	1.000**	.523**	1.000**	1.000**	.868**	.255*	0.183	-0.037	-.291**	0.052	.305**	.406**	1.000**	1

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Source Researcher's data

According to Figure 4.2, the following are observations regarding the correlation of the variables:

Body mass and Age

Crosstabulation for Body mass and Age

This crosstabulation provides information about the distribution of body mass categories across different age groups. It allows us to observe how body mass is distributed within each age group. Using correlation analysis, age shows a weak positive correlation with Body mass (0.154). This suggests that, on average, as individuals get older, their body mass tends to increase slightly.

Body mass and Stretch stature

This crosstabulation provides a visual representation of the distribution of body mass categories across different age groups. It allows us to identify patterns or variations in body mass within each age group. From the correlation analysis, Body mass has a negative correlation with Stretch stature (-0.221*), indicating that taller individuals tend to have lower body mass.

BMI and Body mass

These observations shown above provide insights into the distribution of body mass categories across different BMI ranges. Using correlation analysis, there is a strong negative correlation between BMI and Body mass (-0.295**). As body mass increases, BMI tends to decrease. This is because BMI takes into account both body mass and height, so individuals with higher body mass and relatively greater height would have lower BMI values.

Triceps and BMI

The figure above shows the crosstabulation of BMI and Triceps which provides an overview of the distribution of triceps measurements across different BMI ranges. It shows the counts for each combination of triceps measurements and BMI ranges, as well as the total counts for each BMI range and the total number of triceps measurements overall. Using the correlation analysis, Triceps has a negative correlation with BMI (-0.244*). This implies that individuals with higher BMI values tend to have lower triceps measurements. As BMI increases, the distribution of fat or muscle mass in the body may change, resulting in lower triceps measurements.

Biceps and Subscapular

The crosstabulation above provides an overview of the distribution of biceps and subscapular measurements across different count ranges. It shows the counts for each combination of biceps and subscapular measurements and count ranges, as well as the total counts for each count range and the total number of measurements overall. The correlation of Biceps and Subscapular measurements show a strong positive correlation (0.953**). Individuals with larger biceps measurements also tend to have larger subscapular measurements. This suggests a consistent pattern of body composition, where individuals with more muscular biceps tend to have a higher amount of subscapular fat.

Waist minimum and Gluteal hips

The crosstabulation above provides an overview of the distribution of waist minimum measurements and gluteal hips measurements across different ranges. It shows the counts for each combination of waist minimum and gluteal hips measurements and ranges. The correlation of Waist minimum and Gluteal hips exhibits a positive correlation (0.352**). Individuals with larger waist measurements also tend to have larger gluteal hip measurements. This observation aligns with the understanding that waist and hip measurements are related to body shape and fat distribution, with larger waists often indicating higher abdominal fat and larger gluteal hips indicating wider hip structures.

Calf girth maximum and Humerus Breath

The crosstabulation figure below provides an overview of the distribution of humerus breath measurements and calf girth maximum measurements across different ranges. It shows the counts for each combination of humerus breath and calf girth maximum measurements and ranges.

The correlation of Calf girth maximum and Humerus Breath show a positive correlation (0.666**). Individuals with larger calf girth measurements also tend to have larger humerus breath measurements. This suggests a potential relationship between the size or development of calf muscles and the width of the upper arm bone (humerus).

From this analysis, there is a noteworthy variation that indicates a considerable impact of BMI on sprint athletes' performance. The athlete's optimal distance is shortened the greater their BMI. Athletes perform at their peak over longer distances when their BMI is lower. A study by Zaccagni et al. (2014) demonstrates that, similar to other power-oriented sports, sprinters' lean body mass is indicated by the lack of sensitivity of BMI as an indicator of adiposity in athletes. A high BMI in athletes with low body fat percentages, such as sprinters, can be interpreted as a measure of high muscle mass and, as a result, as a measure of both absolute and relative strength. The study's somatotyping results suggest that ectomorphy and mesomophy are strongly connected. Mesomorphic athletes were those who specialised in shorter sprints, whereas ectomorphic athletes were those who specialised in longer sprints. This indicates that as race distance grew, ectomorphy increased and mesomorphy decreased. The fastest speeds [PB] were recorded by sprint athletes with larger femurs and calf girths, indica. According to Seitz et al. (2018), sprinters with greater muscle mass, lower adiposity, less ectomorphy, and greater strength had superior performances. They also observed that the PB times attained by 100-meter sprinters differed based on body size and somatotype.

4.6 Implementation of the use of Body Composition measurements to identify sprinters for high performance athletes in Zimbabwe.

Figure 3 Implementation of the use of Body composition measurements used to identify sprinters for high performance

One-Sample Statistics				
	N	Mean	Std. Deviation	Std. Error Mean
Body_mass	84	3.5000	1.40995	.15384
Biceps	84	1.5357	.50172	.05474
Subscapular	84	1.5595	.49943	.05449
Iliac_crest	84	1.9762	.83560	.09117
Supraspinale	84	1.5595	.49943	.05449
Abdominal	84	1.5595	.49943	.05449
Front_Thigh	84	2.9286	1.14897	.12536
Medial_calf	84	2.2381	.73827	.08055
Arm_Girthrelaxed	84	2.5000	.98788	.10779
Arm_girthflex_tens	84	4.4643	5.69177	.62102
Waist_minimum	84	2.9643	1.02318	.11164
Gluetal_hips	84	3.1786	3.52328	.38442
Calf_girth_maximum	84	4.1310	1.01530	.11078

Humerus_Breath	84	2.2976	.83276	.09086
Femur_Breath	84	1.5595	.49943	.05449
Bistylod	84	1.5595	.49943	.05449
Triceps	84	1.6786	.46983	.05126
Age	84	1.7619	.72176	.07875
Stretch_stature	84	4.5595	1.56275	.17051
BMI	84	1.6548	.76826	.08382

Source: Researcher's data

The information displayed in Figure 3 indicates that sprint athletes' body composition can be improved by certain relative strength exercises, which raises the necessary performance level when combined with the right training regimen. Sprinters with high front thigh scores reported being efficient in the beginning part of their sprint (driving), demonstrating that higher front thigh scores correlate with higher performance. Since the data was gathered with the assistance of qualified athropometrists using standardised procedures, performance evaluations were based on the athlete's declaration, resulting in error-free data that is given.

4.7 New Insights

Based on the information displayed in Figure 3, it is evident that if according to the research findings, sprinting coaches in high-level athletics competitions in Zimbabwe employ a few body composition measurements—such as stature height, weight, BMI, front thigh skinfold, and calf girth—to detect talent. Since they lack the necessary qualifications to be anthropometrists, they typically do not employ the correct ISAK measurements. Sprint athletes are not identified by measurements of breadths such as the humerus and femur. Sprinters who had a high front thigh score performed well in the first part of their sprint (driving), demonstrating that a higher front thigh score corresponds with higher performance. It is difficult for coaches to measure skinfolds, and they are unaware of the best ways to use the data from skinfolds to identify athletes with potential and train sprinters. The researcher in this study offered suggestions for the most effective ways to use body composition for training and performance prediction, as well as for identifying sprint athlete talent.

4.8 Chapter Summary

The chapter examined the analysis and presentation of data. SPSS Version 20 was used to analyse the data. Together with information pertaining to the study's goals, demographic data was also provided and examined. Tables containing data from the SPSS Version 20 programme were displayed. In this chapter, novel findings from the study were discussed and recommendations were made. The whole investigation is summed up in the next chapter. Additionally, it offers research results, recommendations, analysis, and tactics for using body composition data to identify high-performing sprint athletes in Zimbabwe.

CHAPTER FIVE: SUMMARY CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The study's results were given and examined in the preceding chapter. The study's summary, results, and recommendations were covered in this chapter. The study's primary findings, which are reported in Chapter 4, are described in depth in the summary of the significant findings. Conversely, the study's primary conclusions outline its deductions. The study's recommendations centre on the praises that accountable parties need to embrace in order to improve the application of body composition analysis in spotting sprint athletes with potential. The four research questions listed in the first chapter will be covered in the conclusions.

5.2 General Summary

In high performance facilities in Zimbabwe, the study was conducted to determine the extent to which body compositions are used to identify sprint athletes with potential. The age, weight, stature, height, and BMI of 84 sprint athletes who were enrolled in the ten high-performance centres of the Zimbabwean Province were measured using the ISAK anthropometric level 1 standards. Along with the biceps, iliac crest, supraspinal, front thigh, medial calf, and subscapular muscles, there were measurements taken of the skinfolds. The four types of girths are: minimum waist, gluteal (hips), arm flexed and tensed, and maximum calf girth. Two types of breaths are the epicondylar (humerus breadth) and the femur breadth.

SPSS version 20 data analysis software was used to analyse the quantitative data. The study found that stretch stature height was seen as a characteristic that influenced athletes' performance to a larger degree. Given that there were notable variations in the athletes' BMIs according to their distance and pace, MI was applied successfully. Athletes that specialised in short sprints like the 100- and 200-meter races had higher BMIs. Since the results are low in comparison to the demand profiles of sprint athletes, the biceps, Illiac crest, and supraspinale were not frequently employed to determine talent for sprinters. That is similar to the study. Shorter sprinting athletes were mesomorphic, while longer sprinting athletes were ectomorphic. This indicates that as race distance rose, ectomorphy increased and mesomorphy decreased.

The study found that sprint athletes who scored highly on the front thigh were efficient in the first part of their sprint (the drive), indicating that the higher the score on the thigh, the higher the performance. As a result, coaches used body composition measurements to identify talent for high performance to a lesser extent. It is difficult for coaches to measure skinfolds, and they are unaware of the best ways to use the data from skinfolds to identify athletes with potential and train sprinters. According to the study, coaches should receive ISAK standards-based training to enable them to understand body composition measurements and somatotyping, which will enable them to evaluate body composition data. Since shinfolds, girths, and breadths have a link with performance, coaches should utilise the first 20 ISAK anthropometry body composition data to get a complete performance prediction.

5. 3 Conclusions

5.3.1 Research Question 1

What metrics of the body composition are now employed in Zimbabwe to identify sprinters for high performance athletes?

According to the study, coaches use body composition measurements like stretch stature, weight, BMI, front thigh skinfolds and calf girths, biceps, and triceps to identify sprint athletes who are performing well. These measurements have an impact on the athletes' performance.

5.3.2 Research Question 2

What connection exists between body composition and performance when it comes to selecting sprinters for Zimbabwe's high performance centres?

As the race distance increased, ectomorphy increased and mesomorphy dropped, according to the study, which suggests that athletes who specialise in shorter sprints were mesomorphic and those who specialise in longer sprints were ectomorphic. The fastest timings (PB) were recorded by sprint athletes with larger femurs and calf girths, indicating stronger muscles supported by lower BMI.

5.3.3 Research Question 3

How can the use of body composition measurements to identify sprinters for high performance athletes in Zimbabwe can be implemented?

In order for coaches to be able to understand body composition data, the study suggested that they undergo training in accordance with ISAK guidelines. This would enable them to become knowledgeable about body composition measurements and somatotyping. The first 20 ISAK anthropometry body composition measurements, which comprise skinfolds, girths, and breadths and have a relationship with performance, should be used by coaches to make a complete performance forecast.

5.4 Limitations of the study

- Because there are so many athletes in Zimbabwe working with high performance centres, it was challenging to estimate the proportional qualities to be used in computing the sample size when using the quantitative method. The literature was the study was grounded was developed outside Zimbabwe, where the study was pursued
- The approval letter from the sporting association took long to be delivered
- Due to their hectic schedules, it was challenging to find athletes who performed well enough for body composition measures.
- The research quality was compromised as the performance metrics, or personal bests, were contingent on verbal communication with the athletes.
- In order to address the limits of the research, additional discussions were held with the supervisor to adjust to the current approaches for determining the study's sample size.
- Relationships between the researches were taken into consideration to fit the current study in order to address the literature gap.
- The Secretary General was contacted in order to obtain the letter of clearance from the National Athletics Association of Zimbabwe.

In order to measure sprint athletes in Zimbabwe, follow-up and scheduling appointments were conducted.

5.5 Implication of the study

5.5.1 Implications

Numerous recommendations were suggested by the research findings, and these will be discussed under two headings: implications for management and implications for additional research.

Athletics High performances

By organising workshops for coaches to learn about body compositions, interpret the data, and use the study to obtain literature that makes it simple for them to use body composition in identifying athletes for high performance, they should use the study to help bring about a turning point in the use of body composition in identifying talent for sprint athletes.

Training and Development

Coaches should enrol in ISAK and sports science courses to increase their knowledge of using body composition to spot sprint individuals with high performance potential.

Universities

It is imperative that they create a curriculum that authorises anthropometrists to work in high-performance athletic facilities.

Ministry of Sport and Recreation

In order for coaches and technical experts to be able to apply the use of body composition in recognising talent for sprint athletes at high performance centres, they should support the supply of ISAK body composition courses.

5.6 Implications for future research

It is advised that future researchers use a larger sample size and concentrate on the same research issue. Because of budgetary and scheduling limitations, the researcher was only able to examine a small sample in this study, and given the number of athletes in Zimbabwe's high-performance centres, it may be challenging to generalise the findings.

A more careful examination of the connection between physical characteristics, physiological parameters, and performance in relation to body composition data in order to identify high-performing sprint athletes in Zimbabwe

5.7 Chapter Summary

This study's conclusions and recommendations were covered in this chapter, which began with a general summary of the study's key findings before moving on to discuss the conclusions in relation to each of the study's research objectives, recommendations, and implications for practice. It also included discussions of the study's limitations and potential areas for future research. The references and appendices are the next chapters in this series.

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APPENDIX A

Bindura University of Science Education

ANTHROPOMETRY PROFORMA

Test ID……………………………………   **Lab: Tester ID**…………………………

Name……………………………………   **Sport**:…………………………

DOB……………………………………………..   **Test Date**:……………………
dd mm yy

Address…………………………………………   **Gender** M……. F……….

Country…………………………………………   **Box Ht**:………………

Ethnicity ………………………………………..   **Position**……………….

Basic	ID	Measure	Trial 1	Trial 2	Trial 3	Mean/ Median	Tester ID
	1	Body mass					
	2	Stretch stature					
	3	Sitting height					
Skinfolds (mm)	**4**	Triceps **sf**					
	5	Subscapular **sf**					
	6	Mid axilla					
	7	Biceps **sf**					
	8	Chest					
	9	Iliac Crest **sf**					

	10	Supraspinale **sf**					
	11	Abdominal **sf**					
	12	Front Thigh **sf**					
	13	Medial Calf **sf**					
Girths (cm)	**14**	Arm girth relaxed					
	15	Arm (flexed and tensed)					
	16	Waist (minimum)					
	17	Gluteal (hips)					
	18	Calf girth (max.)					
Breadths (cm)	**19**	Humerus breadth (biepicondylar)					
	20	Femur breadth (biepicondylar)					

APPENDIX B

Bindura University of Science Education

Introduction

The researcher is a student at Bindura University of Science Education pursuing Bachelors of Science Honours Degree in Sports Science and Management (HBScSSM), the researcher is required to undertake a research project. Accordingly, the researcher's area of study is **the extent to which body composition measurements are used to identify high performance athletics in Zimbabwe.** As part of this study, you have been selected to take part in the research. Participation in this study is voluntary and you are allowed to withdraw at any stage without any consequence.

All the measurements taken will be treated in strict confidence, highly valuable, and will be used for academic purposes only. With your permission, the researcher hereby asks you to objectively start body composition measurements