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Starting and running speed on the example of football clubs from Berlin

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Abstract

Currently, football is one of the most popular disciplines in the world. In the country of four-time World Champions, it is the most popular sport in which millions of fans and players are engaged. The German Bundesliga belongs to the Top 4 football leagues in Europe. Constant development of the discipline improves the training process. Shaping and developing selected motor skills seems to be necessary in modern training. In previous studies, many researchers emphasize the importance of motion speed in football. Nevertheless, the research conducted on a group of players of one German team in the 2017/2018 season raised some doubts.

Therefore, the study attempts to expand research and determine the relationship between start speed and running speed and the effectiveness of football games of German teams.

The research subject was 83 footballers from German clubs Berliner TSC and BSC Eintracht Südring Berlin. The results of studies carried out in Berlin in the 2017/2018 and 2018/2019 seasons were analyzed. The take-off speed in 5 m race, 20 m run speed was measured, and the players' effectiveness during the game was modified using the competent referee method. The test results were statistically processed in the Statistica 13.3 program. Descriptive statistics (\bar{X}), minimum (min), maximum (max) and standard deviations (SD) statistics were performed and a correlation coefficient was determined.

In studies on an increased research group, no significant statistical relationship was found between motion speed and the effectiveness of German players' game.

Keywords: training, football, speed

1. Introduction

Universality, uncomplicated rules and regulations of the game, popularity and commercialisation affect the presence of football on all continents. Regardless of race, ethnicity, level of play or age categories, it is assumed that there were about 120 million players practicing this discipline over 30 years ago (Ekblom 1986). The main goal is to gain an advantage over the opponent by scoring more points (goals). High athletic

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performance is possible through the achievement of intermediate goals set by the training staff and implemented by competitors in tactical defense and attack (Panfil 2006). It is assumed that speed is one of the most important motor skills among several factors which influence the effectiveness of the game. Many researchers consider it as the indicator of the selection criterion in football (Reilly, Williams, Richardson 2003; Zieliński, Śledziewski 2006). The level of speed preparation is also one of the components of the sports championship model in other disciplines (Tyc, Śledziewski, Gryko 2016). The importance of speed seems to be quite significant. Nevertheless, achieving high sports results is possible by providing oxygen and energy which is the capacity for maximum effort (Skinner, Mc Lellan 1980). Physical effort undertaken by footballers in the course of sporting competition is a combination of aerobic and anaerobic work. Activities on the pitch done by football players are implemented with submaximal intensity during which energy appearing in speed, endurance and strength (Gargula et al., 2009) is obtained. Scientific reports indicate that football players' leading motor skills related to sports results are: speed endurance and its components such as start speed, running speed and oxygen endurance (Chmura 1993; Wachowski et al. 1995; Strzelczyk et al. 1996). There is an increasing trend towards speed and sprint activities during the match. In the post-match analysis, we can easily find statistics on the number of sprints performed or the distance covered at maximum speed. Observing a football game you can get the impression that it is the speed of action that determines the final result. Nevertheless, it is difficult to state clearly without scientific research whether this is the case at all levels of the game. Bangsbo (1999) emphasises that performing actions such as shots on the goal of changing direction, dribbling or sliding is shaped by non-acid and lactic acid anaerobic endurance and 70% of energy comes from ATP in aerobic processes. Aerobic work is characterised by low intensity in efforts over 4 min. Anaerobic work is characterised by high intensity in efforts up to 2-3 min. In contrast, anaerobic-aerobic work called otherwise mixed occurs in efforts up to 70 - 80 min (Chmura 1997; Kozłowski, Nazar 1999; Jaskólski 2006).

Players' actions during the game are performed in the attacking phases and defense (Nosal 2003) alternating complementary. Players with a certain level of motor skills perform technical and tactical measures adequate to the situation. That is why it is necessary to observe and analyse the elements of the game during sport competition. It can be assumed that only comprehensive training based on game observation, analysis and diagnostic tests enables accurate management of sports training. On this basis, it can be assumed that one of the most important objectives of observation is to quantify the players' actions when playing with and without the ball. In this report, the authors focused on one of the basic elements of football training which is the speed preparation and efficiency of the football players' game. The results obtained in the study on the players of one German team in which the authors obtained no significant relationship between running speed, start speed and game efficiency (Kalinowski et al. 2019) were the motivation to carry out the analysis of research results on a larger research group.

Hence, the purpose of the work was to try to determine the relationship between start and running speed and the effectiveness of football games of German teams.

According to the set goal, the following research questions were formulated:

1. Has a relationship been found between running speed and the effectiveness of German team riders?
2. Is the start speed related to the effectiveness of the game in the examined group of players?

2. Material and methods

83 players representing 4 teams from the German clubs Berliner TSC and BSC Eintracht Südring Berlin took part in the research. The participants were 18 to 36 years old during the study. German teams up to the nineteen years (U19) participated in the league games in the age category which is equivalent to the senior junior in Poland, while teams of seniors participated in the German play class of the Berlin district. Berliner Turn und Sportclub e.v. was founded in 1963, BSC Eintracht Südring Berlin in 1931. These are multi-section clubs. In order to answer the research questions, the level of motion speed was measured and the effectiveness of the game was assessed in the 2017/2018 and 2018/2019 seasons in Berlin. The collected research material was analysed after the publication of research results in one team in the 2017/2018 season (Kalinowski et al. 2019).

The measurement of running speed assessment was carried out by measuring time over a distance of 20 meters from the 0.5 m run, while the start speed was made by measuring the time of running 5 m from the 0.5 m run. Electronic measurement was used with an accuracy of 0.01 seconds. The player attempted twice from the high start. A better result qualified. The effectiveness of the game was assessed by a modified method of competent referees (Brzeziński 2005,2010; own modification), consisting in quantifying the actions of a player participating in a league meeting by five coaches. Coaches rated players on a scale of 1 - 6 with an accuracy of 0.5 point. The assigned note 1 had the highest value and note 6 had the lowest value, according to the German classification (scoring) system. The following criteria were used to assess the players' actions: 1x1 duels in attack and defense, effectiveness of shots, effectiveness of ball passes, creation of shooting situations. At the final stage, the principle of rejecting extreme notes was applied, the sum of the three remaining results was made and the arithmetic average was calculated.

Test results were developed using standard statistical procedures. Descriptive statistics were calculated: arithmetic mean (M), standard deviation (SD), minimum values (min) and maximum values (max). Due to the orderly nature of the variable "performance effectiveness", the Spearman's correlation coefficient was used to assess the relationship. The collected results were statistically processed using the Statistica 13.3 program.

3. Results

On the basis of the conducted research, an average level of assessment of the effectiveness of the activities of German footballers was observed. An average value of 2.23 points was recorded. The lowest average score of a player's score is 4.03, while the highest average score of a player is 1.19. The average time obtained in the 5 m run was 1.22 seconds. The best result of the competitor in the 5 m run was 0.81 seconds, and the weakest 1.73 seconds. In contrast, the average level of time obtained in the 20 m run was 3.01 seconds. The best result in the 20 m run was 2.54 seconds, the lowest 3.51 seconds (Tab. 1).

Tab. 1. Descriptive statistics for the efficiency and speed of German team players.

Variable	Descriptive statistics BSC Eintracht Südring, Berliner TSC					
	N	Mean	Minimum	Maximum	SD	SE
Efficiency	83	2,23	1,19	4,03	0,53	0,06
5m speed	83	1,,22	0,81	1,73	0,21	0,02
20m speed	83	3,01	2,54	3,51	0,20	0,02

In the presented research results, the average level of effectiveness assessment on the pitch and the average level of running speed and start speed were noted. Based on the research, no statistically significant relationship between efficiency, start speed and running speed was found, while a relationship between start speed and running speed was found at 0.253 (Tab. 2).

Tab. 2. Dependence of the results of tests on the speed and efficiency of German football players

Variable	Correlations of game speed and efficiency, $p < 0,05$, $N=83$		
	Start speed 5m	Running speed 20m	Efficiency
Start speed 5m	1,0000	0,253	0,052
Running speed 20m	0,253	1,0000	0,181
Efficiency	0,052	0,181	1,0000

4. Discussion

Requirements in football are constantly increasing and, according to many authors, speed is important for efficiency in football (Reilly, Williams, Richardson 2003. Zieliński, Śledziewski 2006). A problem that appeared to the authors in earlier studies concerned the lack of a relationship between speed and efficiency among footballers of the German team (Kalinowski et al. 2019). Obviously, there are many variables that determine sport success, it is difficult to clearly identify one element. It is assumed that only comprehensive mental, tactical, technical and fitness preparation can be a predictor of athletes' optimal preparation by teaching them to perform increasingly difficult movement tasks (Konarski, Strzelczyk 2012). Therefore, the following question arises: "Does motion speed relate to the quality of football activities at all levels?" Due to the lack of confirmation in previous studies on one team (Kalinowski et al. 2019), the authors, by analysing 4 teams, attempted to find the relationship between start speed, running speed and a qualitative assessment of the German team players' game.

Bearing in mind that football belongs to the group of endurance and speed disciplines (Śledziewski et al. 2005) in which a high level of muscle speed and strength abilities has an important function (Staniak et al. 2005), it seems justified to test the level of speed abilities. Nevertheless, the research did not confirm the previous group of numerous scientific reports on the examined group of players (Reilly, Williams, Richardson 2003). In the 5 m and 20 m run there was no relationship between motion speed and game efficiency. There can be many reasons. Nevertheless, research clearly shows in two seasons 2017/2018 and 2018/2019 that speed is not important at all levels of play.

The studies of Andrzejewski et al. (2011) show the justification for testing the start speed at 5 m and acceleration 15-20 m. The author indicates the importance of freeing

yourself from the opponent without a ball, going out into free field or reaction speed. When analysing the results of the start speed, we pay attention to the average result over a distance of 5 m - 1.22 seconds. It is interpreted by many researchers as a medium-level result (Wachowski et al. 1995; Strzelczyk et al. 2003; Reilly 2007; Konarski et al. 2012), so it is worth looking at the times achieved by individuals and undertaking individual analysis. The player with the result at the level of 1.73 seconds turned out to be the weakest among all participants in a research. Stating that the result is 0.51 seconds weaker than the average, it can be claimed that there is no chance to play at a higher level of play. In contrast, the fastest player in this 5 m test obtained a result of less than a second and exactly 0.81 second, which indicates his high speed capabilities. By determining the importance of speed of action not only in football but in sport today, it can be assumed that this player has all the physical basis of speed to cope at a higher sports level. Nevertheless, it is worth emphasising that at a lower level there is diversity in the team of players with certain predispositions.

Analysing the results of running speed, the average team result over a distance of 20 m - 3.01 seconds. The player with the result of 3.51 seconds turned out to be the weakest in a research. Stating that the result is 0.50 seconds weaker than the average, it can be said that, as in the case of the start speed as a team member in terms of its value, only it can complement it at this level of play. The fastest competitor in the 20 m test scored 2.54 seconds which proves his great speed capabilities. It can be assumed that this player could cope on a higher sports level.

Eighty-three players subjected to the analysis of the effectiveness of sports activities presented an average sports level which was determined on the basis of observation by a modified method of competent judges. Players in terms of effectiveness of actions during the game were rated by trainers and their average rating as a team was 2.22 points, remembering that in Germany school grades are analysed inversely than in Poland, 1 is perceived as very good, as "Weltklasse" , while the 6th grade is considered the weakest. Analysing the ratings of players individually, we can see that the lowest unit rating of 4.03 points on the background of the six-point scale is not the lowest value, which may indicate a fairly even sports level of the teams included in the analysis. The highest level was recorded in a player with an average score of 1.19 points which suggests that he is a player who presents high skills in all aspects assessed at this level of play. He is a player close to the highest rating, allowing him to believe that he has the right range of football skills that will allow him to play at a higher sports level.

The results obtained in the test of the start speed of 5 m and in the test of the speed of 20 m do not show a statistically significant relationship with the efficiency of the game of German team players. In the case of the tested players we deal with players in the lower class, in which, based on the test, it can be concluded that motion speed does not play a significant role. At this level of training and with a limited number of training units, trainers focus more on motivating players and teamwork than shaping motor skills. In addition, assembly settings can be key at this level. Nevertheless, it is worth noting that speed is not one of the most important factors affecting game efficiency at all levels of play. These reports do not coincide with the research of Śledzewski, Socha and Kuder (2012). However, they are somewhat confirmed by Verheijen (1997), which shows that juniors sprint in a match 800-900 m, and amateur seniors only 300-500 m. Obtained results direct attention towards further factors that may affect game efficiency.

5. Conclusions

With regard to the research questions posed, the following final conclusions were formulated:

1. It was found that there is no relationship between running speed and effectiveness of the tested competitors.
2. There was no relationship between the starting speed and the effectiveness of the game in the examined group of players.
3. Travel speed is not important at all levels of football. The research confirms the need to study more levels of both men and women in football.

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