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Aerobic motor skills and the effectiveness of football players on the example of German Club BSC Eintracht Südring Berlin

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Abstract

Constant development and commercialization of football makes it somewhat compelling to look for proven solutions in order to determine both the represented players' level of competence and the most important components of the effectiveness or efficiency of a game. Evolution of walking distance over the years directs attention towards the aerobic motor skills.

In this report, there have been made attempts to determine the relationship between the effectiveness of the game and the endurance of the tested football players of the BSC Eintracht Südring Berlin club.

The research covered a group of 22 players from the Berlin club. The tests were carried out in the autumn round of the 2018/2019 season in Berlin in the period from July to November 2018. The endurance was measured with the help of the Cooper Test, while the players' performance was evaluated by the method of competent judges. The results of the study were statistically analyzed in the Statistica 13.1 program. Descriptive statistics were carried out, the minimum (min), maximum (max), average (X) and standard deviation (SD) values were calculated, and the coefficient correlation was determined.

It was noted a significant correlation between the effectiveness of the game and the endurance.

Keywords: football, endurance, training, game efficiency, training process, motor skills

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Introduction

Nowadays football is one of the most popular disciplines in the world. The development of a discipline, and the technology used in training, requires constant verification of training methods, forms and means. Sozański (1999) defined sport training as a long-lasting pedagogical process, optimally adapted and aimed at the maximum specific effort adaptation. Thanks to high dynamics and variability of conditions, football requires players to prepare in a comprehensive way in terms of physical (Cicirko et al. 2009) and mental (Paluszek 2003, Basiaga-Pasternak 2009) aspects. A similar notion was presented by Talaga (1980), who characterized the properties of a good footballer by having an appropriate level of physical fitness, general fitness, volitional qualities and technico-tactical skills. Taking these definitions into account, it can be assumed that fitness is a fundamental element of the training process (Sozański 1999). Hence, in modern football it is necessary to diagnose, control and optimize training loads. It can be assumed that "one of the major problems to be solved by scientific communities and practitioners in clubs and sports sections is to find effective ways to achieve high sports results" (Kalinowski, Karpowicz 2015, p.24). In the broadly understood training process, the result is determined by many factors. In sports training, we distinguish the time structure, which includes microcycles, macrocycles and mesocycles, as well as the material structure, in which we distinguish fitness, technical and tactical preparation (Sozański 1999).

The authors of this report focus on one of the fundamental elements of football training, which is fitness preparation. Furthermore, they attempt to find connection between the components mentioned above and the effectiveness of action on the pitch. Fitness preparation, as it was proved by numerous scientific reports and practical experiences, significantly relates to the results achieved in sport. Therefore, the level of motor skills and training determine the final effect in a broadly understood training process. Motor abilities, or in other words, physical features include motor coordination, speed, strength and endurance. Scientific reports confirm that among the important physical traits which presuppose the footballers' final result are aerobic endurance, speed endurance, start and run speed (Chmura. 1993, Wachowski et al 1995, Strzelczyk et al. 1996).

During the match, a player defeats about 100 sprints in 3 to 6 seconds, which is approximately 2500 - 3000 meters. Due to the constant variability of the game, running at maximum speed is potentially interwoven with activities performed with medium and low intensity on the pitch. This type of activity lasts on average 40-50 minutes, during which footballers cover a distance of 4 - 8 km, the remaining distance, which is about 1-2 km, is overcomed during 30 -35 minutes. It is assumed that, on average, a competitor overcomes about 9 - 13 km in one meeting (Bangsbo 1999, Wnorowski 2002, 2006, Reilly 2007). It is also worth noting the direction of changes in the distance covered, where in the 2017/2018 season match against the Sport Club Freiburg the German goalkeeper Manuel Neuer ran over 6.5 km, which is about 1.5 km more than the best field players in the second part of the twentieth century (Kalinowski 2017). These tendencies and the need to improve the effectiveness of training justify the modification of the training process (Szczerbowski, Gabryś,

Szmatlan - Gabryś 2015). According to Szwarc (2002), in the model structure of junior players' loads the efforts shaped in the 1st and 2nd intensity range make up on average 30, 27% of the total load. However, a rational and accurate author, provides the following data in the junior training process: range 1 (supporting) from 10 to 15% of the total load, range 2 (aerobic) from 30 to 35% of the total load, range 3 (mixed) from 45 to 50%, range 4 and 5 (anaerobic) from 5 to 10% (Szwarc 2002). Similar results were reported by Cometti (2002), who claimed that the players in the French league make 40% of their efforts being involved in a low intensity work, 35% while having a rest, 20% doing work with a medium intensity, and 5% of their efforts are devoted to a high intensity work. Hence footballers should be prepared for making maximum efforts in each phase of the match. As Bangsbo assumes, one of the fundamental goals of sports training is to shape and sustain "the ability to exercise at a variable intensity (running speed) during long periods of time (endurance)" (Bangsbo 1999, pp. 87-88). It can be assumed that in the preparation of motor competitors, the aerobic preparation, which presupposes the formation of anaerobic endurance, speed and explosive force; is the basic one. In the training process during the championship season, small games of mixed and aerobic effort are most often used in order to shape endurance at that particular period of time. However, in the preparatory periods, tests and measurements of the fitness level are applied to control and optimize the training. According to Ryguła (2000), there are predictive, optimizing and diagnostic tests. To start with, predictive tests give the opportunity to forecast. At the same time, optimizing tests are related to the change of training loads within several microcycles, according to the Wallis-Schanon's law. Finally, diagnostic tests determine the competitors' predispositions and their potential (Ryguła 2000). A well-prepared training plan should be regarded as a predictor and a factor that determines the players' high efficiency on the pitch, which in turn affects the sports result. Naglak states that "only the game reliably and objectively diversifies the players' talents; all other attempts to assess a competitor's aptitude, including control games, do not fully satisfy this condition" (Naglak 1994). In order to evaluate the effectiveness of the game, it is necessary to observe and analyze activities during the game. It can be stated that only reliable assessment and description of technical and tactical activities in the quantitative and qualitative dimension allows to implement the tasks effectively in a broadly understood training process.

Taking into consideration the conclusions above, it seems reasonable to analyze the relation between effectiveness and its major determinants. Therefore, the aim of this study was to find a connection between the effectiveness of the game and the players' of the German BSC Eintracht Südring club aerobic endurance. As a result, the following research questions were formulated:

1. What is the level of cardiorespiratory endurance in the tested players?
2. What is the level BSC Eintracht Südring players' effectiveness?
3. Is there a relationship between efficiency and oxygen endurance in the players of the German club?

Material and methods

A research group consisted of 22 competitors of the German club BSC Eintracht Südring Berlin. Footballers were aged between 19 and 36. The Berlin sports club is situated in the Kreuzberg district in Baerwaldstrasse 35 in Berlin. The club has existed since 1931. The team that formed the research group performs in the German class of the Berlin district (Kreisliga A). However, the lower class (Kreisliga B) is played by a reserve team and four competition classes below the third senior team (Kreissklasse C). In the organizational structure of the club in the 2018/2019 season there were eighteen football teams, including thirteen youth teams. The Berlin club is a multi-sectional association in which there are sections such as football, tennis, futsal, table tennis, badminton, handball for women, taekwondo and volleyball. The most important achievements of the club are victories in the European Cup in Badminton and the German championship. The measurement of the endurance level was carried out using the Cooper Test in the summer preparatory period in July 2018 in Berlin. The assessment of the effectiveness of football players was prepared during the autumn round of the 2018/2019 season from September 2018 to November 2018 and then modified by the competent judges method, which helped to evaluate and qualify the actions of each player who participated for at least 70 minutes in a league match led by five trainers. The coaches rated the competitors on a scale from 1 - 6 with an accuracy of 0.5 points. The associated note 1 had the highest value, and note 6 had the lowest value, according to the German classification system (scoring). The following criteria were used to assess the players' actions: movement according to position, effectiveness of shots, effectiveness of ball passes, creation of shooting situations, 1x1 fights in attack and defensive actions in defense. At the final stage the principle of rejecting extreme notes was used, the sum of the three remaining results was made and the arithmetic mean was calculated.

The measurement of circulatory and respiratory endurance was performed using the Cooper Test. The attempt consists in running the maximum distance within 12 minutes. The used Cooper test showed a high relation with laboratory methods determining maximum oxygen uptake during an exercise test on a mechanical treadmill ($r = 0.897$). Therefore, due to such a high correlation, it is assumed on the basis of a 12 minute test to determine the possibility of estimating the cardiovascular oxygen capacity of the body (Cooper 1968). The collected research results were statistically analyzed in the Statistica 13.1 program. Descriptive characteristics were made, minimum (min), maximum (max), mean (X) and standard deviation (SD) values were calculated, and the correlation coefficient estimated using the Spearman test was determined.

Results

Values referring to the level of efficiency and oxygen endurance are represented in Table 1. It was observed that the previously noted average value of the entire team effectiveness has been at an average level of 2.43. The lowest average value of the score obtained by the player in the autumn round of the 2018/2019 season is 3.33,

while the highest average player's score is 1.67. Similar results were obtained in the Endurance Test. It was observed that the average distance covered by the whole German team was 2702.50 meters. The shortest distance defeated by the goalkeeper was 1450 meters, while the highest result in the team was obtained by a footballer playing as a midfielder, covering a distance of 3335 meters.

Tab. 1 Descriptive statistics for the effectiveness and endurance of the German team

Variable	Descriptive statistics for the players of the BSC Eintracht Südring					
	N	Everage	Minimum	Maximum	Odch.std	Standard. Error
Effectiveness	22	2,43	1,67	3,33	0,44	0,09
Endurance	22	2702,50	1450,00	3335,00	434,68	92,67

Tab. 2 Dependence of the test results of endurance and efficiency of the BSC Eintracht Südring footballers

Variable	Efficiency vs. Endurance p < 0 ,05 N=22
	Endurance
Efficiency	**-,4481**
	p=,036

While conducting the following research, two peculiarities such as an average level of the German BSC Eintracht Südring team competitors' pitch performance evaluation and their average level of endurance were identified. There was a statistically noticeable inverse correlation between the effectiveness of the game and the endurance measured by the Cooper Test at a significance level of p = 0.05. A test compound was realized in about 45% of cases (r = - 0.4481). Due to the fact that the German scoring criteria were used in the assessment of effectiveness, it was shown that the higher the level of endurance was, the lower the level of the obtained score tended to be, resulting in better efficiency (Table 2, Fig. 1).

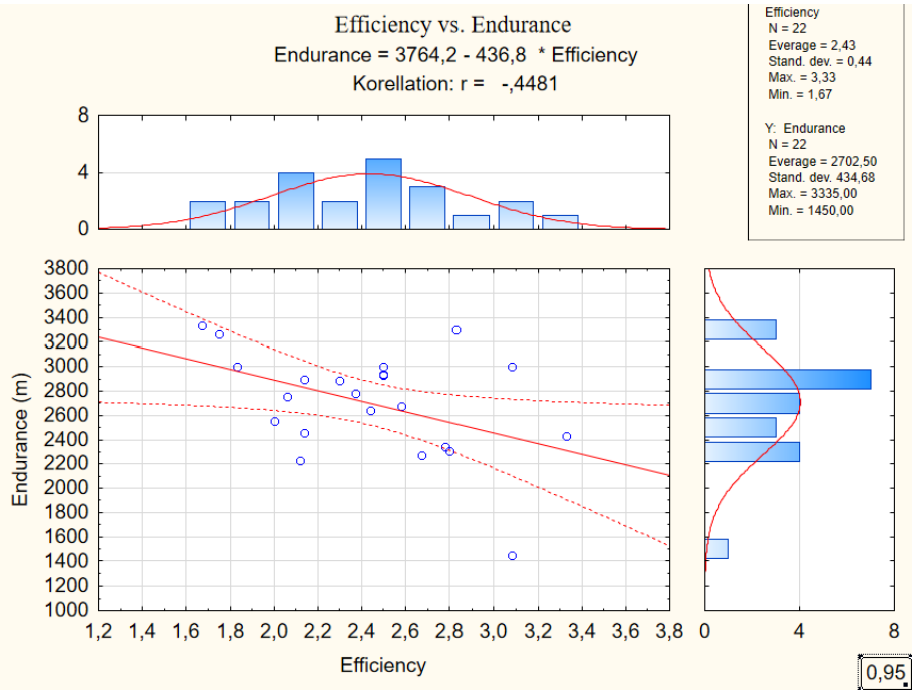

Figure 1. Graphical representation of the relationship between endurance and efficiency of the BSC Eintracht Südring Berlin footballers

Discussion

The level of German football in the world is still high. The Bundesliga is one of the four strongest tournaments in Europe. Despite the failure at the World Championships of Germany, it cannot be said that football is experiencing a period of crisis in this country. The analysis conducted by the staff trained in the World Championships procedure showed not only the team's weaknesses in the tournament, but also the German coaches' great professionalism. It can be assumed that the lack of a high result will lead to the further development of the discipline in the country of our western neighbours. In recent years, the Polish Ekstraklasa has been ranked 27th in Europe (Kalinowski, Chorążyk 2017). Therefore, it was assumed that the application aspect in the conducted research could be important for training processes in our country. The authors who work in Poland and also have some working experience in Germany wanted to draw a reader's attention to the determinants of the German club players' effectiveness. The fundamental elements of the fitness competition preparation that are related to the effectiveness of the game are motor skills. Nevertheless, a final sporting result depends on many elements and it is difficult to clearly determine one of them. In the studies of Konarski and Strzelczyk (2012) it was assumed that the comprehensive preparation of athletes is a predictor of high sports results. Thus, one

may ask the following question "Is and to what extent endurance related to the effectiveness of the game?" The research attempts to find a relationship between the endurance level and the qualitative assessment of the players of the German club.

The choice of the test that defines the level of the cardiopulmonary endurance was directed at its availability; as it has been stated previously, there is a high correlation with the laboratory methods between oxygen intake during the exercise test on a mechanical treadmill at the pace of 0.897 (Cooper 1968) and its practicality. Due to the low cost of the trial, it can be easily used in countries with lower income opportunities at both professional and amateur levels (Andrsić, Cvetkovic, Milic 2016). The average level of stamina has been reported in the Berlin club footballers' tests. These results were similar to the ones obtained in the previous studies on 16 players of the youth team of the Berliner TSC club, conducted by Kalinowski et al. (2017). Nevertheless, a similar level of endurance in the group of junior and senior footballers from the senior team may occur due to the lower division of the BSC Eintracht Südring team. Furthermore, variation in the level of results on particular positions is identical with the results obtained in the studies of Cihan, Can and Seyis (2012), in which the players were tested by means of Yo-Yo Intermittent Recover Level - 1 test (Yo -Yo IR1). The authors, similarly to this report, identified that the highest level was represented by the players in the position of a midfielder compared to those who appeared in other positions. When analyzing the author's of the following paper research, it was shown that the lowest score in the Cooper test was obtained by a goalkeeper player, which is consistent with the characteristics of a goalkeeper's actions, since players in such position have the most limited field of movement.

An attempt to quantify the qualitative activities undertaken by 22 players from the German club demonstrated an average level of game effectiveness. Recalling that the assessment criteria are opposite to that in the author's country, it is worth mentioning that the highest score of 1.67 indicates a very high level represented by a given player. On the other hand, the lowest unit evaluation (at the level of 3.33) in the 2018/2019 season may indicate an even sports level of the team.

The result of the relationship between endurance and gaming efficiency was recorded at a statistically significant level. Still, it did not refer to 100% of cases. In conclusion, the recorded value at the level of about 45% confirms the fact of a complex relationship between the sports result and other components of physical, mental or technico-tactical preparation. Hence, it can be assumed that the level of endurance is very important in the training process, but it is not the only factor which presupposes success in football. In order to confirm the results of this study the need to conduct a broader investigation seems to be highly justified.

Conclusions

In the light of the above, the following conclusions can be made:

1. An average level of cardiopulmonary resilience was indicated among the tested players of the German club.

2. An average level of effectiveness of the BSC Eintracht Südring Berlin players was observed.
3. A correlation between game efficiency and oxygen endurance in players of the German club has gained statistical significance.
4. The results obtained in this report confirm the necessity to continue a scientific research on a wider research group to verify the relationship between the effectiveness of the game and the cardiopulmonary endurance.

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