ANALYSIS OF GOALS SCORED BY PLAYERS WITH CEREBRAL PALSY IN OFFICIAL FOOTBALL 7-A-SIDE MATCHES

Javier Yanci

Faculty of Physical Activity and Sports Science, University of the Basque Country, UPV/EHU, Vitoria-Gasteiz, Spain

Abstract:

The purpose of this study was to analyze goals scored in football 7-a-side matches by players with cerebral palsy (CP) in terms of when they occur in the game, what their characteristics are, what part of the body is used and from what part of the field shots have been taken. This study analysed 23 football matches corresponding to two Football 7-a-side Spanish Championships for players with CP held over two consecutive seasons. A total of 10 teams and 68 players participated in the study. The observation data sheet was made up according to three criteria (when goals were scored in terms of playing time, body part used to score, type of a goal and from where a shot has been taken) and 15 categories. Contrary to what occurs in conventional football, the results of this study show that in the football 7-a-side matches for players with CP a higher number of goals were scored in the first half (58.9%), especially in the first fifteen minutes (30.6%). The majority of goals were scored from inside the penalty area (61.3%). An average of 7.5 goals was scored per match. Most of the goals were scored when the ball was in play (94.9%) and only 5.1% were scored from kicking a stationary ball. It may be of interest to specifically train defensive aspects which can be applied during the first few minutes of the game in order to reduce the number of goals conceded at the beginning of matches.

Key words: goal frequency, match-analysis, Paralympics, tactics, disability

Introduction

Football for players with cerebral palsy (CP) is regulated by the same rules of play as those dictated by the Fédération Internationale de Football Association (FIFA) and other norms specified by the Cerebral Palsy International Sport and Recreation Association (CPISRA, 2014). At the official level, footballers with CP play football 7-a-side. At present, international, national and regional championships are held in this discipline organized by the CPISRA or by the corresponding national federations. Football 7-a-side is also a Paralympic sport and matches are played at the Paralympic Games, and also at the world, continental and national championships. Football 7-a-side matches for players with CP last 60 minutes (two halves of 30 minutes each), with a 10 minute break at the half-time. As its name implies, this discipline is played by 7 footballers a side on a 70-75x50-55 meters pitch with two 5x2 meters goals (CPISRA, 2014). The players in these events are footballers with CP who are able to walk and run and are classified in the CP5-CP8 classes, according to the CPISRA (2013) classification norms.

In spite of the international relevance of football for players with CP, few scientific studies have concentrated on this Paralympic sports discipline. Kloyiam, Breen, Jakeman, Conway, and Hutzler (2011) studied running efficiency and cardiovascular capacity in the Irish football 7-a-side national team. Furthermore, Cámara, Grande, Mejuto, Los Arcos, and Yanci (2013) and Yanci et al. (2014) studied different types of vertical jumps (SJ: squat jump and CMJ: countermovement jump) in the Spanish football 7-a-side national team from the biomechanical viewpoint. However, we have found no study which analyzes specific aspects of play and competition, nor a comprehensive analysis of the main technical and tactical actions in this sports discipline.

The competitive characteristics of football have received a great deal of attention from different points of view (Andersen, Larsen, Tenga, Engebretsen, & Bahr, 2003; Ruiz-Ruiz, Fradua, Fernández-García, & Zubillaga, 2013; Sarmento, et al., 2013; Tenga, Holme, Ronglan, & Bahr, 2010; Yiannakos & Armatas, 2006). Among other aspects, many studies have analyzed goals and the

fundamental characteristics of scoring in different types of matches (Cumming, Hall, Harwood, & Gammage, 2002; Michailidis, Michailidis, Papaiakovou, & Papaiakovou, 2004; Tenga, et al., 2010; Yiannakos & Armatas, 2006) as this technical tactical aspect is the ultimate aim of the game (Yiannakos & Armatas, 2006) and is especially relevant for a team's performance (Michailidis, et al., 2004). Therefore, an objective evaluation of the specific characteristics necessary for scoring a goal in football is of utmost importance (Abt, Dickson, & Mummery, 2002). Although this aspect has been widely studied in football (Armatas, Yiannaakos, & Sileloglou, 2007; Carey, et al., 2001), we have found no similar study on football 7-a-side for players with CP. Thus to know when, where and how many goals are scored in this sports discipline would be of great interest to coaches and would help them to make technical-tactical decisions based on objective data.

The purpose of this study was therefore to analyze when goals are scored (during what period, i.e. after how many minutes of play), with what body part (left leg, right leg or head), from what part of the pitch (area of the field) and what their characteristics are (with the ball in play or stationary) in football 7-a-side matches for players with CP.

Methods

Participants

This study analyzed 23 football 7-a-side matches corresponding to the Spanish Football Championships for players with CP over two consecutive years. In total 10 teams and 68 players participated, all classified in the CP5-CP8 classes by the Classification Committee of the Spanish Federation for Sports for People with Cerebral Palsy (FEDPC). All the matches from qualifying heats, semi-finals and finals were analyzed and no players were sent off so that there was the same number of players from each team on the playing field. All the subjects volunteered to participate, were informed of the research objectives and methods and signed the required informed written consent. All the procedures followed the guidelines of the Declaration of Helsinki (2013) and express consent was obtained from the technical directors of the FEDPC.

Procedure

The matches were monitored *in situ* by two technical specialists from the FEDPC, namely, by the national team manager and the physical trainer of the Spanish football 7-a-side national team. In every match the following was noted: the name of the team which scored a goal, after how many minutes of play, and the number of the match observed. The observation data sheet was made up according to three criteria (game period, i.e. the time point at

which a goal was scored, a part of the body by which a goal was scored, the place from where the shot had been taken and the type of goal) and 15 categories based on the internal logic of the game, technique of the players and their relation with the play area (Table 1). All the categories were comprehensive and mutually exclusive. Figure 1 shows the distribution of the play areas from where the goals could be scored.

Table 1. Coding of the notational system (specific criteria and categories)

Period of the match (P)

P1: Min 1-15
P2: Min 16-30
P3: Min 31-45
P4: Min 46-60

Scoring part

RL: Right leg
LL: Left leg
H: Head
O: Other

Shooting area or type of goal

WA: Within the penalty area (Zone 1)
EA: Edge of the penalty area (Zone 2)
CF: Centre field (Zone 3)
OA: Opponent's area (Zone 4)
P: Penalty, stationary ball
C: Corner kick, stationary ball
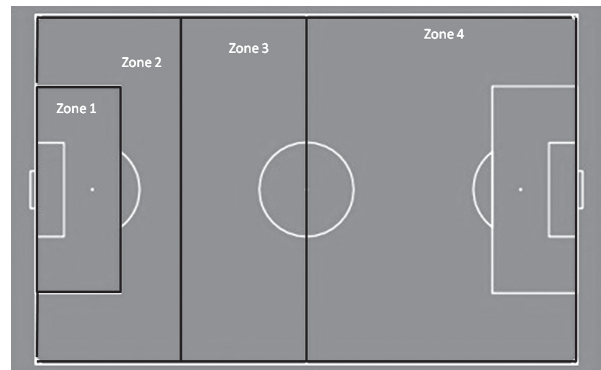F: Direct free kick, stationary ball

Min = minute

Figure 1. Distribution of the areas of the pitch from where goals can be scored.

In order to analyze the reliability of the observations, a protocol was devised where all the criteria and categories were clearly described in the greatest possible detail so that there was no room for ambiguity, thus utmostly facilitating the subsequent work of the observers when they monitored the matches and recorded all the game actions (Pradas, Floría, González-Jurado, Carrasco, & Bataller, 2012). The two observers were responsible for coding all the

matches and these data were used to calculate the inter-annotator agreement. Before the observations, the annotators were given a 5-hour training course on the use of the observation data sheet.

Statistical analysis

The data recorded with the software were exported to Excel 2007 Microsoft® xls spread sheet files. They were then exported and saved in the Statistical Package for Social Sciences (SPSS® Inc, version 20.0 Chicago, IL, EE.UU.) in *.sav* files, and processed as in similar studies (Alonso & Argudo, 2009). Cohen's Kappa coefficient was calculated to determine the inter-annotator agreement, with the hope of obtaining coefficients of above 0.70. The results are presented in absolute values (frequencies) and percentages (%). Non-parametric chi-square (Chi^2) analysis was used to determine the statistically significant differences and the level of significance was set at p<.05.

Results

The values obtained for the reliability of the different observations for the criteria *number of goals, scoring body part, shooting area* and *game period* were very good, not to say optimal (Cohen's Kappa coefficient 0.96, 0.92 and 0.82, respectively).

The results obtained in this study reveal that the average number of goals in football 7-a-side players with CP was 7.5 per match (173 goals in the 23 matches analyzed). In the first half the average number of goals was 4.4, a somewhat higher average (p<.01) than the one of the second half where the

average of goals scored was 3.1 per match. Most goals were scored within the first fifteen minutes (53 goals; 2.3 goals per match). In the game period (31-45 min) the lowest average number of goals was scored (33 goals; 1.4 goals per match). Figure 2 shows the percentage of goals scored in each period.

Of the total of 173 goals scored in all the analyzed matches, 92 (53.2%) were the right leg kicks and 81 (46.8%) the left leg kicks. No goals were scored with the head or any other part of the body.

Figure 3. Percentage of goals scored according to the area of the pitch and type of goal.
** Significant differences (p<.01) between zones (areas of the pitch from where goals can be scored). ## Significantly different (p<.01) from Corner kick and Direct free kick.

Most of the goals were scored by a shot from inside the penalty area (106) or from its edge (47). Eleven goals were scored from the mid-field line, 7 goals from penalty kicks, 1 after a corner and another from a direct free kick. Figure 3 shows the percentages by the area from where the goals were scored.

Table 2 shows the contingency tables with regard to the moment of scoring during the match and the type of goal scored. A large increase can be seen in the percentage of goals scored from the penalty area in the second half (min 31-45=72.7%, min 46-60=78.9%) compared to the first half (min 1-15=52.8%, min 16-30=49.0%). In the second half there was a decrease in the percentage of goals scored from the zones outside the penalty area (the edge of the penalty area and mid-field) and an increase in the goals scored from a penalty kick.

Figure 4 shows the results obtained for the goals scored by either the right or left leg, according to the field zone from where the shot was taken and the type of goal. No goals were scored from headers.
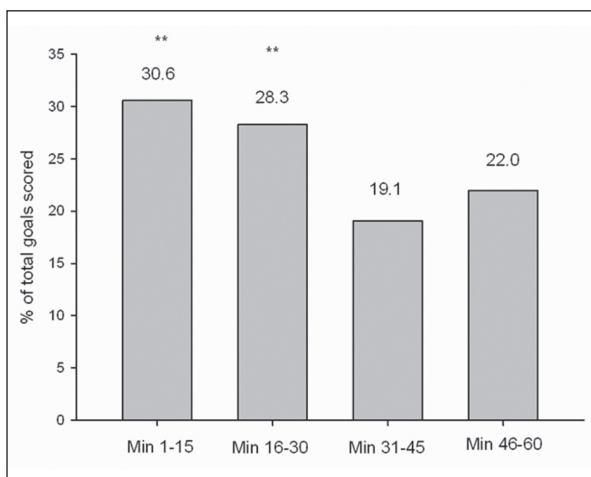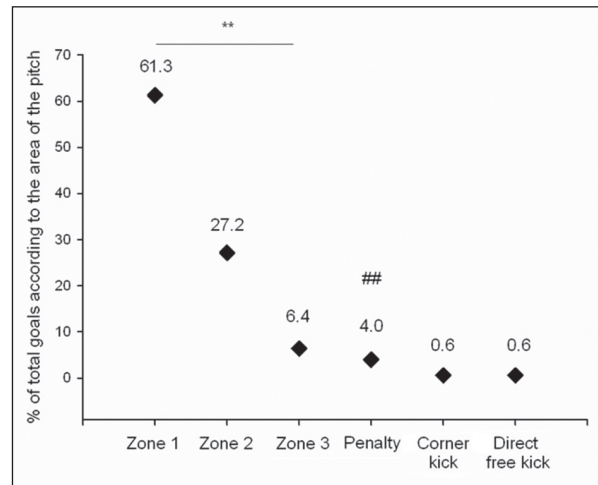
Figure 2. Percentage of goals scored in all the matches analyzed according to the period, i.e. after how many minutes of play. Min = minute, % = percentage.
** Significantly different (p<.01) from 31-45 min and 46-60 min.

Table 2. Number of goals and total percentages according to the moment in the match and the type of goal

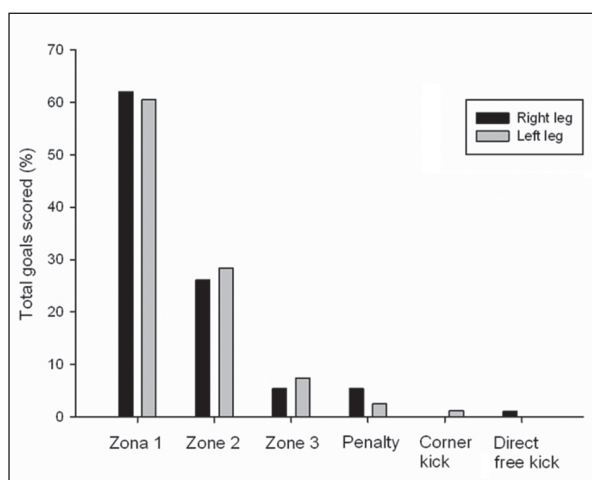|		Zone 1	Zone 2	Zone 3	Penalty	Corner kick	Direct free kick
Min 1-15	Goals	28	15	8	1	1	0
	%	52.8%	28.3%	15.1%	1.9%	1.9%	0.0%
Min 16-30	Goals	24	21	2	2	0	0
	%	49.0%	42.9%	4.1%	4.1%	0.0%	0.0%
Min 31-45	Goals	24	7	0	2	0	0
	%	72.7%	21.2%	0.0%	6.1%	0.0%	0.0%
Min 46-60	Goals	30	4	1	2	0	1
	%	78.9%	10.5%	2.6%	5.3%	0.0%	2.6%

Min = minute, % = percentage

Figure 4. Percentage of goals scored by the right or left leg in each zone and by type of goal.

Discussion and conclusions

This is the first study which analyzes football 7-a-side matches for players with CP. Despite the fact that there is a lot of research on this topic in reference to conventional football (Armatas, et al., 2007; Carey, et al., 2001; Yiannakos & Armatas, 2006), no study has been published to date where the scored goals are analysed (from where they are scored, game period in the match, amount and type) in official games of this sports discipline. In contrast to the conventional football, this study shows that in football 7-a-side matches for players with CP a higher number of goals are scored in the first half and especially in the first 15 minutes. Similarly, most of the goals are scored from within the penalty area. The average number of goals per match was 7.5.

While some studies affirm that the moment or the game periods (in 15-minute blocks) influence scoring frequency (Abt, et al., 2002; Armatas, et al., 2007; Yiannakos & Armatas, 2006), others state that there is no relationship between goals scored and the moment of the match (Michailidis,

et al., 2004). The results of our study show that the average number of goals scored per match in the first half (4.4 goals, 58.9% of the total goals) was significantly higher (p<.01) than the number of goals scored in the second half (3.1 goals, 41.1% of the total). Equally, the first 15 min of play was the game period when most goals were scored (30.6% of the total goals), followed by the second period of the first half (min 16-30=28.3% of the total goals). Periods 3 and 4 of the match (second half) were the game periods when the least goals were scored (min 31-45=19.1% and min 46-60=22% of the total goals). These results contrast those found in the conventional football. Armatas et al. (2007), in their study of goals scored in three World Championships, then Yiannakos and Armatas (2006) in matches at the 2004 European Championship, as well as Armatas, Yiannakos, Papadopoulou, and Skoufas (2009) in matches of the Greek Superleague, observed that the majority of goals were scored in the second half of the matches, more precisely in the last 15 minutes. The obtained differences between our and the other studies of conventional football may be due to specific physical characteristics of athletes with CP (Cámara, et al., 2013; Yanci, et al., 2014); their lower running economy (Maltais, Pierrynowski, Galea, & Bar-Or, 2005) may induce a greater fatigue in the second part of a game. Given these contradictory results, more studies are necessary to analyze this aspect in Paralympic footballers. However, it may be of interest to specifically train defensive game aspects which are applicable in the first minutes of a match to decrease the number of goals conceded at the beginning of the game.

With regard to the place from where the goals were scored and their characteristics, the results of this study show that the majority of goals were scored from within the penalty area (61.3%) or from its edge (27.2%). These results agree with those obtained by Yiannakos and Armatas (2006) in conventional 11-a-side football. Given the characteristics of the disability, functional limitations and a lower level of leg strength (Cámara, et al., 2013;

Yanci, et al., 2014), it is possible that footballers with CP have to work more on the game strategy to get to the areas from where it is easier to score a goal, given that their ability to score from farther away distances may be limited. In the second half of matches (31-45 min and 46-60 min) the percentage of the goals scored from within the penalty area increased considerably (72.7 and 78.9%), and the number of goals scored from outside the penalty area decreased (edge of the area and mid-field). Ruiz-Ruiz et al. (2013) in their study, which analyzed 64 matches from the 2006 Football World Cup, observed that the number of entries into the penalty area was related to the final score and that this number of entries was conditioned by the score line and the quality of the competing teams. From the results obtained in the present study, it would be interesting for coaches to look for the most suitable ways to prevent the opposing players from entering the penalty area, thus reducing the possibility of conceding goals, especially in the second half. Probably, the decrease in performance, evidenced in footballers in the second half (Bangsbo, 1994; Krustrup, et al., 2006; Mohr, Krustrup, & Bangsbo, 2005), produces an increase in goal scoring opportunities in the opposing team's penalty area. Previous studies show that athletes with CP may have a poorer walking economy (Maltais, et al., 2005), which is something that would cause a greater loss of performance in the second half of a match. It would therefore be interesting to analyse if an improvement in physical fitness could minimize this aspect in football 7-a-side CP.

The majority of the goals in the analyzed matches were scored from play (94.9% of the total goals) and only 5.1% of them were scored by a stationary ball kick. Curiously, no goals were scored by a header. This shows the need to train football 7-a-side CP teams in the skills of scoring by kicking stationary balls and by headers in order to improve their effectiveness in matches.

The results of our study show that the average number of goals per match scored in the first half was higher than of those scored in the second half. The first 15 minutes of play were time period when most goals were scored, followed by the second period of the first half, leaving the two periods of the second half with the lowest number of goals. Possibly, the decrease in performance in the second half causes the increase in the goal scoring opportunities in the opponent's penalty area. It would thus be interesting to study if an increase in physical fitness could minimize this aspect in the discipline of football 7-a-side CP.

Most goals were scored from the penalty area or from its edge. In the second half the percentage of goals scored from the penalty area increased greatly and those scored from outside this area decreased. Most of the goals scored in the matches analyzed were when the ball was in play and no goals were scored by a header. This shows that it is necessary to train football 7-a-side CP teams in defensive actions to be applied during the first minutes of play, and in strategies for scoring by kicking a stationary ball and by headers in order to increase their effectiveness in competitions.

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Correspondence to:
Javier Yanci, Ph.D.
Faculty of Physical Activity and Sports Science,
University of the Basque Country, UPV/EHU,
Lasarte 71, 01007, Vitoria-Gasteiz, Spain
E-mail address: javier.yanci@ehu.es