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Assessment and Differences in Anaerobic Capacity of Football Players Playing on Different Positions in the Team, Using Rast Test

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A B S T R A C T

Today's rapid development of football in all stages allocates a dominant role to conditional training. Players who participated in the study played in the 4:4:2 formation, therefore the classification has been made according to the playing position in the aforementioned system. The total sample of respondents consisted of 60 players at the cadet level (14 to 16 years) medically fit for playing football and without any morphological and motor aberrations. The study applied pitch RAST test, which is very convenient for conducting and obtaining fast results on the anaerobic capacity of football players. In addition to this test, the assessment of anaerobic capacity uses the modified Bangsbo test. This research has demonstrated the importance of anaerobic capacity of certain players playing in different positions.

Key words: *anaerobic capacity, football players, rast test*

Introduction

The requirements of modern football match in all segments of energy consumption and motor tasks give a new dimensionality to conditional training that becomes increasingly important foundation for high, team score achievements. Today's rapid development of football in all stages: defense-conversation (defense/attack), the moment of change in ball possession, the set attack -conversation (attack/defense), the moment of losing the possession of the ball, and the transition stage (attack/defense), allocates a dominant role to conditional training (Krulanović, 2016). This research has demonstrated the importance of anaerobic capacity of certain players playing in different positions. In addition, a separate analysis of maximum strength, minimum strength, mean strength and fatigue index determined that in certain positions a dominant capability is to maintain anaerobic performance during the match, the temporal strength failure or there is only the possibility of expressing the maximum strength but without the possibility of repeating in a high pace.

The energetic system the role of which is important for the sport should be developed through the training process. It is therefore very important to determine the energetic potential, which is required for that sport or position in the team, because only in this way can a maximum of sports form be achieved, which is extremely important in football, because different positions on the team alternate the different energetic systems (Fratrić, 2006).

Methods

Players who participated in the study played in the 4:4:2 formation, therefore the classification has been made according to the playing position in the aforementioned system. Five groups of players were formed, namely: centre-backs (12 players), the full backs (15 players), midfielders (14 players), offensive players (13 players) and goalkeepers (6 players). The total sample of respondents consisted of 60 players at the cadet level (14 to 16 years) medically fit for playing football and without any morphological and motor aberrations.

The study applied pitch RAST test, which is very convenient for conducting and obtaining fast results on the anaerobic capacity of football players. In addition to this test, the assessment of anaerobic capacity uses the modified Bangsbo test (Sayers et al., 2008), which consists of seven 35-meter sprints with a change of direction while running and 25-second walk between the sprints. RAST test consists of six 35-meter sprints and 10-second rest between each section which serves to rotate and prepare (Mackenzie, 2005). After the measured times for the six finished sections, strength for each run is calculated, and the following values obtained: minimum strength (the lowest value) which represents the measure of the lowest demonstrated strength and is used to calculate the index of fatigue; maximum strength (maximum value), which represents the measure of the highest manifested strength and provides information about strength and maximal sprint speed; average strength (the sum of all six values/six) indicates the athlete's ability to maintain strength over time. Higher value of the average strength indi-

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cates better ability of the respondents to maintain anaerobic capacity and fatigue index (maximum strength-minimum strength) / total time of 6 sprints, and indicated the extent to which strength is waning among the respondents.

The statistical analysis show the descriptive parameters, mean value, standard deviation (SD), minimum and maximum of all values, the coefficient of variation (CV) confidence interval, measures of asymmetry skewness, measures of flattening kurtosis, and the value of the Kolmogorov-Smirnov test. In addition to the method for obtaining basic statistical parameters, multivariate methods, MANOVA and discriminate analysis were also used. Confullring univariate methods, ANOVA t-test and Roy's test were applied.

Results

RAST test results are shown in four variables for assessing anaerobic capacity, namely: the values of maximum strength (RMAXS), the values of the minimum strength (RMINS), the values of the average strength (RPROS) and fatigue index (RINZA).

The results of the variation coefficient (Table 1) indicate high values in almost all analyzed variables, which show significant differences, i.e. pronounced heterogeneity in all observed groups. Distribution of value ranges within the normal distribution (p) for all variables for the assessment of anaerobic capacity.

Table 1. Basic Statistical Parameters of Anaerobic Capacity of Football Players Regarding Playing Position

	m.v	std.d	grš	min	max	c.var	interv. pov.		sk	ku	p
centre backs											
RMAXS	521.22	123.17	35.56	360.9	773.7	23.63	442.95	599.50	.44	-.42	.923
RMINS	350.52	75.51	21.80	240.6	503.9	21.54	302.54	398.51	.61	-.47	.785
RPROS	419.84	87.49	25.25	309.6	604.0	20.84	364.24	475.44	.61	-.33	.888
RINZA	4.90	1.86	.54	1.9	8.5	38.06	3.71	6.08	.28	-.32	.518
full backs											
RMAXS	514.77	131.33	33.91	247.8	721.6	25.51	442.03	587.52	-.63	-.41	.982
RMINS	328.43	75.95	19.61	139.7	423.7	23.13	286.36	370.50	-.97	.51	.997
RPROS	416.15	103.28	26.67	181.6	544.8	24.82	358.94	473.36	-.75	-.05	.995
RINZA	5.37	2.42	.63	1.4	8.5	45.12	4.03	6.71	-.34	-1.32	.824
midfielders											
RMAXS	512.12	157.90	42.20	267.3	793.7	30.83	420.93	603.32	.19	-1.01	.999
RMINS	317.96	80.02	21.39	158.1	454.0	25.17	271.75	364.18	-.41	-.41	.992
RPROS	401.41	106.79	28.54	212.2	587.9	26.60	339.73	463.08	-.02	-.90	.980
RINZA	5.53	2.93	.78	1.7	10.7	53.03	3.84	7.23	.41	-.99	.903
offensive players											
RMAXS	563.63	125.78	34.88	364.6	790.2	22.32	487.60	639.66	.05	-.63	.881
RMINS	378.85	93.99	26.07	232.2	543.3	24.81	322.04	435.66	.20	-.82	.968
RPROS	457.32	108.95	30.22	300.5	668.8	23.82	391.47	523.18	.39	-.36	.557
RINZA	5.44	1.82	.51	3.2	8.4	33.53	4.34	6.54	.27	-1.30	.560
goalkeepers											
RMAXS	588.82	118.94	48.56	416.3	773.7	20.20	463.97	713.67	.19	-.51	.829
RMINS	349.98	57.72	23.56	271.6	431.2	16.49	289.40	410.57	.00	-1.09	1.000
RPROS	437.63	64.56	26.36	345.4	519.8	14.75	369.87	505.40	-.20	-1.16	1.000
RINZA	6.72	2.39	.98	4.0	10.2	35.52	4.22	9.23	.40	-1.30	.952

By examining the obtained measures of distribution of the standardized asymmetry coefficient (skewness) one can observe that the majority of variables do not significantly deviate from the expected Gauss-Laplace Law on normal distribution of data. Negative values of kurtosis in almost all variables indicate curve flattening, i.e. the concentration of value is lower around the mean. There is a distinct lengthiness of the results in: full backs and offensive players for the fatigue index (RINZA); midfielders for the value of maximum strength (RMAXS); and goalkeepers for the value of minimum strength (RMINS), the value of average strength (RPROS) and fatigue index (RINZA).

Goalkeepers achieved the highest average value of maximum strength (588.82 W), but at the same time have the highest index of fatigue (6.72 W/s), which indicates the poorer capacity of anaerobic sprint endurance (repetitions of better values in a given time period). Offensive players have the highest value of the average strength (457.32 W), i.e. the best capacity to maintain work under anaerobic conditions. Comparing the average values of the observed groups, one can see the similarity in all variables, i.e. it can be concluded, with a certain caution, that there is no difference between the groups.

After the application of multivariate variance analysis (MANOVA), the resulting significance is on the border of significance threshold (p=0.100), i.e. with the increased risk of inference it can be concluded that there is a statistically significant difference in the observed area of anaerobic capacity of football players. However, discriminative analysis (p=0.204) as a more sensitive method indicates no significant difference and clearly defined border between any assessment variable of anaerobic capacity using the RAST test in relation to the playing position of the football players (Table 2).

Table 2. The Significance of Difference in the Area of Anaerobic Capacity of Football Players Regarding Playing Position

	n	F	p
MANOVA	4	1.515	.100
DISKRIMINATIVE	2	1.401	.204

The univariate analysis (Table 3) confirmed the values of discriminative analysis, i.e. there was no significant difference in the observed variables between the groups. Since p=0.204 (discriminative analysis), there is no clearly defined boundary of football players by the playing position, so it is not possible to determine the features of the respondents by the playing position in the broadest sense, in relation to the assessment of anaerobic capacity using the RAST test.

Table 3. The Significance of Differences by Individual Features of Anaerobic Capacity Assessment Regarding Playing Position

ANOVA	F	p
RMAXS	.604	.661
RMINS	1.166	.336
RPROS	.601	.664
RINZA	.619	.651

Since the groups do not have distinct characteristics, it reflected on a reduced percentage value of their homogeneity. In centre backs and fullbacks homogeneity is higher, i.e. eight or nine players have defined characteristics. Defined characteristics of midfielders are reported in 6 of 14 respondents, homogeneity is 42.9% (lower) because 8 respondents have other characteristics. Defined characteristics of offensive players are observed in 7 of 13 respondents, homogeneity is 53.8% (lower) because 6 patients have other characteristics. Defined characteristics of goalkeepers are reported in 3 of 6 respondents, homogeneity is 50.0% (lower) because 3 respondents have other characteristics (Table 4).

Table 4. Homogenity of Football Players Playing in Different Positions by the Assessment of Anaerobic Capacity

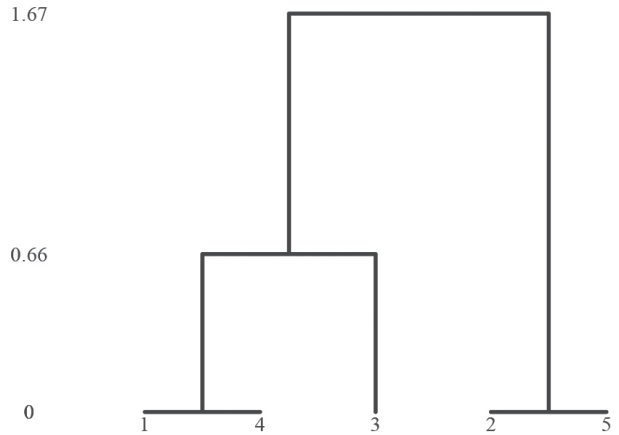
	m/n	%
CENTRE BACK	8/12	66.67
FULL BACK	9/15	60.00
MIDFIELDER	6/14	42.86
OFFENSIVE PLYER	7/13	53.85
GOALKEEPER	3/6	50.00

Distance values (Table 5) between the football players according to the playing position indicate the similarity between the groups and confirm the values obtained in the Table of football players' homogeneity.

Table 5. Distance (Mahalanobis) of Football Players Playing in Different Positions by the Assessment of Anaerobic Capacity

	CENTRE BACK	FULL BACK	MIDFIELDER	OFFENSIVE PLAYER	GOALKEEPER
CENTRE BACK	.00	.73	.24	.00	.97
FULL BACK	.49	.00	.75	.97	.00
MIDFIELDER	.73	.24	.00	.97	1.11
OFFENSIVE PLAYER	.00	.75	.97	.00	1.11
GOALKEEPER	.24	.00	.97	1.11	.00

Based on the displayed dendrogram and grouping values in Figure 1, it can be seen that the closest in their characteristics are center-backs and offensive players with the distance of 0.00, and full backs and goalkeepers with the same distance, and the biggest difference is between the center backs and fullbacks, with the distance of 1.67.



level	closeness	
CENTRE BACK	OFFENSIVE PLAYER	.00
FULL BACK	GOALKEEPER	.00
CENTRE BACK	MIDFIELDER	.66
CENTRE BACK	FULL BACK	1.67

Figure 1. Grouping of Football Players Playing in Different Positions by the Assessment of Anaerobic Capacity

With the detailed review of Figure 2, based on overlapping ellipses, it can be seen that the groups do not differ with respect to two most discriminating variables, the minimum and maximum strength values.

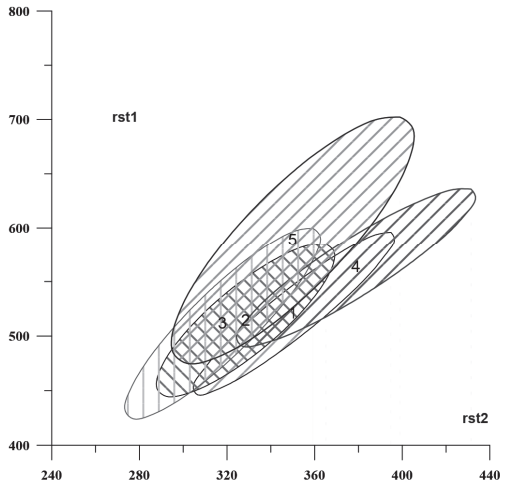


Figure 2. Group Ellipses in Relation to the Value of Minimum and Maximum Strength

Legend: centre backs (1); full backs (2); midfielders (3); offensive players (4); goalkeepers (5); minimum strength value (rst2); maximum strength value (rst1), abscissa (horizontal axis) is the value of minimum strength (rst2) and the ordinate (vertical axis) is the value of maximum strength (rst1)

Discussion

As previously stated, goalkeepers have the highest value of maximum strength (588.82 W), and the largest index of fatigue (6.72 W/s), i.e. poorer capacity of anaerobic sprint endurance. The characteristic of goalkeeper play during the match does not require the capacity to repeat anaerobic-lactate activities, but only the capacity to manifest maximum strength in a short period of time, such as jumping the ball, high or low fall on the ball and other short responses.

Speed-endurance, as body resistance in kind, i.e. the ability to withstand short-term intensive efforts being repeated over a long time, the body's ability to adapt and endure the occurrence of acidification and the emergence of a higher blood concentration of lactate without the work capacity substantially falling, is of great importance - for the football players, for whom this is the main ability they should have given the physiology of their efforts during the match. This knowledge (about footballers) is transmitted by inertia to goalkeepers, who had been prepared and drilled as players for years, and who essentially performed the tasks during the matches in physiological regimes completely different from those in which they had been trained (Andrašić et al., 2003).

Average strength values of the offensive players (457.32 W) indicate the best ability to maintain anaerobic capacity. Unlike goalkeepers, the offensive playera are expected to constantly change the rhythm which involves constant crossing of two players attacking at full sprint. Systematic work in this age can contribute significantly to the development of anaerobic sprint capacity, which is indicated by the applied batteries of tests for the assessment of anaerobic capacity in a sample of 186 players in the Belgium national team (U15, U16, U17, U18 and U19). The survey led to a conclusion that anaerobic strength increased progressively with age (from 15 to 19 yrs.), but the largest increase was between 15 and 17 years of age (Cedric et al., 2007). The values of anaerobic capacity using the RAST test in forty football players of the first Czech junior league (Cipryan & Gajda, 2011) of mean age (17.3±1.36 years) and sports experience of at least ten years, confirm the aforementioned research that the significant increase occurs before the age of 17.

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