

Goal scoring frequency in soccer in different age groups

Frequência de gols marcados no futebol em diferentes faixas etárias

FARIAS VM, BERGMANN GG, VAZ LMT, PINHEIRO ES. Goal scoring frequency in soccer in different age groups. *R. bras. Ci. e Mov* 2018;26(3):47-52.

ABSTRACT: Scoring goals is the main objective and a key factor to success in soccer. Therefore, all the aspects of this important performance indicator must be studied. Many authors have proposed to study different aspects related to goal scoring in soccer. However, most of these studies include adult players from professional or amateur teams. The aim of the present study was to analyze the goal scoring frequency in 388 soccer matches of Professional, Under-20 and Under-17 competitions from Brazil. The impact of the first goal scored on the match outcome was also studied. The frequency of 1100 goals was analyzed by dividing the game in two (first and second half) and six equal periods of time. Data showed a greater number of goals scored over time with a higher percentage of goals scored in second half in Professional, Under-20 and Under-17 competitions, respectively, 55.9% ($P=0.036$), 59.5% ($P=0.000$) and 55.6% ($P=0.020$), especially in the last period of the game, respectively, 21.5% ($P=0.084$), 26.2% ($P=0.000$) and 22.1% ($p=0.009$). It was also found that scoring the first goal had an important influence on the match outcome with a percentage of 65.3% ($P=0.000$), 71.5% ($P=0.000$), and 75.4% ($P=0.000$), respectively, of the matches won by the team scoring first. It was concluded that, despite differences in age and expertise among the players of the three age brackets, the results regarding the goal scoring frequency and the influence of the first goal on the match outcome were similar in all competitions.

Key Words: Soccer; Sports performance; Youth sports.

RESUMO: Marcar gols é o principal objetivo e a chave para o sucesso no futebol. Portanto, todos os aspectos relacionados a este importante indicador de desempenho devem ser estudados. Diversos autores se propuseram a estudar diferentes aspectos relacionados à marcação de gols no futebol, tratando-se, contudo, na sua maioria, de estudos com adultos em equipes profissionais ou amadoras. O presente estudo se propôs a analisar a frequência dos gols marcados em 388 partidas de futebol em competições Profissional, Sub-20 e Sub-17 no Brasil. O impacto do primeiro gol marcado no resultado final das partidas também foi estudado. A frequência de 1100 gols foi analisada dividindo-se as partidas em dois (primeiro e segundo tempo) e seis períodos iguais de tempo. Os dados apontaram um maior número de gols marcados com o passar do tempo com um percentual maior de gols marcados no segundo tempo nas três competições, respectivamente 55.9% ($P=0.036$), 59.5% ($P=0.000$) e 55.6% ($P=0.020$), e, especialmente, no último período do jogo, respectivamente, 21.5% ($P=0.084$), 26.2% ($P=0.000$) e 22.1% ($P=0.009$). Além disso, os resultados mostraram que marcar o primeiro gol teve uma importante influência no resultado final das partidas com um percentual de 65.3% ($P=0.000$), 71.5% ($P=0.000$), e 75.4% ($P=0.000$), respectivamente, dos jogos vencidos pela equipe que marcou o primeiro gol. Concluiu-se que, apesar das diferenças de idade e expertise dentre os jogadores das equipes de diferentes categorias, os resultados relacionados à frequência de gols marcados e à influência do primeiro gol no resultado final das partidas foram semelhantes nas três competições.

Palavras-chave: Futebol; Desempenho atlético; Esportes juvenis.

Vinícius Martins Farias¹
Gabriel G. Bergmann³
Luís Miguel Teixeira Vaz²
Eraldo dos S. Pinheiro³

¹Universidade Federal do Pampa

²Universidade de Trás-os-Montes e Alto Douro

³Universidade Federal de Pelotas

Recebido: 15/06/2016

Aceito: 29/12/2017

Contato: Vinícius Martins Farias - vinicius.farias@hotmail.com

Introduction

The number of studies related to performance analysis in sport has been increasing, promoting a better understanding of the various factors that influence success in sports¹. Therefore, performance analysis in soccer aims to promote knowledge in order to improve the quality of performance of players and teams²⁻⁴. The analysis of match-related statistics and situational variables allows scientists to identify performance indicators and trends, contributing significantly to the modeling of training and successful competitive strategies^{1,5-7}. According to Njororai⁶, it is very important that soccer coaches understand the goals distribution patterns so they can use that information to define the best ways of training, selection of players, half-time instructions, substitutions, tactical formations and strategies. Many published studies aim to identify activity patterns during games⁴ and some of these studies focus in the analysis of characteristics, frequency and distribution of goals in soccer matches^{5-6,8-11}. Scoring a goal can be considered the pinnacle and the main objective of the teams involved in a soccer match, as well as a key indicator of success, as the goals scored determine winning and losing teams^{5-6,11-14}. For this reason, it is necessary to study all the factors that influence scoring goals in soccer matches and also its consequences, such as when it most happens and the impact of the first goal on the match outcome.

The literature related to match analysis in soccer is vast. However, most of the studies analyze adult competitions and there are not as many studies that analyze the behavior of young players¹³. The aim of this study is to analyze the goal scoring frequency and the influence of the first goal on the match outcome of professional and youth competitions from different age groups.

Methods

The study protocol followed the guidelines stated and conformed to the declaration of Helsinki. Teams and players remained anonymous and the data used was available on the internet. For this reason there was no submission of the project to the Research Ethics Committee or the solicitation of signed free consent term.

This study analyzed a total of 1100 goals registered by the referees in 388 matches of the competitions Juvenil A State Championship (Under-17), Junior State Championship (Under-20) and the First Division State Championship (Professional), respectively 128, 129 and 131 matches each. All competitions were held in 2014 and the results of the matches were publicly available on the official website of the Rio Grande do Sul State Soccer Federation (www.fgf.com.br).

The goal scoring frequency was assessed by analyzing the goals scored in 45 minutes (first and second half) as well as dividing the matches into six periods of 15 minutes^{9,11}. In the Under-17 competition, however, the total playing time per match was 80 minutes so each half of the matches was of 40 minutes and the games were divided equally in six periods of 13 minutes and 20 seconds. The impact of the first goal on the match outcome was also analyzed accounting the final result for the scoring team (win, draw or loss).

All data were analyzed using the software SPSS Statistics. Descriptive analysis was used to describe frequency, distribution, average and standard deviation, and the Chi Square test (χ^2) was used to determine significant statistical differences¹⁵⁻¹⁶. The level of significance was set at $P < 0.05$.

Results

The results of the analysis are shown in Tables 1 and 2.

Table 1. Goal scoring frequency per half and periods.

Competition				Goals per half		Goals per period					
	Matches	Goals	Average ± SD	First Half	Second Half	First Period	Second Period	Third Period	Fourth Period	Fifth Period	Sixth Period
Professional	128	311	2.43 ± 1.41	137 44.1%	174 55.9%	45 14.5%	38 12.2%	54 17.4%	50 16.1%	57 18.3%	67 21.5%
				$\chi^2=4.402, P=0.036$		$\chi^2=9.701, P=0.084$					
Under-20	129	363	2.81 ± 1.99	147 40.5%	216 59.5%	55 15.2%	37 10.2%	55 15.2%	63 17.4%	58 16.0%	95 26.2%
				$\chi^2=13.116, P=0.00$		$\chi^2=30.008, P=0.00$					
Under-17	131	426	3.25 ± 2.00	189 44.4%	237 55.6%	62 14.6%	53 12.4%	74 17.4%	63 14.8%	80 18.8%	94 22.1%
				$\chi^2=5.408, P=0.020$		$\chi^2=15.324, P=0.009$					

Table 2. Impact of the first goal on the match outcome.

Competition	Team scoring first		
	Win	Draw	Loss
Professional	77 (65.3%)	26 (22.0%)	15 (12.7%)
	$\chi^2=55.644, P=0.00$		
Under-20	89 (75.4%)	16 (13.6%)	13 (11.0%)
	$\chi^2=94.186, P=0.00$		
Under-17	88 (71.5%)	16 (13.0%)	19 (15.4%)
	$\chi^2=80.927, P=0.00$		

In the Professional competition 128 matches were analyzed with a total of 311 goals and average 2.43 ± 1.41 goals per match (Table 1). In ten matches (7.8%) there were no goals scored. In this age bracket, there were a greater number of goals scored in the second half of the matches. However, there was no significant difference on the distribution of goals between the 15 minutes periods. Regarding the impact of the first goal on the match outcome (Table 2), the teams scoring first won most of the matches.

In the under-20 competition, 363 goals from 129 matches were analyzed, an average of 2.81 ± 1.99 goals per game (Table 1). In eleven matches (8.5%) there were no goals. In this age bracket, there were more goals scored in the second half of the matches and the distribution of goals in periods of 15 minutes showed a greater number of goals scored in the last 15 minutes of the second half (Table 1). In addition, the teams scoring first won most of the matches (Table 2).

In the Under-17 competition 426 goals from 131 matches were analyzed, an average of 3.25 ± 2.00 goals per game (Table 1). There were no goals scored in eight matches (6.1%). Most of the goals were scored in the second half of the matches. Regarding the distribution of goals per periods, in this age bracket there was a greater number of goals scored as the end of the matches approached with a percentage of 22.1% of the goals scored in the last 15 minutes (Table 1). Furthermore, the team scoring first won 71.5% games.

Discussion

The aim of this study was to analyze the distribution of the goals scored, as well as the impact of the first goal on match outcome, in three competitions of different age brackets: Professionals, Under-20 and Under-17.

Regarding the distribution of goals between first and second half, more goals were scored in the second half of the matches, regardless of the age bracket. These results are in agreement with those found in the literature^{5-6,9-10,12,17}. In the study by Alberti *et al.*⁹, 10,885 goals from European national competitions (England, Spain, Italy and France) in a period of three consecutive seasons were analyzed and the same trend of a higher number of goals scored in the second half was observed. In the study of Chiminazzo *et al.*¹⁰, 529 goals from a competition from Brazil were analyzed and a percentage of 57.65% of the goals scored in the second half of the games was found. In the work of Armatas and Yiannakos⁸, there was also a larger number of goals in the second half (52.5%), however, the authors did not find statistical differences, as well as in studies by Armatas *et al.*¹⁸ and Michailidis *et al.*¹¹.

Regarding the frequency and distribution of goals by dividing the matches into six equal periods of time, results showed a greater number of goals towards the end of the matches. These findings also agree with the results of several studies that consider the frequency of goal scoring to be time dependent with the highest incidence in the last 15 minutes^{6,8-10,12,17-18}. The study by Njororai⁶ showed the same trend analyzing various European, South America and international competitions. In the work of Mascara *et al.*¹² the same result was found by comparing three different levels of the 2009 São Paulo state championship in Brazil. In a more recent study by Leite²⁰, analyzing the temporal distribution of 8,270 goals scored in 3,100 matches from ten major European Football leagues, the author found that the highest number of goals happened in the last period of 15 minutes of the games. The study of Michailidis⁵, however, evaluated the distribution of goals during the matches of the 2014 World Cup and found a similar distribution over the periods of 15 minutes, except for the first and the last periods of the first half, and the periods of extra time. In the work of Michailidis *et al.*¹¹, 31 matches of the 2012 European Championship were analyzed and statistical differences were only found to a smaller percentage of goals in the first 15 minutes period and the periods of extra time, in relation to the others.

According to different authors the influence of time on the number of goals scored could be related to physiological factors, due to possible fatigue and reduced physical performance or lack of concentration, shown towards the end of matches^{5-6,8-9,11-12,17-18}. According to Alberti *et al.*⁹, fatigue could not, however, explain for itself this difference in the number of goals scored in different moments of the match and this is probably related to a sum of variables. Another hypothesis would be related to strategic issues, as towards the end of a match one or both teams would be willing to take greater risks, playing forward and seeking to change the score and the match outcome, creating a greater number of goal situations themselves or conceding more scoring opportunities for the opposing team^{5-6,8-9,18}. Another reason could be related to substitutions, as the entry of rested players at the end of the game could change the balance of the matches¹⁷. In the study by Bradley *et al.*¹⁹ it was observed in the English Premier League more substitutions of offensive players than defensive players and that high intensity running was greater in substitute players. These results suggest the important role of substitutions for a higher number of goals as matches approach the end, as rested substitute offensive players could

have an advantage over tired defensive players.

As for the impact of the first goal on the matches outcome, the team scoring first won the game in 65.3%, 75.4% and 71.5% of the cases, respectively, in the Professional, Under-20 and Under-17 competitions. This information has several practical implications for the establishment of game strategies, for instance, the option for more offensive or defensive strategies, according to scoring or conceding the first goal of a match. Other studies also show a strong influence of the first goal on the match outcome^{1,5,8,11,18}. According to Armatas and Yiannakis⁸, in competitions in which there is technical imbalance between teams, it becomes more difficult for the weaker team to react and recover to a conceded goal.

Conclusions

There it seems to be a consensus among the studies analyzing the distribution of goals that the last minutes are decisive in soccer. Even in different formats of competition, seasons, countries and competitive levels, many studies have shown a tendency to a greater number of goals as a match nears the end. The great advantage that a team gets for scoring the first goal of a match also seems to be well established in literature. In the present study, we found the same trends in different age brackets, as the analysis of Professional, Under-20 and Under-17 competitions showed more goals scored at the end of matches and most of the matches won by the team scoring first.

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