MEASUREMENT AND ANALYSIS OF BODY COMPOSITION OF ELITE LEVEL ATHLETES IN WEST NUSA TENGGARA: PRELIMINARY STUDY BASED ON ETHNICITY

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Abstract

This research aims to analyze the body composition of outstanding athletes at National Sports Week in West Nusa Tenggara 2023. The method used in this research is a descriptive method with a survey technique, namely measuring the body composition of outstanding athletes at National Sports Week in West Nusa Tenggara 2023 using a body composition analyzer tool. The respondents in this study were 150 athletes who competed in National Sports Week in West Nusa Tenggara 2023. Based on the results of the analysis, it can be concluded that ethnicity can influence the extent to which athletes are classified in the sports achievement category. In this research, it can be seen from the ethnic factor that the Sasak, Samawa, and Mbojo ethnicities, respectively, occupy the highest number of medal winners, but the ratio of medal winners is inversely proportional. Even though the Mbojo ethnic group won the fewest medals, the ratio of medal wins was the highest. Regarding the age factor, the majority of the sample of teenagers and those in their 20 were silver medalists, and the majority of the sample in their 30 was gold medalists. The majority of underweight samples were gold medalists, the majority of ideal body samples were bronze medalists, the majority of overweight samples were silver medalists, and the obese samples were only participants. From an anthropometric perspective, it can be seen that athletes with ideal body weight, normal body fat, low subcutaneous fat, and proportional skeletal muscle account for the majority of medal winners.

Keyword: Body composition, Athletes, Etnis

Introduction

The body composition of an athlete at the elite level in this type of sport is a very important factor and receives major attention in season-long conditioning programs at all levels of competition (Dettlaff-Dunowska et al., 2022). The physical stress inherent in training sessions and competitions over the course of a season can affect body composition. The relationship between body composition and changes in physical performance is also of great interest to strength and conditioning specialists (Tsukahara et al., 2020). Thus, changes in body composition and physical performance can occur from the beginning to the end of training in the competitive season (Eklund et al., 2021). The contribution of body composition to performance in this sport is still speculative. An understanding of how body composition relates to physical performance. Performance in several sports has been studied (Baranauskas et al., 2022; Ferraz et al., 2022). The relationship between body composition and changes in physical performance is also of great interest to strength and conditioning specialists (Stanković et al., 2023).

Body composition is the relative proportion of fat tissue and fat-free tissue in the body (Gallagher et al., 2012). Body composition consists of two parts, namely fat stores and fat-free tissue (Eka Widyawati et al., 2017). Body composition, which is often assessed in medicine, usually refers to the quantification of body fat and muscle mass (Lee et al., 2019). According to the American College of Sports Medicine (ACSM), body composition is an important indicator in evaluating health and disease risk. They recommend measuring body composition to determine body fat percentage, muscle mass, and fat distribution (Lukaski & Raymond-Pope, 2021). The World Health Organization (WHO) highlights the importance of paying attention to body fat percentage as a factor that can influence the risk of chronic diseases such as heart disease, type 2 diabetes, and hypertension. WHO recommends using body mass index (BMI) as an initial tool for identifying weight problems but also emphasizes the need to consider body composition as a whole (Nugroho et al., 2023). Meanwhile, Prieske et al. (2020) reported that body composition is closely related to an athlete's level of physical fitness. The International Society for the Advancement of Kinanthropometry (ISAK) emphasizes the importance of accurate and valid body composition measurements, including the use of skinfolds, body circumference measurements, and muscle mass estimation. Body composition has an important role in health and exercise. Understanding our body composition can help in determining appropriate exercise programs, evaluating overall health, and identifying disease risks associated with excess fat or a lack of muscle mass (Kochman et al., 2022). Body composition has an important role in health and exercise. Understanding our body composition can help in determining appropriate exercise programs, evaluating overall health, and identifying disease risks associated with excess fat or a lack of muscle mass (Toselli et al., 2022). The main focus of body composition in sports is achieving a healthy and optimal body composition to improve sports performance and overall well-being. Exercise plays an important role in achieving and maintaining a healthy body composition (Campa et al., 2021). In addition to exercise, a balanced diet and strong nutrition are essential to achieving and maintaining a healthy body composition. Therefore, consultation with a nutritionist or sports trainer to design an exercise and diet program that suits individual goals and needs is very important (Sharif et al., 2016). Body composition assesses the percentage of body fat, muscle mass, amount of water in the body, bone mass, basal metabolic rate, metabolic age, and visceral fat (Vári et al., 2023). Nowadays, body composition measurements are useful in clinical, epidemiological, and sports examinations (da Costa et al., 2023). Body composition measurements are useful for evaluating changes in nutritional status and are parameters for selecting athletes, monitoring training, and training planning. Assessing body composition is an important step in evaluating a person's health status (Komici et al., 2023). Body composition is defined as the relative proportion of fat tissue and fat-free tissue in the body. Body composition consists of four main components: total body fat tissue, fat-free mass, bone mineral, and body water (Kuriyan, 2018). The two most commonly measured components of body composition are total body fat tissue and fat-free tissue (Lukaski & Raymond-Pope, 2021; Williams, 2007).

In developing sports performance, support from other supporting knowledge is needed because athlete performance is determined by the quality of training given by the coach to the athlete. Coaches must have the ability to organize all kinds of training portions physical, technical, tactical, and mental to form a strong team (Radicchi & Mozzachiodi, 2016). The physical component is also very important in all sports. Therefore, physical conditions need to receive serious attention and be planned carefully and systematically so that the level of physical fitness and functional ability of the body's organs is better. If the physical condition is good, there will be an increase in strength, flexibility, stamina, speed, and other components of the physical condition (Isnaini et al., 2023). Thus, these factors must really be trained correctly, precisely, systematically, and continuously. The purpose of training is to help athletes improve their skills and performance as much as possible. To achieve this, there are four aspects that athletes need to pay attention to and train carefully, namely: (a) physical training, (b) technical training, (c) tactical training, and (d) mental training (Burhanuddin et al., 2023; Guntoro et al., 2023). The physical condition training program must be well planned and systematic and aimed at improving physical fitness and functional capabilities of the body system so that the athlete is likely to achieve better performance (Woods et al., 2016).

The physical condition component consists of components such as muscle strength, muscle endurance, general endurance, flexibility, speed, coordination, agility, and balance (Zubaida et al., 2023). Developing or improving a physical condition means developing or improving an athlete's physical abilities. Physical ability includes two components, namely the physical fitness component and the motor fitness component. Therefore, the athlete's physical condition or abilities must always be improved and evaluated in the hope that there will be an increase in performance in the future (Gani et al., 2023). Apart from that, regular evaluations must always be carried out regularly so that athletes and coaches can know the progress of their condition

or physical components. Apart from physical condition, body composition must also always be considered because, basically, the more an athlete has an ideal body, the more freedom they will have to carry out various movements. The body composition in question includes the composition of muscle, water, protein, fat, bone density, and basal metabolism (Lukaski & Raymond-Pope, 2021). By knowing some of these body compositions, you can analyze the athlete's body composition. With the aim of improving performance for the athletes themselves.

An outstanding athlete is someone who not only has talent but also the will, confidence, and enthusiasm for a sport, so that they can produce a good impression because they get increased achievements in their field (Wylleman et al., 2016). Coaching is something that cannot be separated from the achievement of athletes in all circles (Abdurachman & Wahyudi, 2023; Lyle & Cushion, 2016). At a practical level, the coaching process is carried out in stages, such as the Long-Term Athlete Development (LTAD) coaching process (Dowling & Washington, 2021; Ford et al., 2011). LTAD, or long-term athlete development, is a multi-stage path of training, competition, and training carried out from children to adults (Balyi et al., 2020). In LTAD, athletes are supported by good coaches, good administration (Dowling & Washington, 2021), correct sports knowledge, and sponsors who make periodization plans appropriate to their age (Balyi et al., 2020). LTAD has seven stages, which are grouped into three: (1) the athlete/student development stage by encouraging physical and sports literacy, including active start, fundamentals, and learning to train; (2) the next stage focuses on excellence, including train to train, train to compete, and train to win; (3) the last stage is the stage that encourages lifelong physical activity (Balyi et al., 2020; Dowling & Washington, 2021).

The body and soul are also important parts and roles in high-achieving athletes because the soul will determine the direction and goal, followed by the mind determining a command, and then the body will carry out movement activities. That way, if the athlete has a good body and soul, it will optimize the athlete's performance (Pangastuti, 2022). Thus, it is not only physical factors that need to be considered, but psychological factors are also an important factor in achieving athletes' achievements. The evidence is that there are many studies that examine the importance of psychology in athletes' achievements; for example, research that examines psychological factors in petanque athletes states that the problem is motivation that often appears when an athlete's performance declines, career anxiety, and stress (Hafidz et al., 2022). Other research examines the role of parental support in increasing athlete achievement, which results in the conclusion that the role of parental support has a great influence on increasing athlete achievement (Huwae, 2023). However, there is also research that reveals that the motivation provided by friends and coaches does not have much effect on athlete performance because there is little camaraderie and openness among athletes (Pratama & Yuliastrid, 2022). There are also those who study mental issues, which often have a big influence on athletes when competing, leading to victory or defeat (Fariz et al., 2023).

Looking at the research literature above, it can be concluded that psychology and physicality in achieving athletes cannot be separated because they have a very important role (Atiya et al., 2022). Psychology will influence each other, both in behavioral patterns and achievement levels in outstanding athletes (Jawoosh et al., 2022). In this way, the higher the psychological and physical preparation of athletes in a structured manner the more it will provide changes and increase their performance to a higher level.

Material and Methods

The research method used in this research is descriptive quantitative. Research methods are basically a scientific way to obtain data with specific purposes and uses, describing the current state of the subject or research object based on visible facts or as they are. In this study, the emphasis was on analyzing body composition and the performance of West Nusa Tenggara athletes based on ethnicity.

Ethical Considerations

This research was carried out in accordance with the Declaration of Helsinki and the protocol was approved by the Ethics Committee of the Indonesian National Sports Committee in West Nusa Tenggara with number: 245.A/KONI-NTB/VII/2023.

Participants

In this research, information was collected from respondents using tests that were determined in the research instrument. Based on this, the participants who will be used in this research are outstanding athletes who competed in National Sports Week in West Nusa Tenggara 2023, totaling 150 people (found in three tribes, namely the Sasak, Samawa, and Mbojo tribes).

Instrument

The instrument that will be used in this research is a type of test instrument.

In order to be more effective, the assessment must be specific and valid, and the resulting actions must be reproducible and sensitive to changes in performance. Assessments should mimic supervised practice. Likewise, field-based as well as laboratory-based procedures may provide improved characterization of movement patterns. The instrument used is a body composition analyzer; this tool is used to measure weight, height, fat, whole fat, and whole muscle (Lorena, 2016).

Design and Procedures

This survey research was conducted from 24 June to 31 July 2023 at the committee of the Indonesian National Sports Committee in West Nusa Tenggara (Indonesia). This survey research aims to collect information regarding: (i) body weight, (ii) body height, (iii) BMI, (iv) body fat, (v) fat under the skin and (vi) skeletal muscle. See at Figure 1.

Statistical Analysis

All data obtained in this research will be analyzed using the Jamovi 2.3.2.8 statistical application. First, the analysis is carried out to find the mean, standard deviation, maximum and minimum values. Second, in this study the percentage of each variable is presented.

Result and Discussion

Based on the results of the tests that have been carried out, the following data is obtained Table 1:

Based on the results of descriptive data calculations, it can be seen that the average National Sports Week in West Nusa Tenggara sample/athlete has an average body weight of 58.77 ± 8.91 kg, an average height value of 165.27 ± 8.43 cm, an average BMI value of 21.48 ± 2.42 points, an average body fat percentage value of 18.52 ± 6.94%, an average percentage of fat under the skin of 14.89 ± 6.89%, and an average percentage of skeletal muscle of 33.03 ± 4.57%.

Based on the results of the tests that have been carried out, the following data is obtained Table 2:

From the data above, it can be seen that the majority of the male sample were silver medalists with 42 athletes, and the majority of the female sample were bronze medalists with 23 athletes.

It can be seen from the ethnic factor that the Sasak, Samawa, and Mbojo ethnicities, respectively, occupy the highest number of medal winners, but the ratio of medal winners is inversely proportional. Even though the Mbojo ethnic group won the fewest medals, the ratio of medal wins was the highest.

Figure 1. Measurement Activities.

Table 1. Description of data from body composition analyzer analysis results.

Variables	Mean	Standard Deviation	Maximum	Minimum
Anthropometrics				
Body Weight (kg)	58.77	8.91	98	42.30
Body Height (cm)	165.27	8.43	195	145
BMI (score)	21.48	2.42	30.40	16.30
Body fat (%)	18.52	6.94	35.80	2.60
Fat under the skin (%)	14.89	6.89	33.70	0
Skeletal Muscle (%)	33.03	4.57	40.20	22.60

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Table 2. Analysis of body composition ratios, anthropometrics, athletes' achievement and ethnicity.

Variables	Gold Medalist	Silver Medalist	Bronze Medalist	Participant	Ratio
Gender					
Man	19	42	14	13	0.85
Woman	11	20	23	8	0.87
Ethnicity					
Sasaka	8	22	27	19	0.75
Samawa	12	31	0	6	0.88
Mbojo	10	9	4	2	0.92
Age (years)					
Teenager	7	40	21	13	0.84
20 Years	19	21	15	8	0.87
30 Years	4	1	1	0	1.00
Anthropometrics					
BMI (score)					
Underweight	4	4	4	1	0.92
Ideal	23	53	30	18	0.85
Overweight	2	5	3	2	0.83
Obesity	0	0	0	1	0.00
Body fat (%)					
- Low	5	3	6	2	0.88
- Normal	20	54	29	16	0.87
- Tall	5	5	2	3	0.80
Fat under the skin (%)					
- Low	18	42	17	10	0.89
- Normal	16	13	12	10	0.76
- Tall	6	7	8	1	0.95
Skeletal Muscle (%)					
- Low	5	7	4	4	0.80
- Proportional	24	55	33	17	0.87
- Tall	0	0	0	1	0.00

Regarding the age factor, the majority of the sample of teenagers and those in their 20 were silver medalists, and the majority of the sample in their 30 was gold medalists. The majority of samples with underweight bodies were gold medalists; the majority of samples with ideal bodies were bronze medalists; the majority of samples with overweight bodies were silver medalists; and the samples with obese bodies were only participants.

From an anthropometric perspective, it can be seen that athletes with ideal body weight, normal body fat, low fat under the skin, and proportional skeletal muscle are the majority of medal winners.

Discussion

This research aims to analyze the body composition of the athletes. Based on the results of the analysis presented, it shows that of the 150 athletes who carried out the test, a distribution was obtained.

Furthermore, from the physiological aspect, the research results show that the samples in this study on average had an ideal body, low fat mass, and high skeletal muscle. In this aspect, it is quite difficult to find research on the physiological aspects of athletes as a whole, so researchers found information on the physiological aspects of elite athletes in general from research that is not related to this, in accordance with research findings 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 & Muaidi, 2018; Escalante et al., 2021).

Research findings show that gender, age, and ethnicity have a significant relationship with the sports performance of National Sports Week in West Nusa Tenggara athletes. Gender has a significant relationship with achievement, which means that gender influences the extent to which athletes are classified into sports achievement categories. Even though the association value is not that strong, it is enough to prove that there are differences between men and women in describing sporting achievements. Both in Indonesia and in Malaysia (Elumalai et al., 2022) or Korea (Roh & Chang, 2022), women still have lower participation rates than men in sports.

Age has an influence on the extent to which achievements can be classified based on the athlete's age. This is sufficient proof that, in describing an achievement, age differences can be seen; age shows experience, maturity, and level of mental toughness (Nicholls et al., 2009). But it cannot be denied that physical abilities also have the opposite effect from the explanation above, whereas age increases, it cannot be denied that physical abilities will decrease.

As explained previously in univariate analysis, ethnicity has a significant relationship with achievement, although not purely because of different ethnicities but could be due to access to peak performance, family support, environment, and socio-culture (Higgins & Dale, 2013). This means that ethnicity can influence the extent to which athletes are classified in the sports achievement category.

Conclusion

Based on the results of the analysis, it can be concluded that ethnicity can influence the extent to which athletes are classified in the sports achievement category. In this research, it can be seen from the ethnic factor that the Sasak, Samawa, and Mbojo ethnicities, respectively, occupy the highest number of medal winners, but the ratio of medal winners is inversely proportional. Even though the Mbojo ethnic group won the fewest medals, the ratio of medal wins was the highest. Regarding the age factor, the majority of the sample of teenagers and those in their 20 were silver medalists, and the majority of the sample in their 30 were gold medalists. The majority of underweight samples were gold medalists, the majority of ideal body samples were bronze medalists, the majority of overweight samples were silver medalists, and the obese samples were only participants. From an anthropometric perspective, it can be seen that athletes with ideal body weight, normal body fat, low subcutaneous fat, and proportional skeletal muscle account for the majority of medal winners.

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