



Available online at:

<https://ejournal.upi.edu/index.php/penjas/article/view/6-1-12>

DOI: <https://doi.org/10.17509/jpjo.v6i1.32985>

Differences of Anthropometric Characteristics and Cardiovascular Endurance between U18 Football Players

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Article Info

Article History :

Received February 2021

Revised February 2021

Accepted March 2021

Available online April 2021

Keywords :

anthropometric characteristics, cardiovascular endurance, zon keramat, akademi mokhtar dahari

Abstract

The main purpose of this study was examine the differences of anthropometric characteristics and cardiovascular endurance among under 18 football players. Thirty-six football players were involved as respondent. Data was collected using Bioelectrical Impedance Analysis monitor scan for evaluating anthropometric characteristics whereas Yo-Yo Intermittent Recovery Test Level 1 was used for evaluating cardiovascular endurance. Overall results shown that U18 Akademi Mokhtar Dahari football players had greater performance compared to Zon Keramat football players. BMI, there was a slight difference for both groups. The results obtained showed that there were no significant differences between height ($p=0.14$), trunk ($p=0.14$) and legs ($p=0.84$). However, there were significant differences for weight ($p=0.01$) and Body Mass Index ($p=0.02$). There were also significant differences with result of yoyo test where Akademi Mokhtar Dahari football players had better performance with ($p=0.00$). Conclusion, Akademi Mokhtar Dahari football players had better results compared to Zon Keramat football players.

INTRODUCTION

Football is one of the well-known sport that participated by majority of people in the world. Regardless of regions, everyone supports the development of football until today. Basically, when players decided to get involved in sports, they had to know the requirements needed to get selected. Anthropometry has been shown to play an important role in selection of athletes and sports performance (Gutnik, 2015). Due to the needs of specific demands, athletes should have specific anthropometric characteristics for their own sports discipline (Masanovic, 2018). Eventually, in football, these players require to have the ideal body physique in order to have the advantage when competing. An athlete's body mass can influence their speed and endurance. The physical performance can also be affected with an non ideal body mass (Nikolaidis & Karydis, 2011). It had also been stated that elite football players will tend to have better anthropometric characteristics relating to sports performance (Csáki et al., 2017).

Besides physical attributes, components such as cardiovascular endurance also needed to be focused in order for football players to succeed. In this age category, youth football players also needed to be exposed with high intensity training to give them chance to develop their fitness level to be at the highest level. Therefore, the researcher would like to assess the differences lie between two different levels of football teams. It has been proven that a quality football performance is in conjunction with the amount of high intensity running performed in a game (Krustrup, 2003). Football players need to be at the highest level of cardiovascular endurance due to the demands of their sport. It is very important for a player's physical ability to manage in producing high intensity intermittent bouts during games that last for 60-120 minutes (Harrison, 2015). Both groups bring different performances regarding this component due to different experience gained by them. Thus, they will tend to have better ability to sustain high work rates throughout training and matches (Vaeyens, 2008).

The differences had been identified among non-elite and elite youth football players and there were few theories related to this problem. According to Baxter-Jones (1993), it would seem that around the age of 14 years old, it has a critical impact on the development of physiological characteristics in pubertal athletes. There-

fore, these youth football players will have a slight margin of differences among them not only in anthropometric characteristics but also their fitness levels. Some researchers founded that youth players at the age of 15-17 years old had the same anthropometric measurements but not cardiovascular endurance (Harrison, 2015). Hence, different nature of training sessions and exposure given will determine the players' body physique and fitness to be competing in the tournaments.

Anthropometrical profile is associated with match related performance where the players with higher endurance level and lower body fat percentage have a higher chance of winning (Mario, 2015). Ensuring the process of predicting ultimate performance potential at an early age is difficult and complex. Moreover, previous researchers have nevertheless attempted to identify factors that predispose certain players toward success in soccer with attention being paid to anthropometric characteristics (Carling, 2009). As for cardiovascular endurance, Harrison (2015) founded, aerobic fitness among young youth team sport players received limited attention. Therefore, this study focused on identifying cardiovascular endurance of young football players.

Logically, if a player does not have the best condition when playing, he may be hard to succeed. A high intensity sports with having contacts with their opponents requires them to be in the best shape. Anthropometric characteristics has been usually left out when finding players in building a football team. It is very important to have players that have ideal anthropometric figures in order to compete in higher level in the future. It has been stated that higher percentage of body mass will likely slow a person down and decrease their speed and movements. As for cardiovascular endurance, it is very important for the players to be in a fit condition to compete in a 90-minute game. The high demands of the game require the players to have good cognitive and technical skills on the field. Therefore, these two variables will be taken into measures for this study. The purpose of this study is to identify the differences of anthropometric characteristics and cardiovascular endurance between youth football players.

METHODS

The research design for this study is causal comparative. It is suitable to be used because it involves

identifying differences. It also investigates the possible cause, effect and relationships that explain differences that have existed among subjects. This study is to identify the differences of anthropometric characteristics and cardiovascular endurance. According to Sandelowski (2015), this particular design is better because the researcher does not have to move as far from or into the data and does not require an abstract rendering of data compared to other designs.

Participants

Purposive sampling had been implemented in this study to gather participants. The purposive sampling technique is the deliberate choice of a participant due to the qualities the participant possessed (Etikan, 2016). Criteria needed were under 18 football players, injury prone, compete in competitive league. Whereas, the exclusion criteria were players that had injuries and under 13,14 football players from same school.

Table 1. Criteria of Sample

Inclusion Criteria	Exclusion Criteria
Aged 15 – 17 years old	Injured players
Play in active league	

Thus, the subjects that had been tested throughout this study were 36 football players. 18 of them were from Zon Keramat schools whereas another 18 being represented by Akademi Mokhtar Dahari players. The players from Zon Keramat schools were chosen due to their victory in MSSMKL tournament recently. As for Akademi Mokhtar Dahari players, they were selected to participate in this study because they were the elite football athletes in Malaysia for young age category. The subjects were all aged from 15-17 years old and the total subjects had been gathered based on the effect size with an amount of 0.96 (Deprez, 2015). Additional with 20% of total size in conjunction with possibility of dropout during this study, the researcher has added 6 football players more.

Instrument and Procedure

As for anthropometric characteristics, instrument used is Bioelectrical Impedance Analysis monitor scan. Whereas, for cardiovascular endurance, the researcher used yo-yo intermittent recovery test to evaluate their levels.

Anthropometric Measurements

In order to measure the subjects' anthropometric characteristics, the apparatus used is Bioelectrical Impedance Analysis monitor scan. Areas that had been evaluated in this study were body weight, height, BMI, fat percentage of trunk and legs. Procedures that had been implemented in this study were the total body resistance was measured using foot-pad bioelectrical impedance analyser. The details of the subjects such as height, age in years, sex were inserted in BIA device. Then, the subjects were asked to stand erect with the feet must be shoulder-width apart. This procedure has been standardized and being recommended (Ostojic, 2006).

Cardiovascular Endurance Yo-yo Test

To determine cardiovascular endurance level of the football players, yo-yo intermittent recovery test has been carried out. The subjects ran 20m shuttles and each shuttle will provide a recovery period. The speed of running will be increasing with a 10s period controlled by audio signals prepared by the researcher. This method was very suitable to be used in youth football players. It is valid to measure for young and trained soccer players (Povoas et al., 2016). Then, their partners filled in the scoring sheet and marked their partner's achievement during the test.

Data Analysis

The data gathered through the tests have been evaluated by different analysis. Each objective stated has been analysed being analysed to gain valid data. As for identifying anthropometric characteristics and cardiovascular endurance, the researcher used descriptive analysis. Whereas, to determine the differences of both dependent variables towards the selected football players, the analysis used was independent t-test. Then, the data obtained after this study completed will be analysed using IBM SPSS 25.

RESULT

Demographic Data

A total of 36 healthy young male subjects had been recruited to complete this study. The mean \pm standard deviation age of the subjects was 16.00 ± 0.00 , mean \pm standard deviation of body weight was 57.56 ± 8.06 and

mean ± standard deviation for height was 167.31 ± 6.87. Table 2 shows mean and standard deviation for demographic data of the football players involved.

Table 2. Demographic Data of Football Players

Demographic Data	Mean ± SD
Zon Keramat	
Age	16.00 ± 0.00
Weight (kg)	54.29 ± 8.89
Height (cm)	165.61 ± 6.87
Akademi Mokhtar Dahari	
Age	16.00 ± 0.00
Weight (kg)	60.85 ± 5.66
Height (cm)	169.00 ± 6.63

Table 3. Anthropometric characteristics of U18 Zon

Variable	Mean	SD
Weight (kg)	54.29	8.89
Height (cm)	165.61	6.87
Body Mass Index	19.81	2.10
Trunk (%)	7.10	1.77
Legs (%)	12.50	2.50

The mean weight for U18 Zon Keramat football players was 54.29±8.89. The mean height for them was 165.61±6.87. Body Mass Index for the players was 19.81±2.10. Mean fat percentage for trunk was 7.10±1.77. Mean fat percentage for legs was 12.50±2.50 .

Table 4. Anthropometric Characteristics of U18 Akademi Mokhtar Dahari football players

Variable	Mean	SD
Weight (kg)	60.85	5.67
Height (cm)	169.00	6.63
Body Mass Index	21.33	1.67
Trunk (%)	6.96	0.90
Legs (%)	11.66	0.36

As for U18 Akademi Mokhtar Dahari, the mean weight for the players was 60.85±5.67. The mean height for this group was 169±6.63. Referring table 4,

the mean for Body Mass Index was 21.33±1.67. The mean fat percentage of trunk was 6.96±0.90. Mean percentage of legs for this elite football players was 11.66±0.36

Table 5. Cardiovascular Endurance of U18 Zon Keramat and Akademi Mokhtar Dahari football players

Variable	Mean	SD
Zon Keramat		
Yoyo Intermittent Test	14.14	0.28
Akademi Mokhtar Dahari		
Yoyo Intermittent Test	19.02	0.81

Result shown in Table 5 the mean result of Yoyo Intermittent recovery test for Zon Keramat was 14.14±0.28. Mean result of Yoyo Intermittent recovery test for Akademi Mokhtar Dahari was 14.14±0.81.

Table 6. Anthropometric Characteristics between U18 Zon Keramat and Akademi Mokhtar Dahari football players

Variable	Mean(SD)	P value
Weight		
Zon Keramat	54.29(8.89)	0.01*
Akademi Mokhtar Dahari	60.85(5.66)	
Height		
Zon Keramat	165.61(6.87)	0.14
Akademi Mokhtar Dahari	169.00(6.63)	
BMI		
Zon Keramat	19.81(2.10)	0.02*
Akademi Mokhtar Dahari	21.33(1.67)	
Trunks		
Zon Keramat	7.10(1.77)	0.14
Akademi Mokhtar Dahari	6.96(0.90)	
Legs		
Zon Keramat	12.50(2.60)	0.84
Akademi Mokhtar Dahari	11.66(0.36)	

*p<0.05

Table 6 presented Independent T Test analysis between U18 Zon Keramat and Akademi Mokhtar Dahari. The results obtained showed that there were no significant differences between height (p=0.14), trunk (p=0.14) and legs (p=0.84). However, there were significant differences for weight (p=0.01) and Body Mass Index (p=0.02). This result indicated that from age

group football players shown differences in terms of anthropometric measurements.

Table 7. Cardiovascular Endurance between U18 Zon Keramat and Akademi Mokhtar Dahari football players

Variable	Mean (SD)	P value
Yoyo Test		
Zon Keramat	14.14 (0.28)	0.01*
Akademi Mokhtar Dahari	19.02 (0.81)	

Based on Table 7, the result shown there was a significant difference among U18 Zon Keramat and Akademi Mokhtar Dahari football players in term of cardiovascular endurance level ($p=0.00$). The mean score for Zon Keramat was 14.14 whereas for Akademi Mokhtar Dahari was 19.02. These two groups showed the differences obtained due to different type and intensity of training involved.

DISCUSSION

In this present study, the researcher found that there were certain variables shown significantly different among these two groups. The areas involved for anthropometric characteristics were weight, height, fat percentage of trunk & legs. There were arguments regarding this study due to the usage of Bioelectrical Impedance Analysis monitor scan rather than skinfold measurement. The researcher has initially chosen BIA as main instrument for anthropometric characteristics due to time consumption. This decision has been supported by Ostojic (2006), estimation of body fat were similar between skinfold and BIA with significant correlation ($r=0.96$). Bioelectrical Impedance Analysis method is less time – consuming. As for cardiovascular endurance level, they were being tested through a test called Yoyo intermittent recovery test level 2. According to Povoas (2016), this intermittent test was valid to measure young and trained football players. According to Gonzalez-Rave (2013), these each type of intermittent tests were only focusing on similar situation to a specific intermittent type of sport.

Some physical and physiological requirements were needed as well as technical and tactical skills. These attributes were important in order to succeed in football especially. Due to different level of playing from these two categories, the data collected shown

various results to be interpreted. In this study, elite and non-elite football players presented different results for each variables respectively. Cardiovascular endurance level was measured through intermittent test. This study has chosen these tests due to several sceptical views from other people. Previous studies showed most of them did studies on foreign countries. Hence, according to Harrison (2015), aerobic fitness training for youth team sport players have received limited attention. Therefore, the researcher has taken an initiative by assessing this study on U18 local football players in Malaysia.

In the sport of football, players are considered to be somewhat homogenous group. Values found in the present study for mean value of weight of Akademi Mokhtar Dahari were better than Zon Keramat football players. The p value of this variable showed there was a significant difference of weight involving these two categories. Mean value of height represented by both groups showed that football players from Akademi Mokhtar Dahari were majority taller compared to the other group. This was because the selection being done by the elite coaches in bringing players into the academy was focusing on suitable size to compete against foreign countries. In order to summarize for both weight and height for these two groups, BMI data has been analysed and the results were significantly different. U18 football players from Akademi Mokhtar Dahari showed a good result in BMI analysis compared to Zon Keramat's players. This has been an initial mission for the elite players to be in a perfect shape involving height and weight in order to cope under pressure. Suggestions being made that training and nutritional interventions for young professional soccer players should be more closely aligned to the goal of promoting lean mass gain as opposed to those targeting reduced fat mass (Milsom, 2015). In other words, Zon Keramat's players did not being supervised about their nutritional intake although they had training sessions arranged by the coaches. These limited resources may affect a team's quality to perform better in a higher level.

In this present study, the researcher has taken an initiative to include measurement of fat percentage using Bioelectrical Impedance Analysis monitor scan. This is to identify in more detail regarding anthropometric among young football players. Areas that had been measured were fat percentage of trunk and legs.

These areas had been implemented based on previous study by Figueiredo (2012). In this present study, the results shown that players from Akademi Mokhtar Dahari had leaner trunk and legs. Despite these results, it had shown that Asian youth football players grown slower than European young football players. Realistically, both Asian and European football players received different type of approach from the coaches respectively. Therefore, it has been agreed that these teams faced changes in terms of body composition due to amount of playing time, training volume and intensity, dietary practices, illnesses, injuries and traveling (Mukherjee & Chia, 2010).

Based on the results, it was proved that Asian football players body composition and fat percentage were lower than European football players. Several improvements should be done by Asian youth football national team or clubs are increased resistance training and dietary protein as opposed to stimulate body fat loss and energy restriction during football training (Milsom, 2015). Elite players tended to present more years of soccer experience and hours of training during the season than non-elite players. By inference, total time in systematic practice may be critical in the development of youth soccer players (Figueiredo, 2012). Researcher had found that elite and non-elite football players had slight anthropometric differences. This study showed similar result with Gutnik (2015) where anthropometrical profile may indicate whether the player is suitable to play in the highest level.

As for cardiovascular endurance level, result showed a significant difference among these two categories. Mean values measured from the intermittent test showed that Akademi Mokhtar Dahari football players had better endurance level compared to Zon Keramat. Players need to meet the requirements of aerobic fitness to be capable of maintaining fast movements over the entire match (Mohr et al., 2005). Therefore, the training faced by Akademi Mokhtar Dahari players were suitable and effective whereas Zon Keramat only had training prior to their football tournaments. Elite players tend to have slight difference in terms of fitness level compared to non-elite players (Harrison et al., 2015). Hence, there was a significant difference showed in this present study. Other study stated that elite players tend to present more years of soccer experience and hours of training during the season than non-elite players

(Figueiredo, 2012). According to Fransen (2017), aerobic endurance and soccer specific skill in 11-17 years old players has been demonstrated to have more gradual changes in these fitness characteristics.

CONCLUSION

The result of this study showed that players from both Zon Keramat and Mokhtar Dahari had slight similar anthropometric characteristics. However, there was also a slight difference between them regarding cardiovascular endurance result. It has shown that Akademi Mokhtar Dahari football players tend to have better cardiovascular ability in sustaining good during football matches. Besides that, this study was conducted in order for other researchers to gain knowledge regarding this topic the researcher has conducted. Moreover, with the outcome of this study, the findings can help local schools that wanted to have a football team similar with elite football academy to improvise their training program.

The results revealed that certain anthropometric areas measured proved there were similar results among them. Despite that similarity, cardiovascular endurance level showed the significant differences due to training program faced by both categories. These findings showed that to have a high level of cardiovascular endurance, the team must attend a proper training with a supervision during consuming food to maintain a quality team. Hence, it can be considered that sets of coaches with adequate amount of training for Akademi Mokhtar Dahari football players were well organised and managed to produce world class young football players.

RECOMMENDATION

Based on this study that has been conducted by the authors, it was an important knowledge to be gained on the differences showed by these two group of young football players. Assessing these elite and non-elite football players brought valuable experience that can be used in future. Besides that, there were a few areas that needed to be improvised for future used.

Recommendations from the authors is to have more young athletes being tested properly. This step is to ensure that grassroots activities will be a success in the future and not wasting money. Besides that, those

young athletes can be from any sports but they must be in an age category. Furthermore, future study must add other variables to be measured to gain more knowledge on other aspects.

Lastly, present study faced challenges in order to get school football players to commit to this tests. This is due to the restriction of permission from the school. It is recommended for future study to assess the variables on club players. This is to ensure there will be no rules being barged by anyone.

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