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Fat mass versus body mass index as relationship connectivity contribute to the prediction of the aerobic capacity growth level to monitor the football player Weight

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ABSTRACT: Background: The question of ideal body weight historically is a subject of study that raises more questions than answers [1] [2]. However, there are more methods that are accurate available to determine the ideal body weight [3]. Where among health care professionals, the best-known method for assessing body size is the body mass index [4]. While weight is not the best indicator in the case of athletes due to increased bone and skeletal muscle [5] since the BMI is limited perfect measure to interpret the body fat confirmed by repeated analysis in the similar studies [6]. Gregory L. Landry appointed that there are better measures to adjust the optimal ideal body weight to the particularity of sport [7]demands [8]. Where Michael M. Rothkopf, et al indicts It is important for the metabolic physician to know the ranges for BMI in terms of the weight category [9] The current study compared fat mass versus body mass index as a relationship connectivity contributes to the prediction of the aerobic capacity growth level to monitor the football player weight. Methods: Thus, Ideal body weight in terms Heath is the weight associated with the lowest mortality rate estimated as body form in terms performance sportive [10] [11] [12] [13] based on the less mass body fat [14] [15]. Where Body weight is easily measured, but not always a good indicator of body composition changes [16] that control should be included as part of a comprehensive weight management [17] based on aerobic fitness which is related to body weight [18] as the soccer game is largely an aerobic sport [19] this study was undertaken and aimed at the evaluation of the relationship between Body Fat VS body mass index composition contributing to a healthy aerobic fitness body weight program among 160 male soccer players their age category under 19 years. Based on the descriptive method using the cooper test as a physiological parameter to esteem VO2max, and weight-height to calculate the BMI and body fat as anthropometric measurements. Results: based on the results obtained and applied statistics the most important finding of our study concerns within:

- The body fat and Height as best predictors of the level VO2max.
- The body fat is best predictors of the adjusted healthy aerobic fitness body weight.

Conclusions: the current study supports the hypothesis that BMI alone should not be used to determine an "ideal" body where the level of VO2max is the best predictor of the body composition, however, to develop equation more studies are needed to prove this hypothesis.

KEY WORDS : Body Fat, BMI, aerobic fitness, healthy body weight, soccer player

INTRODUCTION

There is a wide range of methods for body composition determination, which are suitable in laboratory practice (BIA, DEXA, CT, and MRI); however, they require costly equipment, which is not always available [20] [21]. Thus, they are not suitable either for everyday medical practice or in population-based studies [22].

According to the similar studies recommendations that BMI is limited by the fact that it does not differentiate between the contribution of muscle, fat or oedema to body weight. [23] [24]where WHO standards of BMI are not suitable for the evaluation of body fat [25].

The current study focused on Ideal body weight (IBW) which is the optimal weight recommended for optimal health [26] due to body fat which is less metabolically more active than lean body mass the case in athletic performance. Where Rosalinda T. League, et al marked that adjusted weight is used to determine energy diet VO2max, which is primarily determined by the aerobic capacity of the working [27]. While Joseph G. Murphy, et al Suggest that the solution is to develop predicted values for VO2 that account for not only age and sex but also the relation between body weight & height [28] and the distribution of body weight according to Ronald Klomp [29]. Whereas the most useful measure to assess for extreme weight loss in adolescents is a body mass index (BMI) adjusted [30] as Ideal body weight which can be calculated using [31]Height [32] weight [33] [34]. While the Health/fitness professionals recommend the percent of total body weight fat and what amount aspects of physical fitness, and fitness. [35] From the above, this study focus on body fat as predictor of control body weight program to promote health and fitness [36] aimed at the evaluation of the relationship between Body Fat VS body mass index composition contributing to enhance aerobic fitness as part of program body weight control among 160 soccer players under 19 years holder with experience exceeds 08 years of practice. A test based on cooper test as a physiological parameter to esteem VO2max and weight to height [37] to estimate BMI and body fat as anthropometric measurements. Where literature review confirms that aerobic fitness is cardiovascular fitness [38] [39]and better health quality of life [40] which Helps maintain recommended body weight [41]. Which we confirm that Body weight and body composition in athletes should be evaluated as part of a weight control program [42] . Thing confirmed by Sayyed Mohammad Marandi, et al [43] It seems that aerobic activity (endurance) is one of the best forms of exercise in weight control programs.

Thus, the body fat is a weight loss program that a lower body fat percentage and higher lean mass are optimal for athletes to enhance their Performance basis of weight and body fat percentage [44] [45]. The current study uses the descriptive method to answer the question: fat mass vs. body mass index which relationships predict aerobic capacity to monitor the football player Weight

METHODS

Study design and participant

The data used in this study were obtained from the database of Team 5 Physical Education Institute Laboratory OPAPS for the academic year 2014-2015. In terms of player-related data, 160 male soccer players under 19 years, with experience that exceeds 8 years in the world of soccer from the Algerian championship national territory was examined in parameters (anthropometric and physiological decide for the current study) by Team 5 listed in Table 1. at the end of the physical preparation for the year 2014-2015 after the agreement with their coach, were all examinations were realized for the first weeks before the start of the championship. Whereas expertise the study protocol and methods, we choose the laboratory OPAPS “Institute of Physical Education of our University” who approve it by the professors of football and physiologist training effort..

Procedure and variable assessment

The data collection tool was a structured base on the following tests approved by the professors of football and physiologist training effort.

The maximal aerobic capacity: We have chosen the maximal aerobic capacity based on the formula Test Cooper [16] (VO2 max=22.351 d (km)- 11.288 (ml/min/kg)) where John Gormley,et al confirm that the Cooper 12-minute test, the 1.5-mile test, the Rockport One-Mile Fitness Walking Test and the multi-stage shuttle have a corresponding laboratory VO2 max obtained by the formula [46] where Daniel Mayorga-Vega, et al set them accurate is correlated between 90- 95% [47]. wherever the Cooper Institute indict that the Cooper test provide a better picture of endurance of maximal aerobic capacity [48] which evaluate Aerobic fitness who leads to better health and a higher quality of life [49].

While Wener W.K. Hoeger, et al confirm that VO2max is affected by genetics, training, gender, age, and body composition [50].

Weight and height: Height (m) and weight (kg) were each measured in the standing position [45] to calculate the body mass index BMI= weight (kg) /height(m2) [51] where Goto Y, et al confirm that the VO2 peak is associated with biological status after controlling for height and weight [52]. whereas Ideal body weight is the body weight for a given height that is statistically associated with the greatest longevity [53] which can be estimated either by reviewing the medical record for the body weight [54] and calculated mathematically by dividing weight in kilograms by the square of height in meters [55]. Whereas this formula represents the

calculi of BMI where Vishwanath Sardesai (2011) confirms Some football players, may be overweight because of their increased lean body mass, but not obese or overfat [56]. Since BMI is not a perfect measure, it does correlate strongly with percent body fat according to Lauren M Rossen, et al [57] we use The formula proposed by Deurenberg, et al. body Fat = (1,2 × BMI) + (0,23 × age) - (10,8 × Sex) - 5,4 [58] as inexpensive and convenient means for our coaches and players.

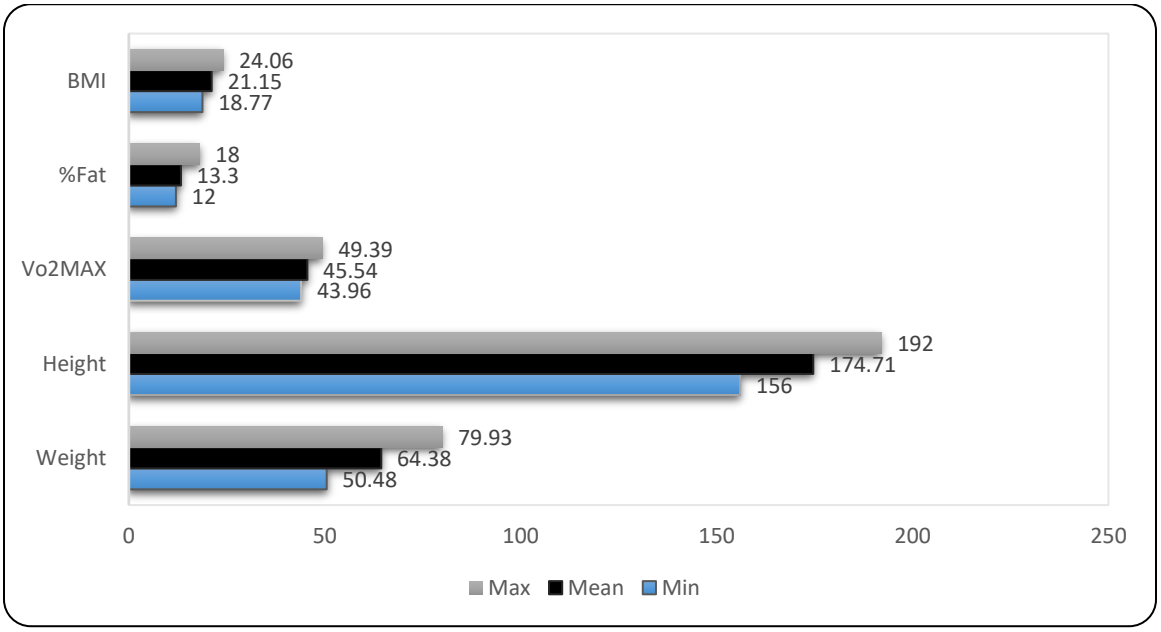
STATISTICAL RESULTS

Data analysis was performed using SPSS 22.0 for Windows (32- bit). Data obtained from the tests showed a normal distribution and homogeneity, presented as a mean ± standard deviation, Shapiro-Wilk test and Levene's test. Regression analyses were conducted to analyse the combined of the variables chosen to study where the relationship between the variables was analysed by Pearson correlations (r).

Table 1. Presents the Baseline characteristics of the participants Physiological and Anthropometric characteristics of the total group.

	N	Min	Max	Mean ± S. D	Shapiro-Wilk		Levene's test	
	Stat	Stat	Stat	Stat	Stat	Sig	Stat	Sig.
Weight	**160**	**50.48**	**79.93**	**64.38± 6.22**	**0.98**	**0.06**	**1.80**	**1.81**
Height		**156.00**	**192.00**	**174.71± 6.26**	**0.99**	**0.17**	**0.27**	**0.29**
Vo2MAX		**43.96**	**49.39**	**45,54± 1.99**	**0.99**	**0.47**	**3.16**	**0.37**
%Fat		**12.00**	**18.00**	**13,30± 2,21**	**0.99**	**0.19**	**1.17**	**0.29**
BMI		**18.77**	**24.06**	**21.15± 1.84**	**0.99**	**0.14**	**2.14**	**0.15**

Figure 1. Presents the Baseline characteristics of the participants Physiological and Anthropometric characteristics of total group



RESULTS

The characteristics of the study sample are presented in Table1. All the variables accept Normality based on Shapiro-Wilk test and the Variance homogeneity based on Levene's test where our sample range between fair and good levels VO2max according to Normative data for VO2max [59]. The Mean ± SD of all the variables shows the Good level of fitness and physiological characteristics of the participants. Where our results are consisting in terms vo2max with norms proposed by Peter R.J. Reaburn (2014) VO2max soccer: 36.3 ± 11.3 ml/kg/min, [60]in %Fat set in normal class according to Raul Garrido-Chamorro, et al [61] for the BMI our players range from 18.5 to 24.9 = normal weight Body Mass Index (BMI)according to Marie A. Boyle [62].

All the correlations in Table 2 are strongly significant at $p \leq 0.05$ and 0.01. Where Vo2MAX is a strong positive correlate with Height in the opposite of other variables tested in the current study. While Height and Weight are strongly negative correlate with % body Fat and BMI in opposite BMI & body fat.

Table 2: Presents the correlations between the variables tested in the current study.

		Weight	Height	Vo2MAX	BMI	%Fat
Weight	**Pearson Correlation**	**1**	**0.486****	**-0.434****	**0.705****	**0.683****
Height		**0.486****	**1**	**0.318****	**-0.274****	**-0.282****
Vo2MAX	**Sig. (2-tailed)**	**-0.434****	**0.318****	**1**	**-0.738****	**-0.750****
%Fat		**0.705****	**-0.274****	**-0.738****	**1**	**0.982****
BMI		**0.683****	**-0.282****	**-0.750****	**0.982****	**1**

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

Through the Table 3 mode1 method ENTER showed a strong and significant positive association between Vo2max and %Fat as Predictors of a healthy body aerobic fitness. Whereas the program Excluded Weight, Height, BMI from the regression.

Table 3: Presents the Results of regression model 1 analyses relating VO2max and the variables tested in the current study.

Model ENTER	R	R 2	Adjusted R 2	Coefficients	T	P	F	P
1	**0.75a**	**0.56**	**0.56**	**(Constant)**	**85,40**	**0.00**	**203,68**	**0.000b**
				%Fat	**-14,27**	**0.00**		

a. Dependent Variable: Vo2MAX. b. Predictors: (Constant), %Fat. Excluded Variables: Weight, Height, and BMI.

Through the Table 4 mode2 method ENTER showed a strong and significant positive association between Vo2max and %Fat with Height as Predictors a healthy body aerobic fitness. Whereas the program Excluded Weight, BMI from the regression.

Table 4: Presents the Results of regression model 2 analyses relating VO2max and the variables tested in the current study.

Model ENTER	R	R 2	Adjusted R 2	Coefficients	T	P	F	P
				(Constant)	**14,68**	**0.00**		
2	**0.76b**	**0.58**	**0.57**	**%Fat**	**-13,25**	**0.00**	**106,37**	**0.000b**
				Height	**2,13**	**0.03**		

a. Dependent Variable: Vo2MAX b. Predictors: (Constant), %Fat, Height Excluded Variables: Weight, BMI.

DISCUSSION

Based on the statistical applied. Our results confirm:

• Body Fat as the best predictor of the maximum aerobic capacity.

Where our result table 2and 3 lines with N Koutlianos confirmation that age, gender factor was more effective than BMI [63]. Thing confirms by Laxmi CC [15] in effects of increasing BMI on Cardiorespiratory Fitness case sports studies and total adiposity case the medical studies according to Tauseef Nab, et al [64]. Whereas to estimate VO2 max Peter Slinger confirms that it is based on age, sex, and height [65] in our case all the players are sex male and categories under 19 years, which we confirm the results of regression model 2 set in table 4 and the strong relationships Vo2max & Height as must Predictors of vo2max. From the proof, we agree on one hand that further studies are needed to implement the actual findings associated with this hypothesis. Where in other we invite our metabolic physician to develop equation which take the account of ranges for BMI in terms of the weight category [9] as new anthropometric equations to determine change in body Weight [66] fat-free mass, total body water and body fat [67].

• Body fat and height are good predictors of the level VO2max where the level VO2max is a good indicator of the adjusted body weight among the soccer players:

Our results correlate with the judgement of Allen L, Prentice A [68] that the body mass index (BMI) is considered to be one of the most objective anthropometric indices when it permits the correction of body weight for height. Thing observed in table 2and4 where %Fat and Height are the only predictors of the levels of Vo2max. We agree Connie Henke Yarbro, et al [69] to esteem the adjusted body weight [70] we need to detect the excess body weight in the form of fat that Anita Bean, et al [71] report as a distinct disadvantage in almost every sport.

From the above, we agree on one hand that BMI alone should not be used to determine an “ideal” body weight range. [72] where on another we invite the laboratory metabolic physician to set a range of acceptable values for body fat and body weight within each sport and to monitor the health and performance. Since exercise is beneficial for health and physical fitness [73] where the success of the training program largely depends on the individual's aerobic capacity. [74]

CONCLUSION

Our finds confirmed that:

- Ideal body weight (IBW) is the weight associated with the lowest mortality rate for a given height and gender [75] where the use of BMI alone is cautioned in athletes. Thus, body weight may be altered significantly by changing proportions of muscle and fat masses [42].
- body weight and body composition should be evaluated as part of a weight control program [76] based on lean body mass which is more closely associated with height than weight [77] evidence which confirms that the body fat and height improved prediction for the esteem VO2max based on fitness test [78]
- VO2max as the best index for aerobic fitness and program body fat loss [79] [80]. Whereas to manage body weight [81]

In the case of our study we recommend the analysis of body composition which is important for any complete fitness program, whether it is important for our players and coaches to identify the changes in body composition to evaluate the impact of their program training [45]. To conclude, we agree that Athletes’ must estimate them ideal weights based on age, height and lower weight as the crucial physiological characteristic and low percentage body fat as the most important physical characteristic [82].

From the proof the current study supports the hypothesis that that BMI alone should not be used to determine an “ideal” body where the level of vo2mas is the best predictor of the body composition, However, to develop equation more studies are needed to prove this hypothesis.

CONCLUSION

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