Analysis of the frequency of goals scored in the 2023 Women's Soccer World Cup

Análisis de la frecuencia de los goles anotados en el Mundial De Fútbol Femenino 2023

Authors

Sofía López-Araya [1]
Jorge Salas [2]
Pablo López-Sierra [3]
Sergio J. Ibáñez [4]

[1, 3, 4] University of Extremadura(Spain)
[2] National University (Costa Rica)

Corresponding author:
Sofía López-Araya
slopezar@alumnos.unex.es

Received: 05-12-25
Accepted: 17-02-26

How to cite in APA

López-Araya, S., Salas, J., López-Sierra, P., & Ibáñez, S. J. (2026). Analysis of the frequency of goals scored in the 2023 Women's Soccer World Cup. *Retos, 78*, 283-294. https://doi.org/10.47197/retos.v78.118297

Abstract

Introduction: Women's Soccer has become a new sports phenomenon. This fact has led to a growing interest in its study within the scientific community. However, research that can generate a consolidated body of knowledge is still scarce.
Objective: To analyze the frequency of goals scored in the 2023 Women's World Cup.
Methodology: Descriptive statistics were used to analyze the frequency of goals scored by teams based on game time, in 15-minute and 5-minute intervals.
Results: The goals scored during regular time were very similar, slightly higher in the first half. Based on the 15-minute intervals, two periods with the most goals were identified (first half= 16-30 min and second half= 61-75 min). According to the 5-minute intervals, five high-scoring periods were identified (first half= 11-15 min, 26-30 min, and +45 / second half= 61-70 min and 85- +90 min). Furthermore, the first goal appeared very early in the match.
Discussion: Historically, soccer has been characterized by a higher number of goals in the second half, which was not observed in the 2023 Women's World Cup, and the periods with the most goals varied depending on the analyzed tournaments.
Conclusions: There is a need to study the goal pattern in more detail. Additionally, the first goal in Women's Soccer tends to be scored in the early minutes of the match.

Keywords

Goals; order of scoring; period; soccer; woman

Resumen

Introducción: El Fútbol Femenino se ha convertido en un nuevo fenómeno deportivo. Este hecho provocó un interés creciente en la comunidad científica por su estudio. Sin embargo, aún son escasas las investigaciones que permiten generar un cuerpo de conocimiento consolidado.
Objetivo: Analizar la frecuencia de goles realizados en el Mundial de Fútbol Femenino 2023.
Metodología: Se empleó estadística descriptiva para conocer la frecuencia de los goles anotados por las selecciones en función de los tiempos de juego, en periodos de 15 minutos y 5 minutos.
Resultados: Las anotaciones entre los tiempos reglamentarios fueron muy similares, ligeramente mayores en el primer tiempo. En función de los intervalos de 15 minutos, se identificaron dos periodos con más goles (primer tiempo= 16-30 min y segundo tiempo= 61-75 min). Según los intervalos de 5 minutos, se identificaron cinco periodos con más goles (primer tiempo= 11-15 min, 26-30 min y +45 / segundo tiempo= 61-70 min y 85 - +90 min). Además, el primer gol suele suceder en los primeros instantes del partido.
Discusión: Históricamente, el fútbol se ha caracterizado por una mayor cantidad de anotaciones en el segundo tiempo, la cual no se respetó en el Mundial de Fútbol Femenino 2023 y los periodos de tiempo con más goles variaron en función de los torneos analizados.
Conclusiones: Surge la necesidad de estudiar el patrón de goles de manera más detallada. Además, el primer gol en Fútbol Femenino suele ser anotado en los primeros minutos del partido.

Palabras clave

Fútbol; goles; mujer; orden de anotación; periodos.

Introduction

Women's Soccer (WS) has become the new sporting phenomenon, driven by the interest of fans in its various competitive formats. As a result, its importance as a sports discipline has grown, highlighting the need to examine its game dynamics from a technical and tactical perspective, while documenting the various soccer-related events within this sport (Soroka, 2017). However, throughout history, this sport has faced different challenges that have not allowed it to develop as directly and smoothly as Men's Soccer (MS). Among these events are its prohibition during certain periods in history, as well as its late recognition and the creation of international competitions (Clarke, 2019; González, 2023). Therefore, in WS, research on technical, tactical, and physical performance, as well as its relationship with different contextual variables, remains scarce (Harkness-Armstrong et al., 2022).

The study of the goal as a key element in performance analysis in low-scoring team sports (Reina & Hernández, 2012) such as soccer, futsal and soccer for visually impaired players, has been widely explored in recent scientific literature. Research in conventional soccer has identified patterns in goal frequency and timing, emphasizing the importance of variables such as game time and finishing zones (Sarmento et al., 2022). In the case of futsal, emphasis has been placed on the speed of offensive transitions and the impact of set-piece actions in generating goals (Amatria et al., 2021). On the other hand, in soccer for visually impaired players, studies have highlighted the importance of the timing of goal-scoring, as well as the prediction of shot effectiveness based on the starting zone and type of strike (Gamonales et al., 2019). These studies not only contribute to understanding the determinants of goal-scoring in different sports modalities but also provide tools to optimize training and game strategies in diverse competitive contexts.

The importance of scoring the first goal in soccer has been the subject of numerous studies analyzing its impact on both MS and WS (Mitrotasios et al., 2022). In MS, research has indicated that scoring the first goal significantly increases the chances of winning (García-Rubio et al., 2015; Ugalde-Ramírez & Rivas-Borbón, 2023), due to the psychological effects on the teams, such as increased confidence for the scorer and pressure on the opponent (Lago-Peñas et al., 2016; Liu et al., 2021; Sánchez-Murillo et al., 2021). On the other hand, in WS, although game dynamics may differ, recent studies highlight that the first goal is also a key factor, especially in high-competition matches, as it influences the subsequent tactical approach of both teams and the opportunities for success (Codina et al., 2025; Ibáñez et al., 2018). These findings emphasize the relevance of effective offensive strategies at the beginning of the match and the psychological value of the first goal in both genders.

The frequency of goals scored is a widely studied variable in different MS competitions, such as World Cups, continental competitions, and league tournaments (Barrios, 2015; Martínez & González-García, 2018; Njororai, 2014). In the case of the Men's World Cups (MWC), different editions have been grouped to understand the goal-scoring behavior throughout history. Some studies have included the analysis of older editions, such as the 1930 World Cup in Uruguay and the 1966 World Cup in England, up to more recent editions like the 2014 World Cup in Brazil and the 2018 World Cup in Russia (Kubayi & Toriola, 2019; Mićović et al., 2023; Soares, 2013). These investigations show a historical trend in goal-scoring behavior during the MWC, with goals being scored primarily in the second half of matches, specifically in the last 15 minutes of play (Armatas, Yiannakos, & Sileloglou, 2007).

However, in more recent MS competitions, such as the 2018 MWC, while the trend of a higher number of goals scored in the second half of matches remained, the 45-60-minute period was added to the last 15 minutes of the game as part of the time segments with the most goals scored (Çobanoğlu, 2019; de Paula & Magalhães, 2018). This second-half behavior continued during the 2022 MWC, although the highest-scoring periods varied, and for the first time, a 15-minute period in the first half was reported as a time segment with a high number of goals, along with the 61-75-minute period of the second half, which showed the greatest number of goals (Rance, 2023; Yolgörmez & Tütüncü, 2023).

In the case of WS, the goal-scoring behavior has been studied in various futsal tournaments (Barreto et al., 2014; Patrício et al., 2011) and has also been analyzed based on the effectiveness of attacking actions (Scanlan et al., 2020). Armatas et al. (2007) studied the frequency of goals scored in Women's World Cups (WWC), from the second edition in Sweden in 1995 to the fourth edition in the United States in 2003. In these editions, the trend observed in MS was maintained, with a higher number of goals scored

in the second half, specifically in the last 15-minute period. However, Mesquita et al. (2023), after studying one season of two European WS leagues, found that there was no single period in which goals were scored more frequently. In the first half, it occurred between 30 and 45 minutes, and in the second half, between 45 and 60 minutes.

Recording the goals scored in a soccer World Cup would allow for the identification of time intervals in which a greater number of goals were scored, either to exploit a competitive advantage or to reduce the likelihood of such actions occurring during a specific period. For this reason, the general objective of this study was to analyze the frequency of goals scored in the 2023 WWC. Specifically, it was operationalized into three specific objectives: i) to analyze the timing of goals scored in high-level WS matches, both in regular time and extra time, in 15-minute intervals and 5-minute intervals, ii) to identify the periods with the most goals based on the frequency of goals scored, and iii) to study the time periods in which goals are scored according to the order of scoring.

Methodology

Design

This study is framed within an empirical research approach, using a descriptive strategy and an observational design, specifically indirect observational, as it analyzes previously occurred dynamics through continuous archival records. These characteristics also correspond to a non-experimental research design, since the events were described without manipulation of variables and without controlling the random assignment of groups. This approach aligns with current methodological frameworks in Sport Sciences (Ato et al., 2013; Shaughnessy et al., 2012; Ibáñez & Feu, 2026).

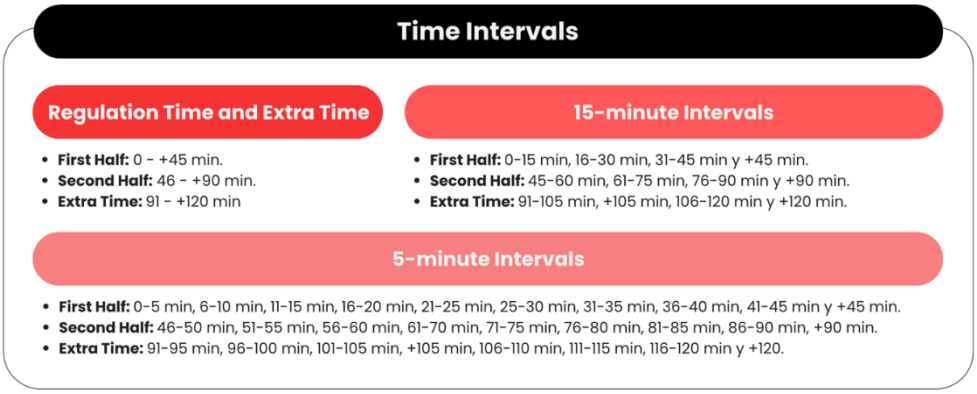
Sample

The goals from the 64 matches of the 2023 Women's World Cup were collected. Data were gathered from the two teams that participated in each match, resulting in an analysis of 128 total cases. The data were collected through the official FIFA website for the 2023 WWC Australia-New Zealand (https://www.fifa.com/es/tournaments/womens/womensworldcup/australia-new-zealand2023/scores-fixtures?country=ES&wtw-filter=ALL) (FIFA, 2023).

Variables

The independent variables of this study correspond to three analyzed time interval formats in which goals occurred during the 2023 WWC (see Figure 1). On the other hand, the dependent variables studied include the goals scored in the 2023 WWC and the goal-scoring behavior based on the order of scoring: First Goal (1G), Second Goal (2G), Third Goal (3G), Fourth Goal (4G), Fifth Goal (5G), Sixth Goal (6G), and Seventh Goal (7G) in the 2023 WWC.

Figure 1. Time Interval Formats Analyzed in the 2023 WWC.



Instrument

An ad hoc Microsoft Excel spreadsheet was used for the data tabulation provided by FIFA. Subsequently, the data were transferred to the statistical software package Jamovi 2.4.7 to conduct the respective statistical analyses (R Core Team, 2022; The Jamovi Project, 2023).

Procedure

Once the data were tabulated, they were transferred to the statistical software package. Each specific time in which FIFA reported a goal was assigned to a time interval based on the established 15-minute and 5-minute periods. Subsequently, the reliability of the data was assessed, with values greater than .932 being reported, which were considered very good and high values, according to the Kappa Coefficient and the Intraclass Correlation Coefficient (Altman, 1991; Vincent, 1999).

Data analysis

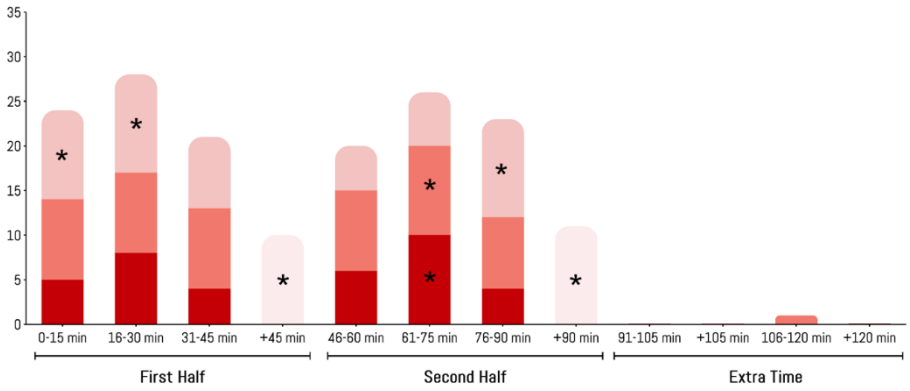
For the data analysis, descriptive statistics (frequencies and percentages) were performed. All results were generated using the data analysis software Jamovi 2.4.7 (The Jamovi Project, 2023), which utilizes the R language (R Core Team, 2022), as well as the Microsoft Excel program (version 16.88).

Results

In the 64 matches of the 2023 WWC, a total of 164 goals were scored, averaging 2.56 goals per match and 1.28 goals per team. However, in nine matches, there were no goals and in 55 instances, one team did not score during a match in the 2023 WWC.

According to the analysis of the 45-minute periods and extra time, most goals during the 2023 WWC were scored during regulation time. In the first half, 83 goals were scored (50.61%), three more than in the second half, where 80 goals were scored (48.78%). In comparison, only one goal was scored during extra time (0.61%) (see Figure 2 and Appendix 1).

Figure 2. Frequency of goals scored according to 15-minute and 5-minute intervals.



*= highest-scoring periods; ■ = First 5-minute period of each 15-minute interval; ■ = Second 5-minute period of each 15-minute interval; ■ = Third 5-minute period of each 15-minute interval and ■ = Extra periods of each regulation time.

When analyzing the distribution of goals in 15-minute intervals, it was observed that in the first half, the highest number of goals occurred between minutes 16 and 30 (28 goals, 17.07%), while in the second half, the most goals were scored in the 61-75-minute period (26 goals, 15.85%). Additionally, the only goal in extra time occurred between minutes 106 and 120 (0.61%). On the other hand, when analyzing the distribution of goals in 5-minute intervals, in the first half, the highest number of goals occurred in the 11-15-minute period (10 goals, 6.10%), the 26-30-minute period (11 goals, 6.71%) and the +45-minute period (10 goals, 6.10%), while in the second half, the highest number of goals was scored in the 61-65-minute and 66-70-minute periods (10 goals, 6.10% each), as well as in the 86-90-minute and

+90-minute periods (11 goals, 6.71% each). Additionally, the only goal in extra time occurred between minutes 111 and 115 (0.61%) (see Appendix 2).

According to the 15-minute period analysis, it can be observed that there are two high-scoring periods throughout the 2023 WWC. In the first half, this corresponds to the period between 16 and 30 minutes with 28 goals, during which the 1G is most likely to occur. In the second half, the highest-scoring period corresponds to the 61-75-minute period, with 26 goals, during which the 2G is most likely to occur. Adding the 5-minute period analysis, it is clear that within the highest-scoring first-half period between 16 and 30 minutes, special attention should be given to the period between 26 and 30 minutes, as 11 goals were scored in this 5-minute interval, during which the 1G is most likely to occur. As for the highest-scoring second-half period, between 61 and 75 minutes, more attention should be paid to the 61-70-minute range, where 20 goals were scored (ten goals in each 5-minute period), during which the 2G and 4G are most likely to occur, respectively.

However, thanks to the 5-minute goal frequency analysis, two other high-scoring periods in the first half can be identified, between 11 and 15 minutes and +45 minutes, with ten goals in each period, in which the 1G is most likely to occur. As for the second half, another high-scoring period can be distinguished, approximately 10 minutes long, between 86 and 90 minutes and +90 minutes, with a total of 22 goals (11 goals in each 5-minute period), in which the 1G and 2G are most likely to occur. Therefore, there are three high-scoring 5-minute periods in the first half and two high-scoring periods of approximately 10 minutes each in the second half.

Regarding the behavior of each goal in terms of the order of scoring in the 2023 WWC, the following was reported: 74 first goals (57.8%), 41 second goals (32.0%), 21 third goals (16.4%), 13 fourth goals (10.2%), 9 fifth goals (7.1%), 5 sixth goals (4.0%), and only 1 seventh goal (0.8%). According to the 15-minute and 5-minute period analysis, the 1G was most frequently scored between 0 and 15 minutes (22 goals; 17.2%), specifically between 6 and 10 minutes (9 goals; 7.0%). The 2G was most frequently scored between 61 and 75 minutes (10 goals; 7.8%), specifically between 61 and 65 minutes (5 goals; 3.9%). The 3G was most frequently scored between 31 and 45 minutes (5 goals; 3.9%), specifically between 36 and 40 minutes (3 goals; 2.3%). The 4G was most frequently scored between 61 and 75 minutes (5 goals; 3.9%), specifically between 66 and 70 minutes (3 goals; 2.3%). On the other hand, due to the low number of 5G, 6G, and 7G scored in the 2023 WWC, it is not possible to indicate a specific 15-minute or 5-minute period, though these were scored in the second half (see Figure 3: 15-minute intervals and Figure 4: 5-minute intervals).

Figure 3. Behavior of each goal based on the order of scoring in the MFF 2023 according to the 15-minute period.

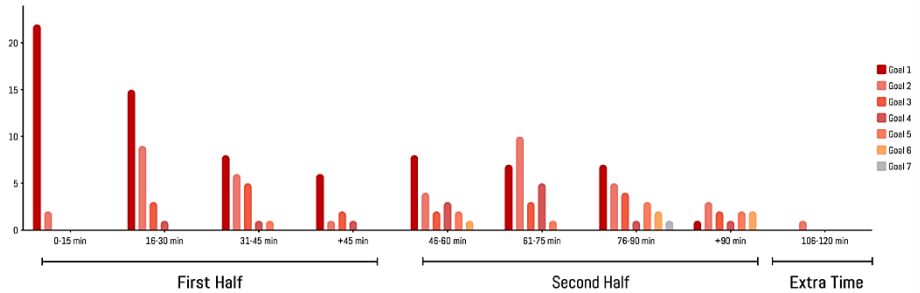
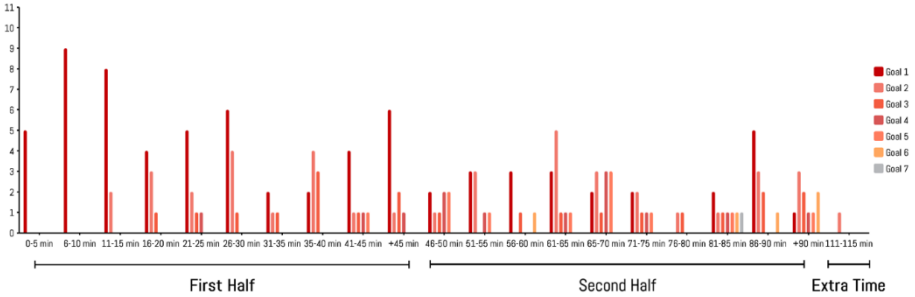


Figure 4. Behavior of each goal based on the order of scoring in the MFF 2023 according to the 5-minute period.



Discussion

The general objective of this study was to analyze the frequency of goals scored in the 2023 WWC. Specifically, the study aimed to examine the frequency of goals scored according to the periods of play, 15-minute intervals, and 5-minute intervals. Additionally, it sought to identify the highest-scoring periods based on the frequency of goals scored and to examine the timing of the goals according to the order of scoring. A higher number of goals was observed in the first half of the matches played in the 2023 WWC. Based on the goal recordings in 15-minute and 5-minute intervals, different high-scoring periods were identified in both the first and second halves, with varying patterns between the two. Additionally, based on the scoring order, the 1G was observed to occur early in the match.

In the overall analysis of goal frequency according to regulation time and extra time in the 2023 WWC, most goals occurred during regulation time, with a slight predominance of goals scored in the first half. This behavior differs from the goal frequency observed in the 1995/1999/2003 WWC and 2018/2022 MWC, where a significantly higher number of goals were recorded in the second half (Armatas et al., 2007; Kubayi, 2020; Rance, 2023). In the 2006 MWC, although this pattern was observed, the distribution of goals between the two halves was much more balanced, similar to the case of this study (Acar et al., 2008). While there is a historical trend in soccer characterized by a predominance of goals in the second half, this trend was not observed in the 2023 WWC. This new phenomenon could be the result of a change in the playing dynamics of the teams, due to new strategies employed, such as scoring goals in the early minutes of the game.

According to the analysis of goal frequency in the 2023 WWC in 15-minute intervals, two high-scoring periods were identified. The highest-scoring period in the first half of this study does not coincide with the one reported in the French and English Women's Leagues or in the 2022 MWC, where the highest-scoring periods in those competitions occurred between the 30- and 45-minute mark. However, the highest-scoring period in the second half of the 2023 WWC does align with the one recorded in the 2022 MWC. In contrast, in the European Women's Leagues, the highest-scoring period occurred between 45 and 60 minutes, surpassing the highest-scoring period identified in this study by only one goal (Mesquita et al., 2023; Yolgörmez & Tütüncü, 2023). These results suggest that the dynamics of goal-scoring tend to vary depending on different soccer competitions, likely due to factors such as playing style, competition type, club philosophy, and technical, tactical and physical components. Therefore, it is important to identify the frequency of goals in the context of each competition.

When conducting a more specific analysis of the goals scored in the 2023 WWC in 5-minute intervals, the number of highest-scoring periods increased in each playing half. This type of detailed analysis has also been conducted in other formats of soccer, such as Álvarez et al. (2020), who analyzed different European women's futsal leagues, indicating that the highest number of goals occurred in the second half, especially in the final 10 minutes of the match and even more specifically in the last 5-minute period. Additionally, in the 2021 Women's Futsal Copa Libertadores, the goal-scoring trend in the second half was maintained, but a more detailed analysis identified two highest-scoring 5-minute periods in each half of the game (Guerra & Valencia, 2022). These results highlight the importance of conducting more detailed analyses in shorter time intervals regarding the dynamics of goal-scoring. In this study, this analysis revealed distinct behaviors between the two halves of play. In the first half, the goal-scoring

dynamics revealed three highest-scoring 5-minute periods, while in the second half, two highest-scoring 10-minute periods were identified.

On the other hand, the study of goals based on the scoring order indicated that the first goal is usually scored in the early minutes of the match. In different European WS leagues, it has been reported that the first goal scored by a team typically happens within the first 15 minutes, and the benefits of scoring the first goal in a match have been analyzed. Studies have shown that the teams that won their matches had scored the first goal more frequently than their rivals (Sánchez-Murillo et al., 2021). It is evident that in WS, the importance of scoring the first goal is closely related to the temporal moment in which it occurs, as it directly influences the dynamics of the match and the tactical planning of the teams. Recent studies have demonstrated that goals scored within the first 30 minutes of a match have a significant impact on the final result, as they allow teams to adopt stronger defensive strategies and control the pace of the game (Sarmento et al., 2022). Additionally, it has been observed that the timing of the first goal is associated with variations in the response capacity of the opposing team, particularly in high-level competitions where scoring opportunities are often limited (Ibáñez et al., 2018). The results of this study indicate that the teams participating in the 2023 WWC scored between one and three goals per match, with it being rare to score more than four goals, suggesting that there were few matches with a very wide margin in the score. Furthermore, considering the advantage a team might gain by scoring first and considering that in WS this typically occurs in the first 15 minutes of play, this aspect should continue to be studied, as such an advantage would manifest early in the match. This highlights the importance of training offensive and tactical skills to maximize the chances of scoring early in the game and securing a competitive advantage.

Overall, the results of this study indicate that during the 2023 WWC, specific time-related patterns were observed for this competition. However, Iván-Baragaño et al. (2025) reported that during this World Cup edition, goal-scoring actions could not be identified under a clear tactical pattern but rather showed very specific characteristics. In their study, the variables that most influenced the outcome of ball possession were the possession zone, attack duration, number of passes, and starting zone. Therefore, to achieve a more comprehensive understanding of WS performance during the ninth World Cup edition, other variables may have influenced goal behavior. For example, based on match outcomes in the 2023 WWC, winning teams maintained a more dominant offensive dynamic, while teams that lost or drew were required to perform more defensive actions. In addition, differences in playing styles across confederations have been reported (López-Araya, Sánchez-Ureña, et al., 2025). Similarly, teams that finished in higher positions performed fewer offensive actions but were more effective than teams that only participated in the group stage (López-Araya, Gutiérrez-Vargas, et al., 2025). Overall, these findings suggest that goal frequency may vary according to other factors, such as contextual, tactical, or even physical variables, which were not considered in this study. Therefore, more detailed studies, preferably conducted at the team level, are needed to better understand the specific temporal and tactical dynamics of each team when preparing for potential matchups.

Conclusions

The results of the 2023 WWC analysis showed that, despite a balanced number of goals between the two halves, the highest number of goals in the 15-minute intervals occurred between minutes 16 and 30 of the first half and between minutes 61 and 75 of the second half. In addition, the findings highlighted the need for more detailed analyses using 5-minute intervals, since this approach increased the number of high-scoring periods and revealed different patterns between halves. In the first half, three-time intervals showed the highest number of goals, specifically 11–15 minutes, 26–30 minutes, and +45 minutes. In the second half, two 10-minute periods showed the highest number of goals, specifically 61–70 minutes and 86–+90 minutes. Overall, analyzing goal frequency using shorter time intervals allowed the identification of more specific high-scoring moments, supporting the need to use smaller intervals, either alone or combined with broader intervals, to better understand goal-scoring patterns.

On the other hand, based on the results according to scoring order, between one and three goals were scored per match. The first goal was observed to occur early in the match. Therefore, further research is recommended to continue analyzing this variable and the possible advantage of scoring the first goal

in relation to the match outcome, considering that this advantage may appear very early. Thus, studying the first goal represents a determinant factor, as it is considered a key factor during the match.

Practical Applications

As soccer is a low-scoring sport, recording goals in different tournaments is a key tool for identifying the high-scoring periods in which the greatest number of goals are concentrated. This information allows coaching staff to make more informed decisions about strategies to implement and adjust training to optimize offensive and defensive performance based on the key time intervals identified in each competition. In the case of WS, and more specifically for the upcoming 2027 WWC in Brazil, identifying these highest-scoring periods in the 2023 WWC will be crucial, as it will allow the participating teams to adjust their tactical plans. Special attention should be paid to the highest-scoring periods of 5 and 10 minutes in the first and second halves, respectively, as they are usually the decisive moments of the game.

The information about the highest-scoring periods also highlights the importance of physical preparation and real-time monitoring of players during the match. Physically, players must be prepared to perform at their best during the 90 minutes of a match and any added time by the referee. The WWC analysis revealed that there is a highest-scoring period in the final 10 minutes of the match, where accumulated fatigue can impact players' performance. This period can be exploited to take advantage of the opponent's physical deterioration, either to maintain a lead or prevent a goal. Another strategy to consider is making substitutions near the final minutes, ensuring that players enter the field with enough physical capacity to endure the final stretch, being able to score or prevent a goal by the opponent.

In addition to technical, tactical and physical preparation, this information reinforces the importance of players paying greater attention during the highest-scoring periods of the game. Specific actions during these periods should be adjusted to the phase of play taking place, as well as the level of opposition from the rival team. Coaching staff can design training sessions that simulate defensive and offensive situations during these moments, so the team is prepared to counter the opponent’s attempts or exploit their fatigue. It is also essential to consider the score in the final minutes, as strategy can change depending on the context of each match.

Lastly, this analysis reveals the need to study the highest-scoring periods based on the characteristics of each phase of a World Cup tournament, as well as a specific analysis of a team’s goal-scoring and conceding frequency after a competition. The results obtained contribute not only to improving each team's individual strategies but also to the scientific evidence in WS. This will enable coaching staff to develop more specific training tasks tailored to the needs of women's tournaments, helping maximize the chances of success in competition.

However, the results of this study should be interpreted with caution and should not be generalized to all soccer formats, categories, competitions, levels of play, or other types of tournaments. First, this study analyzed only one performance variable. Although examining goal frequency across different time periods helps identify when goals were scored, a single variable cannot fully explain performance in WS. Other key components of the game, such as contextual factors (e.g., opponent quality, stage of the tournament or match type), as well as tactical and physical demands, may have influenced scoring patterns. Second, this study focused on only one tournament format, a single WWC, within one gender and one competitive category. Therefore, future research should include other tournament formats, different age groups and levels of competition, and a wider range of genders and contexts to provide a more complete and generalizable understanding of goal frequency, the importance of the first goal, and other relevant aspects of soccer.

Acknowledgements

This work was carried out with the support of the “Grupo de Optimización del Entrenamiento y Rendimiento Deportivo” (GOERD), whose collaboration and commitment to sports science research have been essential for the development of this study.

Financing

This research was partially funded by the Research Group Support Grant (GR24133). It was co-funded at 85% by the European Union through the European Regional Development Funds (ERDF), and by the Regional Government of Extremadura (Department of Education, Science, and Vocational Training). The Managing Authority is the Ministry of Finance of Spain.

In addition, the author Pablo López-Sierra is a scholarship holder of the 2023 University Teaching Training Program funded by the Ministry of Science, Innovation and Universities, under grant code FPU23/02997.

References

Acar, M. F., Yapicioglu, B., Arikan, N., Yalcin, S., Ates, N., & Ergun, M. (2008). Analysis of goals scored in the 2006 World Cup. In T. Reilly & F. Korkusuz (Eds.), *Science and Football* (pp. 261–268). Routledge.

Altman, D. G. (1991). Practical Statistics for Medical Research. Chapman & Hall.

Álvarez Medina, J., Murillo Lorente, V., Ramírez San José, J., & Amatria Jiménez, M. (2020). Momentos críticos del partido en las mejores ligas europeas de fútbol sala (Critical moments of the match in the best european football leagues sala). *Retos*, *38*, 77-82. https://doi.org/10.47197/retos.v38i38.73001

Amatria, M., Álvarez, J., Ramírez, J., & Murillo, V. (2021). Identification of the Patterns Produced in the Offensive Sequences That End in a Goal in European Futsal. *Frontiers in Psychology*, *12*, 1–10. https://doi.org/10.3389/fpsyg.2021.578332

Armatas, V., Yiannakos, A., Galazoulas, C., & Christos, G. (2007). Goal scoring patterns over the course of a match: Analysis of Women's high standard soccer matches. *Physical Training*, 1–9.

Armatas, V., Yiannakos, A., & Sileloglou, P. (2007). Relationship between time and goal scoring in soccer games: Analysis of three World Cups. In *International Journal of Performance Analysis in Sport*, (7)2, 48-58. 10.1080/24748668.2007.11868396

Ato, M., López, J. J., & Benavente, A. (2013). Un sistema de clasificación de los diseños de investigación en psicología. *Anales de Psicologia, 29*(3), 1038–1059. https://doi.org/10.6018/analesps.29.3.178511

Barreto, G., Merseburger, L., & Fossati, F. (2014). Análise de Fatores determinantes do gol no Futsal Feminino. *Revista Brasileira de Futsal e Futebol*, *6*(19), 18–26.

Barrios, T. (2015). A Incidência de gols na fase classificatória para a copa do mundo de 2010 na África do Sul. *Revista Brasileira de Futsal e Futebol*, *7*(23), 67–71.

Clarke, G. (2019). Soccerwomen : the icons, rebels, stars, and trailblazers who transformed the beautiful game. Bold Type Books.

Çobanoğlu, H. O. (2019). Analysis of Goal Scored on Russia World Cup 2018. *Journal of Education and Training Studies*, *7*(2), 184. https://doi.org/10.11114/jets.v7i2.3998

Codina, J. S., Ballester, R., Casal, C., & Huertas, F. (2025). Analysis of goal scoring patterns in the UEFA Women's EURO 2022. *Biology of Sport*, *42*(2), 45-56. https://doi.org/10.5114/biolsport.2025.142646

de Paula, A., & Magalhães, F. (2018). Incidência temporal de gols na Copa do Mundo de Futebol 2018. *Revista Brasileira de Futsal e Futebol*, *10*(41), 759–762.

FIFA. (2023). *Resultados y partidos*. https://www.fifa.com/fifaplus/es/tournaments/womens/womensworldcup/australia-new-zealand2023/scores-fixtures?country=ES&wtw-filter=ALL

Gamonales, J. M., Muñoz-Jiménez, J., León, K., & Ibáñez, S. J. (2019). Effectiveness of the launch at FA5 for blind persons in 2016 paralympic games. *Revista Internacional de Medicina y Ciencias de La Actividad Fisica y Del Deporte*, *19*(76), 745–764. https://doi.org/10.15366/rimcafd2019.76.012

García-Rubio, J., Gómez, M. Á., Lago-Peñas, C., & Ibáñez, S. J. (2015). Effect of match venue, scoring first and quality of opposition on match outcome in the UEFA champions league. *International Journal of Performance Analysis in Sport*, *15*(2), 527–539. https://doi.org/10.1080/24748668.2015.11868811

González, P. (2023). *Fútbol femenino: una historia de lucha y discriminación*. https://www.despertaferro-ediciones.com/2023/futbol-femenino-una-historia-de-lucha-y-discriminacion/

Guerra, A., & Valencia, W. (2022). Analysis of offensive actions that resulted in goals in the Conmebol Libertadores Futsal Cup, Uruguay 2021. *Retos*, 46, 501–510. https://doi.org/10.47197/retos.v46.93543

Harkness-Armstrong, A., Till, K., Datson, N., Myhill, N., & Emmonds, S. (2022). A systematic review of match-play characteristics in women's soccer. *PLOS ONE*, *17*(1). https://doi.org/10.1371/journal.pone.0268334

Ibáñez, S. J., Pérez-Goye, J. A., Courel-Ibáñez, J., & García-Rubio, J. (2018). The impact of scoring first on match outcome in women's professional football. *International Journal of Performance Analysis in Sport*, *18*(2), 318–326. https://doi.org/10.1080/24748668.2018.1475197

Ibáñez, S. J., & Feu, S. (2026). Research designs in Sports Science. *E-Balonmano com Journal of Sport Science, 26*(1), 1-46.

Iván-Baragaño, I., Ardá, A., Losada, J. L., & Maneiro, R. (2025). Goal and shot prediction in ball possessions in FIFA Women's World Cup 2023: a machine learning approach. *Frontiers in Psychology*, *16*. https://doi.org/10.3389/fpsyg.2025.1516417

Kubayi, A. (2020). Analysis of Goal Scoring Patterns in the 2018 FIFA World Cup. *Journal of Human Kinetics, 71*(1), 205–210. https://doi.org/10.2478/hukin-2019-0084

Kubayi, A., & Toriola, A. (2019). Trends of goal scoring patterns in soccer: A retrospective analysis of five successive FIFA World Cup tournaments. *Journal of Human Kinetics*, *69*(1), 231–238. https://doi.org/10.2478/hukin-2019-0015

Lago-Peñas, C., Gómez-Ruano, M., Megías-Navarro, D., & Pollard, R. (2016). Home advantage in football: Examining the effect of scoring first on match outcome in the five major European leagues. *International Journal of Performance Analysis in Sport*, *16*(2), 411–421. https://doi.org/10.1080/24748668.2016.11868897

Liu, T., García-de-Alcaraz, A., Wang, H., Hu, P., & Chen, Q. (2021). Impact of Scoring First on Match Outcome in the Chinese Football Super League. *Frontiers in Psychology*, *12*, 1–8. https://doi.org/10.3389/fpsyg.2021.662708

López-Araya, S., Gutiérrez-Vargas, R., Ugalde-Ramírez, A., & Ibáñez, S. J. (2025). Analysis of the differences in the technical-tactical performance indicators in The FIFA Women's World Cup 2023 according to the final classification. *E-Balonmano com Journal of Sport Science, 21*(1), 117–130. https://doi.org/10.17398/1885-7019.21.117

López-Araya, S., Sánchez-Ureña, B., Gómez-Ruano, M. Á., & Ibáñez, S. J. (2025). Analysis of the differences in the 2023 FIFA Women's World Cup according to match outcome and confederation of origin. *International Journal of Performance Analysis in Sport*, 1–15. https://doi.org/10.1080/24748668.2025.2505308

Martínez, F. D., & González-García, H. (2018). Analysis of goals in European football and the most influential part in final standings. *E-Balonmano com Journal of Sport Science*, *14*(2), 89–98.

Mesquita, P., Silva, B., Rodrigues, M., Maurício, N., Clemente, F. M., Camões, M., & Lima, R. (2023). Analysis of goal-scoring in an elite European women's football teams. *Sustainability and Sports Science Journal*, *1*(1), 16–24. https://doi.org/10.61486/uuga2681

Mićović, B., Leontijević, B., Dopsaj, M., Janković, A., Milanović, Z., & Garcia Ramos, A. (2023). The Qatar 2022 World Cup warm-up: Football goal-scoring evolution in the last 14 FIFA World Cups (1966–2018). *Frontiers in Psychology*, *13*. https://doi.org/10.3389/fpsyg.2022.954876

Mitrotasios, M., González-Rodenas, J., Armatas, V., & Aranda Malavés, R. (2022). Creating Goal Scoring Opportunitites in Men and Women UEFA Champions League Soccer Matches. Tactical Similarities and Differences (Creación de Ocasiones de Gol en la UEFA Champions League Masculina y Femenina. Diferencias y Similitudes Tácticas). *Retos*, *43*, 154-161. https://doi.org/10.47197/retos.v43i0.88203

Njororai, W. (2014). Timing of Goals Scored in Selected European and South American Football Leagues, FIFA and UEFA Tournaments and the Critical Phases of a Match. *International Journal of Sports Science*, *4*(6A), 56–64. https://doi.org/10.5923/s.sports.201401.08

Patrício, F., de Oliveira, M., & Coppi, A. (2011). A incidência de gols na Liga Futsal Feminina nos anos 2010 e 2011. *Revista Brasileira de Futsal e Futebol*, *3*(9), 229–235.

R Core Team. (2022). R: A Language and environment for statistical computing. (Version 4.1) [Computer software]. https://cran.r-project.org.

Rance, J. J. (2023). Examination of goals scored in the 2022 World Cup football tournament in Qatar. *Journal of Physical Education and Sport*, *23*(11), 2951–2962. https://doi.org/10.7752/jpes.2023.11336

Reina, A., & Hernández, A. (2012). Revisión de indicadores de rendimiento en fútbol. *Revista Iberoamericana de Ciencias de La Actividad Física y El Deporte*, *1*(1), 1–4. https://doi.org/10.24310/riccafd.2012.v1i1.1990

Sánchez-Murillo, P., Antúnez, A., Rojas-Valverde, D., & Ibáñez, S. J. (2021). On-match impact and outcomes of scoring first in professional european female football. *International Journal of Environmental Research and Public Health*, *18*(22), 1–9. https://doi.org/10.3390/ijerph182212009

Sarmento, H., Clemente, F. M., Afonso, J., Araújo, D., Fachada, M., Nobre, P., & Davids, K. (2022). Match Analysis in Team Ball Sports: An Umbrella Review of Systematic Reviews and Meta-Analyses. *Sports Medicine*, *8*(66), 1–22. https://doi.org/10.1186/s40798-022-00454-7

Scanlan, M., Harms, C., Cochrane Wilkie, J., & Ma'ayah, F. (2020). The creation of goal scoring opportunities at the 2015 women's world cup. *International Journal of Sports Science and Coaching*, *15*(5–6), 803–808. https://doi.org/10.1177/1747954120942051

Shaughnessy, J., Zechmeister, E., & Zechmeister, J. (2012). *Research Methods in Psychology* (9th ed.). McGrawHill.

Soares, W. (2013). Analysis of Goals in Soccer World Cups and the determination of the critical phase of the game. *Facta Univesitatis*, *11*(3), 247–253.

Soroka, A. (2017). History of Women´s Footbool World Championship in 1991-2007. *Physical Education, Sport and Health Culture in Modern Society*, 3(39), 122–127. https://doi.org/10.29038/2220-7481-2017-03-122-127

The Jamovi Project. (2023). *Jamovi. (Version 2.4) [Computer Software].* https://www.jamovi.org

Ugalde-Ramírez, J. A., & Rivas-Borbón, M. (2023). Home Advantage and Effects of Scoring First in the Costa Rican Professional Soccer. Analysis of Championships 2012/13 - 2018/19. *MHSalud*, *20*(1), 1–13. https://doi.org/10.15359/mhs.20-1.10

Vincent, W. (1999). *Statistics in Kinesiology* (2nd ed.). Human Kinetics.

Yolgörmez, A. C., & Tütüncü, O. (2023). Analysis of Goals Scored in 2022 FIFA Qatar World Cup. *Hacettepe Journal of Sport Sciences*, *34*(3), 107–117. https://doi.org/10.17644/sbd.1243811

Authors and translators' details:

Sofía López-Araya	slopezar@alumnos.unex.es	Author
Jorge Salas	jorge.salas.cabrera@una.cr	Author
Pablo López-Sierra	pablols@unex.com	Author
Sergio José Ibáñez	sibanez@unex.es	Author

Appendix

Appendix 1. Analysis of the Frequency of Goals Scored in the 2023 WWC by 15-minute intervals and scoring order.

Time Intervals		Goal 1		Goal 2		Goal 3		Goal 4		Goal 5		Goal 6		Goal 7		15 min-Int		PPET	
		F	%	*F*	%	*F*	%	*F*	%	*F*	%	*F*	%	*F*	%	*F*	%	*F*	%
First Half	0-15 min	22	17.2	2	1.6											24	14.63	83	50.61
	16-30 min	15	11.7	9	7.0	3	2.3	1	0.8							28	17.07		
	31-45 min	8	6.2	6	4.7	5	3.9	1	0.8	1	0.8					21	12.80		
	+45 min	6	4.7	1	0.8	2	1.6	1	0.8							10	6.10		
Second Half	46-60 min	8	6.2	4	3.1	2	1.6	3	2.3	2	1.6	1	0.8			20	12.20	80	48.78
	61-75 min	7	5.5	10	7.8	3	2.3	5	3.9	1	0.8					26	15.85		
	76-90 min	7	5.5	5	3.9	4	3.1	1	0.8	3	2.3	2	1.6	1	0.8	23	14.02		
	+90 min	1	0.8	3	2.3	2	1.6	1	0.8	2	1.6	2	1.6			11	6.71		
Extra Time	91-105 min															0	0.00	1	0.61
	+105 min															0	0.00		
	106-120 min			1	0.8											1	0.61		
	+120 min															0	0.00		
Total Goals		74	57.8	41	32.0	21	16.4	13	10.2	9	7.1	5	4.0	1	0.8	164	100	164	100
No Goals		54	42.2	87	68.0	107	83.6	115	89.8	119	93.0	123	96.1	127	99.2	-	-	-	-

F= frequency; %= percentage; 15 min-Int= 15-minute Intervals; PPET= periods of play and extra time.

Appendix 2. Analysis of the Frequency of Goals Scored in the 2023 WWC by 5-minute intervals and scoring order.

Time Intervals		Goal 1		Goal 2		Goal 3		Goal 4		Goal 5		Goal 6		Goal 7		5 min-Int		PPET	
		F	%	*F*	%	*F*	%	*F*	%	*F*	%	*F*	%	*F*	%	*F*	%	*F*	%
First Half	0-5 min	5	3.9													5	3.05	83	50.61
	6-10 min	9	7.0													9	5.49		
	11-15 min	8	6.2	2	1.6											10	6.10		
	16-20 min	4	3.1	3	2.3	1	0.8									8	4.88		
	21-25 min	5	3.9	2	1.6	1	0.8	1	0.8							9	5.49		
	26-30 min	6	4.7	4	3.1	1	0.8									11	6.71		
	31-35 min	2	1.6	1	0.8	1	0.8									4	2.44		
	36-40 min	2	1.6	4	3.1	3	2.3									9	5.49		
	40-45 min	4	3.1	1	0.8	1	0.8	1	0.8	1	0.8					8	4.88		
	+45 min	6	4.7	1	0.8	2	1.6	1	0.8							10	6.10		
Second Half	46-50 min	2	1.6	1	0.8	1	0.8	2	1.6							6	3.66	80	48.78
	51-55 min	3	2.3	3	2.3			1	0.8	2	1.6					9	5.49		
	56-60 min	3	2.3			1	0.8					1	0.8			5	3.05		
	61-65 min	3	2.3	5	3.9	1	0.8	1	0.8							10	6.10		
	66-70 min	2	1.6	3	2.3	1	0.8	3	2.3	1	0.8					10	6.10		
	71-75 min	2	1.6	2	1.6	1	0.8	1	0.8							6	3.66		
	76-80 min			1	0.8	1	0.8			2	1.6					4	2.44		
	81-85 min	2	1.6	1	0.8	1	0.8	1	0.8	1	0.8	1	0.8	1	0.8	8	4.88		
	86-90 min	5	3.9	3	2.3	2	1.6					1	0.8			11	6.71		
	+90 min	1	0.8	3	2.3	2	1.6	1	0.8	2	1.6	2	1.6			11	6.71		
Extra Time	91-95 min															0	0.00	1	0.61
	96-100 min															0	0.00		
	101-105 min															0	0.00		
	+105 min															0	0.00		
	106-110 min															0	0.00		
	111-115 min			1	0.8											1	0.61		
	116-120 min															0	0.00		
	+120 min															0	0.00		
Total Goals		74	57.8	41	32.0	21	16.7	13	10.3	9	7.2	5	4	1	0.8	164	100	164	100
No Goals		54	42.2	87	68.0	107	83.6	115	89.8	119	93.0	123	96.1	127	99.2	-	-	-	-

F= frequency; %= percentage; 15 min-Int= 15-minute Intervals; PPET= periods of play and extra time.