

## Analysis of goal scoring patterns as a factor in understanding the evolution of international cerebral palsy football

### Análisis de los patrones de anotación de goles como un factor para comprender la evolución del fútbol internacional para personas con parálisis cerebral

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**Abstract.** Cerebral palsy (CP) football is undergoing a process of professionalisation which is improving the performance in this para-sport. This study aims to report the evolution of goal performance between the Seville 2019 and Salou 2022 IFCPF World Cups. Goals from eighty-eight matches over two consecutive IFCPF World Cups, in which the 16 best-ranked national teams took part, were analysed. The results revealed a decrease in the average of goals per match between championships (from 5.6 to 4.5 goals/match). Scored and received goals correlated to the teams' final ranking position in both Seville 2019 and Salou 2022. The distribution of goals by halves and 15-minute periods, the probability of winning the match when a team scores first, the classification of goalkeepers and scoring players, and the type of goals (type of attack, the action leading to the goal, and the distance of the goal) in Salou 2022 in comparison to the Seville 2019 World Cup, a notable enhancement in the parity among the teams involved is discernible, alongside a rise in the competitive nature of CP football spanning across the aforementioned tournaments. This study also provides some practical applications to CP football coaches and practitioners as the importance to concede fewer goals rather than scoring more, the importance of scoring first, the importance of physical performance in the last minutes of the match, the importance of FT2 players as scorers rather than FT3 players or the most effective kind of attacks.

**Keywords:** Para-sport, international, performance analysis, paralympic, soccer.

**Resumen.** El fútbol para personas con parálisis cerebral (PC) está experimentando un proceso de profesionalización que está mejorando el rendimiento en este deporte adaptado. Este estudio tiene como objetivo informar sobre la evolución del rendimiento goleador entre las Copas del Mundo de la IFCPF en Sevilla 2019 y Salou 2022. Se analizaron los goles de ochenta y ocho partidos durante dos Copas del Mundo consecutivas de la IFCPF, en las cuales participaron los 16 mejores equipos nacionales clasificados. Los resultados revelaron una disminución en el promedio de goles por partido entre campeonatos (de 5.6 a 4.5 goles por partido). Los goles marcados y recibidos se correlacionaron con la posición final en la clasificación de los equipos tanto en Sevilla 2019 como en Salou 2022. La distribución de goles por mitades y por períodos de 15 minutos, la probabilidad de ganar el partido cuando un equipo marca primero, la clasificación de porteros y jugadores anotadores, y el tipo de goles (tipo de ataque, la acción del gol y la distancia del gol) en Salou 2022 en comparación con Sevilla 2019 sugieren una tendencia hacia una mayor igualdad entre los equipos y un aumento del nivel competitivo en el fútbol para personas con PC en los últimos años. Este estudio también proporciona algunas aplicaciones prácticas para entrenadores y practicantes de fútbol para personas con PC, como la importancia de conceder menos goles en lugar de marcar más, la importancia de marcar primero, la importancia del rendimiento físico en los últimos minutos del partido, la importancia de los jugadores FT2 como anotadores en lugar de jugadores FT3, o el tipo más efectivo de ataques.

**Palabras Clave:** Deporte adaptado, internacional, análisis de rendimiento, paralímpico, fútbol.

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## Introduction

The interest in football for people with cerebral palsy (CP) and acquired brain injury (ABI), commonly known as CP football, is increasing in these last years. CP football is a 7-a-side football modality, played on a 70m x 50m field during two 30-min halves, and it is played by people with CP or ABI with a minimum impairment of hypertonia, athetosis or ataxia, which are three of the eight eligible impairments for the Paralympics (IFCPF, 2018). One of the main characteristics of this para-sport is that players must be classified according to their impairment profile (A: bilateral spasticity; B: unilateral spasticity; C: coordination impairments produced by ataxia or dyskinesia) and according to the impact of their impairment on the game (FT1: severe impact; FT2: moderate impact; FT3: mild impact). By means this classification process, which is performed following an evidence-based criterion (Yanci et al., 2021), the CP football player receives a final sport class with a combination of both, his/her impairment profile, and the impact

of the impairment on the game (e.g., A-FT1). The classification process is very important in CP football as it has an impact on the team strategies, as each team is required to have a minimum of one FT1 player on the field (or one player less if they do not have any FT1 player in the team) during the whole match. In addition to this, each team is allowed to have a maximum of one FT3 player on the field, although it is not mandatory, and teams are allowed to play without a FT3 player. This classification process gives CP football higher tactic possibilities as coaches must decide the field position of their FT1 and FT3 player, considering that the FT1 player has a higher limitation in the game and that the FT3 player is the player with less playing limitation. The wide range of profiles of FT2 players (A, B or C) is another factor that gives more tactic possibilities to CP football.

There has been an increase in the scientific research related to CP football performance that includes the anthropometric features of CP football players and how they differ from the regular (able-bodied) football players (Sarabia et al., 2020), their jump performance (Reina et al., 2019;

Yanci et al., 2014), sprint performance (Peña-González, Sarabia, et al., 2021) including the sprint force-velocity profile (Peña-González, Javaloyes, et al., 2022), change of direction and dribbling abilities (Daniel et al., 2020; Peña-González, Roldan, et al., 2021; Reina et al., 2016) and intermittent endurance (Kloyiam et al., 2011). Moreover, the physical demands in CP football competition have been reported by Yanci et al., (2018 and 2019) and it was observed that CP football players cover less distance at high intensity running and sprinting, perform a smaller number of moderate and high-intensity accelerations and decelerations, have lower Player Load and make fewer changes of direction in competition than regular football players (Yanci et al., 2019). More interestingly, they also reported differences between CP football players with different sport class in external match load variables, favouring those players with a lower impairment limitation (Reina et al., 2020; Yanci et al., 2018).

However, football performance is multifaceted and technical, tactical and behavioural parameters, in addition to the physical performance, influence a player's performance in a match (Bennett et al., 2018). The main aim of football is to score goals, which is the ultimate determinant of success in this sport (Kubayi, 2020). For this reason, the parameters and patterns of the goals in regular football have been widely analysed in many national and international leagues and championships. For example, the scoring rate in the last FIFA World Cup (Russia 2018 FIFA World Cup) was 2.64 goals per match (Kubayi, 2020), and most of the goals came from open play (60.9%; out of which 82.5% were from organized attacks and 17.5% from counterattacks), while a 39.1% came from set pieces (mainly from penalties [34.9%], corner kicks [31.8%] and free kicks [30.3%]) (Kubayi, 2020). In addition, the higher possibilities to score a goal are when players shoot from the penalty and goal areas, rather than from long distances (outside the penalty area) (Sarkar & Chakraborty, 2018). Another highly studied factor is the impact of the first goal on the result, since previous research has observed that scoring the first goal is highly related to eventually winning the match (García-Rubio et al., 2017; Ramos-Pérez et al., 2021). Previous studies in CP football have reported the goal patterns in both national (Goh et al., 2022; Peña-González, Maggiolo, et al., 2022) and international (Gamonales-Puerto et al., 2018; Gamonales et al., 2019; Yanci, 2015) championships, showing important differences in comparison to regular football. First, the scoring rate (goals per match) in CP football championships seems to be systematically higher than in regular football. Peña-González, Maggiolo et al., (2022) observed 6.8 goals per match in the Spanish National League and Goh et al., (2022) observed 6.0 goals per match in the Australian National League. Other findings in these studies revealed that goal patterns in CP football and regular football are different in the distribution of goals by time periods, the distance from which the goals are scored and the kind of attack (Goh et al., 2022; Peña-González, Maggiolo, et al., 2022).

Although the research on CP football performance has increased lately and recent research has shown the importance of goal patterns in both, national and international CP football championships, to the best of the authors' knowledge, there is no previous research that compares goal performance between championships, thus showing the possible evolution of CP football over time. The aim of this study was to analyse the goal patterns of CP football teams in two consecutive World Cups (Seville 2019 and Salou 2022 IFCPF World Cups) and report the main differences between these goal patterns.

## Methods

### Study design

This study analysed 88 matches of the IFCPF World Cup over two consecutive editions, Seville 2019 and Salou 2022. The 16 best-ranked national teams participated in each championship. However, only 15 teams took part in Salou 2022 because the Russian team did not take part. All the analyses were performed based on the official match reports (they are available in the official IFCPF website: (<https://www.ifcpf.com>) and on the official match videos of the matches provided by the organization. The analyses performed based on the official match reports were: 1) the number of goals and the scoring rate (goals per match); 2) the relationship between the final ranking and the number of goals scored and received by each national team; 3) the annotation period, divided into two halves (1<sup>st</sup> and 2<sup>nd</sup> half of the match) and also divided into four 15-minute periods (min 1-15; min 16-30, including the added time of the first half; min 31-45, and min 46-60, including the added time of the second half); 4) the probability of winning, drawing or losing the match when a team scored the first goal of the match; and 5) the sport class of the players who scored and received the goals (FT1, FT2 or FT3). The official match reports included 100% of the matches and goals of both, the Seville 2019 and Salou 2022 championships. The examinations carried out utilizing official match recordings delved into various aspects of offensive strategies. The elements scrutinized encompassed: 6) the nature of offensive manoeuvres leading to a goal, which was classified as either an organized attack (OA), counterattack (CA), or set piece (SP); 7) the distance from which goals were scored, distinguished by shots taken within the goal area (GA - the nearest zone), the penalty area (PA - a larger zone), or from long range (LD - outside the penalty area); and 8) the manoeuvres performed by one or more players preceding the goal, which were categorized as individual actions by the scorer (IA), crosses from teammates (C), passes from teammates (P), rebounds involving teammates or opponents (R), and errors made by opponents (E). These variables are categorized and analysed to improve comprehension of the effectiveness and characteristics of offensive tactics in attaining goals.

To ensure high reliability in video analysis data observation, three matches were randomly selected. The primary

researcher analyzed these matches twice, categorizing the goals by type of attack, distance from which they were scored, and the action used to score them. Additionally, a second researcher independently analyzed the same three matches, employing the same categorization criteria as the primary researcher. Ten goals were analyzed across the three matches. Intra-observer reliability was assessed by comparing the first and second analyses conducted by the primary researcher, while inter-observer reliability was evaluated by comparing the analyses of the primary researcher with those of the second researcher. The percentage of agreement for both intra- and inter-observer reliability was 100% across all analyzed goal categories. Furthermore, a Cohen's Kappa analysis was conducted to confirm the agreement, yielding a Kappa coefficient of 1.00, indicating perfect agreement.

### Statistical analysis

Data was reported by absolute (n) and relative (%) frequency. A Spearman's rank correlation analysis was performed to show the relationship between the national teams' ranking in the championships and the goals which they scored and received, and it was interpreted as: <0.10, trivial; 0.10-0.29, small; 0.30-0.49, moderate; 0.50-0.69, high; 0.70-0.89, very high; and 0.90-1.0, almost perfect (Hopkins et al., 2009). A Krustal-Wallis test with the chi-squared ( $\chi^2$ ) statistic was carried out to analyse the goal distribution for the following variables, using the following information as "expected" distribution:

- Goal distribution by halves: 50% of the expected goal distribution for each half.
- Goal distribution by 15-min periods: 25% of the expected goal distribution for each period.
- Goal distributions by halves and by 15-min periods in Salou 2022 compared to Seville 2019: Data from Seville 2019 as the expected distribution.
- Percentage of won, drawn, and lost matches when a team scores the first goal: 33.3% for each case.
- Percentage of won, drawn, and lost matches when a team scored the first goal in Salou 2022 compared to Seville 2019: Data from Seville 2019 as expected distribution.
- Goal (scored) distribution by the scorer player's classification: Number of players of each class that are usually in the field at the same time (1 FT1 [14.3%], 5 FT2 [71.4%] and 1 FT3 [14.3%]).
- Goal (received) distribution by goalkeeper's classification: Number of goalkeepers of each class in the championship (FT1: 44.4%; FT2: 51.9%; FT3: 3.7%).
- Goal (scored and received) distribution by player's classification in Salou 2022 compared to Seville 2019: Data from Seville 2019 as the expected distribution.
- Goal distribution by kind of attack: 33.3% for each kind of attack.
- Goal distribution by the distance of the goal: 33.3% for each distance zone.
- Goal distribution by the action performed before

the goal: 20% for each kind of action.

- Goal distribution by kind of attack, the distance of the goal and the previous action in Salou 2022 compared to Seville 2019: Data from Seville 2019 as the expected distribution.

All the analyses were performed using Microsoft Excel® (Microsoft, Seattle, WA, USA) and SPSS statistics (version 25.0 for Windows; SPSS Inc, Chicago, IL, USA). The statistical significance was set at  $p < 0.05$ .

### Results

The average of goals per match was a 19.6% lower in the Salou 2022 (4.5 goals/match) than in the Seville 2019 (5.6 goals/match) IFCPF World Cup. The relationship between the SG and the RG with the team's ranking position (table 1) was similar between championships (Seville 2019:  $r = -0.73$ ;  $p < 0.01$  for SG and ranking and  $r = 0.88$ ;  $p < 0.01$  for RG and ranking; Salou 2022:  $r = -0.71$ ;  $p < 0.01$  for SG and ranking, and  $r = 0.87$ ;  $p < 0.01$  for RG and ranking). The relationship between SG and RG was moderate to high ( $r = -0.72$  in 2019 and  $r = -0.54$  in 2022, with  $p < 0.05$ ).

Table 1.

Scored and received goals per team and ranking classification in the IFCPF World Cup 2019 and the IFCPF World Championship 2022

Ranking 2019	Teams	SG	RG	Ranking 2022	Teams	SG	RG
1 <sup>o</sup>	Russia	27	1	1 <sup>o</sup>	Ukraine	28	4
2 <sup>o</sup>	Ukraine	28	3	2 <sup>o</sup>	Iran	11	5
3 <sup>o</sup>	Brazil	19	6	3 <sup>o</sup>	Brazil	18	5
4 <sup>o</sup>	England	16	12	4 <sup>o</sup>	United States	11	10
5 <sup>o</sup>	Iran	29	11	5 <sup>o</sup>	The Netherlands	6	9
6 <sup>o</sup>	United States	28	9	6 <sup>o</sup>	England	21	6
7 <sup>o</sup>	Argentina	14	14	7 <sup>o</sup>	Ireland	17	13
8 <sup>o</sup>	The Netherlands	6	20	8 <sup>o</sup>	Argentina	17	15
9 <sup>o</sup>	Ireland	25	9	9 <sup>o</sup>	Canada	9	14
10 <sup>o</sup>	Germany	27	23	10 <sup>o</sup>	Spain	8	13
11 <sup>o</sup>	Australia	13	15	11 <sup>o</sup>	Australia	6	11
12 <sup>o</sup>	Canada	10	14	12 <sup>o</sup>	Germany	6	14
13 <sup>o</sup>	Japan	7	20	13 <sup>o</sup>	Venezuela	9	15
14 <sup>o</sup>	Thailand	10	21	14 <sup>o</sup>	Thailand	7	14
15 <sup>o</sup>	Spain	10	24	15 <sup>o</sup>	Northern Ireland	5	31
16 <sup>o</sup>	Finland	1	68				

SG: Scored goals, RG: Received goals.

The distribution of goals by halves and by 15-min periods did not show significant biased distribution nor in the Seville 2019 nor in the Salou 2022 World Cup (Seville 2019: 1<sup>st</sup> half: 133 goals [49.3%], 2<sup>nd</sup> half: 137 goals [50.7%],  $\chi^2 = 0.1$ ,  $p = 0.88$ ; min 1-15: 71 goals [26.3%], min 16-30: 62 goals [23.0%], min 31-45: 63 goals [23.3%], min 46-60: 73 goals [27.4%],  $\chi^2 = 0.5$ ,  $p = 0.92$ ; Salou 2022: 1<sup>st</sup> half: 81 goals [45.3%], 2<sup>nd</sup> half: 92 goals [51.4%],  $\chi^2 = 0.5$ ,  $p = 0.79$ ; min 1-15: 42 goals [23.5%], min 16-30: 39 goals [21.8%], min 31-45: 41 goals [22.9%], min 46-60: 51 goals [28.5%],  $\chi^2 = 1.2$ ,  $p = 0.76$ ). The comparison between the goals scored by halves and by 15-min periods in Seville 2019 and Salou 2022 is shown in the figure 1. The goal distribution by halves and by 15-min periods in Salou 2022 was not statistically biased when compared to Seville 2019. The goals scored in extra periods increased

from 1 goal (0.4%) in Seville 2019 to 6 goals (3.4%) in Salou 2022.

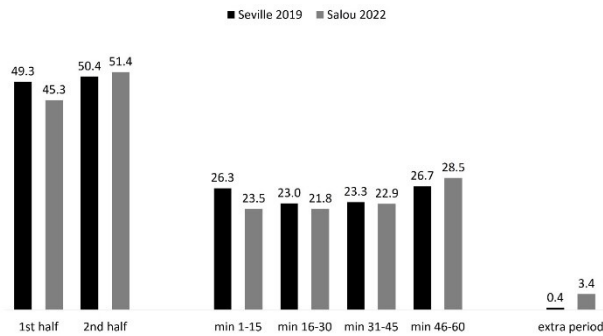


Figure 1. Distribution of scored goals in the Seville 2019 and Salou 2022 IFCPF World Cups by halves and by 15-min periods of time, including the goals scored in the extra times. Goal distribution by halves in Salou 2022 compared to Seville 2019:  $\chi^2 = 0.3$ ,  $p = 0.84$ ; Goal distribution by 15-min periods in Salou 2022 compared to Seville 2019:  $\chi^2 = 0.5$ ,  $p = 0.92$ .

In Seville 2019, 91.7% of the times the team which scored the first goal won the match, while in 6.5% of the matches, the team which scored the first goal lost the match. There was a 1.7% of the matches in which the team that scored the first goal finally drew ( $\chi^2 = 81.5$ ;  $p < 0.01$ ). In Salou 2022, 64.1% of the times the team which scored the first goal won the match, 20.5% of the times, the team which scored the first goal drew the match and 15.4% of the times, the team which scored first finally lost the match ( $\chi^2 = 43.0$ ;  $p < 0.01$ ). The comparison of the times that a team won, drew and lost the match when they scored the first goal between Seville 2019 and Salou 2022 is presented in figure 2, showing a skewed distribution of the times that a team wins, draws or loses when they score the first goal in Salou 2022 compared to Seville 2019.

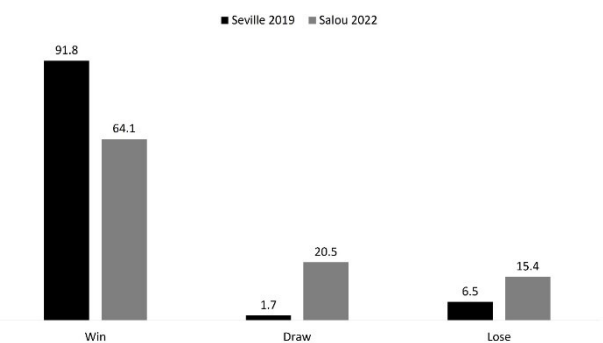


Figure 2. Comparison of the percentage of wins, draws and losses when a team scored the first goal of the match in the Seville 2019 and Salou 2022 IFCPF World Cups.  $\chi^2 = 228.5$ ,  $p < 0.001$ .

FT2 players scored a higher number of goals in Seville 2019 than FT1 and FT3 players (FT1: 18 goals [6.7%], FT2: 183 goals [67.8%] and FT3: 66 goals [24.4%]; the other 1.1% of goals were own goals). Nevertheless, the chi-square analysis showed a significant biased distribution of goals favouring FT3 players as they scored more goals compared to the number of FT3 players allowed on the field during a match ( $\chi^2 = 22.1$ ;  $p < 0.01$ ). In Salou 2022, FT2

players continued scoring a higher number of goals (FT1: 14 goals [7.8 %], FT2: 123 goals [68.7%] and FT3: 36 goals [20.1%]; the other 3.4% of goals were own goals). However, non-significant skewed distribution was observed between the scoring rates by class ( $\chi^2 = 5.4$ ;  $p = 0.07$ ). Regarding the class of the goalkeeper who received the goals, in Seville 2019, both FT1 and FT2 goalkeepers received 133 goals (49.3% each), while FT3 goalkeepers received 4 goals (1.5%) ( $\chi^2 = 4.7$ ;  $p = 0.09$ ). In Salou, FT1 goalkeepers received 87 goals (48.6%), FT2 received 88 goals (49.2%) and FT3 received 4 goals (2.2%) ( $\chi^2 = 1.1$ ;  $p = 0.59$ ). The comparison between the scored and received goals by the player's classification is shown in the figure 3 and there were no significant skewed distributions of scored and received goals according to the player's classification in

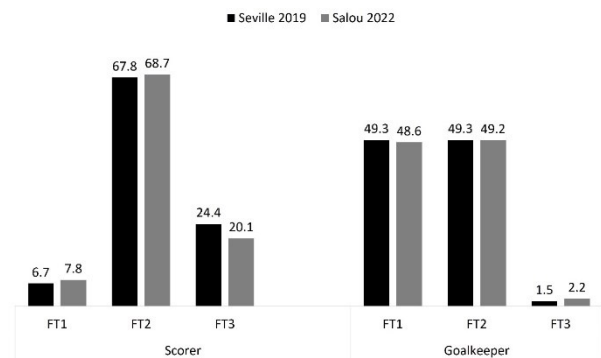


Figure 3. Distribution of scored and received goals according to the player's classification in the Seville 2019 and Salou 2022 IFCPF World Cups. Scored goal distribution by class in Salou 2022 compared to Seville 2019:  $\chi^2 = 0.9$ ,  $p = 0.62$ ; Received goal distribution by class in Salou 2022 compared to Seville 2019:  $\chi^2 = 0.3$ ,  $p = 0.85$ .

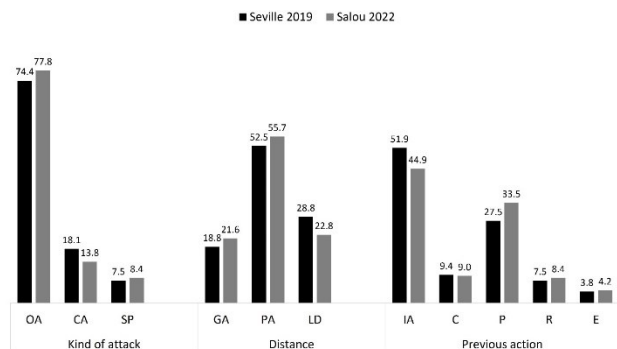


Figure 4. Distribution of goals in Seville 2019 and Salou 2022 considering the kind of attack (OA: organized attack; CA: counterattack; SP: set pieces) the distance of goal (GA: goal area; PA: penalty area; LD: long distance – out of penalty area) and the previous action performed before the goal (IA: individual action of the scorer; C: cross from a teammate; P: pass from a teammate; R: rebound from a teammate or opponent; E: error of an opponent). Goal distribution by kind of attacks in Salou 2022 compared to Seville 2019:  $\chi^2 = 1.2$ ,  $p = 0.53$ ; Goal distribution by the distance of the goal in Salou 2022 compared to Seville 2019:  $\chi^2 = 0.6$ ,  $p = 0.39$ ; Goal distribution by the previous action in Salou 2022 compared to Seville 2019:  $\chi^2 = 1.0$ ,  $p = 0.66$ .

The distribution of goals according to the kind of attack, the distance of the goal and the previous action was biased both, in Seville 2019 (kind of attack:  $\chi^2 = 1.1$ ;  $p = 0.59$ ; distance:  $\chi^2 = 1.1$ ;  $p = 0.59$ ; previous action:  $\chi^2 = 1.1$ ;  $p = 0.59$ ) and Salou 2022 (kind of attack:  $\chi^2 = 1.1$ ;  $p = 0.59$ ;

distance:  $\chi^2 = 1.1$ ;  $p = 0.59$ ; previous action:  $\chi^2 = 1.1$ ;  $p = 0.59$ ) in favour of goals from OA (representing 74.4% in Seville 2019 and 77.8% in Salou 2022), scored from the PA (representing 52.5% in Seville 2019 and 55.5% in Salou 2022) and scored after an IA (representing 51.9% in Seville 2019 and 44.9% in Salou 2022). The table 4 shows the goal distribution in Seville 2019 and Salou 2022 considering the attack type, the distance of the goal and the previous action performed before the goal. In addition to this information, the goals scored by set pieces were from penalties and free kicks both in Seville 2019 (58.4% and 41.6%, respectively) and Salou 2022 (87.7% and 13.3% respectively) without there being any goals scored from any other kind of set pieces.

## Discussion and conclusions

The aim of this study was to analyse the goal patterns of CP football teams in two consecutive World Cups (Seville 2019 and Salou 2022 IFCPF World Cups) and report the main differences between these goal patterns. The results of the present study suggest a higher equality between teams in the last World Cup and goal patterns more similar to the observed in regular football. A decrease in the scoring rate, in the probability to win when a team scores first or in the scoring importance of FT3 players, together with an increase of goals in the last period of the match or in the probability of a comeback in the game are some of the results of this study that suggest an enhancement of the competitive level in international CP football championships in the last years.

One of the main reported characteristics in CP football has been the high scoring rate per match. While averages of 2.6 goals per match in international championships (Russia 2018 FIFA World Cup) (Kubayi, 2020) and 2.5 goals per match in national championships (Spanish 2022 football league) have been reported in regular football, previous research in CP football observed scoring rates of 6.0, 6.8 and 7.5 goals per match, in Australian and Spanish National CP football leagues, respectively (Goh et al., 2022; Peña-González, Maggiolo, et al., 2022; Yanci, 2015). The present study showed that the scoring rate in the Seville 2019 IFCPF World Cup (5.6 goals per match) was similar to those reported in previous studies. However, the goal average per match decreased a 19.6% in the Salou 2022 IFCPF World Cup (with 4.5 goals per match) which is closer to the scoring averages of regular football. The decrease in goals scored could be related to several factors. One of them could be an increase in the level of competition among the teams participating in the Salou 2022 championship compared to the 2019 World Cup in Seville. This higher level of competition could have led to greater defensive efficiency by the participating teams, resulting in a decrease in the number of goals scored per match. Additionally, due to the growth of research in the field, coaches may have made changes in playing strategies and tactics. These combined factors could have contributed to the decrease in the

number of goals scored in the Salou 2022 championship, bringing it closer to the scoring averages of regular football.

In the two analysed championships the number of goals scored and received by teams correlated to their final position in the ranking. This is in line with previous literature in regular football that showed very high correlations between the SG and RG with the final ranking in two consecutive seasons of a national league (Castellano, 2018). In the same line, it has been observed that in regular football the “best ranked” teams scored more goals than the “worse ranked” teams in different competitive levels (different divisions) during a season (Raya-González et al., 2020). Specifically in CP football, it was observed that in an international championship the best ranked teams performed a higher number of throws to goal (Gamonales et al., 2019). In addition, the same relationship as in the present study between the SG, RG and the final ranking has been observed in the Spanish national league, showing high to very high correlations ( $r = 0.71$  and  $r = 0.81$ ) (Peña-González, Maggiolo, et al., 2022). Interestingly, in Seville 2019, the correlation between the SG and the final ranking, as well as the RG and the final ranking were similar. However, although the correlation between these variables in Salou 2022 was still significant, the correlation between the SG and the final ranking was high, while the correlation between the RG and the final ranking was very high, indicating that a good defensive system could be more important than the attack to succeed. This finding may help CP football coaches to plan their match strategies in international championships.

The goal distribution by halves and by 15-min periods (excluding the extra time of these distributions) were not significantly biased. However, there was a tendency to score more goals in the second half and in the last period (min 41-60), especially in Salou 2022. Furthermore, an increase in the number of goals during extra time was observed in Salou 2022, primarily due to the greater number of extra time periods played. This phenomenon suggests that matches could be decided in the final part of the game, indicating a greater parity between teams. Moreover, the intensity of the match and the fatigue levels of the teams could create spaces and goal-scoring opportunities for the opposing team. This trend is reinforced by previous results in the literature regarding the goal distribution by time periods in CP football. Peña-González, Maggiolo et al., (2022) observed a higher percentage of goals in the first half (53.5%) and in the first 15-min period of each half (min 1-15: 31.0%; min 16-30: 22.5%; min 31-45: 26.8%; min 46-60: 19.7%). Similar trends were observed by Goh et al., (2022) with a higher percentage of goals in the first half (53.9%) and in the first period of each half (min 1-15: 31.1%; min 16-30: 22.8%; min 31-45: 26.9%; min 46-60: 17.4%). This tendency to score later on in the game is progressing from the first reported results in CP football, in which Yanci (2015) observed a significant higher percentage of goals in the first half of the match (58.9%) and higher percentages of goals in the two first 15-min periods (min 1-

15: 30.6%; min 16-30: 28.3%; min 31-45: 19.1%; min 46-60: 22.0%).

In CP football, there is a saying: “Score first and you will win the match”. Coaches and professionals in CP football are convinced that it is almost impossible to turn the score around in this para-sport. In regular football it has been observed that scoring first is very important and it increases the probability to go on to win the match (Altarriba-Bartés et al., 2020; Pratas et al., 2017; Ugalde-Ramírez & Rodríguez-Porras, 2021). However, there is only one reference in CP football that supports the high probability of winning once a team scores first, which shows that in 72.2% of such cases, the team won the match (Peña-González, Maggiolo, et al., 2022). The results related to the importance of the first goal in Salou 2022 could provide evidence supporting the authors' hypothesis regarding the increased competitive level of CP football teams in the last World Cup. This could suggest differences in the effectiveness of some teams and their competitive level. Although these results do not allow for definitive conclusions, they may indicate that, despite the continued importance of scoring the first goal (64.1%), teams that conceded the first goal still had the opportunity to draw (20.5%) or even win (15.4%) the match. This may indicate greater parity among teams and increased competitiveness in the sport.

Probably, the main feature with a high impact on the game in CP football is the players' classification. The sport class of players influences the coaches' decisions and strategies, as only one FT3 player can play at the same time, and they are forced to have at least one FT1 player on the field. The coach must decide the field position of these players knowing the high impact of the impairment of FT1 players in the game and the low physical limitations of FT3 players. This study showed that FT2 players scored more goals in Seville 2019 and Salou 2022, but this is normal considering that teams usually play with five FT2 on the field at the same time. The distribution of goals considering the sport class of the players who scored the goals was biased in favour of FT3 players in Seville 2019 ( $\chi^2 = 22.1$ ;  $p < 0.01$ ) as they scored a higher percentage of goals in comparison to the number of players who can be in the field. This is in line with Gamonales et al., (2018) who observed more goal actions from those players with less impairment impact, and with the previous study by Peña-González, Maggiolo, et al., (2022) in which similar results were obtained from the Spanish CP football league ( $\chi^2 = 9.7$ ;  $p = 0.05$ ). However, this distribution of goals by the player's classification was not biased in the Salou 2022 World Cup ( $\chi^2 = 5.4$ ;  $p = 0.07$ ), indicating that the importance of FT3 players in the goal performance of teams has decreased. These results should be approached with caution by the reader, as the playing positions of the goal-scoring players were not taken into account in the study, and this variable could be influencing the outcomes. Future research should consider the playing position of the goal scorer, in addition to the sport class. Regarding the sport class of the goalkeepers who received the goals, the goal distributions were not biased.

Most coaches used FT1 and FT2 players as goalkeepers, and they received the great majority of goals in both championships. These are novel findings that could be especially important for coaches to decide their match strategies and to decide the field position of their players according to their impairment limitations.

Regarding tactics, coaches need to know what the most effective type of attack is to be successful. By knowing this, coaches could decide their game strategy in attack and defence. The results of this study showed similar goal patterns regarding the kind of attack, the distance of the goal and the action performed before the goal in Seville 2019 and Salou 2022. Organized attacks were the most successful kind of attacks (74.4% and 77.8% of the goals in Seville 2019 and Salou 2022, respectively), while there were fewer goals from counterattacks (18.1% and 13.8%) and set plays (7.5% and 8.4%). These results show that goals from set plays are reduced in CP football in comparison to regular football, in which it has been widely reported that set plays make up approximately 30% to 35% of goals, irrespective of the competition analysed (Pratas et al., 2018). Specifically in the last FIFA World Cup in regular football it was observed that 39.1% of goals came from set plays (Kubayi, 2020). It is common to highlight the importance of these set plays in regular football due to the high incidence of goals, especially when the match is very tight; however, in CP football, it seems that it does not mean a clear factor for success. In addition to this, 100% of goals in set plays were scored from penalties (58.4% in Seville 2019 and 86.7% in Salou 2022) and free kicks (41.6% in Seville 2019 and 13.3% in Salou 2022), without any goals coming from other set pieces, as corner kicks. In the last regular football World Cup, 34.9% of goals from set pieces were from penalties, 31.8% from corner kicks and 33.3% from free kicks (Kubayi, 2020). These differences mainly in goals scored from corner kicks may be due to the impact of the disability on players' coordination, which makes it more difficult for them not only to jump but also to coordinate their ball throwing perception, their jump and their technical movement to kick the ball. It seems very important for coaches to plan their attack and defence strategies in the match to score goals and to avoid receiving them, while planning the set plays could be secondary. Given the low percentage of goals from set plays in CP football, the percentage of goals from open play (organized attacks and counterattacks) is higher in CP football than in regular football: approximately 60%-65% of goals in regular football (Kubayi, 2020; Pratas et al., 2018; Wright et al., 2017) versus over 90% in CP football (Goh et al., 2022; Yanci, 2015). However, the analysis of goals from open play revealed that there are more goals scored from organized attacks than from counterattacks both in regular (82.5% vs 17.5%) and in CP football (80.4% vs 19.6%) (Goh et al., 2022; Kubayi, 2020).

Other important factors of scoring are the distance from which the goal was scored and the action of play taken to score the goal. The highest number of goals (52.5% in Se-

ville 2019 and 55.7% in Salou 2022) were scored from inside the penalty area, while 28.8% (Seville 2019) and 22.8% (Salou 2022), and 18.8% (Seville 2019) and 21.6% (Salou 2022) of the goals were scored from out of the penalty area and from the goal area, respectively. Although Goh et al., (2022) studied the distance of the goals in CP football, their results are not comparable to the present study due to the different zones they used in the method. However, they reported 67.1% of goals were in their Zone 1, which includes the goal and penalty areas. This is similar to, but slightly lower than, the results of the present study, in which the sum of the goals from the goal and penalty areas was 71.3% in Seville 2019 and 77.3% in Salou 2022. In regular football, Ugalde-Ramírez and Rodríguez-Porras (2021) reported a 60.2% of goals from the penalty area, a 30.2% from the goal area and a 9.6% of goals from out of the penalty area in the 2019 CONCACAF Gold Cup (Ugalde-Ramírez & Rodríguez-Porras, 2021). Similarly, Michailidis et al. (2013) reported similar percentages of goals from the penalty area, goal area and outside the penalty area (71.1%, 21.1% and 7.9% respectively). The differences in the percentages in CP football from regular football in terms of goal distance are mainly for goals scored from outside the penalty area and they could be explained by the impact of the disability on the goalkeepers and the strategy of teams and coaches, who encourage their players to shoot from long distances taking advantage of the impairment of the goalkeepers. Regarding the playing actions before scoring goals, the individual action is the most successful action (51.9% and 44.9%), followed by a pass from a teammate (27.5% and 33.5%), crossings (9.4% and 9.0%), rebounds (7.5% and 8.4%) and from an error of the opponent (3.8% and 4.2%). Similarly, in regular football Michailidis et al. (2013) reported a 35.5% of goals after a pass from a teammate and 14.5% after an individual action (among others) in the 2012 Euro (Michailidis et al., 2013). The main difference in the action before the goal is the high incidence of individual actions in CP football, and the main explanation is the player impairment limitations. When the FT3 player (the player with less impairment impact) has the ball, it is very common to see that he tries to end the action. However, and following the hypothesis of an improvement of the competitive level in CP football that increases the equality between teams, in Salou 2022, the percentage of goals from individual actions decreased, and the percentage of goals after a pass from a teammate increased, suggesting that team collaboration is more necessary now than in previous championships to be successful. Contrary to what most people in CP football believe, there are not more goals originating from mistakes by opponents than in regular football (Michailidis et al., 2013).

The main limitation of the present study is that video analysis was performed on 65% of the video matches in Seville 2019 and on 97.5% of them in Salou 2022, which were the total number of video matches available. In the first case, video analysis-related variables were analysed in the 59.3% of the total championship goals, while in Salou 2022,

93.3% of the total goals of the championship were analysed. Moreover, this research also encounters a limitation due to the significant differences in team performances during the 2019 Sevilla World Cup. The top two teams managed to net in excess of 25 goals each and allowed less than three, contrasting sharply with the bottom-ranked team, which let in 68 goals and managed to score only once. In addition, this study presented the results by frequencies and percentages of goals which have not been normalized by the number of attempts or opportunities of goal. This limitation was pointed out by Goh et al., (2022) and could provide relevant information not only about the scoring performance of teams and players, but also of their scoring efficiency. Future research should consider goal scoring performance according to total attempts for a better understanding of the effectiveness of teams according to their type of attack or the classification of their player, among others, which may influence the team's playing strategies.

### Practical implications

This study provides some practical applications to CP football practitioners and coaches. Although it is a type of football with a higher number of goals per match compared to regular football, it seems that nowadays it is more important to concede fewer goals than to score more goals in order to have good position in the ranking at the end of the championship, considering that both strategies correlate to the final ranking. Moreover, it seems that goals seem to be scored later and later in the last championships, so a good physical performance to reach the end of the game with less fatigue could be important. The first goal seems to be less important now than in previous world championships and a comeback is more feasible if the team receives a goal. Nowadays, it seems that the FT3 player is not determinant to scoring goals so a good strategy could be to give more importance to the FT2 players in the goal strategy as there are more of this type of players on the field at the same time. The equitable distribution of goals among the different sport classes of goalkeepers suggests the feasibility of using players designated as FT1 for the goalkeeper position, as they do not exhibit a higher frequency of goals conceded compared to FT2 players. It is noteworthy that, due to their physical limitations, FT2 players, who often exhibit a hemiparetic profile, face significant obstacles when placed as goalkeepers. Selecting an FT2 player for the goalkeeper role requires the involvement of an FT1 player, who faces more pronounced physical limitations, as a field player. This involves performing more complex motor activities and physically demanding tasks, which may not be optimal considering their physical condition. Consequently, designating an FT1 player as goalkeeper not only leverages their strengths in a more regulated environment, but also allows FT2 players, who usually have superior mobility, to occupy positions on the field where their effectiveness can be optimized. This approach promotes a more effective utilization of the team's potential by aligning the specific skills of the

players with the requirements of their respective positions. Finally, the most interesting attack to be successful in CP football should be an organized attack, finishing in the penalty area and scoring through an individual action or after a pass from a teammate.

### Declaration of interest

The authors acknowledge that we did not have any financial or personal relationships with other people or organizations that could inappropriately influence the work described in the current manuscript.

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