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International Society of Performance
Analysis of Sport



World Congress of Performance Analysis of Sport XII

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September 19 – 23 2018

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FOREWORD

The Proceedings Book is consisted of 134 abstracts and full papers written by more than 420 authors from 36 countries. Topics of the World Congress of Performance Analysis of Sport XII are: sports performance, analysis of referees, coaching process, coach behaviour, biomechanics, analysis of technique, technical effectiveness, tactical evaluation, patterns of play, neuromotor control, movement in sport, motor learning and feedback, work rate, physical demands, performance analysis technology, analysis of elite athletes and teams, effectiveness of performance analysis support, performance analysis in health and senior sport, performance analysis in youth sport, observational analysis of injury risk, technology and performance analysis systems, gymnastics & dance, doping, nutrition and supplementation influence on performance. Papers and abstracts that will be presented at the Congress are intended for sports scientists, kinesiologists, coaches, athletes and others interested in any aspect of performance analysis of sport.

We are especially proud that Soccer day is the part of this year's Congress. Soccer day is organised in cooperation with Croatian Football Federation and it will be a great opportunity to analyse the World Cup 2018 held in Russia and other aspects of performance analysis in soccer.

We would like to express our gratitude to partners and cooperating institutions like Faculty of Teacher Education, University of Zagreb, Croatia, Faculty of Physical Education and Sport, University of Priština "Hasan Prishtina", Kosovo, Faculty for Sport and Physical Education, Nikšić, University of Montenegro, Science and Research Centre, Koper, Slovenia, Faculty of Education, University of Travnik, Bosnia and Herzegovina, Faculty of Physical Education and Sport, University of Niš, Serbia, Faculty of Electrical Engineering and Computing, University of Zagreb, Faculty of Sport and Physical Education, University of Sarajevo, Bosnia and Herzegovina, Faculty of Kinesiology University of Split, Croatia, School of Natural Sciences and Health, University of Tallin, Estonia.

At the end, special thanks goes to the members of Organising and Scientific Committee, international reviewers and all others included in the preparation and organisation of this Congress for their effort. We sincerely hope that all participants of the Congress will gain new knowledge and contacts for the future collaboration in various scientific and professional projects in performance analysis of sport.

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Opening Lecture



Sports performance

Body mass index (BMI) vs body fat percentage (BFP) as a relation to estimate players' physiological soccer adaptation profile

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Purpose: In a soccer game, a VO₂max of 60 ml/kg/min has been suggested as the minimum fitness requirement for male soccer players to play at elite level. While the average maximal oxygen intake for elite adult players are reported to be in the range of 55 to 69 ml/kg/min. Although to predict the effective endurance training to improve maximal oxygen uptake, recent research confirmed obesity in terms of Fat percentage is a better parameter than BMI for the prediction of low VO₂max. On its scientific basis, our aims are to test BMI VS BFP as a relation to estimate players' physiological soccer adaptation profile.

Methods: to archive this objective, 148 well-trained first division soccer players under 18 years, at the end of the preparatory phase before the start of the Algerian championship 2016-2017, took part in the study. Split into two groups based on their VO₂max under or superior to 56 ml/kg/min. As a protocol, based on the validity of Test Cooper to predict VO₂max in the field. Acceptable by cooper institute as an index of physiological training response or as indicators of current training status.

Results: our results show in general that VO₂max is acceptable indicators of current training status. In the benefits of up to ≥ 56 ml/kg/min then it's less. Claim in the present through physiological soccer adaptation profile more related to obesity in terms of Fat percentage as a better parameter than BMI for the prediction of low VO₂max among players under 18years.

Conclusions: our protocol admits that training response in soccer game requests the use of more accurate systems, such as body fat percentage (BFP) as a relation with VO₂max to estimate adaptations of soccer program training correlated with its aerobics performance. Inspect in this study via VO₂max up to ≥ 56 ml/kg/min as the minimum fitness requirement to improve players' aerobic capacity relative to its body fat adjustments.

Key words: BFP, BMI, VO₂max, physiological, soccer player

Introduction

In professional soccer, Aerobic capacity is an important factor that affects the final league ranking, the quality of the game and the covered distances (Evangelos, Bekris; Lefteris, Mylonis; Aristotelis, Gioldasis; Ioannis, Gissis; Natalia, Kombodieta, 2016). Estimate in the case of performance among competitive soccer players through the average VO₂max score between 55 and 60 ml/kg/min. Admitted by (Manuel J. Coelho e Silva, António J. Figueiredo, Marije T Elferink-Gemser, Robert M. Malina, 2016) at the average to be in the range of 55 to 69 ml/kg/min. In fact, (Youlian Hong, 2014) set that level male soccer player ranges from 55-68 mL·kg⁻¹·min⁻¹, with individual values higher than 70 mL·kg⁻¹·min⁻¹.

Confirmed by (Strudwick Anthony, 2016) as a significantly greater total distance covered during elite soccer match play approximate to 12 at 13 km. Interpret by (Franco Simini, Pedro Bertemes-Filho, 2018) in the benefits of players with the smallest amount of Fat Muscle.

For the above proofs and Previous studies, which advises the significant relation between Vo₂max and distance covered during a match, as much as rank order in the league of the best teams (J Hoff, U Wisløff, L C Engen, O J Kemi, J Helgerud, 2002). Set by research at 60 ml/kg/min of VO₂max suggested as the minimum fitness requirement for male soccer players to play at an elite level (Almeida AMd, Santos Silva PR, Pedrinelli A, Hernandez AJ, 2018).

The purpose of this study was to evaluate aerobic capacity levels as an index to estimate the disadvantages of senior soccer players' physiological profile. Admit by similar studies as the most typical method to enhance cardiorespiratory fitness and recover more rapidly. As much as most priority areas of any fitness program helping to control body weight or stroke. Observed through the high correlation between Vo₂max and distance covered supporting the adoption of training regimes that raise the Vo₂max of soccer players to high levels (K McMillan, J Helgerud, R Macdonald, J Hoff, 2005). Requesting the analysis of body composition as important for any complete fitness program (Zerf Mohammed, 2018). State in the current study through the hypothesis that the relationship between Body fat percentage (BFP) is the best way to know, recommended body weight. Sustenance by Joseph G. et al to predict the value of Vo₂max account should not be based solely on age, sex, weight, and height. But also the percentage of body fat (Joseph G. Murphy, Margaret A, Lloyd, 2012). The case of this study that debates in one hand the hypothesis that 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. Where in other, the hypothesis, which agreed on Body fat percentage as a super factor affecting VO₂ max and thus the cardiovascular status of the athletes (Anjali N. Shete, Smita S Bute and P.R Deshmukh, 2014). Conclude by Mondal H, & Mishra SP (2017) via obesity in terms of Fat% attend to be a better criterion than BMI for prediction the low VO₂max (Mondal H, Mishra SP, 2017). Where

Material and Methods

Approximation method

The present study compared the performance of soccer players under 18 years from Algerian elite S-League players in a 12 minutes Cooper test. Performance in this test was assessed with players VO₂max estimate from its formula, as well as their body composition estimate based on BMI and BFP formulas. Support by (Arvind Sathi, 2016) as an accurate measure to keep track of weight loss goals among Sports and Fitness programs, according to (Stephen Statile, 2016). Admit by (Zerf Mohammed, 2018) via aerobic fitness as cardiovascular fitness as part of the weight control, helping the players/ human to maintain the recommended body composition. Definitely by lower

body fat percentage and higher lean mass as optimal for athletes to enhance their aerobic performance. Claim by (J Hoff, U Wisløff, L C Engen, O J Kemi, J Helgerud, 2002) via the significant amount of training time used to improve players' aerobic capacity. However, it is not known whether soccer specific training fulfils the criterion of effective endurance training to improve maximal oxygen uptake. The case of this study, which base its investigation on the average maximal oxygen intake for elite adult players, is reported to be in the range of 55 to 69 ml/kg/min according to (Manuel J. Coelho e Silva, António J. Figueiredo, Marije T Elferink-Gemser, Robert M. Malina, 2016). Built on its protocol to categorise the sample set between $VO_{2max} \pm 56$ ml/kg/min.

Participants

A total of 148 male adult elite players, representing some teams from the league Oran year 2016-2017. Were examined by the Research Team 5 Laboratory OPAPS in parameters (anthropometric and physiological) during the transition phase of the championship listed in Table 1.

Table 1. Descriptive characteristics of the soccer players participating in the study based on $VO_{2max} \leq 56$ ml/kg/min \geq as protocol.

Variables	Protocol	N	Mean±SD	Levene		Independent T-test	
				F	P≤0.05	T	P≤0.05
Height (cm)	$VO_{2max} < 56$ ml/kg/min	74	173.74±5.34	0.88	0.83	1.53	0.13
	$VO_{2max} > 56$ ml/kg/min	74	175.16±5.91				
Weight (kg)	$VO_{2max} < 56$ ml/kg/min	74	65.25±7.78	0.91	0.43	2.36	0.02
	$VO_{2max} > 56$ ml/kg/min	74	62.37±7.07				
BMI(kg/cm ²)	$VO_{2max} < 56$ ml/kg/min	74	21.61±2.33	0.59	0.44	3.34	0.01
	$VO_{2max} > 56$ ml/kg/min	74	20.34±2.26				
BFP%	$VO_{2max} < 56$ ml/kg/min	74	24.67±2.79	0.61	0.46	3.45	0.00
	$VO_{2max} > 56$ ml/kg/min	74	23.15±2.72				
VO ₂ MAX	$VO_{2max} < 56$ ml/kg/min	74	53.35±2.07	1.91	0.18	2.40	0.02
	$VO_{2max} > 56$ ml/kg/min	74	58.56±1.93				

Tests and protocol

- **Cooper 12-minute Run Test:**
Is a popular maximal running test of aerobic fitness, in which participants try to cover as much distance as they can in 12 minutes. To estimate VO_{2max} (in ml/kg/min) from the distance scored. We use the formula $VO_{2max} = (22.35 \times \text{kilometres}) - 11.29$. Admit by (Thomas Reilly, 2003) as a better indication of an individual's state of aerobic, directly related to the physical demands and physiological cardiovascular function.
- **Body Mass Index (BMI):**
BMI was calculated from body mass (W) and height (H). $BMI = W / (H^2)$, where W = body mass in kilograms and H = height in meters.
- **Body fat percentage:**
For adults (Deurenberg P, Weststrate JA, Seidell JC, 1991) set that the prediction formula was $BF\% = 1.20 \times BMI + 0.23 \times \text{age} - 10.8 \times \text{sex}$ (males = 1, females = 0) - 5.4. Its validity is comparable to the prediction error obtained with other methods of estimating BF%, such as skinfold thickness measurements or bioelectrical impedance.

Statistical analysis

Data analysis was performed using SPSS 22.0 for Windows (32-bit) (IBM, Armonk, NY, USA). Data obtained from the tests showed the homogeneity of the sample, presented as mean \pm standard deviation, Levene's test. The independent T-test was used to determine the differences between players based on $VO_2\max \leq 55 \text{ ml/kg/min} \geq$ as protocol integrates into this study. Regression analyses were conducted to analyse the combined of the variables chosen to study. While the relationship between the variables was analysed by Pearson correlations (r). All statistical significance set at $p \leq 0.05$.

Results

Based on the protocol used. Our results in Table 1. Shows by the significance of the independent T-test that upper $VO_2\max$ is directly related to the physical performance allied to aerobic capacity as physiological demands correlate to fewer anthropometrics fat index. Admit in Table 2 based on the inverse correlation in the benefits of the players with the highest $VO_2\max$ and less body weight, fat or fatness. Our finds advance the finds of (James Jay Dawes, Robin Marc Orr, Claire Louise Siekaniec, Andrea Annie Vanderwoude and Rodney Pope, 2016) via the evidence that increasing %BF is associated with decreasing performance. Suggests as a targeted approach applied in efforts to achieve optimal improvement in physical fitness performance. Record in the present through regression Table 3. Support by previous prevalence studies, due to overweight AS difficulties in performing everyday activities after intense physical exertion (Eliane Cristina de Andrade Gonçalves, Diego Augusto Santos Silva, 2016). Establish in this study via $VO_2 \max > 56 \text{ ml/kg/min}$ as an exercise intensity consistent with exercise maximum and energy requirements (Zerf MOHAMMED, 2017). Limited by soccer studies among the male elite adult players through the mean values of $VO_2 \max$ between 56 and 69 ml/kg-min (Warwick Spinks, Thomas Reilly, Aron Murphy, 2002).

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

Pearson of the total sample		BMI	BFP	Height	Weight
$VO_2\max$	$P \leq 0.05$	-0.34**	-0.36**	0.32**	-0.30**

Where model method forward showed a strong and significant positive association between $VO_2\max$ and %Fat as the only predictors of training response relative to $VO_2\max$ values among our players under 18 years. Record via BMI as independent variables excluded from the regression. Support by this study through the hypothesis, which approves Body fat percentage as a factor affecting $VO_2 \max$ and thus the cardiovascular status of the athletes (Anjali N. Shete, Smita S Bute and P.R Deshmukh, 2014).

Table 3: Presents the Results of regression analyses relating $VO_2\max$ and anthropometrics fat index

Dependent Y	$VO_2\max$
Method	Forward
Enter variable if $P <$	0,05
Remove variable if $P >$	0,1
Sample size	148
Coefficient of determination R^2	0,1207
R^2 -adjusted	0,1147
Multiple correlation coefficient	0,3475

Residual standard deviation	3,1009				
Independent variables	Coefficient	Std. Error	rpartial	t	P
(Constant)	66,0645				
BFP	-0,4816	0,1076	-0,3475	-4,478	<0,0001
Variables not included in the model					
BMIa					
F-ratio	20,0486				
Significance level	P<0,0001				
Pearson test for Normal distribution	accept Normality (P=0,1248)				

Discussion

Based on the study design and statistical applied. Our results confirm:

- 1) VO₂max up to ≥ 56 ml/kg/min is an advantage of physiological training response than less among soccer players. Admit by (TRISHA D. SCRIBBANS, STEPHAN VECSEY, PAUL B. HANKINSON, WILLIAM S. FOSTER, and BRENDON J. GURD, 2016) that training at any intensity above $\sim 60\%$ of VO₂max is likely to improve maximal oxygen uptake in healthy adults. Suggest in the present through training at or greater than $\sim 56\%$ of VO₂max improves maximal oxygen uptake as well as the decreases body weight or stroke. Confirmed by (Hassane Zouhal, G Emmeran LeMoal, G Del P. Wong, G Omar BenOunis, G Carlo Castagna, G Corentin Duluc, G Adam L. Owen and Barry Drust, 2013) that in training-related studies, increased VO₂max of the well-trained subject are generally observed after training at high intensity. Indicate by (Thevenet D, Tardieu M, Zouhal H, et al, 2007) via the amount of oxygen consumed during exercise could serve as a good criterion to judge the effectiveness of this exercise on the development of physiological soccer game recruitment. Declare in the present study through the inverse correlation between VO₂max and the fat index used in this study. In their upper reduce the levels of aerobic fitness capacity. Indicate in similar, as the basis for a good form of sports players' formation. Support by a number of tests confirming that increase the level of maximum oxygen uptake (VO₂max), improves the sports performance of the game. Inspected by (Fortuna Małgorzata, Szczurowski Jacek, Zabłocki Tomasz, Pałasz Dagmara, Demczyszak Iwona, 2018) above the player lengthens the distance run during the match, the intensity of the globally performed work increases, the number of sprints increases and the number of actions with the ball increases.
- 2) BFP is a superior better anthropometrical tool than BMI to predict the low VO₂max as the detriment of physiological training response relative to aerobic fitness among our players under 18years. Our results table 2 and 3 lines with N Koutlianos, which confirm percent body fat equation as slightly more accurate than the BMI equation (N Koutlianos, E Dimitros, T Metaxas, M Cansiz, AS Deligiannis, E Kouidi, 2013) in predicting the impact of body fat composition in term overweight. Support by (Mondal H, Mishra SP, 2017) to predict obesity in terms of Fat, BFP is a better parameter than BMI for prediction the low VO₂max. Confirmed by Laxmi CC (Laxmi CC, Udaya IB, Vinutha Shankar S, 2014) trendy the effects of increasing BFP on Cardiorespiratory Fitness case sports studies and distribution adiposity case the medical studies, according to Tauseef Nab, et al (Tauseef Nabi, Nadeema Rafiq, Ouber Qayoom, 2015). Although based on the strong negative correlation between VO₂max, BFP and BMI, we agree that increase in BM of 1 kg can increase the aerobic demand of exercise by 1 to 14%. Disclose in similar as a significant negative correlation between BMI and

VO₂max (ml/kg/min) signifying the possibility of body fat effect on cardiorespiratory function (Radovanović S, Kocić S, Gajović G, Radević S, Milosavljević M, Nićiforović J., 2014).

From the above, we reach agreement that high aerobic capacity request from the players and their coaches to detect the excess body weight in the form of a fat percentage. Report by Anita Bean, et al (Anita Bean, Carol Vorderman, 2000) as a distinct disadvantage in almost every sport.

Record in the case of our study through the advantage players up to 56% of VO₂max that allows many adaptive changes concerns bodily functions related to oxygen consumption. Set by similar as an advantage in the benefits of top team compared with those in the lowest placed among the Norwegian elite league, according to (J Hoff, U Wisløff, L C Engen, O J Kemi, J Helgerud, 2002). Interpret by (Hassane Zouhal, G Emmeran LeMoal, G Del P. Wong, G Omar Benounis, G Carlo Castagna, G Corentin Duluc, G Adam L. Owen and Barry Drust, 2013) as a training body adaptation, allied to body composition management (Paul Insel, Don Ross, Kimberley McMahon, et al, 2016). Admit in this study via the levels of aerobic capacity relative to changes in body fat percent (Mohammed Z, Abelatif H, Mokhtar M, Ali B, 2016) as effective endurance training to improve maximal oxygen uptake allied to physiological soccer demand. Conclude via this study, based on VO₂max ≤ 56 ml/kg/min \geq used in this study as a protocol in the benefit of percentage body fat as the most important body weight management (Draper N, Marshall H, 2014) more associated with the prediction of lesser Vo₂max.

Recommended through this study as the most typical method to control body weight or stroke. Observed through the high Vo₂max as adopt soccer training (K McMillan, J Helgerud, R Macdonald, J Hoff, 2005). Requesting for our coaches the use of our protocol to estimate players' physiological soccer adaptation profile built on the analysis of body composition allied to VO₂max levels (Zerf Mohammed, 2018). State in the current study through the hypothesis that the relationship between Body fat percentage (BFP) and VO₂max is the best way to know, physiological profiles of soccer players and the physiological adaptations its training interventions.

Conclusion

Since the aerobic capacity of athletes is a vital element of success in soccer achievements. It reflects physical fitness of player to transport and utilize oxygen during exercise done at increasing intensity. However, its absolute value is strongly affected by body weight; body composition, body fat percentage, body mass index and muscle mass. Where the decrease in body fat or fatness increases aerobic capacity. Our finding confirmed that the levels of VO₂max below 56 ml/kg/min reflect the impact of body fat in term of BFP on the capacity of athletes to transport and utilize oxygen during exercise, due to its cardiovascular fitness developments. Admit in the case of this study via the significant negative correlation between BMI and VO₂max (ml/kg/min) suggesting the possibility of effect of body fat percent on cardiorespiratory function. Report at present through the effect of BFP associate to decrease of aerobic soccer game demand (Paul Barash, Bruce F. Cullen, Robert K. Stoelting, 2013).

References

1. Almeida AMd, Santos Silva PR, Pedrinelli A, Hernandez AJ. (2018). Aerobic fitness in professional soccer players after anterior cruciate ligament reconstruction. *PLoS ONE*, 3, e0194432. doi:<https://doi.org/10.1371/journal.pone.0194432>
2. Anita Bean, Carol Vorderman. (2000). *The Complete Guide to Sports Nutrition*. US: A & C Black Publishers.
3. Anjali N. Shete, Smita S Bute and P.R Deshmukh. (2014). A Study of VO₂ Max and Body Fat Percentage in Female Athletes. *J Clin Diagn Res*, 8(12), BC01–BC03. doi:10.7860/JCDR/2014/10896.5329

4. Arvind Sathi. (2016). *Cognitive (Internet of) Things: Collaboration to Optimize Action*. New York: Palgrave Macmillan US: Palgrave Macmillan.
5. Deurenberg P, Weststrate JA, Seidell JC. (1991). Body mass index as a measure of body fatness: age- and sex-specific prediction formulas. *Br J Nutr*, 65(2), 105-14. Récupéré sur <https://www.ncbi.nlm.nih.gov/pubmed/2043597>
6. Draper N, Marshall H. (2014). *Exercise Physiology: For Health and Sports Performance*. USA: Routledge.
7. Eliane Cristina de Andrade Gonçalves, Diego Augusto Santos Silva. (2016). Factors associated with low levels of aerobic fitness among adolescents. *Revista Paulista de Pediatria*, 2. doi:<http://dx.doi.org/10.1016/j.rppede.2015.06.025>
8. Evangelos, Bekris; Lefteris, Mylonis; Aristotelis, Gioldasis; Ioannis, Gissis; Natalia, Kombodieta. (2016). Aerobic and Anaerobic Capacity of Professional Soccer Players in Annual Macrocycle. *Journal of Physical Education and Sport (JPES)*, 16(2), 527 - 533. doi:10.7752/jpes.2016.02082
9. Fortuna Małgorzata, Szczurowski Jacek, Zabłocki Tomasz, Pałasz Dagmara, Demczyszak Iwona. (2018). Estimation of evaluation some spirometric's parameters of football players during preparation period. *Journal of Education, Health and Sport.*, 8(6), 69-79. doi:<http://dx.doi.org/10.5281/zenodo.1252282>
10. Franco Simini, Pedro Bertemes-Filho. (2018). *Bioimpedance in Biomedical Applications and Research*. Cham: Springer International Publishing: Springer.
11. Hassane Zouhal, G Emmeran LeMoal, G Del P. Wong, G Omar BenOunis, G Carlo Castagna, G Corentin Duluc, G Adam L. Owen and Barry Drust. (2013). Physiological Responses of General vs. Specific Aerobic Endurance Exercises in Soccer. *Asian J Sports Med. Sep; 4(3):* ., 4(3), 213–220. Récupéré sur <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3880666/>
12. J Hoff, U Wisløff, L C Engen, O J Kemi, J Helgerud. (2002). Soccer specific aerobic endurance training. *British Journal of Sports Medicine (BJSM)*, 36(3), 218-221. doi:<http://dx.doi.org/10.1136/bjbm.36.3.218>
13. James Jay Dawes, Robin Marc Orr, Claire Louise Siekaniec, Andrea Annie Vanderwoude and Rodney Pope. (2016). Associations between anthropometric characteristics and physical performance in male law enforcement officers: a retrospective cohort study. *Ann Occup Environ Med*, 28(26), 1-7. doi:10.1186/s40557-016-0112-5
14. Joseph G. Murphy, Margaret A, Lloyd. (2012). *Text book, Mayo Clinic Cardiology*. UK: Oxford University Press.
15. K McMillan, J Helgerud, R Macdonald, J Hoff. (2005). Physiological adaptations to soccer-specific endurance training in professional youth soccer players. *British Journal of Sports Medicine*, 39(5), 273-277. doi:<http://dx.doi.org/10.1136/bjbm.2004.012526>
16. Laxmi CC, Udaya IB, Vinutha Shankar S. (2014). Effect of body mass index on cardiorespiratory fitness in young healthy males. *International Journal of Scientific and Research Publications*, 4(2), 1-4. Récupéré sur www.ijsrp.org
17. Manuel J. Coelho e Silva, António J. Figueiredo, Marije T Elferink-Gemser, Robert M. Malina. (2016). *Assessment of biological maturation in adolescent athletes: application of different methods with soccer and hockey players*. Portuguese: University the Colomba.
18. Mohammed Z, Abelatif H, Mokhtar M, Ali B. (2016). Height versus Weight which Cassel Parameter Determine Pulmonary Functions Fitness among the Algerians Soccer Players. *J Pulm Respir Med*, 6(353). doi:10.4172/2161-105X.1000353
19. Mondal H, Mishra SP. (2017). Effect of BMI, Body Fat Percentage and Fat-Free Mass on Maximal Oxygen Consumption in Healthy Young Adults. *J Clin Diagn Res*, 11(6), CC17-CC20. doi:10.7860/JCDR/2017/25465.10039
20. N Koutlianos, E Dimitros, T Metaxas, M Cansiz, AS Deligiannis, E Kouidi. (2013). Indirect estimation of VO₂max in athletes by ACSM's equation: valid or not? *Hippokratia*, 17(2), 136–140.
21. Paul Barash, Bruce F. Cullen, Robert K. Stoelting. (2013). *Clinical Anesthesia*, 7e. US: Wolters Kluwer Health.
22. Paul Insel, Don Ross, Kimberley McMahon, et al. (2016). *Nutrition*. US: Jones and Bartlett Publishers.
23. Radovanović S, Kocić S, Gajović G, Radević S, Milosavljević M, Nićiforović J. (2014). The impact of body weight on aerobic capacity. *Med Glas (Zenica)*, 11(1), 204-9. Récupéré sur <https://www.ncbi.nlm.nih.gov/pubmed/24496365>
24. Stephen Statle. (2016). *Beacon Technologies: The Hitchhiker's Guide to the Beacosystem*. Berkeley, CA: Apress.

25. Strudwick Anthony. (2016). *Soccer Science*. Champaign, IL: Human Kinetics.
26. Tauseef Nabi, Nadeema Rafiq, Ouber Qayoom. (2015). Assessment of cardiovascular fitness [VO₂ max] among medical students by Queens College step test. *International Journal of Biomedical and Advance Research*, 6(5), 418-421. doi: 10.7439/ijbar
27. Thevenet D, Tardieu M, Zouhal H, et al. (2007). Influence of exercise intensity on time spent at high percentage of maximal oxygen uptake during an intermittent session in young endurance-trained athletes. *Eur J Appl Physiol*, 102(1), 19–26. doi:<https://doi.org/10.1007/s00421-007-0540-6>
28. Thomas Reilly. (2003). *Advances in Sport, Leisure and Ergonomics*. London: Routledge.
29. TRISHA D. SCRIBBANS, STEPHAN VECSEY, PAUL B. HANKINSON, WILLIAM S. FOSTER, and BRENDON J. GURD. (2016). The Effect of Training Intensity on VO₂max in Young Healthy Adults: A Meta-Regression and Meta-Analysis. *Int J Exerc Sci*, 9(2), 230–247. Récupéré sur <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4836566/>
30. Warwick Spinks, Thomas Reilly, Aron Murphy. (2002). *Science and Football IV*. London: 2002.
31. Youlian Hong. (2014). *Routledge Handbook of Ergonomics in Sport and Exercise*. London: Routledge.
32. Zerf MOHAMMED. (2017). Influence of maximum heart rate predicts method on appropriate exercise intensity via Algerian soccer training programs. *Turkish Journal of Sport and Exercise*, 254 - 260. doi:<http://dx.doi.org/10.15314/tsed.323317>
33. Zerf Mohammed. (2018). Aerobic Fitness as a Superior Predictor Factor to Estimate the Optional Body Weight among the Soccer Players. 2.: *J. Hum Bio & Health Edu*, 2, 010. Récupéré sur <https://bioaccent.org/humanbiology-healtheducation/humanbiology-healtheducation10.php>