After scoring the first goal, is the team more vulnerable to suffer the equalizer soon after? An analysis of the Brazilian soccer Championship Serie A between 2011 and 2021
Después de marcar el primer gol, ¿el equipo es más vulnerable a sufrir el empate poco después? Un análisis del Campeonato Brasileño de fútbol Serie A entre 2011 y 2021

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Abstract. The aim of the present study was to investigate whether, after scoring a goal, the team becomes more vulnerable to conceding a goal soon after. A total of 518 results were collect and integrate the data of the present study. The independent Chi-square test was used to analyze the data. The values of adjusted residue were observed, and all values outside the range of -1.96 to 1.96 were considered relevant to significant difference. All analyzes were performed using $\alpha = 5\%$. The scoring goal equalizer moment happened in first quarter 109 matches (21.0%), second quarter 156 matches (30.1%), third quarter 127 matches (24.5%), and fourth quarter 126 matches (24.3%), totalizing 518 (100%) matches, but no association between season and scoring goal equalizer moment ($\chi^2 (30) = 28.196$, $p>0.05$; Cramer's V test: 0.135). The data collected showed that the equalizing goal can occur at different moments of the game, not only right after the first goal is score.
Keywords: team sports, soccer, sport science, sport performance.

Resumen. El objetivo del presente estudio fue investigar si, después de marcar un gol, el equipo se vuelve más vulnerable a recibir un gol poco después. Se recogieron un total de 518 resultados que integraron los datos del presente estudio. Se utilizó la prueba de Chi-cuadrado independiente para analizar los datos. Se observaron los valores del residuo ajustado, y todos los valores fuera del rango de -1,96 a 1,96 se consideraron relevantes para una diferencia significativa. Todos se realizaron usando $\alpha = 5\%$. El momento del gol del empate ocurrió en el primer cuarto en 109 partidos (21,0%), segundo cuarto en 156 partidos (30,1%), tercer cuarto en 127 partidos (24,5%) y último cuarto en 126 partidos (24,3%), totalizando 518 partidos (100%), pero sin asociación entre la temporada y el momento del gol del empate ($\chi^2 (30) = 28,196$, $p>0,05$; prueba de la V de Cramer: 0,135). Los datos recopilados mostraron que el gol del empate puede ocurrir en diferentes momentos del juego, no solo justo después de que se marque el primer gol.
Palabras clave: deportes colectivos, fútbol, ciencias del deporte, rendimiento deportivo.

Introduction

Soccer is the most popular sport on the planet (Buchheit, Lacome & Simpson, 2019; Sawe, 2018). It is estimated that the broadcast of the World Cup in Russia attracted 3.57 billion viewers (Millet, Brocherie & Burtscher, 2021; FIFA, 2018). Most of these (3.26 billion) watched the games at home. The most watched game was the final between France and Croatia, by 1.12 billion people. It was estimated that 4.5 billion people, about two thirds of the world's population, practiced the sport. Among the sports included in the Olympic Games program, it was identified that nine of them (soccer, cycling, athletics, swimming, marathon, basketball, baseball, tennis, and rowing) were involved in 69% of the published articles and 75% of the citations generated. Soccer was the sport that contributed the most, reaching 19.7% of the total number of publications and 26.3% of the citations (Millet, Brocherie & Burtscher, 2021).

During a soccer match, players cover distances between 8 − 12 km (Stolen, Chamari, Castagna & Wisloff, 2005). Approximately 88% of the actions involve activities with aerobic characteristics and the remaining time (12%) anaerobic activities (Shepard & Leatt, 1987; Reilly, 1996). Among the activities with anaerobic characteristics are actions involving great muscle strength and power to perform jumps, kicks, high-speed running and high-speed running

with a change of direction (Loturco, Pereira, Kobal & Nakamura, 2018; Loturco, Bishop, Freitas, Pereira & Jeffreys, 2020). During the 2006-07 English Premier League season versus the 2012-13 season, an increase in the number of sprints (number of sprints: 31±14 to 57±20) and running speed (running speed: 9.12±0, 43 to 9.55±0.40 m.s-1) in a match (Barnes, Archer, Hogg, Bush & Bradley, 2014). It is noteworthy that these actions are considered important because they precede the scoring of a goal. For example, running in a straight line occurs in 45% of the times a goal is scored and the second most frequent action before a goal is the jump, an action observed in 16% of the times (Faude, Koch, & Meyer, 2012).

The Brazilian Soccer Championship involves 20 teams each year (CBF, 2022). These teams play 38 round and return matches, totaling 380 matches. At the end, teams can qualify, depending on their position in the ranking, for other competitions, such as the *Copa Libertadores da América*, *Pré-Libertadores da América* and *Sul-americana*. The four teams that scored the least throughout the season are relegated to the B series of the competition that bears the same name. Throughout the competitive season, the games are highly dispute, as all points are important to reach the best classification. The average of goals in the competition was 2.18 − 2.68 goals per match during the period covered in this work (2011-2021). Thus, we understand that the "*Brasileirão*" is a qualified and representative soccer cham-

pionship for the accomplishment of the present study.

The grandiosity of the numbers and the number of people involved with soccer are impressive, and it is also a subject discussed among people. This generates beliefs that can be investigated, using the scientific method, to confirm them or not. Different studies attempt to identify the moment in which the goal is scored (Armatas, Yiannakos & Sileloglou, 2017; Evangelos, Gioldasis, Ioannis & Georgia, 2018; Njorarai, 2014; Ribeiro, Teodoro, Silva, Baganha, Oliveira & Lacerda, 2017; Souza, Ferah & Dias, 2012). One of these beliefs is in the idea of fans that the team becomes more vulnerable to conceding a goal soon after scoring a goal. Vulnerability in soccer refers to the increased susceptibility of a team to conceding a goal immediately after scoring. It represents a momentary lapse in defensive stability and an elevated risk of allowing the opposing team to equalize or gain an advantage shortly after the team has scored. This vulnerability can manifest in various ways, such as a loss of focus, relaxation, altered team dynamics, or opponent's strategic response. Understanding vulnerability in soccer is crucial for coaches, players, and sports scientists to develop strategies and countermeasures that minimize the likelihood of conceding goals during this critical period, ultimately optimizing team performance and improving game outcomes. In this regard, players often share the same belief that fans. In a survey of Premier League players, the following question was asking: 'Do you think teams are temporarily more vulnerable right after scoring a goal?' The answer was 'yes' for eleven of the fifteen players who took part in the survey (Ayton & Braennberg, 2008). The authors then concluded that some players believe that a team, when scoring a goal, becomes more vulnerable (Ayton & Braennberg, 2008).

In the Brazilian soccer championship, teams may often experience an increased vulnerability to conceding a goal soon after scoring. This phenomenon has received limited scientific attention, despite its practical implications for team strategies and game outcomes. Considering the previous information, there is a significant research gap regarding the vulnerability of soccer teams to conceding goals immediately after scoring during the Brazilian soccer championship. Understanding the factors contributing to this vulnerability is crucial for optimizing team performance and developing effective countermeasures. Thus, the aim of the present study is to investigate whether, after scoring a goal, the team becomes more vulnerable to conceding a goal soon after. The hypothesis is that all moments after the team scores the first goal will have the same importance in terms of conceding the equalizing goal.

Material and Method

Data collection

Data were collected from games that ended in a 1 x 1 tie in the editions of the 'Campeonato Brasileiro de Futebol Serie A' (named here of Brazilian Soccer Championship), between the years 2011 and 2021. The scores were searched on the World Wide Web. A total of 518 results were collected and integrated the data of the present study. During the period, 4,180 games were played, 380 of them in each edition of the Brazilian Soccer Championship. Table 1 presents descriptive information about the Brazilian Soccer Championship in the investigated period.

Table 1
Brazilian soccer championship characteristics.

Season	Mean goals per match	number of matches	Number of draws	Percentage of draws by number of matches (%)	Number of draws in 1x1	Percentage of draws in 1x1 by draw number (%)	Score most frequently in the championship
2011	2.68	380	105	27.63	52	49.52	1 x 1
2012	2.47	380	105	27.63	50	47.61	1 x 1
2013	2.46	380	108	28.42	49	45.37	1 x 0
2014	2.26	380	92	24.21	46	50.00	1 x 0
2015	2.36	380	91	23.94	33	36.26	1 x 0
2016	2.40	380	95	25.00	41	43.61	1 x 0
2017	2.43	380	103	27.10	52	50.48	1 x 1
2018	2.18	380	110	28.94	50	45.45	1 x 0
2019	2.31	380	98	25.78	49	50.00	1 x 0
2020	2.48	380	108	28.42	57	52.77	1 x 1
2021	2.22	380	113	29.74	47	41.59	1 x 0

Procedures

The following information were collected: name of team A, name of team B, time when the first goal took place, time when the equalizing goal took place and total game time. From the first goal scored, the remaining playing time was dividing by quarter, representing each of the four quarters. After the division of the quarters, the equalizing goals were framing. This procedure was adopting to identify the quarter in which the team that opened the scoring suffered a tie.

Statistical Analysis

Data were presented as relative frequency and absolute frequency for all questions. The independent Chi-square test was used to analyze the data. Cramer's V test was used to describe the association between scoring goal equalizer moment and quarters scored after score a goal. The values of adjusted residue were observed and all values outside the range of -1.96 to 1.96 were considered relevant to explain significant statistical difference. All analyzes were performed using $\alpha = 5\%$.

Results

Table 2 presents the absolute and relative frequencies of the fourth in which the equalizing goal was score in each edition of the Brazilian football championship of the last ten years. No association between scoring goal equalizer moment and quarter after score a goal was found (χ^2 (30) = 28.196, p>0.05; Cramer's V test: 0.135).

Table 2

Brazilian soccer championship characteristic of scoring goal equalizer moment (total of 518 match results presented as frequency and percentage by quarter after score a goal).

Season	Q1 (%)	Q2 (%)	Q3 (%)	Q4 (%)	Total (%)
	Scoring Goal Equalizer Moment				
2011	15 (28.8)	15 (28.8)	12 (23.1)	10 (19.2)	52 (100)
2012	11 (22.0)	18 (36.0)	13 (26.0)	8 (16.0)	50 (100)
2013	11 (22.9)	15 (31.2)	9 (18.8)	13 (27.1)	48 (100)
2014	8 (19.5)	13 (31.7)	6 (14.6)	14 (34.1)	41 (100)
2015	5 (15.6)	8 (25.0)	9 (28.1)	10 (31.2)	32 (100)
2016	7 (17.5)	9 (22.5)	15 (37.5)	9 (22.5)	40 (100)
2017	14 (26.9)	15 (28.8)	12 (23.1)	11 (21.2)	52 (100)
2018	9 (18.0)	20 (40.0)	13 (26.0)	8 (16.0)	50 (100)
2019	9 (18.4)	8 (16.3)	17 (34.7)	15 (30.6)	49 (100)
2020	9 (15.8)	22 (38.6)	10 (17.5)	16 (28.1)	57 (100)
2021	11 (23.4)	13 (27.7)	11 (23.4)	12 (25.5)	47 (100)
Total	109 (21.0)	156 (30.1)	127 (24.5)	126 (24.3)	518 (100)

Notes. Q: quarter.

Discussion

In this study, we aimed to investigate whether the team that scores the first goal becomes more vulnerable to suffering the equalizer soon after. The main result of the present study was that there is no association between scoring a goal and conceding another soon after. So, the team that scores the first goal can concede the equalizer at different moments of the match.

The present study wasn't that there is no association between scoring a goal and conceding another soon after during Brazilian Soccer Championship. The previously study aimed investigate the moment that an equalizing goal during two season (1994-95 and 1995-96) of the English Premier League, involving a total of 27 games ending in 1 x 1 (Ayton & Braennberg, 2008). It was shown that the equalizing goal happened in 1/4 time in 16.54%, 2/4 in 26.77, 3/4 in 23.19% and 4/4 in 32.50% of the time. The authors therefore concluded that the frequency of goals in 1/4 was lower compared to 4/4. That is, the moment when the equalizing goal happens most frequently is not right after the team the first goal, but more at the end of the game. In the present study, the lowest percentage (21.0%) of equalizing goals also occurred in the 1/4, that is, right after the team scored the first goal and different from what was presented by Ayton & Braennberg (2008), the highest percentage happened in 2/4 (30.1%). A limitation of the study carried out with data from Premier League games is that the authors do not present statistical tests to point out an association between scoring a goal and suffering a draw soon after. In the present study, the chi-square test did not indicate a significant association (p<0.05) for scoring and conceding others in any of the four quarters analyzed.

Sports scientists who research soccer will identify the moment in which the goal occurs in different ways and competitions (Baert & Amez, 2018). Some studies will attempt to identify the moment in which the goal occurs in different competitions (Armatas, Yiannakos & Sileloglou, 2017; Evangelos, Gioldasis, Ioannis & Georgia, 2018; Njorarai, 2014; Ribeiro, Teodoro, Silva, Baganha, Oliveira & Lacerda, 2017; Souza, Ferah & Dias, 2012). In general, the goals are marked with the highest frequency in the second time of play. When the game is divided into periods of 15 minutes, the highest absolute frequency of goals was identified in the final 15 minutes (76 – 90 minutes). (Armatas, Yiannakos & Sileloglou, 2017; Evangelos, Gioldasis, Ioannis & Georgia, 2018; Njorarai, 2014; Ribeiro, Teodoro, Silva, Baganha, Oliveira & Lacerda, 2017; Souza, Ferah & Dias, 2012). The Mitrotasios, González-Rodenas, Armatas & Malavés' study (2022) found tactical differences between men's and women's soccer during the start and development of team possessions that led to scoring opportunities. The authors conclude that these differences highlight the fact that men implemented a more combinative style of play that included a higher passing tempo, while women progressed to the opposing goal with shorter team sequences and slower passing tempo (Mitrotasios, González-Rodenas, Armatas & Malavés, 2022). Another author' group investigate how reaching the pitch's final third is related to scoring opportunities in soccer (Guimarães, Rochael, Andrade, Bredt & Praça, 2022). It was identified that the criteria central corridor (z=5.5), ball recovery (z=6.8), midline vs. offensive line (z=2.9), offensive line vs. backline (z=2.6), and offensive line vs. empty zone (z=4.0) were positively associated with successful offensive unities. The authors conclude that soccer teams should try to achieve the final third through the central corridor, with offensive compactness, and forward passes to overcome the defensive lines (Guimarães, Rochael, Andrade, Bredt & Praça, 2022). This type of analysis has been repeated in different competitions, however, we have not identified studies that have investigated the effect of the first goal on the moment in which the tie occurred in successive seasons of the Brazilian professional soccer championship.

Compared to other team sports, scoring (goals) in soccer is a rare event (Anderson & Sally, 2013). The low frequency of goals per game makes soccer different from other invasion team sports (Mitrotasios, González-Rodenas, Armatas & Malavés, 2022). Therefore, it is necessary to understand the dynamics of a goal and know when it happens. The results of the present study help coaches and players to understand that the team can concede the equalizing goal at any time, after scoring the first goal in the match. As it is an opposition game, played with the feet and there are several factors that determine performance, unpredictability is present in each match. Technicians and coaches must bear in mind that physical, technical, tactical and psychological characteristics are factors that exert an influence on competitive success in soccer

(Teoldo, Guilherme & Garganta, 2022). Because different factors contribute to the final result of a game or increase in tactical efficiency results in more chances for victory or draw. Menegassi, Jaime, Rechenchosky, Borges, Souza, Mendes & Rinaldi (2022) they will verify that the increase in the efficiency of execution of offensive and defensive principles increases the chances of the players who will be in the groups tied (11 to 24%) or victorious (10% to 21%) in relation to defeat. The greater tactical efficiency is sustained by good physical conditioning of the player (Guzman, & Young, 2023; Hernández-Belmonte, Alegre, & Courel-Ibáñez, 2022; Loturco, Bishop, & Freitas, 2020; Loturco, Freitas, Alcaraz, Kobal, Hartmann Nunes, Weldon, & Pereira, 2022; Raya-González, Castillo, & Beato, 2021; Walker, & Hawkins, 2018). Many times, when the team is behind, not blocking the players, we increase the physical demands to attend to the technical and tactical attacks and tie the game (Araújo Júnior, Santos, Gripp & Santos, 2020; Dolci, Hart, Kilding, Chivers, Piggott & Spiteri, 2020).

Finally, the main limitation of the present study was the cut made, since we limited the results only to the games finished tied by 1 x 1, disregarding other results. However, the 1 x 1 tie score was the most frequent in professional soccer leagues in different locations around the world, such as Premier League, Bundesliga and Serie A of the Italian championship (Anderson & Sally, 2013). In the Brazilian Soccer Championship, the 1 x 1 score was the most frequent in the 2011, 2012, 2017 and 2020 editions (Table 1), having happened on 518 occasions between 2011 and 2021, representing 12.4% of the total number of games in the period. Another limitation of the present study is related with the moment that a team concedes the equalizing goal that varied according to the moment it scores the first goal. However, choosing only the 1 x 1 score makes it possible to better understand when the equalizing goal is scored.

Conclusions

Based on the findings of this study, there was no statistical difference identified between moments when a soccer team scored a goal. This suggests that all moments following a team scoring a goal are equally important in terms of the vulnerability to conceding an equalizing goal. As head coaches and assistant coaches, this information can guide strategic decision-making during matches. It highlights the need for consistent vigilance and defensive focus throughout the game, regardless of the timing of team's goals. It is essential to communicate this to players and emphasize the importance of maintaining defensive organization and concentration even after scoring. Rather than relying on assumptions about certain moments being more vulnerable than others, it is crucial to emphasize a proactive and disciplined approach to defense at all times. This includes reinforcing defensive positioning, communication, and maintaining a collective defensive effort even after scoring

a goal. Additionally, this study underscores the value of ongoing analysis and evaluation of team's performance. By monitoring match data and studying the dynamics of goal vulnerability, can identify any potential patterns or areas of improvement specific to soccer team. This knowledge can inform training sessions and allow to implement targeted strategies to minimize vulnerability after scoring. Ultimately, a comprehensive understanding of the dynamics surrounding goal vulnerability can help to optimize team's performance and increase the likelihood of securing positive results. By remaining vigilant and proactive in addressing defensive responsibilities, head coaches and assistant coaches can minimize the risk of conceding goals and maintaining control over matches, thus improving team's overall success.

Acknowledgements

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