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Temporal analysis of goals scored in European football leagues

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Abstract

Actually, the investigations on the football are more directly directed to the analysis of offensive processes. Among the many technical and tactical aspects of player behaviour, goals are the most studied. The aim of this study is to analyze the incidence of goals in the matches of the 10 major European football leagues. The playing time was divided in periods of 15 minutes, seeking to obtain results regarding the distribution of the incidence of goals over the total time of match. In total, were analyzed 8.270 goals in 3.100 matches. The data regarding the number of goals and the moment they were scored were obtained through the Soccer stats website. According to the results, we can see that the highest number of goals, 1.892 (22.88%), was scored in the last period of the matches, from 76th to 90th minute. The frequency of goals scored during a match is usually depends on time. I.e., as time goes by and the game is approaching its end, the more likely it is to score goals. This fact can be explained, mainly, by the physical fatigue of the athletes, and it is also associated to the psychological wear.

Keywords: Periods of match, Tactical aspects, Incidence of goals, Soccer

Introduction

Actually, the investigations on the football are more directly directed to the analysis of offensive processes. It is sought, therefore, to inquire performance indicators, from a technical-tactical perspective, that unbalance the game in our favour (Hughes, 2004) ^[1]. According to Barros *et al.* (2002) ^[2], the production of quantitative data on athletes' technical-tactical performance is an irreversible trend in modern sport.

Among the many technical and tactical aspects of player's behaviour, the goals are the most studied (Cachay & Thiel, 2000) ^[7]. The goal is the aim and, therefore, the most important aspect of the match (Fukuda & Santana, 2012) ^[10]. Thus coaches and sports scientists in general strive to learn the scoring patterns and the basic situations that prevail during matches so as to improve players' scoring skills. One of the key aspects of scoring that the coach and players should pay attention to is the distribution of goals throughout the match (Njororai, 2007) ^[18]. Studies on football goal analysis have shown that there are critical moments within the matches (Miguel, 2012) ^[14].

The evaluating goal scoring patterns in soccer matches may contribute to determining the factors that enable effective competition performance (Armatas, Yiannakos, Papadopoulou & Skoufas, 2009) ^[3]. The information collected from researchers through these studies, and transferred to coaches and players, is very important for the design of the training, the choice of the appropriate tactic and its application in the game (Yiannakos & Armatas, 2006) ^[33].

The analysis of the temporal occurrence of goals should be routinely redone and thus guide, along with other variables, the process of preparation (Campos, Drezner & Cortez, 2016) ^[8]. In the international literature we have observed that these studies have a great value with respect to the context of the preparation of high level athletes (Miguel, 2012) ^[14]. Thus, the aim of this study is to analyze the incidence of goals in the matches of the 10 major European football leagues in the 2015-2016 season, verifying in which period of the matches occurs the greater incidence of goals scored.

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Materials and Methods

Sample

We analyzed all matches from the 10 major European football leagues in the 2015-2016 season. As a parameter, the UEFA selections ranking (consulted on April, 23 2017) was used, with the top 10 being: Spain (La Liga), Germany (Bundesliga), England (Premier League), Italy (Serie A), France (Ligue 1), Russia (Premier League), Portugal (Premeira Liga), Ukraine (Premier League), Belgium (Jupiler Pro League), and Turkey (Superliga) respectively. In total, 8,270 goals were analyzed in 3,100 matches. The data regarding the number of goals and the moment they were scored were obtained through the Soccerstats website (www.soccerstats.com).

Method

The total playing time was divided into 15 minute time periods*: 1st-15th min.; 16th-30th min.; 31st-45th min.; 46th-60th min.; 61st-75th min.; 76th-90th (*The periods 31st-45th and 76th-90th also include the additional time).

Data Analysis

All data were analyzed using the statistical package for PC SPSS 20.0. (Lead Technologies Inc, USA). Non parametric chi-square (χ^2) analysis was used to determine the statistically significant differences and the level of significance was set at $p < 0.05$.

Results

Table 1 shows the temporal distribution of goals scored, divided by periods of the match, into European football leagues in the 2015-2016 season. In total, 8,270 goals were scored, with: 1,073 goals (12.98%) in the period from the 1st to 15th minute; 1,172 goals (14.17%) in the period from the 16th to 30th minute; 1,369 goals (16.55%) in the period from the 31st to 45th minute (+ additional time); 1,382 goals (16.71%) in the periods from the 46th to 60th and from the 61st to 75th minute; 1,892 goals (22.88%) in the last period of the match, from the 76th to 90th minute (+ additional time).

Table 1: Distribution of goals scored by periods of the match in European football leagues.

Half	1 st half			2 nd half			Total	Matches
	1 st -15 th	16 th -30 th	31 st -45 th	46 th -60 th	61 st -75 th	76 th -90 th		
Belgium	102	80	101	124	118	168	693	240
England	118	153	186	164	177	228	1.026	380
France	120	126	158	166	162	228	960	380
Germany	102	128	151	140	154	191	866	306
Italy	130	139	168	158	162	222	979	380
Portugal	123	119	136	138	128	187	831	306
Russia	81	102	87	97	98	123	588	240
Spain	151	161	162	171	154	244	1.043	380
Turkey	101	108	135	138	145	199	826	306
Ukraine	45	56	85	86	84	102	458	182
Total	1.073	1.172	1.369	1.382	1.382	1.892	8.270	3.100
%	12.98	14.17	16.55	16.71	16.71	22.88	100	-

Discussion

According to the data found in table 1, we can verify that the highest number of goals scored in European football leagues, whether analyzed separately or in total, 1,892 (22.88%), was scored in the last period of the match, from 76th to 90th minute. This result shows a statistically significant difference in relation to the other periods.

The results found in this study confirm other studies carried out in football, which also report a trend towards a higher incidence of goals in the last period of the match, 15 final minutes (e.g. Armatas, Yiannakos & Sileloglou, 2007; Armatas *et al.*, 2009; Leite, 2013; Leite & Barreira, 2014; Nororai, 2014) [2, 3, 12, 13].

A review of the relevant studies shows that the frequency of goals scored during a match is usually depends on time. I.e., as time goes by and the match is approaching its end, the more likely it is to score goals. As can be seen in table 1, the number of goals scored increases gradually from the 1st to the 6th period.

According to the literature, this predominance of goals at the end of the match can be related mainly to the athletes' fatigue (Armatas *et al.*, 2007; [2]. This deterioration of performance at the end of the match can be related to a number of factors such as decreased level of muscle glycogen, accumulation of metabolic by products, failures in the nervous system and the mechanism of stimulus-contraction (Bianchi, Grossi & Bargossi, 1997; Mohr *et al.*, 2005; Rahnama, Reilly & Lees, 2004; Reilly, 2003; Rienzi, Drust, Reilly, Carter, & Martin,

2000; Spencer & Katz, 1991; Stolen, Chamari, Castagna & Wisloff, 2005; Weineck, 2000; Wilmore & Costill, 2001) [6, 15, 22, 24, 25, 27, 28, 30, 31].

As the playing time elapses, fatigue interferes with athletes' performance. Studies that compared the rates of effort between the first and second half have shown reduced performance of athletes. There is a 5% reduction in the total distance of the second half compared to the first (Bangsbo, Norregaard & Thorsoe, 1991; Rienzi *et al.*, 2000; Stolen *et al.*, 2005) [4, 25, 28]. Thus, it has been demonstrated that the amount of sprinting, high-intensity running, and distance covered are lower in the second half than in the first half of a match Bangsbo *et al.*, 1991; as cited in Armatas *et al.*, 2007; Rahnama *et al.*, 2004; Reilly, 1997; Stolen *et al.*, 2005) [4, 2, 22, 23, 28]. Other factors such as dehydration (Armatas *et al.*, 2007) [2] and declining heart rate (Stolen *et al.*, 2005) [28] also appear as factors that explain this phenomenon.

For Reilly (2003) [24], the highest occurrence of goals at the end of the match cannot simply be explained by a fall in intensity due to physical wear, as this is balanced, logically for both teams. For the author, the more marked deterioration in performance between the defenders, which gives an advantage to the attackers at the end of the match, and lapses of concentration could be possible explanations.

Alternatively, players could be related to psychological fatigue and a lapse in concentration, more marked as a result of sustained physical exertion, leading to tactical and motor errors, opening the possibility of the goals being converted

(Aragón-vargas, 2004; Armatas *et al.*, 2007; Reilly, 2003; Solera, Salazar & Passe, 1999; Weineck, 2000) ^[1, 2, 24, 26, 30]. Thus tactical imbalances appear more frequently at the end of the matches (Vargas, Saretti & Bojikian, 2011) ^[29].

Some studies on the physical dimension of soccer players indicate that the player is essential to have a good aerobic capacity because it seems to avoid the slowdown in the job until the end of the match (Reilly, 2003; Weineck, 2000; Wilmore & Costill, 2001) ^[24, 30, 31]. Some authors suggest that players may show improved technical and tactical performance during matches if they improve their aerobic capacity (Stolen *et al.*, 2005; Wisloff, Helgerud & Hoff, 1998) ^[28, 32].

Due to the high intensity and long duration of a football match, players must be able to maintain a high level of effort throughout the match (Mortimer, Condessa, Rodrigues, Coelho, Soares & Silami-Garcia, 2006) ^[16]. Differentiated strategies and tactics can also be used to reduce the effects of fatigue that can happen in the final stages of the match (Reilly, 1997) ^[23].

Thus, fatigue, both physical and psychological, in football, can manifest itself as a complicating factor, especially at the end of the match, because, according to several studies, a significant number of goals have been scored at this moment (Ekblom, 1994; Njororai, 2004; Palomino, Rigottiz & Rustichinix, 2000; Piekarski, 1987; Reilly, 2003; Weineck, 2000) ^[9, 17, 20, 21, 24, 30].

Conclusion

According to the results obtained in this study, we can conclude that the highest incidence of goals scored, 1.892 (22.88%), occurred in the last period of the matches, in the final 15 minutes. This fact can be explained, mainly, by the physical fatigue of the athletes, and it is also associated to the psychological wear.

A good aerobic capacity is indicated as an important aspect to protect against physical wear. Tactical aspects applied by teams can also be important to reduce fatigue at the end of matches.

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