Original Article

Game rhythm and stoppages in soccer. A case study from Spain

JOSÉ HERNÁNDEZ-MORENO[1], ANTONIO GÓMEZ-RIJO[2], ULISES CASTRO[1], ANTONIO GONZÁLEZ-MOLINA[1], MIRIAM E. QUIROGA[1], FRANCISCO GONZÁLEZ-ROMERO[1]

[1]*Departamento de Educación Física, Universidad de Las Palmas de Gran Canaria, Spain*

[2]*Departamento de Didáctica de la Expresión Musical, Plástica y Corporal, Universidad de La Laguna, Spain*

ABSTRACT

Hernández-Moreno J, Gómez-Rijo A, Castro U, González-Molina A, Quiroga ME, González-Romero F. Game rhythm and stoppages in soccer. A case study from Spain. *J. Hum. Sport Exerc.* Vol. 6, No. 4, pp. 594-602, 2011. The purpose of this paper was to quantify and analyze the participation/pause game times and stoppages of 11-a-side soccer. A total of 617 players of 44 Spanish men's teams and 33 matches of the 2007/08 and 2008/09 men's soccer players of 2nd division A and B and 3rd division were studied. The methodology used is observational and systematic, active and non-participating and with an observational instrument based on a category system. The variables studied were: Stoppages and Game Rhythm. The most frequent stoppage is out of bound (mean±SD) (59.03±10.15), followed by fouls (37.33±7.09). The stoppage which registers the longest duration (in hours, minutes and seconds) is foul (16'35"±3'48"), followed by out of bound (14'30"±3'26"). Regarding game rhythm the real time of each match totaled an average of 1h36'14"±2'03" seconds. The actual time of play is on average 49'±4'44" while the pause time is 47'14"±5'23"seconds. In the description of the implications of pause time in the game dynamics of soccer, some regularities can be observed; such as the fact that the most frequent stoppages are those made due to fouls and out of bound and that the duration of the majority of these stoppages varies within a range of 4 to 7 seconds. The pauses have shown to be a major element in the study of soccer game rhythm because they take at least half the total time of the match. Consistent with this, it is understood that game rhythm can easily be improved with regulatory modifications such as the elimination of interruptions because of substitutions. **Key words**: SOCCER, DYNAMIC, STRUCTURE, PARTICIPATION, PAUSE.

Corresponding author. Departamento de Educación Física. Universidad de Las Palmas de Gran Canaria. Edificio de Educación Física del Campus Universitario de Tafira. 35017, Las Palmas de Gran Canaria. Spain.
E-mail: jmoreno@def.ulpgc.es
Submitted for publication June 2010
Accepted for publication October 2011
JOURNAL OF HUMAN SPORT & EXERCISE ISSN 1988-5202

doi:10.4100/jhse.2011.64.03

INTRODUCTION

Currently Motor Praxeology applied to sports focuses on trying to know what the internal logic –of each group of sports in general and each sport specifically– is like, and how the development of game action is produced during motor action and motor situation (Parlebas, 2001).

Some of the most significant studies related to the epistemological knowledge of Motor Praxeology carried out so far have been done by Rodríguez-Ribas (1997), Parlebas (2001) and Hernández-Moreno & Rodríguez-Ribas (2004). On the other hand, those related to the analysis of the structure of sports (and specifically to the development of game action) have been developed by Hernández-Moreno (1996), Lago & Anguera (2003), Lago & Martín-Acero (2005), Lago & Martín-Acero (2007), Lago et al. (2007), Castellano (2008) and Castellano & Casamichana (2009) in 11-a-side 1st division soccer. Thus the present work provides a study of game rhythm characteristics in Spanish men's soccer divisions that have never been studied for such purposes before, i.e. 2nd division A, 2nd division B and 3rd division.

The soccer played nowadays features as one of its main characteristics the so-called *game rhythm*, i.e., the speed of play and its variations throughout the course of the matches. *Game rhythm* makes it increasingly necessary for players to train their physical qualities to suit the demands of the game. Moreover, very often, teams are increasingly using the so-called "tactical errors" to influence both the dynamics of the game and game strategies. These facts are being increasingly studied in order to adapt the training of players and teams to these circumstances (Martín-Acero, 2000; Lago & Martín-Acero, 2005).

The purpose of this paper was to quantify and analyze the participation/pause game times and stoppages of 11-a-side soccer in 2nd division A and B and 3rd division.

MATERIAL AND METHODS

Subjects

The study sample consisted of 33 soccer matches of the category 2nd division A (10 games and 14 teams), 2nd division B (13 games and 15 teams) and 3rd division (10 games and 15 teams) where 44 Spanish men's teams participated with a total of 617 players. The age of the studied subjects ranged from 17 to 36 years old. The results have been recorded during the 2007/08 and 2008/09 seasons. The subjects were informed of the nature of the study and its intended use, in accordance with ethical guidelines of Declaration of Helsinki.

Measures

The study's design was descriptive, correlational, and transversal. The observation instrument used was a category system (Anguera, 2006). The variables studied were: Stoppages (unsporting behavior, out of bound, beyond the goal line, corner, incidents, foul, penalty, goal, substitution, and out of play) (see Table 1) and Game Rhythm (match real time, match effective time, pause time, home ball-possession time, visitor ball-possession time, total number of pauses, maximum pause time, and minimum pause time (see Table 2). The observation instrument was designed and validated by pilot observation, data analysis testing, and observer training test.

Table 1. *Categories for the variable Stoppages.*

Category	Definition	#
Unsporting behavior	A player's behavior which is contrary to sports ethics and leads to a disciplinary sanction which is recorded in the game sheet.	UC
Out of Bound	The ball is thrown by a player over the touch line in violation of the established regulations.	OB
Beyond the Goal Line	The ball is thrown by an attacking player beyond the goal lines of the field.	BGL
Corner	The ball is thrown by a defending player beyond the goal line.	C
Incidents	Temporary interruption of the game for non-essential reasons requiring timeout by the referee-judge.	I
Foul	The infringement committed by a player of the team which has no possession of the ball on a player of the opposing team, which is sanctioned by a shot from the place of occurrence of the infringement and recorded in the offending player's sheet.	F
Penalty	Infringement committed by a player of the team which has no possession of the ball on a player with possession of the ball and is sanctioned by a shot to the offending team's goal from a distance of 11 meters.	P
Goal	Action consisting of introducing the ball into the goal of one of the two teams in accordance with established regulations and is granted by the referee as valid and thus scores in the records of the game in favor of the team opposing the team in whose goal line the ball has been introduced.	G
Substitution	Action consisting in changing a field player against one on the bench.	S
Out of Play	Foul committed by a player of the team which is in possession of the ball, whilst not having himself possession of the ball, when placing himself between the goalkeeper of the opposing team and the other players of the opposing team before he has access to the ball, and is therefore whistled by the referee.	OP

Acronym

Table 2. *Categories for the Game Rhythm variable.*

Category	Definition	Acronym
Match Real Time	Period of time from the start of the match according to the referee until the end of it, minus half time of the game.	MRT
Match Effective Time	Period of time elapsed with the ball in play in possession of either team.	MET
Pause Time	Period of time elapsed without game action, excluding time-out periods between half times.	PT
Home Ball- Possession Time	Total game time in which the home team has possession of the ball.	HBPT
Visitor Ball-Possession Time	Total game time in which the visiting team has possession of the ball.	VBPT
Total Number of Pauses.	Frequency of pauses of the two teams during a match.	TNP
Maximum Pause Time.	Maximum pause duration of a team during a match.	MaxPT
Minimum Pause Time.	Minimum pause duration of a team during a match.	MinPT

Procedures

Observations were made of digital recordings taken with Panasonic- P2 DVC Pro HD camera that was located in the area usually reserved for the media so it would be possible to record all players in the playground. The recordings were made by a technical expert in audiovisual media.

The matches were analyzed through systematic observation by experienced observers, who were trained using the methodology described by Anguera (2006). NAC-SPORT software has been used to analyze data. The inter- and intra-reliability of two separate observations was calculated to guarantee sufficient quality of the observation system. An inter-reliability and intra-reliability index of 0.80 was found (intra-class correlation coefficient and Kappa index).

With the aim of a systemic approach, it can be considered that the structure of cooperative /confrontational sports -and thus of the sports to be analyzed- is determined by the following parameters: *laws of the game or balancing system* (as a starting point), *gesture* or *technique*, *sport space, sport time, motor communication*, and, ultimately, *motor skill strategy* (Parlebas, 2001; Hernández-Moreno & Rodríguez-Ribas, 2004).

The development of *game action* is the result of the interaction between the structure of the game and the player, occurring in a specific motor situation. This research focuses exclusively on two of these structures: time and laws of the game, and it specifically addresses *game rhythm* and stoppages. For the study and analysis of *game rhythm* what is called *play time* has been taken into account, i.e., the time that elapses while the ball is in play, and pause time, i.e., the time during the interruptions of the game motivated by the stops in the game which are caused by regulatory stoppages.

Regulatory stoppages are defined as any event that causes a stop in the game, i.e., leading to an interruption of the development of the game situation and that are explicitly mentioned in the rules of each sport, in this case, the rules of 11-a-side soccer.

Table 1 shows the categories that we considered for the variable stoppages (unsporting behavior, out of bound, beyond the goal line, corner, incidents, foul, penalty, goal, substitution and out of play), and Table 2 shows the categories that we considered for the variable Game Rhythm (match real time, match effective time, pause time, home-ball possession time, visitor-ball possession time, total number of pauses, maximum pause time and minimum pause time), these being new to this type of study.

Data analysis

A descriptive analysis of the different variables was carried out using Correlational Analysis Pearson. A one-factor ANOVA (according to the division to which each team belonged, 2nd, 2nd B and 3rd) was carried out to detect significant differences among the common aspects of the three divisions. Firstly, for the *stoppages* variable in relation to the observed frequencies and time spent. Secondly, the variable in relation to *game rhythm* for each category. Statistical program SPSS v.15 was used for statistical analysis. Statistical significance was set at 0.05.

RESULTS

Table 3 shows that the most frequent stoppage is out of bound (mean±SD) (59.03±10.15), followed by fouls (37.33±7.09). The least recorded stoppage is penalty (0.48±0.66). Also, the following variables correlate positively and significantly: the variable unsportsmanlike conduct-incidents ($p<0.01$), incident-goal ($p<0.05$), fouls-out of bound ($p<0.01$) and goal-penalty. On the contrary, fouls-corner ($p<0.01$) negatively and significantly correlate.

Table 3. *Mean, Standard Deviation and Correlations of all categories for the variable Stoppages (frequencies).*

	M	*SD*	1	2	3	4	5	6	7	8	9	10
1.Incidents	1.79	2.13		0.67(**)	0.16	0.30	0.25	-0.10	0.39(*)	-0.12	0.16	0.18
2.Unsporting behavior	2.88	3.23			0.15	0.16	0.40(*)	-0.25	0.28	-0.25	0.12	0.05
3.Fouls	37.33	7.09				-0.00	0.25	0.48(**)	-0.06	0.04	-0.10	-0.51(**)
4.Substitutions	4.33	1.55					0.00	-0.19	-0.09	-0.27	-0.10	0.29
5.Out of Play	5.91	2.75						0.03	0.06	-0.18	-0.31	-0.20
6.Out of Bound	59.03	10.15							-0.07	0.01	0.02	-0.27
7.Goal	2.52	1.41								0.02	0.45(**)	-0.08
8.Beyond the Goal Line	21.18	4.62									0.02	0.14
9.Penalty	0.48	0.66										0.22
10.Corner	9.18	3.31										

***p<0.01, *p<0.05. M= Mean; SD= Standard Deviation*

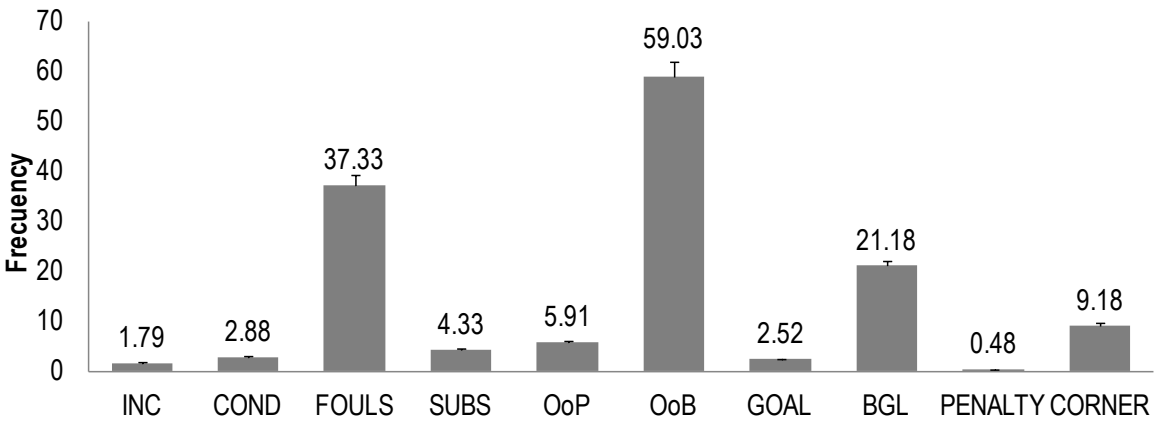

Figure 1. *Mean of the frequencies for the variable Stoppages. INC=Incidents. COND=Conduct. FOULS=Fouls. SUBS=Substitutions. OoP=Out of Play. OoB=Out of Bound; GOAL=Goal. BGL=Beyond the goal line. PENALTY=Penalty. CORNER=Corner.*

Table 4 shows that the stoppage which registers the longest duration (in seconds) is foul (16'35"±3'48"), followed by out of bound (14'30"±3'26"). The stoppage which registers the shortest duration (in hours, minutes and seconds) is penalty (46"±1'12"). Also, the variable unsportsmanlike conduct- incidents (p<0.01), foul-out of bound (p<0.05), goal-penalty (p<0.01) and (over the goal line)-corner (p<0.01) all correlate positively and significantly. By contrast, unsportsmanlike conduct-out of bound (p<0.05), unsportsmanlike conduct-over the goal line (p<0.05), foul-penalty (p<0.05) and out of play – penalty (p<0.05) all correlated significantly and negatively.

Table 4. *Mean, Standard deviation and correlations in all categories for the variable Stoppages (in minutes and seconds).*

	M	*SD*	1	2	3	4	5	6	7	8	9	10
1. Incidents	1'54"	2'08"		0.68(**)	0.07	0.26	0.25	-0.06	0.34	-0.02	-0.03	0.23
2.Unsporting behaviour	2'29"	3'04"			0.00	0.27	0.26	-0.43(*)	0.33	-0.35(*)	0.02	-0.12
3. Fouls	16'35"	3'48"				-0.01	0.18	0.34(*)	-0.12	0.30	-0.34(*)	0.08
4. Sustitutions	3'32"	1'28"					-0.15	-0.18	0.18	-0.06	0.30	0.21
5. Out of Play	2'10"	1'21"						-0.09	-0.07	-0.13	-0.38(*)	-0.20
6. Out of Bound	14'30"	3'26"							-0.15	0.37(*)	0.06	0.23
7. Goal	2'41"	1'38"								-0.19	0.63(**)	0.02
8. Beyond the goal line	8'48"	2'39"									-0.26	0.65(**)
9. Penalty	46"	1'12"										-0.00
10. Corner	4'21"	1'49"										

***p<0.01, *p<0.05. M= Mean; SD= Standard Deviation*

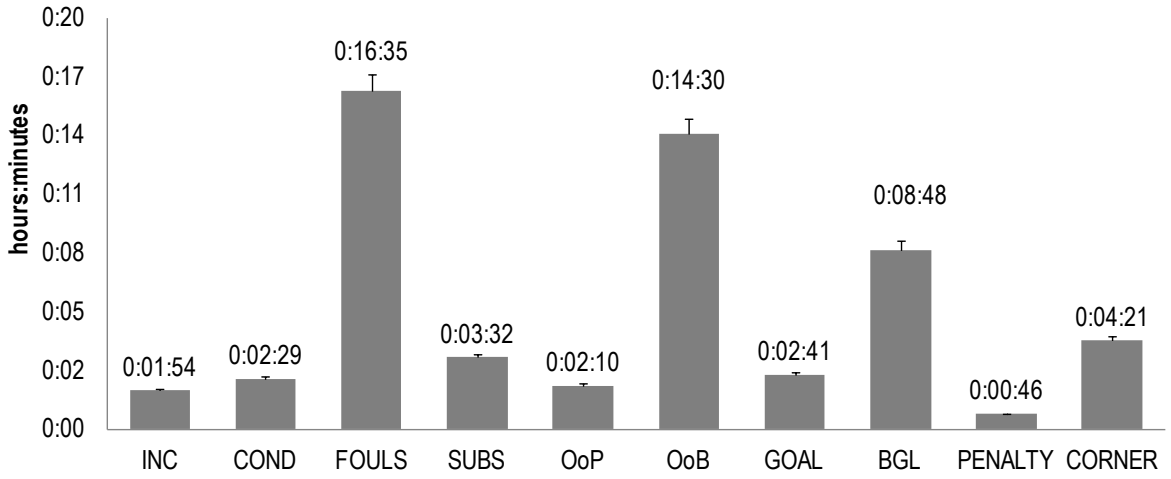

Figure 2. *Mean duration (in minutes and seconds) for the variable Stoppages. INC=Incidents. COND=Conduct. FOULS=Fouls. SUBS=Substitutions. OoP=Out of Play. OoB=Out of Bound; GOAL=Goal. BGL=Beyond the goal line. PENALTY=Penalty. CORNER=Corner.*

Table 5. *Mean, standard deviation, and correlations in all the categories for the variable Game Rhythm.*

	M	*SD*	1	2	3	4	5	6	7	8
1. Match Real Time	1h36'14"	2'03"		-0.14	0.50(**)	-0.11	-0.05	0.17	0.36(*)	0.13
2. Match Effective Time	49"	4'44"			-0.92(**)	0.63(**)	0.53(**)	-0.18	0.06	-0.11
3. Match Pause Time	47'15"	5'23"				-0.58(**)	-0.50(**)	0.23	0.07	0.13
4. Home Ball-Possession Time	25'02"	4'07"					-0.31	0.06	0.05	-0.13
5. Visitor Ball-Possession Time	23'54"	3'52"						-0.29	0.02	0.01
6. Total Number of Pauses	134	15.46							-0.27	0.00
7. Maximum Pause Time	2'04"	35"								-0.00
8. Minimum Pause Time	2"	1"								

***p<0.01. *p<0.05. M= Mean. SD= Standard Deviation.*

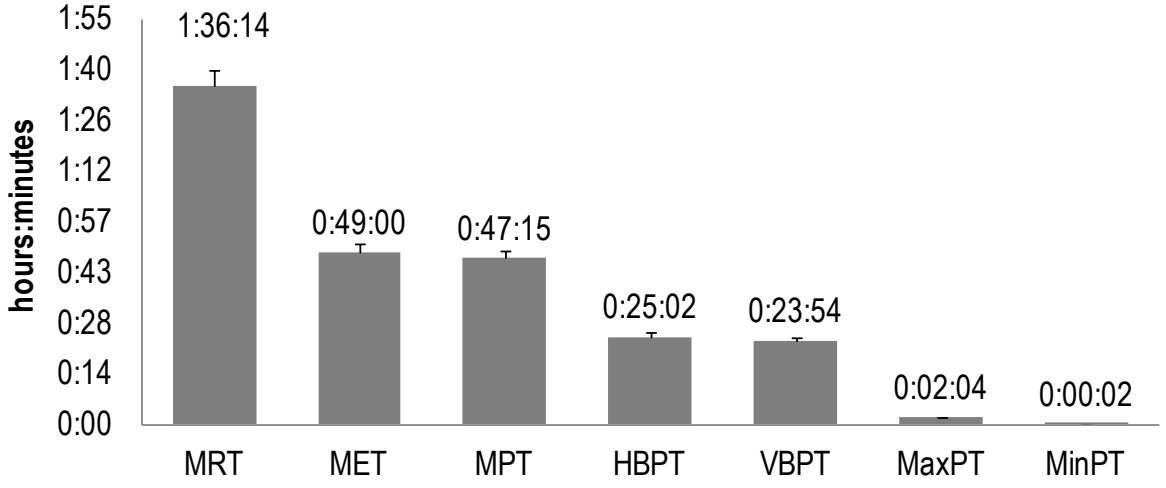

Figure 3. *Mean duration for the variable Game Rhythm. MRT=Match Real Time. MET=Match Effective Time. MPT=Mach Pause Time. HBPT=Home Ball-Possession Time. VBPT=Visitor Ball-Possession Time. MaxPT=Maximum Pause Time. MinPT=Minimum Pause Time.*

Regarding game rhythm the real time of each match totaled an average of 1h36'14"±2'03". The actual time of play is on average 49'±4'44" while the pause time is 47'15"±5'23".

Regarding the variables *game rhythm* and *stoppages* no significant differences were observed in the three categories (2nd A, 2nd B and 3rd), except in *total amount of pauses* (F=8.16; p<0.05) and in the *Fouls* category (F=6.40; p<0.05).

DISCUSSION AND CONCLUSIONS

Authors such as Carling et al. (2006), Lago & Martin-Acero (2005), Jones et al. (2004), and Hughes & Bartlett (2002) refer to a series of collective factors that influence the performance of soccer teams. These factors are related to tactics and strategy but do not provide –unlike the present study– sufficient data allowing for the characterization of game dynamics.

As regards the descriptive and correlational analysis carried out in the present work, only the features considered as the most relevant have been highlighted in order to compare them with the few earlier works that have been found. Thus, regarding game stoppages, Mombaerts (1991), and Castellano et al. (1996) considered that the average was 120 stoppages. Whereas Hernández-Pérez (1994) considered 134 stoppages as the average –which coincides with the average amount of stoppages in our study, also 134.

In our study, the longest total Pause Time corresponds to the categories of Out of Bound (14'30") and Fouls (16'35") with a total average Pause Time of 47'15" per match. There is no comparative data available since our study is the first one to analyse these categories. Given the importance of the studied categories it would seem appropiate to include them in further similar studies.

As regards Game Rhythm (Pause and Participation), Mombaerts (1991) indicates an average Pause Time of 15" and an average Play Time of 22", whereas for Hernández-Pérez (1994), Pause Time is 23" and Play Time is 27.5". For Hernández-Moreno (1996) the average Pause Time is 20" and 17.4" for Participation Time and Castellano (2008) presents 19.2" and 19.5" respectively. I our study total Pause Time was 21.1" and 21.9" for Participation Time, which is very close to the results obtained by Castellano (2008) during the 2008 European National Selection Championship.

In the light of data obtained in this study, it can be stated that, in the description of the implications of pause time in the game dynamics of soccer, some regularities can be observed; such as the fact that the most frequent stoppages are those made due to fouls and out of bound and that the duration of the majority of these stoppages varies within a range of 4 to 7 seconds. It has been observed when comparing the means of pause time among the three divisions (2nd A, 2nd B and 3rd) that its duration of pause time decreases as the category of the teams analyzed is higher. The pauses have shown to be a major element in the study of soccer game rhythm because they take at least half the total time of the match. Consistent with this, it is understood that game rhythm can easily be improved with regulatory modifications such as the elimination of interruptions because of substitutions.

The results obtained from this study on regulatory incidences and their influence on game rhythm may be useful in the design of training plans so as to make them better suited to the game's actual dynamics.

Further research should therefore consider the specificity and game performance indicators used in the present study –and others which may be determined as long as they are referred to strategy and tactics– in order to acquire in-depth knowledge of game action development.

REFERENCES

1. ANGUERA MT. *Aplicación de la metodología observacional al estudio de las conductas motrices*. ULL. Unpublished manuscript; 2006 Doctoral Thesis. [Back to text]
2. CARLING C, WILLIAMS M, REILLY T. *Handbook of soccer match analysis: a systematic approach to improving performance.* London and New York: Routledge; 2006. [Abstract] [Back to text]

3. CASTELLANO J, MASACH J, ZUBILLAGA A. Cuantificación del esfuerzo físico del jugador de fútbol en competición. *Training Fútbol*. 1996; 7:27-42. [Abstract] [Back to text]
4. CASTELLANO J. Análisis de las posesiones de balón en fútbol: frecuencia, duración y transición. *Revista Motricidad. European Journal of Human Movement.* 2008; 21:179-196. [Full Text] [Back to text]
5. CASTELLANO J, CASAMICHANA D. Análisis de los diferentes espacios individuales de interacción y los efectos en las conductas motrices de los jugadores: aplicaciones al entrenamiento del fútbol. *Revista Motricidad. European Journal of Human Movement.* 2009; 23:143-167. [Full Text] [Back to text]
6. HERNÁNDEZ-MORENO J. Tiempo de participación y pausa, y de las incidencias reglamentarias en deportes de equipo. *Revista de Entrenamiento Deportivo.* 1996; 10(1):23-30 y (2):39-43. [Back to text]
7. HERNÁNDEZ-MORENO J, RODRÍGUEZ-RIBAS JP. *La Praxiología motriz: fundamentos y aplicaciones.* Barcelona: INDE; 2004. [Abstract] [Back to text]
8. HERNÁNDEZ-PÉREZ JM. El Tempus como parámetro de la lógica interna del fútbol. *Revista de Entrenamiento Deportivo*. 1994; 8(2):31-35. [Back to text]
9. HUGHES M, BARTLLET R. The use of performance indicators in performance analysis. *J Sport Sci*. 2002; 20:739-754. doi:10.1080/026404102320675602 [Back to text]
10. JONES PD, JAMES N, MELLALIEU SD. Possession as a performance indicator in soccer. *International Journal of Performance Analysis in Sport.* 2004; 1:98-102. [Abstract] [Back to text]
11. LAGO C, ANGUERA MT. Utilización del análisis secuencial en el estudio de las interacciones entre jugadores en el fútbol de rendimiento. *Revista de Psicología del Deporte.* 2003; 12(1):27-37. [Abstract] [Back to text]
12. LAGO C, MARTÍN-ACERO R. Análisis de variables determinantes en el fútbol de alto rendimiento: el tiempo de posesión del balón (abriendo la caja negra del fútbol). *Revista de Entrenamiento Deportivo*. 2005; Tomo XIX (2):13-19. [Back to text]
13. LAGO C, MARTÍN-ACERO R. Determinant of possession of the ball in soccer. *J Sport Sci*. 2007; 25(9):969-974. doi:10.1080/02640410600944626 [Back to text]
14. LAGO C, MARTÍN-ACERO R, SEIRUL·LO F. El rendimiento en el fútbol. Una modelización de las variables determinantes para el F.C. Barcelona. *APUNTS de Educación Física*. 2007; 90:51-58. [Full Text] [Back to text]
15. MARTÍN-ACERO R. Velocidad y/o resistencia de juego y/o equipo (ECD), y del jugador (ED). *Revista Digital.* 2000; 25. [Full Text] [Back to text]
16. MOMBAERTS É. *Football: De l'analyse du jeu á la formation du joueur.* France: Actio; 1991. [Back to text]
17. PARLEBAS P. *Juego deporte y sociedad. Léxico de praxiología motriz***.** Barcelona: Paidotribo; 2001. [Abstract] [Back to text]
18. RODRÍGUEZ-RIBAS JP. *Fundamentos teóricos y metodológicos de la Praxiología Motriz*. Tesis doctoral. Departamento de Educación Física Universidad de Las Palmas de Gran Canaria; 1997. [Back to text]