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A Comparative Study of Physiological Characteristics of U17 Ethiopian Youth Sport Academy Football Players

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ABSTRACT

This study entitled “A comparative study of physiological characteristics of U17 Ethiopian youth sport Academy football players” was designed to compare their physiological characteristics. The total number of players ($N=81$, male=40 and female=41) was taken from Ethiopian Youth Sport Academy. SPSS version 20.0 was used to analyse an independent sample t -test. As the result, there was a statistically significant difference between male and female U 17 age groups in their VO_{2max} , resting heartbeat, vertical jump and systolic blood pressure, except diastolic blood pressure at the $p<0.05$ level. As a result, physiological characteristics in the academy are different for males and females. Therefore, in this result, sex was a major determinant factor of the most physiological parameter of U17 footballers. As a recommendation, physiological parameters such as VO_{2max} , leg muscular power, heart rate and blood pressure should be taken into consideration during the selection and training based on their sex.

Keywords: Physiology, VO_{2max} , Vertical jump, Football, Blood pressure, Heartbeat

INTRODUCTION

Football is the planet's most accepted teams' games, being played in every nation without exception. That is the reason which has attracted more people around the world [1]. Besides other authors [2], football is the only sport which attracts almost the entire world population. Football is now being played in more than 210 countries throughout the world [3]. Twenty-two million players were identified as youth players with 18.7 million and 2.9 million male and female players, respectively [4]. Furthermore a large number of populations around the world are watching football. For example, in the 2014 world cup reached 3.2 billion viewers around the globe [5].

Football at a young age is extremely important for the national team. Football is a dynamic and outstanding sport, which requires a very high level of physiological characteristics to compete at organized international competitions.

According to Pannenberg [6] Likewise the world, football is the most popular sport in Africa and millions of supporters are available in each country, hundreds of thousands of players, many clubs and countless competitions and tournaments at all possible levels. Football is also one of the interesting and important sports in Ethiopia. Correspondingly, football is one of the most popular sports in the country with player numbers increasing annually at an explosive rate but it is unregistered number. This day Ethiopia built the first youth sport academy of its kind in the nation to increase professional players. In this respect, the role of such kind of youth academy is vital in the long-term development of football players [7]. However, opening sport academies is not guaranty to produce talented football players unless the measurements of physiology available in the academy.

In football there are multidimensional demands of physiology. The reason behind is players are required to repeatedly run, jog, accelerate, sprint, jump and decelerate [8]. Football players in different playing position have different physiological characteristic [9]. Measuring physiology of one football player through physiological parameters which help us to understand how the football player's body is working. Therefore, different physiological parameters such as VO_{2max} , Resting heartbeat, blood pressure and vertical jump are very essential to understand U17 age group football players.

The VO_{2max} represents an integrated physiological function with contributions from lung, heart, blood and active

muscles [2]. According to Esco [10] maximal oxygen consumption (VO_{2max}) is an important physiological determinate of athletic performance among many team sports. Based on the length of the game (90 min), at least 90% of energy requirements would have to come from aerobic energy sources [11]. In later research, it was estimated as much as 98% of all energy requirements in football come from aerobic sources, with only 2% from anaerobic sources [12].

Heart rate (HR) is one of the physiological parameters most frequently assessed by physicians in daily practice [12]. Similarly, According to Sengupta and Sahoo [12] Resting heart rate is a useful parameter of cardiovascular homeostasis which tends to get lower in heavy workers. Krstrup et al. [13] furthermore studied that, the mean and peak heart rates of players were estimated to be around 85 and 98, respectively. Researchers states that resting heart rate averages between 60-80 bpm, with men averaging 70 bpm and women around 75 bpm. Athletes usually have lower HR than physically inactive people [14,15].

According to American Society of Hypertension [16] blood pressure, lower than or equal to 120/80 is ideal. Diastolic pressure usually remains about the same or moderately lowers with rising dynamic work, whereas systolic blood pressure increases as a result of increasing cardiac output [17]. Football players usually have owing to their unique lifestyle, epitome of health and unexpected physical achievements. However, participation in football exposes the players not only to musculoskeletal injuries, but also cardiovascular (CV) risks [18]. Blood pressure (BP) status in athletes is mainly derived from pre-participation office BP (OBP) screening on one occasion without organized follow-up [19].

According to Bickley [20], VJ is used to assess the power of leg or strength of leg, which is a significant fitness component testing in sedentary population as well as in athletes. The ability to generate high levels of muscular power is an important attribute of football players. Football Players are required to have high levels of muscular power in order to effectively perform the tackling, lifting, pushing and pulling tasks that occur during a match. In addition, high levels of muscular power are required to provide fast play-the-ball speed and leg drive in tackles [21].

All physiological characteristics might be varying player to player. More specifically between male and female players it will be even hugely different. Therefore, it is essential to compare physiological parameters of football players based on their sex. In this area there is a shortage of study in Ethiopian youth football players. The purpose of this study was to compare male and female player physiological characteristics of the Ethiopian Youth Sport Academy U17 age groups football players.

MATERIALS AND METHODS

Subjects

In this study 40 male and 41 female players (total=81) were taken from Ethiopian Youth Sport Academy. Due to reasonably controllable population size and ease of accessibility, the entire population was selected for participation.

Procedure of data collection

After approval from Ethiopian youth sport Academy officials and ½ h orientation about the significance of the research to coaches and players data collection was started. Henceforth, measurement of physiological parameters such as VO_{2max} , Heartbeat, and blood pressure (systolic and diastolic) and vertical jump were conducted in the academy by an independent investigator.

Procedure of variables measurement

The following procedures were used to collect data for physiological characteristics of U17 Ethiopian youth sport academy football players.

Resting heartbeat

For football players a radial pulse rate [22] was obtained manually by counting for 30 s and were multiplied by two to provide a 60 s RPR in beats per minute (NHANES) [23]. As of ACSM [24] for Palpation of pulse there are two common anatomical sites for the measurement of HR: these are radial and carotid. Therefore, based on these steps resting heartbeat was recorded.

VO_{2max}

To measure VO_{2max} through indirect method, one of the most widely used running tests for assessing cardio respiratory

(CR) fitness is the Cooper 1.5 mile (2.4 km) was applied. The objective of 1.5 mile (2.4 km) test is to run the distance in the shortest period of time [19].

Blood pressure

Before exercise the examinations were conducted. Because some player might want to exercise before examination, but this leads the result, genuine; however, at least 1 h rest was requested. BP was measured by trained personnel after 5 min rest in a sitting position.

Vertical jump

To measure vertical ability of players all procedures were adapted from Mackenzie [22], 101 Performance Evaluation Tests. A smooth wall with a ceiling high from this wall aboard a 150 cm vertical distance was mounted to a wall during the vertical jump test.

Statistical analysis

Statistical Package for Social Science (SPSS) version 20.0 was used to compare their physiological characteristics. Hence, with the help of this software an independent t-test was applied.

RESULTS AND DISCUSSION

Results

Descriptive statistics of U17 age groups physiological characteristics

The mean and standard deviations of VO_{2max} of male players is greater (53.58 ± 5.11 ml/kg/min) than female players (50.83 ± 3.19 ml/kg/min). Regarding resting heart rate, the mean and standard deviation of male is lower (59 ± 7.37 beats/min) than female players (70 ± 9.54 beats/min). Concerning systolic blood pressure, male player have a higher (115 ± 8.47 mm Hg) with compared to female footballers (109.27 ± 10.10 mm Hg). Besides the mean and standard deviation of female diastolic pressure is lower (78.05 ± 8.13 mm Hg) than male footballer (80.75 ± 6.56 mm Hg). Vertical jump of male players is higher (43 ± 5.79 cm) than female (30.46 ± 4.64 cm), for further information is given in Figure 1.

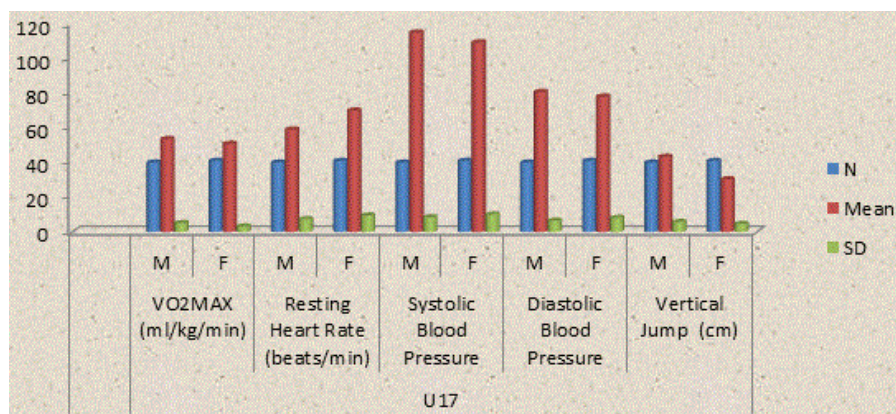


Figure 1: Physiological characteristics of Ethiopian youth sport academy U17 male and female players

An independent-samples t-test of U17 for physiological parameters

To compare the physiological characteristics of Ethiopian youth sport academy U17 age groups, male and female footballers, an independent-samples t-test was conducted.

As a result of Table 1, in their VO_{2max} there was a significant difference in scores for males ($M=53.58$ ml/kg/min, $SD=5.11$) and females ($M=50.83$, $SD=3.19$; $t(79)=2.919$, $p=.005$ (two tailed). The magnitude of the differences in the means (mean difference= 2.7557 , 95% CI: 0.8766 to 4.6347) was large (eta squared= 0.1).

Table 1: An independent-samples t-test for physiological parameters of Ethiopian youth sport academy U17 football players

Age Group		N	Mean	SD	T-test
U17	VO _{2max} (ml/kg/min)	M	40	53.58	t (79)=2.919, p=0.005
		F	41	50.83	
	Resting Heartbeat (beats/min)	M	40	59.00	t (79)=-5.8, p=0.001
		F	41	70.00	
	Systolic Blood Pressure	M	40	115.00	t (79)=2.764, p=0.007
		F	41	109.27	
	Diastolic Blood Pressure	M	40	80.75	t (79)=1.643, p=0.104
		F	41	78.05	
	Vertical Jump (cm)	M	40	43.30	t (79)=11.019, p=0.001
		F	41	30.46	

Regarding resting heartbeat, there was a significant difference in scores for males (M=59.00 beat/min, SD=7.37) and females (M=70.00, SD=9.54; $t(79)=-5.8$, $p=0.001$ (two tailed) as ensued in Table 1. The magnitude of the differences in the means (mean difference=-11.000, 95% CI: -14.775 to -7.225) was large (eta squared=0.3).

Concerning systolic blood pressure, there was a significant difference in scores for males (M=115.00 mm Hg, SD=8.47) and females (M=109.27, SD=10.1; $t(79)=2.764$, $p=0.007$ (two tailed). The magnitude of the differences in the means (mean difference=-11.000, 95% CI: -14.775 to -7.225) was moderate (eta squared=0.09). Correspondingly, diastolic blood there was not a significant difference in scores for males (M=80.75, SD=6.56) and females (M=78.05, SD=8.13; $t(79)=1.643$, $p=0.104$, (two tailed) as presented in Table 1.

Similarly, there was a statistically significant difference in vertical jump scores for males (M=43.30 cm, SD=5.79) and females, M=30.46 cm, SD=4.64; $t(79)=11.019$, $p=0.001$ (two tailed) as it is appeared in Table 1. The magnitude of the differences in the means (mean difference=12.8366, 95% CI: 10.5179 to 15.1553) was very large (eta squared=0.61).

DISCUSSION

For comparing and distinguishing the differences among the physiological characteristics of U17 Ethiopian Youth Sport Academy footballers the following discussion has been taken.

As of the result, there was a statistically significant difference of players in their VO_{2max} at $p=0.005$. Therefore, sex can convey the difference of VO_{2max} for U17 age groups, male and female football players.

Similarly, Ethiopian Youth Sport Academy U17 football players in their resting heartbeat there was a statistically significant difference at $p=0.001$. Indeed sex is a major determinant factor which makes the difference among footballers in the academy. Many studies suggested that, lower resting heartbeat per minute is more advantageous for footballers' as well as people of the world at different sex and age groups.

Likewise, systolic blood pressure at $p=0.007$ level, it was a statistically significant difference between male and female players. As a result sex is the foremost factor for systolic blood pressure of academy football players. But in case of diastolic pressure, a significant difference was not occurring. Therefore, sex is an influential factor to make a difference among footballers in the in their diastolic blood pressure.

Congruently, in their vertical jump there was a statistically significant difference between male and female players at $p=0.001$. Thus, vertical jump performance of Ethiopian youth sport academy football players is being highly affected by sex. As result, sex is a major factor to bring difference in leg muscle power. This result puts in the picture that vertical jump is very essential variable for football players that make the difference between players by their sex.

CONCLUSION

1. Ethiopian Youth Sport Academy footballers VO_{2max} is superior with reference to Cooper Institute for Aerobics Research. However, male players have higher VO_{2max} than female players. Reason is because of the location of high altitude.
2. The majority of players are in an average condition in their resting heart beat as of a standard reference of

YMCA of the USA. However, females have greater resting heart beat than males. In fact the reason might be lower in males, are physically fit.

3. The ideal blood pressure of football players (male and female) is around 120/80 mm Hg. This implies that players have a lower risk of heart disease and stroke. Hence, both sexes of football player have a capacity to perform football activities without any difficulty.
4. From this study, it can be concluded that the jumping ability of male U17 football players in a football academy in general and female players in particular is not satisfactory. The reason behind might be player had not been properly selected based on talent identification screen steps.

RECOMMENDATIONS

Physiological parameters such as VO_{2max} , leg muscular power, heart rate and blood pressure should be taken into consideration during the selection and training based on their sex.

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