New Trends and Issues Proceedings on Humanities and Social Sciences

Issue 1 (2017) 463-467

ISSN 2421-8030
www.prosoc.eu

Selected paper of 8th World Conference on Educational Sciences (WCES-2016), 4-8, February 2016, University of Alcala, Madrid, Spain

Fatigue index of female athletes in relation with body mass index

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Suggested Citation:
Moraru, C. E., Grigore, U., Alexandru-Rare, P., & Elisabeta, E. L. (2017). Fatigue index of female athletes in relation with body mass index. *New Trends and Issues Proceedings on Humanities and Social Sciences.* [Online]. 01, pp 463-467. Available from: www.prosoc.eu

Selection and peer review under responsibility of Jesus Garcia Laborda, University of Alcala, Spain

Abstract

Intense physical efforts performed at maximal or near-maximal speeds are important for successful of team-sport performance. The aim of our paper is to find out if are any differences between female football players and female 7th rugby players in relation with their body mass index. 26 female athletes (rugby N=12; football N=14), with a mean age 20.56±3.31 years participated in this study. Certain anthropometric measurements as height and weight and Running-based Anaerobic Sprint Test for anaerobic performance were conducted. On the base of measurements we found out the fatigue index. Statistical analyses relieved no statistical differences for fatigue index between groups, and Pearson moment revealed a higher correlation between fatigue index and anthropometrics (height and weight). In conclusion, fatigue index depends on specific sports (team, individual), gender and not in the end on height and weight.

Keywords: Football,rugby 7th; female, fatigue, height, weight.

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1. Introduction

Fatigue is a physiological state characterized by the decreased ability to work caused by an excess of activity, accompanied by local and general sensations (Bota & Predescu, 1997). At the same time, researchers agree that fatigue is a physiological state and by lowering the temporary capacity of body on work it disappears after a rest period (Bota, 2000; Teodorescu, 2006). We can summarize that the fatigue is a physiological state, reversible, manifested by reduction of physical or mental performance capacity arising after requesting effort and may be reduced by a rest period. Preparation is the key! An essential part of any training program is to prepare the fundamental factors, namely; physical, tactical, physiological and theoretical. Physical training is organized and hierarchical assembly of training procedures to develop and use physical capacity of the athlete. It must at all times be maintained at all levels of training (Grosu, Iurian, Szabo, Gheorge & Grosu, 2008). At the same time, achievement or maintaining an optimal weight is an important concern in the daily sport practice. In this context, monitoring of body mass index might help reach target properly for a specific range of weight for a given height (Nikolaidis, 2014).

Rugby women in seven is a new sport introduced for the first time in the program of the Olympic Games in Rio de Janeiro (2016), in which the players require a high level of physical fitness, the speed and agility as well as aerobic and anaerobic and strength (Henne, Bassett & Andrews, 2011; Paquet, Babault, Mouchet, Piscione, & Deley, 2014). Sports specialist literature reveals that rugby is used for a variety of tests that measure the ability of the players and the motor default level of specific physical training. This makes it impossible to compare results obtained in previous studies by other authors (Johnston & Gabbet, 2011; Lockie, Murphy, Schultz, Knight, & de Jonge, 2012).

Football is considered as an intermittent activity; the game takes place over an extended time period and is characterized by numerous short periods of high or maximum intensity exercise, interspersed with brief recovery periods (Stolen, Chamari, Castagna & Wisloff, 2005). Both aerobic and anaerobic energy systems must be activated to meet the energy demands of the muscles during play (Wisloff, Castagna, Helgerud, Jones & Hoff, 2004).

Several studies have described the anthropometric and physical performance characteristics of women's rugby players or soccer players; however, these studies were limited to a single fitness-testing session performed either pre, mid- or post- sessions (Gabbett, 2007; Henne, Bassett & Andrews, 2011; Karahan, 2012; Quarrie et al., 1995; Suel, 2015). For our research, we measured anaerobic power by RAST (Running based Anaerobic Sprint Test), developed to test the athletes' anaerobic performance (Reza & Rastegar, 2012).

2. Material and method

1.1. Period and place of the research

The research was conducted in October-November 2014 and was held in the Sports Complex of the Stadium "Emil Alexandrescu" from Iasi. We note that in accordance with the Declaration of Helsinki and the Amsterdam Protocol we obtained the approval of the Ethics Commission from the Faculty of Physical Education and Sport of Iasi to conduct research on human subjects and oral consent of the coaches and athletes participating in the study were also obtained.

1.2. Subjects

A total of 26 players participated in the study; football players of CS Navobi Iasi and players of rugby 7's female team of CS Politehnica Iasi with a mean age of 21.92 ± 2.35; years (rugby, n = 12) and 19.57 ± 3.61 years (football, n = 14). Subjects regularly participated in a number of training 6-7 hours per week while the majority took daily classes in secondary education or university. Note that both teams participate in the upper echelons of the Championship on their sport.

1.3. Methods

Anthropometrical measurements were done before, as weight and height in minimal clothes and barefoot. On the base of those two measurements, we calculated the body mass index as the quotient of weight (kg) to height squared (m2). Anaerobic performance was evaluated by Running-based Anaerobic Sprint Test (RAST) that has been developed at the University of Wolverhampton as a sports-specific anaerobic test (MacKenzie, 2001). The test consists in a six by 35 meters discontinuous sprint. Each sprint represents a maximal effort with 10 seconds between each sprint for turnaround. The time was recorded for each sprint and recorded to the nearest hundredth of a second.

Each run was measured and the index was calculated after the six runs were completed: maxim power (highest value), minimum power (the lowest value), average power (sum of all six value/6) and fatigue index (maximum power-minimum power)/total time for the 6 sprint.

1.4. Statistical analyses

Data were expressed as mean and standard deviation of the mean±SD. The variable means for maximum power, minimum power, average power and fatigue index were compared by using Independent Sample t Test for analysis of variance. Pearson moment was applied to find out the type of correlation between fatigue index and anthropometrics for both groups. The IBM SPSS v.20.0 (SPSS, Chicago, USA) was used for all statistical analyses, by adopting a significance level of 0,05.

2. Results and discussions

Comparisons between groups (Table 1) revealed that both type of athletes are of similar height and BMI and a normal BMI. The mean age of female rugby players are greater and the weight is lower than the other group.

Table 1. Mean and SD for age and anthropometric measurements

Groups		Age (years)	Height (cm)	Weight (kg)	BMI (%)
Football	Mean	19.57	1.64	58.28	21.42
N=14	±SD	3.61	0.05	7.17	1.78
Rugby	Mean	21.71	1.64	57.20	21.12
N=12	±SD	2.61	0.04	5.40	2.51
Total	Mean	20.56	1.64	57.78	21.28
N=26	±SD	3.31	0.05	6.31	2.11

The running anaerobic sprint test (RAST) is a test used in the field of sports to evaluate de anaerobic power and the fatigue index. Anaerobic power was evaluated as maximum, average and minimum power and usually is employed by coaches to improve the training sessions and to establish the reference value for each sport (Gomez, 2014).

The independent samples t test shows that there are no significant differences between groups (Table 2). For the football group, the mean of maximum and minimum power output was highest compared with the rugby group. The fatigue index shows us the ability to resist intermittent and repeated sprinting fatigue (Hanjabam&Kailashiya, 2015; Keir, Theriault, Serre, 2012). The best score for fatigue index was obtained by rugby female team (3,33%), but difference between groups is not significant. The lower value of fatigue index indicates a better ability to resist fatigue. Fatigue index indicates the rate at which power declines, hence indirectly provides an assessment for ability to maintain required power output and anaerobic performance over time (Hanjabam&Kailashiya, 2015).

Table 2. Differences of power and fatigue Index of female players

Variables	Groups	Mean±SD	Mean Differences	Sign.
Max. Power (Watt)	Football	452.49±72.41	6.73	0.81
	Rugby 7s	445.76±74.64		
Average Power (Watt)	Football	360.34±64.19	-21.81	0.38
	Rugby 7s	382.16±60.41		
Min. Power (Watt)	Football	342.61±69.78	10.90	0.66
	Rugby 7s	331.71±56.11		
Fatigue Index (%)	Football	3.75±1.50	0.57	0.46
	Rugby 7s	3.33±1.41		

Table 3. Correlation between anthropometrics and RAST indexes of female players

Variables	Max Power	Average Power	Min Power	Fatigue Index
Height	0,612**	0.416*	0.432*	0.474*
Weight	0.733**	0.457*	0.510**	0.519
BMI	0.434	0,249	0.295	0.283

*correlation is significant at the 0.05 level (2-tailed)

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

Maximum, average and minimum power output have a great level of correlation with height and weight and no correlation with BMI (Table 3). Fatigue index correlates only with height, if height is greater the level of fatigue index will grow too. In the other studies, the relationship between BMI and physical fitness characteristics have been examines (Nikolaidis, 2013; Nikolaidis, 2014). Nikolaidis (2014) found an inverse correlation with various indices of anaerobic power with Wingate anaerobic test.

3. Conclusions

Female team sports as football and rugby 7s required different type of movement as acceleration, deceleration, and changes of direction. All of these are in direct relation with stimuli such as opponents, team mates or the ball. In our paper it was seen that whole participants had a good fatigue index, it means that good skill training were applied for both groups. The mean of maximum and minimum power output for football athletes was highest compared with the rugby group, and the rugby group obtained higher scores for average power. This fact reflects a good anaerobic power and fatigue index.

References

Bota, C. (2000). *Ergofiziologie.* București: Editura Globus.

Bota, C., & Predescu, B. (1997). *Physiology of physical education and sports*. Bucharest (in Romanian): Antim Ivireanu Publishing House.

Gabbett, T.J. (2007). Physiological and anthropometric characteristics of elite women rugby league players. *J Strength Cond Res.*,*21*(3),875-881.

Gomez, G.A. (2014). Anaerobic and aerobic performances in elite basketball players. *Journal of Human Kinetics, 42*,137-147.

Grosu, E. F., Iurian, C., Szabo, P., Gheorge, S. & Grosu, V.T. (2008). *Optimizarea antrenamentului sportiv*. Cluj Napoca: Editura GMI.

Hanjabam, B., & Kailashiya, J. (2015). Gender difference in fatigue ındex and its reated physiology. *Indian J Physiol Pharmacol, 59*(2), 170-174.

Henne, N.M., Bassett, S.H., & Andrews BS. (2011). Physical fitness of elite women's rugby union players. *Afr J Phys Health Educ Recr Dance*, *17*(1), 1-18.

Johnston, R.D. & Gabbett, T.J. (2011), Repeated-sprint and effort ability in rugby league players. *J Strength Cond Res.* 2011, 25(10), 2789-2795.

Karahan, M. (2012). The effect of skill-based maximal intensity trening on aerobic and anaerobic performance of female futsal players. *Biol. Sport.* 29,223-227.

Keir, D.A., Theriault, F., & Serresse, O. (2012). Evaluation of the running based anaerobic sprint test as a measure of repeated sprint ability in collegiate level soccer players. *J Strength Cond Res,* 27, 1671-1678.

Lockie, R.G., Murphy, A.J., Schultz, A.B., Knight, T.J., & de Jonge, XAKJ. (2012), The effects of different speed training protocols on sprint acceleration kinematics and muscle strength and power in field sport athletes. *J Strength Cond Res*, 26(6), 1539-1550.

Nikolaidis, P.T. (2014). Weight status and physical fitness in female soccer players: is there an optimal BMI? *Sport Sci Health*, 10(1),41-48.

Nikolaidis, PT. (2013). Body mass index and body fat percentage are associated with decreased physical fitness in adolescent and adult female volleyball players. *J Res Med Sci*, 18(1), 22-26.

Paquet, JB., Babault, N., Mouchet, A., Piscione, J., & Deley, G. (2014). Physical demand and movement pattern specificities in elite female rugby sevens, CEP Dijon, pg. 1-7.b http://expertise-performance.u-bourgogne.fr/pdf/rugby_7.pdf

Quarrie KL., Handcock P, Waller AE, et al. (1995). The New Zealand rugby injury and performance project. III. Anthropometric and physical performance characteristics of players. *Br J Sports Med.* 29(4), 263-270.

Reza, A.N., & Rastegar, M. (2012). Correlation between running based anaerobic sprint test (RAST) field tests, sargent jump and 300 yard shuttle run test in evaluation of indoor soccer players anaerobic readiness, *Annals of Biological Research*, 3(1), 377-384.

Stolen, T., Chamari, K., Castagna, C., & Wisloff, U. (2005). Physiology of soccer: An update**,** *Sports Med*, 35(6):501–536.U.

Suel, E. (2015). The effect of skill based maximal ıntensity trening on power. Agility and Speed (PAS) in Female Sport Players. *Anthropologist*. 21(1,2):120-128.

Teodorescu, S. (2006). *Teoria antrenamentului și a competiției*, București: Editura ANEFS.

Wisloff, U., Castagna, C., Helgerud, J., Jones, R., & Hoff, J. (2004).Strong correlation of maximal squat strength with sprint performance and vertical jump height in elite soccer players. *Br J Sports Med*, 38(3), 285–288.