Analysis of the shots in Football for blind people in the 2021 World Grand Prix

Análisis del lanzamiento en Fútbol para personas ciegas en el World Grand Prix 2021

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Abstract

The present study analyses all in-game goal kicks (*n* = 424) in 5-a-side football for blind people in the international tournament World Grand Prix 2021, held in Tokyo (Japan). For this purpose, the IOLF5C instrument was used, which consists of 14 variables to analyse the effectiveness of shooting at goal. A descriptive study and association between the independent variables of the analysis (contextual and game actions), and the study variable (result of the throw-in) was carried out. The results show that 5-a-side football for blind people is a sport modality with a reduced number of technical-tactical actions. The winning team of the tournament is the one that performs the highest number of shots at goal, they start the play in the starting zone and shoot at goal from the offensive zone. Perform a fast progression with driving and throwing to goal, without blocking, and, mainly, they hit the ball with the right foot and, mostly with the toe/start. In addition, the result of the throw is conditioned by the variables team status, starting zone, throwing opposition and body zone. Therefore, it is recommended that coaches should design situations that favor quick ball stealing after effective pressure in offensive zones.

Key words: IOLF5C, shooting, effectiveness, performance.

Resumen

El presente estudio analiza todos los lanzamientos a portería en juego (*n* = 424), en Fútbol a 5 para personas ciegas del torneo internacional World Gran Prix 2021, celebrado en Tokio (Japón). Se empleó el instrumento validado IOLF5C para analizar la eficacia del lanzamiento a portería, que consta de 14 variables. Se realizó un estudio descriptivo y junto con otro de asociación entre las variables independientes del análisis (contextuales y acciones de juego), y la variable del estudio (resultado del lanzamiento). Los resultados muestran como el fútbol a 5 para personas ciegas es una modalidad deportiva con un reducido número de acciones técnico-tácticas. El equipo ganador del torneo es quien realiza mayor número de lanzamientos a portería, inicia la jugada en la zona de comienzo y lanza a portería desde la zona ofensiva. Realizan una progresión de forma rápida, con conducción y lanzamiento a portería, sin bloqueo, principalmente golpean el balón con el pie derecho, y casi siempre de puntera/empeine. Además, el resultado del lanzamiento se muestra relacionado con las variables situación del equipo, zona de comienzo, oposición del lanzamiento y zona corporal. Tras el análi-

sis en profundidad de los resultados de la investigación, se recomienda a los entrenadores diseñar situaciones que favorezcan el robo rápido del esférico tras una presión eficaz en zonas ofensivas.

Palabras clave: IOLF5C, lanzamiento, eficacia, rendimiento.

Introduction

Football for Blind people (Fa5) is a Paralympic sport that has been part of the medal table since the Athens 2004 Paralympic Games. Likewise, it is a low-scoring invasion sport with specific particularities, and it differs from the rest of the football modalities in the technical-tactical actions performed by the players, such as the types of progression, the blocks, or game tactics, which directly influence the shots at goal in a game situation (Gamonales et al., 2019; Gamonales, Muñoz-Jiménez, Mancha-Triguero et al., 2021). Despite becoming one of the most popular sports among this group (Gamonales, Muñoz-Jiménez, León et al., 2021), works related to Fa5 are not frequent in the literature (Gamonales et al., 2018a; Gamonales et al., 2022).

There are studies that analyse players' strategies with respect to game comprehension in Fa5 (Morato et al., 2011), the effects of training on physical fitness parameters (Alves et al., 2019), or body composition (Campos et al., 2013; Finocchietti et al., 2019; Gorla et al., 2017). The influence of body composition on ball transfer speed (Sancio et al., 2021), cardiorespiratory alterations in relation to the motor profile of Fa5 players of Paralympic teams (Campos et al., 2014), the profile of players with biomechanical variables related to bilateral force production (Campos et al., 2015), or the genotypic and allelic frequency of ACTN3 R577x and RCT i/D in athletes of the modality (Oliveira et al., 2020) have also been studied.

In addition, there is a study focused on assessing the characteristics and prevalence of sport-related injuries in people with visual impairment, including Fa5 (Magno et al., 2013). Other research compares the relationship between mental representation and sound directions comparing blind football players, non-blind athletes and people without visual impairment (Velten et al., 2014; Velten et al., 2016), or the work of the guide in blind football players (Suárez, 2014), There is a line of research investigating sport performance in Fa5 (Gamonales et al., 2018b; Gamonales, Muñoz-Jiménez, León et al., 2021), and more specifically the use of inertial devices to assess the load during the competition (Gamonales, Muñoz-Jiménez, Mancha-Triguero et al., 2021; Gamonales, León et al., 2021).

Scientific literature shows that sport performance in football is the result of a complex interrelationship of multiple variables (Garganta, 2000). Analyzing performance indicators applied in team sports allows for understanding the sporting performance of these variables, to advance the knowledge of the game context, improving future results (Rein & Memmert, 2016). The term performance indicator does not apply to any variable, only to those confirmed as valid measures of an important aspect of sport performance analysis, and have an objective measurement procedure, a known measurement scale and an appropriate interpretation (O'Donoghue, 2015). Thus, coaches can have an accurate knowledge of the game (Ardá et al., 2014; Reina-Gómez & Hernández-Mendo, 2012), and extract relevant information about the reality of the specific context to be investigated (Lames & McGarry, 2007).

The throw or shot at goal is the most studied action, considered as a factor and performance indicator of maximum efficiency in the game (Ibáñez et al., 2009), as it determines sporting success in football. Performance indicators applied in team sports facilitate understanding the logic of the game, through the study of technical-tactical factors (Gómez-Ruano, 2017; Gómez-Ruano et al., 2013; Reina-Gómez & Hernández-Mendo, 2012). The description of offensive or defensive variables (Ibáñez et al., 2009; Thomas et al., 2009; Marcelino et al., 2011; Sampaio et al., 2010), allows coaches to better control training and competitions (Gómez-Ruano et al., 2017).

The literature review shows little research related to the performance indicators in Fa5. Therefore, the aim of the present study is to analyse the effectiveness of shots on goal in Fa5, during the international tournament World Grand Prix 2021 (WGP 2021), held in Tokyo (Japan).

Method

Design

The present study is part of the quantitative empirical studies. An arbitrary observation code was used in a natural environment (Montero & León, 2007).

Sample

All shots on goal (n = 424) of Fa5 matches played in the WGP 2021 international tournament (n = 12) were analysed. The study was developed under the premises of the Declaration of Helsinki (2013), being approved by the University of Extremadura Bioethics Committee (Registration number 79/2022).

Variable codification

The definition of each variable and its categories were outlined from Block I of the observation instrument IOLF5C, published in a previous study (Gamonales, León et al., 2018), which was designed and validated to understand the

competitive performance indicators in Fa5. The variables recorded were: contextual variables (phase, team, type of shot on goal, time of the shot on goal, team status, and final result of the match), game variables (starting zone, type of progression, shooting zone), hitting situation (block, opposition during the shots on goal, body zone, and type of hit), and outcome variable (result of the shot on goal).

Instruments

The observation instrument IOLF5C (Gamonales, Muñoz-Jiménez, León et al., 2018) was used to record all game actions of the competition, defined in the study variables, characterizing in-game shots on goal during the WGP 2021 tournament, and were counted using an Excel spreadsheet.

Procedure

The section of IOLF5C instrument used was basic actions designed to determine the efficiency in terms of success and failure in shooting at goal. For this purpose, the coders followed a training process to confirm that the data are valid and reliable and can be used for research (Gamonales et al., 2018c). During the training process in Fa5, there was an improvement in the concordance between the two coders, who had great knowledge about Fa5 modality. It was obtaining a Kappa value of inter-observer reliability greater than p = .90 in all variables, and, also, a p-value of 1 was obtained for intra-observer reliability. Finally, all shots on goal (n = 424) from WGP 2021 individually were registered.

Statistical Analysis

A descriptive analysis of frequencies and percentages was performed. To assess the strength of association between variables, Chi-square ($\chi 2$) and Cramer's V (φc) tests were applied (Newell et al., 2014). Association strength between variables was defined by Crewson (2006) proposal: Small (<. 100), low (.100 - .299), Moderate (.300 - .499), and High (> .500).

Fisher's Exact Test (FET) was performed, using the Monte Carlo method, because sample studied is too small to applicate $\chi 2$ with the standard procedure (De la Fuente-Fernández, 2016).

The degree of association between the variables was studied through the Adjusted Standardized Residuals (ASR) of the contingency tables (Field, 2009) between the variables contextual and game actions and shooting outcome. Data analysis was performed in the SPSS 27.0 statistical package (IBM SPSS Statistics 2021, Armonk, NY, USA). Significance was determinated at $p < .05$.

Results

Contextual variables, game variables and outcome variables in Fa5 are described in Table 1.

Table 1. Description of the Contextual Variable, Game Variable and Outcome Variable

Variables	Categories				
Stage	Group Stage	Final Stage			
n	*370*	*54*			
%	*87.3*	*12.7*			
Team	Spain	Thailand	France	Japan	Argentina
n	*90*	*65*	*58*	*76*	*135*
%	*21.2*	*15.3*	*13.7*	*17.9*	*31.8*
Time	1st half	2nd half			
n	*241*	183			
%	*56.8*	*43.2*			
Team status	Wining	Losing	Tie		
n	*105*	*107*	*212*		
%	*24.8*	*25.2*	*50.0*		
Final outcome	Wining	Losing	Tie		
n	*217*	*149*	*58*		
%	*51.2*	*35.1*	*13.7*		
Initial zone	Defensive zone	Predefensive zone	Preoffensive zone	Offensive zone	
n	*131*	*77*	*64*	*152*	
%	*30.9*	*18.2*	*15.1*	*35.8*	
Type of advancement	Combination	Direct	Quick		
n	58	158	208		
%	*13.7*	*37.3*	*49.1*		
Shooting zone	Defensive zone	Predefensive zone	Preoffensive zone	Offensive zone	

n	*10*	*16*	*24*	*374*	
%	*2.4*	*3.8*	*5.7*	*88.2*	
Circumstances leading to shot	Pass-control-shot	Pass-shot	Control-shot	Other	
n	*89*	*20*	*266*	*49*	
%	21.0	4.7	62.7	11.6	
Blocks	No deflection	Deflection in front of the shot	Deflection at same height of shot	Deflection from behind the shot	Other
n	*408*	*14*	*1*	*1*	*0*
%	*96.2*	*3.3*	*0.2*	*0.2*	*0*
Opposition to shot	Without opposition	Goalkeeper	Distant opposition	Nearby opposition	Other
n	*1*	*63*	*23*	*329*	*8*
%	*0.2*	*14.9*	*5.4*	*77.6*	*1.9*
Body zone (for control)	Right foot	Left foot	Other		
n	*312*	*110*	*2*		
%	*73.6*	*25.9*	*0.5*		
Type of contact/ touch	Inside of foot	Instep/Toe kick	Outside of foot	Heel kick	Other
n	*78*	*337*	*4*	*2*	*3*
%	*18.4*	*79.5*	*0.9*	*0.5*	*0.7*
Shooting outcome	Goal	Refusal goal	No-refusal goal	Straight out	Other
n	*24*	*17*	*126*	*137*	*120*
%	*5.7*	*4.0*	*29.7*	*32.3*	*28.3*

n: frequency; %: percentage

Table 2 shows the results of the association between variables shooting outcome and the independent variables of the study. Four variables have a significant relation with a low association strength (φc = 0.100 – 0.299), according to Crewson (2006).

Table 2. Relation between the Shooting Outcome Variable and the Independent Variables of the study

Variables	Shooting Outcome							
	χ^2	df	p	FET	p	φc	p	Association size
Stage	8.258	4	.083	7.597	.091	0.140	.079	---
Team	20.178	16	.212	20.154	.191	0.109	.212	---
Time	0.988	4	.912	1.001	.919	0.048	.915	---
Team status	30.651	8	.000*	25.297	.001*	0.190	.000*	Low
Final outcome	11.090	8	.197	10.769	.197	0.114	.190	---
Initial zone	26.217	12	.010*	25.533	.008*	0.144	.008*	Low
Type of advancement	7.056	8	.531	6.751	.561	0.091	.534	---
Shooting zone	15.363	12	.222	12.983	.257	0.110	.213	---
Circumstances leading to shot	20.433	12	.059	19.924	.047	0.127	.047	---
Blocks	9.453	12	.664	13.870	.398	0.086	.413	---
Opposition to shot	53.312	16	.000*	39.063	.000*	0.177	.001*	Low
Body zone (for control)	18.034	8	.021*	15.660	.022*	0.146	.031*	Low
Type of contact/touch	15.652	16	.477	16.554	.340	0.096	.340	---

χ2: Chi-square; df: degree of freedom; * p<.05; FET: Fisher's Exact Tests; **φc**: Cramer's V

The analysis of association degree between the variables categories, was develop using the ASR of the contingency tables, as shown on Table 3.

Table 3. Association between the Shooting Outcome Variable and the Team Status, Initial Zone and Body Zone

Variables	Shooting outcome														
	Goal			Refusal goal			No-refusal goal			Straight out			Other		
Team status	n	%	ASR	n	%	ASR	n	%	ASR	n	%	ASR	n	%	ASR
Winning	17	4.0	5.4	3	0.7	-0.7	31	7.3	0.0	28	6.6	-1.4	26	6.1	-0.9
Tie	1	0.2	-2.4	4	0.9	-0.2	31	7.3	-0.2	38	9.0	0.8	33	7.8	0.7
Losing	6	1.4	-2.5	10	2.4	0.7	64	15.1	0.2	71	16.7	0.5	61	14.4	0.2
Initial zone	n	%	ASR	n	%	ASR	n	%	ASR	n	%	ASR	n	%	ASR
Defensive zone	6	1.4	-0.6	10	2.4	2.5	46	10.8	1.6	39	9.2	-0.7	30	7.1	-1.7
Predefensive zone	4	0.9	-0.2	1	0.2	-1.3	25	5.9	0.6	27	6.4	0.6	20	4.7	-0.5
Preoffensive zone	3	0.7	-0.4	2	0.5	-0.4	27	6.4	2.4	14	3.3	-1.9	18	4.2	0.0
Offensive zone	11	2.6	1.1	4	0.9	-1.1	28	6.6	-3.8	57	13.4	1.7	52	12.3	2.0
Opposition to shot	n	%	ASR	n	%	ASR	n	%	ASR	n	%	ASR	n	%	ASR
Without opposition	1	0.2	4.1	0	0.0	-0.2	0	0.0	-0.7	0	0.0	-0.7	0	0.0	-0.6
Goalkeeper	9	2.1	3.2	7	1.7	3.1	18	4.2	-0.2	15	3.5	-1.6	14	3.3	-1.2
Distant opposition	0	0.0	-1.2	1	0.2	0.1	10	2.4	1.5	10	2.4	1.2	2	0.5	-2.1
Nearly opposition	14	3.3	-2.3	9	2.1	-2.5	96	22.6	-0.5	106	25	-0.1	104	24.5	2.8
Other	0	0.0	-0.7	0	0.0	-0.6	2	0.5	-0.3	6	1.4	2.6	0	0.0	-1.8
Body zone	n	%	ASR	n	%	ASR	n	%	ASR	n	%	ASR	n	%	ASR
Right foot	13	3.1	-2.2	14	3.3	0.8	85	20.0	-1.9	103	24.3	0.5	97	22.9	2.1
Left foot	10	2.4	1.8	3	0.7	-0.8	40	9.4	1.8	34	8.0	-0.4	23	5.4	5.4
Other	1	0.2	2.7	0	0.0	-0.3	1	0.2	0.6	0	0.0	-1.0	0	0.0	-0.9

n: frequency; %: percentage; ASR: Adjusted Standardize Residuals > |1.96|

Discussion

The aim of the research was to analyse the efficiency of goal shooting in Fa5 during the international tournament WGP 2021, held in Tokyo (Japan). Considering that research works related to sports performance indicators in Fa5 are scarce in the scientific literature (Gamonales et al., 2018a; Gamonales et al., 2022), descriptive results of the present study show how players perform more shots on goal in the groups phase and during the 1st half of the games. In addition, the players from the winning teams perform shots at goal more frequently from the offensive zone, after performing a quick progression with the ball under control, shooting at goal without opposition. The ball was mostly struck with the right foot and, above all, with the toe/kick. These results are similar to those existing in the scientific literature (Gamonales et al., 2018b; Gamonales et al., 2019; Gamonales, Muñoz-Jiménez, León et al., 2021). Fa5 is a sport modality with little variety of technical-tactical actions, since field players mainly use other sensory-perceptual resources for the absence of vision, except for the goalkeeper, who can see. This sport requires a great capacity for attention and concentration, as well as good orientation and spatial perception of the ball and the other players, to maintain tactical order. A relevant information provided by performance indicators can help to establish team strategy and tactics (Petersen et al., 2008).

It is recommended that the technical staffs of the Fa5 teams analyse the technical-tactical actions of international competitions, to learn about the game systems of the rival teams. The analysis of the associations between variables shows relationships between three significant variables, as found in previous studies (Gamonales et al., 2019; Gamonales, Muñoz-Jiménez, León et al., 2021) that highlighted significant relationships between the

performance variables in Fa5. The results shows that the success on shooting outcome can be influence by team status, initial zone and opposition to shot. in addition, there is a positive relationship between the number of shots on goal of the teams and their final ranking in the competition. In this case was Argentina, the winning team of the WGP 2021, which stood out by its offensive actions compared to the other teams, confirming previous studies such as (Gómez-Ruano et al., 2013) which shows that winning teams develop more actions near the opponent team goal zone. Notwithstanding, Ibáñez et al. (2009), and Sampaio et al. (2010), found a similar relationship between final ranking and sport performance in basketball.

It seems that in Fa5 the result of the match can be conditioned by external causes, as happens in other sports. The refereeing performance or a player replacing during the game, can have a significant effect on the game (Caballero et al., 2017; Lago-Peñas et al., 2010). Other causes are the technical-tactical demands of Fa5 (Morato et at., 2011), efficiency in guiding orientation (Suárez, 2014), team travel to match venues (García-Rubio et al., 2014), sports injuries (Gamonales et al., 2022), and even accumulated fatigue from playing several matches in short spans of time (Gamonales, Muñoz-Jiménez, Mancha-Triguero et al., 2021).

The relationship between the team status variables and the shooting outcome shows that the winning team of the match has a higher probability of scoring a goal, compared with the teams that draw or lose. Fa5 is a low-scoring sport (Gamonales et al., 2018b; Gamonales et al., 2019; Gamonales, Muñoz-Jiménez, León et al., 2021). Analyse the evolution of performance indicators during the game is more difficult than in other sports, such as basketball or handball (Reina-Gómez & Hernández-Mendo, 2012). However, it is possible to quantify the causes of success or failure in Fa5, considering that is a very complex sport but with relatively simple technical and tactical actions. In this context, the psychological abilities are important to help the players to deal with an adverse score and train it can be very useful.

The relationship between variable starting zone and shooting outcome, indicates that when plays start in the defensive zone have a higher probability of ending in a shot on goal that is disallowed for the team that perform the shot. A team play that starts in the pre-offensive zone has a higher probability of ending in a throw-in to goal without a rebound, or to obtain goal with a rebound for the opposing team. Furthermore, team plays started in the offensive zone have a high probability of not ending in a shot on goal without a rebound. Therefore, the performance is similar to previous studies related to Fa5 (Gamonales et al., 2018b; Gamonales et al., 2019; Gamonales, Muñoz-Jiménez, León et al., 2021), and even in other sports, such as Basketball (Ibáñez et al., 2009), confirming that shots on goal during play and executed in the areas closest to the scoring point are the most likely to end in success. Keeping the ball in defensive areas for too long can have adverse consequences if the ball is lost, as it would increase the pressure of the opposing players on the goal. It would be useful for coaches to set up training exercises to avoid losing the ball, and high defensive pressure exercises in areas close to the opposing goal.

Regarding the relationship between opposition to shot and the shooting outcome variables, shots on goal without opposition end in goal most of the times, while shots where there is close opposition have a higher probability of not being a goal or ending in a rejection by the opponent team, or in other situations such as a corner. About shots on goal in which only the goalkeeper stands in the way, a high probability of ending in a goal or goal kick emerges with a refusal for the kicking team. Finally, when a shot on goal is performed with the opposition of defenders, there is a high probability that will go straight out. These results are the same as those existing in the actual scientific literature (Gamonales et al., 2018b; Gamonales et al., 2019; Gamonales, Muñoz-Jiménez, León et al., 2021). Something similar was observed regarding the physical performance of athletes, which influences the performance (Gamonales, Muñoz-Jiménez, Mancha-Triguero et al., 2021; Gamonales, León et al., 2021), because more shots on goal were observed in the present study in the first half of the game. Therefore, coaches should consider physical preparation in training and design and train play situations with as little opposition as possible, aiming to score more easily in Fa5.

The association between the body zone and shooting outcome variables shows that there is a lower probability than expected that the throws to goal executed with the right foot do not result in a goal. Furthermore, there is a higher probability than expected that when the ball is hit with the left foot, other things happen. These results corroborate those obtained by Gamonales et al. (2018b), Gamonales et al. (2019), and Gamonalesal. (2021). Fa5 is an unpredictable sport modality, despite being a sport with little variety of technical-tactical actions. Therefore, it is recommended that coaches design individual training skills tasks where ball striking with different body zones is worked and developed, in absence of vision. Finally, a series of limitations have been found in the present study, such as the size of the sample (only 12 matches were analysed) and the lack of previous research studies. Hence, some proposals of studies are detailed, for example, it is suggested developing new tools for analyzing the shots in different sports or modalities in football for people with disability.

Conclusions

From a general perspective, it can be observed that in the group phase of the tournament, the first half of the matches and the moments games are associated with a draw (e.g., 0 - 0 or 1 - 1), are those associated with more shots on goal, with the tournament winning team, Argentina, presenting the higher number of shots on goal.

This could also be a consequence of fatigue, which reduces the number of shots as the tournament progresses.

The predominant attacking action is the control and shot, performed without rebound, and it was observed that many shots are taken with close opposition. In relation to the area of the body with which the ball is kicked, right foot shot is predominant, with the toe/foot, and it is more frequent that wide or without rebound shots on goal.

Regarding the shooting outcome, this is conditioned by the different variables studied above (team status, initial zone, opposition to shot and body zone), therefore, these can influence the success in Fa5. Coaches should design playing situations that favor the quick ball recovery after effective pressure in offensive zones. They should also look for situations in which shots at goal are performed with as little opposition as possible.

Coaches should also design playing situations in Fa5 that favor quick ball stealing after effective pressure in offensive zones. Allowing to shot on goal with as little opposition as possible.

Fa5 is an invasion sport with a low-scoring, with important differences compared to other sport and parasport modalities, mainly because the technical-tactical actions are conditioned by the absence of vision.

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