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ORIGINAL ARTICLE

Investigation of Some Performance Parameters of Professional Football Players According to Game Regions

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ABSTRACT

Background and Study Aim: The aim of this study is to evaluate the Anaerobic Speed Reserve (ASR), Maximal Sprint Speed (MSS) and Maximal Aerobic Running Speed (MAS) parameters in terms of the players' playing positions on the field.

Material and Methods: In this study, a total of 89 players consisting of 20 stoppers, 15 backs, 25 centre midfielders, 17 wingers and 12 strikers from 4 different 3rd league teams in Turkey with the average height of 1.82±7.20 cm and the average body weight of 75±5.20 participated as volunteers. Players were applied 10-30 meters speed test and Yo-Yo Intermittent Recovery Level 1 Test. Results In the MSH parameter, a statistically significant difference was found between the players playing in the stopper area (28.42±2.08) and the players playing in the wing area (30.40±1.94) ($p < 0.05$). However, there was no statistically significant difference between the game positions in ASR parameter ($p > 0.05$). While a very high positive significant correlation was detected between MSS and ASR ($r = 0.95$, $p < 0.001$), a moderate but negative significant correlation was found between MAS and ASR ($r = -0.59$, $p < 0.001$). The findings revealed that wingers stand out in terms of MSS while centre midfielders are ahead of the other regions in terms of MAS.

Conclusions: Regarding these findings, sports science experts and especially trainers should consider these differences when programming their training. In addition, the present study has indicated that further research is required to better understand the ASR parameter in football.

Keywords: anaerobic speed reserve, maximal aerobic running speed, maximal sprint speed, football players

INTRODUCTİON

Football is a branch of sport that includes movements of different intensity such as walking, running, sprinting, jumping, etc., and these movements are not continuous and there is rest between them. Elite football players perform 150-250 actions during a match. When the movement profile is examined, it has been observed that 80-85% of these movements consist of low-intensity activities (Bangsbo et al., 2006). Even though this information emphasizes the importance of aerobic energy metabolism regarding the energetics of football, considering this movement profile, it is highlighted that dribbling, jumping, sprinting, changing direction and similar movements with anaerobic energy production mechanisms are important in winning a game (Deprez et al., 2015). When taking the game tactical strategy of football into consideration, it can be observed that the players in different game zones on the field undertake different tasks. For example, while the main task of central midfielders is to form sets and transfer the ball to attack with passes, defenders are responsible for trying to stop the attacks by preventing the opponent team's passes (Yi et al., 2018; Modric et al., 2019).

When the game zones in football are examined, it is clearly seen that there are differences in terms of physical performances as well as tactical differences. In a study conducted by Mohr and his friends it was determined that the total distance and high-intensity distance covered by central defensive midfielders were less compared to the other game zones (Mohr et al., 2003). In another study in which the movement profile was questioned, it was discovered that the players who covered the distance at high intensity and sprint distance the least were the centre midfield players, and the players who covered these distances the most were the strikers (Dellal et al., 2011).

Beside these studies, there are many studies evaluating the differences in game zones in terms of aerobic endurance parameters such as maximal oxygen consumption, anaerobic threshold running speed, maximal aerobic power and in terms of anaerobic endurance parameters such as maximal sprint speed, vertical jump, peak power (Dellal et al., 2010; Chmura et al., 2015; Slimani et al., 2019; Buchheit et al., 2010; Aziz et al., 2008). Anaerobic speed reserve is a parameter considered to guide performance in high-intensity intermittent training loads in the literature and determined by calculating the speed difference between maximal aerobic speed and maximal sprint speed (Del Rosso et al., 2016). The higher anaerobic speed reserve means less metabolic and peripheral fatigue in the athlete at exercise loads above maximum oxygen consumption (Clarke et al., 2016). In other words, having a high anaerobic speed reserve means that the athlete's fatigue appears later in repeated high-intensity exercise loads. In football, where the high intensity activity profile is gaining importance day by day, the status of the anaerobic speed reserve and its position in the playing zones is an issue that requires further clarification. It is believed that the evaluation of anaerobic speed reserve and similar parameters in terms of game zones in football will provide information that will help coaches select

players. The aim of this study is to evaluate the maximum sprint speed, maximal aerobic speed and anaerobic speed reserve parameters in terms of the game zone in professional football players.

MATERİAL AND METHODS

Participants: In this research study, a total of 89 players consisting of 20 stoppers, 15 backs, 25 centre midfielders, 17 wingers and 12 strikers from 4 different 3rd league teams in Turkey with the average height of 1.82±7.20 cm and the average body weight of 75±5.20 participated as volunteers.

Research Design: Football players train at least 5 days a week and play one league match. Participants' heights were measured with a Holtain brand stadiometer and their body weight with a Tanita brand scale. First, the players were applied a 10-30-meter speed test to calculate their maximal sprint speed, and then the Yo-Yo Intermittent Recovery Level 1 Test was applied to calculate their maximal aerobic speed. Applications were made on turf pitch using the standard football player equipment. Ethics committee report was received from Bilecik Şeyh Edebali University Ethics Committee before the study started (2021/11043). All volunteers were verbally informed before they were included in the study, and their written consent to participate in the study was obtained.

Maximal Sprint Speed Test: A 30-meter sprint test was applied to the players to determine their maximal sprint speed. The test was implemented on the grass where the players are used to. Each player's 10-meter and 30-meter transition times were measured twice with the two-door photocell system (Fusion Sports), and their best 20-meter performance was recorded as the maximal sprint speed in km/h (Ortiz et al., 2018).

Yo-Yo Intermittent Recovery Level 1 Test: The test setup is in the form of 2 signs located 20 m away and a 3rd sign located 5 m away from the 2nd sign. During the test, a computer-connected sound system, which increases depending on the protocol of the test and helps the player to run at a speed in accordance with the protocol, was used. The player started the test from the middle sign. After jogging to the sign in a distance of 20m at the pace of the stimulus coming from the sound system, the player walked/ran around the 3rd sign located 5m away in 10 seconds and waited at the starting point. This cycle was repeated as predetermined by the test protocol. The test was continued until the player quit the test or missed 2 signals in a row. The initial speed of the test was applied as 10 km / h as predetermined by the protocol (Bangsbo et al., 2008). After the test, the maximal aerobic speed parameters of the players were calculated with the maximal aerobic speed formula produced by Heaney (Heaney et al., 2014) 0.45625 x YOYO IR1 distance (km) + 3.61744

Determination of Anaerobic Speed Reserve: The anaerobic speed reserve parameter was determined by calculating the difference between the maximal sprint speed and maximal aerobic speed of the players (Del Rosso et al., 2016). Anaerobic Speed Reserve (km/h): Maximum Sprint Speed (km/h) - Maximal Aerobic Speed (km/h)

Statistical Analysis: In the study, it was examined whether there is a difference in terms of averages in the parameters of the players selected according to the game zones. In addition, the relationship between anaerobic speed reserve parameter and both maximal aerobic speed and maximal sprint speed was explored. In the analyses performed, the normal distribution evaluations of the data were conducted with the Shapiro-Wilk test and the variance homogeneity was tested with the Levene test. Since the data reveal a parametric distribution in the results obtained, analysis of variance test, ANOVA, was applied to the independent groups in comparing the means, and if there was a difference, the Bonferoni test was carried out to determine the origin of the difference. The Spearman Correlation Test was used for correlation because the parameters were nonparametric. According to the analysis results, the coefficient of r was categorized as very low between 0-0.1, low between 0.1-0.3, medium level between 0.3-0.5, high 0.5-0.7, very high 0.7-0.9, and > 0.9 significantly very high. The level of significance was set as 0.05 in all statistical analyses (Hopkins et al., 2009).

RESULTS

As Table 1 displays, there is statistically significant difference in terms of MSS and MAS parameters among game fields. On the other hand, there is no statistically significant difference in terms of ASR parameter.

K: shows statistically significant difference from wing players, S: shows statistically significant difference compared to stoppers, O: shows statistically significant difference compared to Central Midfielders

Table 1: ANOVA Table of Performance Parameters for the Game Positions

		$\bar{x}$	sd	f	p
MSS	**Stoppers**	28.42	2.08	2.42	0.04*
	Backs	29.79	1.66		
	Centre Midfielders	29.52	2.34		
	Wingers	30.4	1.94		
	Strikers	29.18	1.61		
MAS	**Stoppers**	16.79	0.91	2.51	0.03*
	Backs	17.09	0.90		
	Centre Midfielders	17.27	0.41		
	Wingers	16.61	0.71		
	Strikers	16.76	0.81		
ASR	**Stoppers**	11.62	2.63	2.00	0.10
	Backs	12.69	2.16		
	Centre Midfielders	12.25	2.47		
	Wingers	13.78	2.29		
	Strikers	12.41	2.08		

*p<0.05

Table 2: Performance Parameters Comparison Table in terms of Game Fields.

	Stoppers	Backs	Centre Midfielders	Wingers	Strikers
MSS (km/h)	28.42±2.08^{K}	29.79±1.66	29.52±2.34	30.40±1.94^{S}	29.18±1.61
MAS (km/h)	16.79±0.91	17.09±0.90	17.27±0.41^{K}	16.61±0.71^{O}	16.76±0.81
ASR (km/h)	11.62±2.63	12.69±2.16	12.25±2.47	13.78±2.29	12.41±2.08

Table 3: MSS, MAS and ASR Correlation Table

	n	$\bar{x}$	sd	r	p
MSS (km/s)	89.00	29.44	2.07	-0.32	0.02*
MAS (km/s)		16.94	0.77		
MSS (km/s)	89.00	29.44	2.07	0.95	0.00*
ASR (km/s)		12.50	2.43		
MAS (km/s)	89.00	16.94	0.77	-0.59	0.00*
ASR (km/s)		12.50	2.43		

*p<0.05

When Table 2 analysed, there is statistically significant difference between players who play in stoppers field (28.42±2.08) and players who play in wingers field (30.40±1.94) in terms of MSS parameter (p<0.05). There is no statistically significant difference for the other fields of game in terms of MSS (p>0.05). When game fields are compared in terms of MAS, there is statistically significant difference between players who play as centre midfielders (17.27±0.41) and players who play as wingers (16.61±0.71) (p<0.05). The same table shows that there is no statistically significant difference among the game fields in ASR (p>0.05).

When the correlational relationships between the parameters in Table 3 are examined, it has been obtained that there is a statistically significant negative correlation between MSS and MAS (r = -0.32, p = 0.02). While a very high positive significant correlation is detected between MSS and ASR (r = 0.95, p = 0.00), a moderate but negative significant correlation has been found between MAS and ASR (r = -0.59, p = 0.00).

DISCUSSION

The review of literature reveals that there are some practical difficulties in sampling from professional players. Especially when the professional football is considered, it is essential to determine the metabolic needs of players who have tactically different tasks on the field. Only if the strengths and weaknesses of the players playing against each other can be determined, then the training will be directed appropriately.

Considering previous studies, it is emphasized that the ASR parameter is a critical factor, especially in performances above the MAS level (Clarke et al., 2016; Ortiz et al., 2018). There is only one study in the literature examining the spatial differences in terms of the ASR parameter. 46 defenders, 45 midfielders and 29 strikers who played for the Brazilian Super League participated in the study conducted by Ortiz and his friends. As a result of the examinations, no statistically significant difference (p> 0.05) was found in terms of game positions in the ASR parameter (Ortiz et al., 2018). Similarly, there was no statistically significant difference in regional comparisons in terms of ASR (p> 0.05) in the present study. In the same study, the relationship between ASR-MSS and ASR-MAS was also evaluated. It was determined that ARH was in a highly positive significant relationship with MSS (r = 0.72-p <0.05) and at the same time showed a moderately negative relationship with MAS (r = -0.63, p <0.05). Similar to this study, in our study, ASR was found to be in a highly positive significant relationship with MSS (r = 0.95, p <0.05), and in a moderately negative correlation with MAS (r = -0.59, p <0.05). It is concluded that the results obtained are unprecedented and will provide guidance in football regarding the relationship between the parameters in question.

In another study by Boone (Boone et al., 2012) in which 289 athletes from six different teams from the Belgian First League participated, it was observed that 0-5 meters and 5-10 meters' duration of back players and strikers were statistically significantly lower (p <0.05) than centre midfielders, centre defenders and goalkeepers. In the current study, it was determined that wingers are different from centre defensive players in terms of MSS parameter. In this study, unlike Boone and his friends' study, it is considered that there is no difference in the MSS parameter of the strikers due to the fact that the players playing in the side parts of the midfield are described as wingers.

Çetinkaya et al. (Çetinkaya et al., 2018) reported that in terms of 30 meters' sprint performance, strikers and midfielders achieved better scores than defenders (p <0.05) in their study on 33 football players. In our study, it is observed that wingers with offensive nature are better than centre defenders in terms of sprint performance (p <0.05).

In another study conducted by Sylejmani et al. (Sylejmani et al., 2019) with 120 young Kosovar elite football players, it was reported that the Yo-Yo Endurance Test results of midfielders were statistically significantly higher (p <0.05) compared to other positions. In our study, parallel to Sylejmani and his friends' finding, it was determined that central midfielders have higher MAS parameters compared to other positions, and particularly this difference is statistically significant compared to wingers (p <0.05).

In a study where Andrzejewski et al. (Andrzejewski et al., 2018)tracked the running distance in a total of 81 matches of 21 teams in the Polish First League, it was discovered that the total distance covered by the centre midfield players was longer than the centre defenders, backs, wingers and strikers (p <0.05). This result reveals that our finding is supported by the data obtained from the field. In another study conducted by Aslan (Aslan, 2015), in which 23 amateur football players participated, no

statistically significant difference (p> 0.05) was found between the positions in terms of the maximum oxygen consumption performances in 30-meter Sprint and Crunch Test. Although this result seems to contradict with the findings of the present study, the fact that the participants were amateur football players suggests that the quality of the training performed may not have created a positional difference. It is suggested that high-level and specific trainings should be carried out in order for the game areas to be specialized regarding the physical capacity.

CONCLUSION

When the literature is reviewed, it is observed that centre midfielders stand out in football in terms of endurance parameters such as MAS, while strikers and wingers stand out in terms of supramaximal movement profile that requires anaerobic power such as MSS parameter. Even though studies on the ASR parameter in football are not yet sufficient in terms of the positions, it can be asserted that the ASR feature is more closely related to the MSS parameter. It is suggested that further studies on football should be carried out in order to conduct the trainings in relation to ASR and to achieve optimal periodization.

Conflicts of Interest: The authors declare no conflicts of interest.

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