PROPOSAL OF A PREDICTIVE MODEL FOR THE ATTACK IN WOMEN'S FOOTBALL DEPENDING ON THE PART OF THE MATCH

Rubén Maneiro[1], José Luís Losada[2], Antonio Ardá[3], and Iyán Iván-Baragaño[4]

[1]Department of Science of Physical Activity and Sport, Pontifical University of Salamanca, Salamanca, Spain
[2]Department of Social Psychology and Quantitative Psychology, University of Barcelona, Barcelona, Spain
[3]Department of Physical and Sport Education, University of A Coruña, A Coruña, Spain
[4]Faculty of Sports Sciences, Universidad Europea de Madrid, Madrid, Spain

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Abstract:

Women's football is currently a phenomenon in expansion, both in the number of practitioners and federative records. Scientific research must be at the forefront of this growth, proposing solutions with empirical support that help improve performance not only during training but also during competition. The objective of this study was to propose a multivariate model based on the decision tree technique, with the aim of classifying and predicting the criteria that modulated the attack depending on the part of the match (either the first or second part). To do this, 6063 attacks from the two most recent world championships have been collected and analysed. The available results indicate that, although more attacks occur during the first part, it is in the second part when the goals are scored. In addition, the presented model confirms that the most successful attacks (goal, shot or sending to the area) occur with the score winning or losing, and with a duration of less than 20 seconds. The results of this study can help female soccer coaches to improve the training process of offensive actions and attack.

Key words: *female soccer, performance analysis, decision tree, offensive phase*

Introduction

The analysis of sports performance is a subdiscipline of research in the field of sports sciences (Borms, 2008), which has experienced great interest in the scientific community for two decades now. The consolidation of new methodologies that allow a holistic approach to sports performance (Anguera, Camerino, Castañer, & Sánchez-Algarra, 2014; Castañer, Camerino, & Anguera, 2013), as well as the development of new technologies such as GPS devices, heart rate monitors or new observation-based data collection tools such as LINCE Plus (Soto, Camerino, Iglesias, Anguera, & Castañer, 2019), is leading to new paradigms within the analysis of sport.

Women's sport, and more specifically women's football, has experienced exponential growth in recent years. According to data from the FIFA Research Report, it is estimated that by 2026 more than 60 million girls and women will play football in the world, also enjoying great social and media interest among part of the population (Lago, Lago-Peñas & Lago-Peñas, 2022; Williams, Pope, & Cleland, 2021).

As far as scientific research is concerned, the available works are still not up to the sociological and sports data. Kirkendall (2007) points out that most of the studies on women's sports are focused on injury or physiological aspects, and very few on motor behaviour. In addition, only 20% of the works focus on the analysis of soccer and its variables (Kirkendall & Krustup, 2020). As Cho (2013, in Lago, et al., 2022) points out, women's football is not a by-product of men's football, but the empowerment of women promotes the success of women's football.

Some of the works that have focused on the technical-tactical profile have done so by addressing set pieces (Beare & Stone, 2019; Lee & Mills, 2021; Maneiro, Casal, Ardá, & Losada, 2019), or ball possession and its variables (Maneiro, Losada, Casal, & Ardá, 2020; Maneiro, Losada, Casal, &

Ardá, 2021; Scanlan, Harms, Cochrane, & Ma'ayah, 2020). Regarding the analysis of the offensive phase and the mechanisms for scoring goals, the literature is still scarce (de Jong, Gastin, Angelova, Bruce, & Dwyer, 2020; Iván-Baragaño, Maneiro, Losada, & Ardá, 2021; Iván-Baragaño, Maneiro, Losada, & Ardá, 2022a; Iván-Baragaño, Maneiro, Losada and Ardá, 2022b; Mara, Wheeler, & Lyons, 2012;).

Therefore, the objective of this study was to continue deepening the knowledge of women's football. It has been shown that in men's soccer the parts of the match (the first half or the second half) modify the behavior of players (Greve, Nesbø, Rudi, & Salikhov, 2020). Knowing what criteria or variables are modulating this behaviour in women's soccer can help optimize not only training, but also performance during competition and subsequent success during it. For this, the decision tree statistical technique has been used. This technique is based on a prediction model, based on the information gain presented by each criterion considered.

Methods

For the development of this work, the observational methodology (Anguera, 1979) has been used, a methodology that has been shown to be one of the most suitable for the study of spontaneous behaviour of interaction between athletes, also from its mixed methods aspect (Anguera, et al., 2014; Anguera & Hernández-Mendo, 2016; Castañer, et al., 2013)

The design of this research is punctual, intersessional, multidimensional and nomothetic (Anguera, Blanco-Villaseñor, Hernández-Mendo, & Losada, 2011). Please, note that the observation is governed by the criteria of scientificity, with a total perceptivity and non-participant observer.

Participants

For the selection of participants, an intentional or convenience observational sampling was carried out (Anguera, et al. 2011). The ball possessions executed during the final phase of the FIFA Women's World Cup, specifically the 2015 and 2019 editions, were collected and analysed. In total, 6,063 attacks were analysed. For this, the inclusion criteria proposed by Garganta (1997) were followed. In addition, extra times were not collected as they were considered special situations.

The data collection was carried out through public images broadcast on television, which were of general interest and sponsored by different private entities.

Observational instrument

To carry out this work, the observational instrument proposed by Maneiro et al. (2020) (Table 1) was used, given its good molar-molecular fit in the collection of this type of data, which was used in similar studies on women's football (Iván-Baragaño, 2021).

Table 1. Observational instrument. Source: Maneiro, et al. (2020)

Criteria	Categories
Classification phase	Groups
	Round of 16
	Quarterfinals
	Semifinals
	Final
Half time (match part)	First half
	Second half
Start form	Transition
	Set piece
Interaction context	AR: forward versus delayed line
	AM: forward versus middle line
	AA: forward versus forward line
	MM: middle versus middle line
	MR: middle versus delayed line
	MA: middle versus forward line
	RA: delayed versus forward line
	RM: delayed versus middle line
	PA: goalkeeper versus forward line

Criteria	Categories
Intention	Progress
	Keep
MD	Time the observed team keeps the ball in its defensive zone
MO	Time the observed team keeps the ball in its offensive zone
ZC	Zone in which the team maintained possession the most time
Time possession	Total possession duration
Passes	Number of total passes of the team possessing the ball
Move outcome	Goal scored
	Shot on goal
	Send to area
	No success
Match status	Winning
	Drawing
	Losing
Final score	Win
	Draw
	Lose

The observational instrument is a combination of field format and category systems (Anguera, Magnusson, & Jonsson, 2007), being nested in the different field formats.

Recording and coding

The registration of the data (Hernández-Mendo, et al., 2014) was carried out using the Lince Plus program (Soto, et al, 2019), reaching an inter-concordance value between the observers of 0.83 that was very good according to the scale of Fleiss, Levin, and Paik (2003). Four observers were selected for data collection, three of them Ph.D.s in sports sciences and national-level soccer coaches. In addition, to ensure the quality of the methodological process, a methodologist, an expert in observational methodology also participated in the study (Table 2).

Before the coding process, and to reduce the interobserver variability, eight training sessions were carried out, following Anguera, Blanco-Villaseñor, Losada, and Sánchez-Algarra (1999). The training sessions lasted 2-h each. The first three sessions were carried out in groups with the selected observers. The study was presented to them theoretically, the players' behaviours to be observed were defined, the observational instrument was presented to them, and the observers were trained in the use of the Lince Plus recording instrument. The fourth session consisted of the observation and recording by the observers of 20 offensive actions previously selected by the principal investigator, arranged from the least to the most complex. Once the actions were registered, the discrepancies found were discussed. The fifth and sixth sessions were carried out individually with each of the observers. The delimitation of the registered actions was previously carried out by the principal investigator, and those observed were instructed in the registration of actions. The last two training sessions were also carried out individually, and in them, Cohen's Kappa coefficient of agreement was verified between the principal investigator and each of the observers. Finally, two files were delivered to each of the observers with the offensive actions under analysis.

The data obtained are type IV, that is, concurrent and time-based (Bakeman, 1978). This responds to the fact that there are co-occurrences of players' behaviours.

Analysis of data

To carry out the analyses, the SPSS Statistics 25 program was used. The decision tree is a predictive classification technique that allows the organisation and classification of different predictive criteria based on the information gained from each criterion. In the data analysis, all variables were treated as nominal and each node contained a frequency table showing the number of cases (frequencies and percentages) for each category of the explained criterion. As a growth method, the *Chi-square automatic interaction detector* (CHAID) was used; it consists of a statistical and multidirectional tree algorithm that explores the data quickly and efficiently and creates segments and profiles with respect to the desired result. This growth method chooses at each moment the independent criterion or predictor that presents the strongest association with the dependent criterion at each moment. In the creation of the decision tree, 11 criteria were used without including the "half time" criterion, with a total of 6063 observations from both competitions.

The analysis of sports performance through decision trees has been implemented in different works of the same nature (Iván-Baragaño, et al., 2021; Pic, Lavega-Burgués, & March-Llanes, 2019).

Table 2. Results of Cohen's Kappa analysis for each criterion

Criteria	O1O2	O1O3	O1O4	O2O3	O2O4	O3O4	$\overline{X}$
Classification phase	0.961	0.958	0.953	0.972	0.921	0.949	0.939
Half time (match part)	0.919	0.813	0.906	0.853	0.860	0.847	0.883
Start form	0.985	0.971	0.981	0.942	0.960	0.963	0.967
Interaction context	0.915	0.921	0.941	0.896	0.846	0.871	0.989
Intention	0.839	0.943	0.916	0.864	0.828	0.943	0.888
MD	0.86	0.847	0.826	0.880	0.848	0.874	0.844
MO	0.882	0.827	0.876	0.926	0.888	0.926	0.887
ZC	0.818	0.823	0.813	0.951	0.779	0.723	0.817
Time Possession	0.795	0.791	0.789	0.870	0.91	0.818	0.828
Passes	0.807	0.907	0.829	0.657	0.713	0.763	0.779
Move Outcome	0.872	0.887	0.911	0.793	0.801	0.816	0.846
Match Status	0.829	0.850	0.839	0.718	0.670	0.632	0.756
Final Score	0.919	0.928	0.910	0.988	0.891	0.91	0.954
$\overline{X}^b$	0.860	0.851	0.849	0.841	0.839	0.852	0.831

Results

The CHAID classification tree shows a total of nine nodes, of which six are terminal. The tree has three levels (level 1: partial match result; level 2: time of possession; and level 3: move outcome). The general results of the decision tree model are presented in Table 3.

Next, the prediction criteria of the model are presented in Table 4 (Classification table) and Table 5 (Risk table). In this way, the evaluation of the goodness of the model's operation can be observed. The results in Table 3 indicate that the model correctly classified 63.8% of the cases in general. Specifically, for each category of the dependent criterion, it offered a higher success rate for the "first part" category, with 71.2%.

The optimized decision tree (Figure 1) is presented using the test set. It opens with the first node that corresponds to the "half time" criterion, which is the dependent criterion. In this node, a higher percentage of attacks was observed in the first part (52.4%) compared to the second part (47.6%). This criterion branches into two nodes, node 1 and node 2, belonging to the "match status of the match" criterion, indicating that this is the main predictor criterion (χ^2=295.27; p<.001). Node 1 was formed by the categories "winning" and "losing", presenting a greater occurrence in the second part of the matches (62.3%), compared to node 2, formed by the category "drawing", which occurred mostly in the first part (69.9%). The next criterion that the algorithm introduced from node 1 was MD (time in seconds of own field possession; χ^2=29.57; p<.001), which branches into nodes 3, 4 and 5 (two of them terminal). In these three nodes, the proba-

Table 3. Summary of the presented model

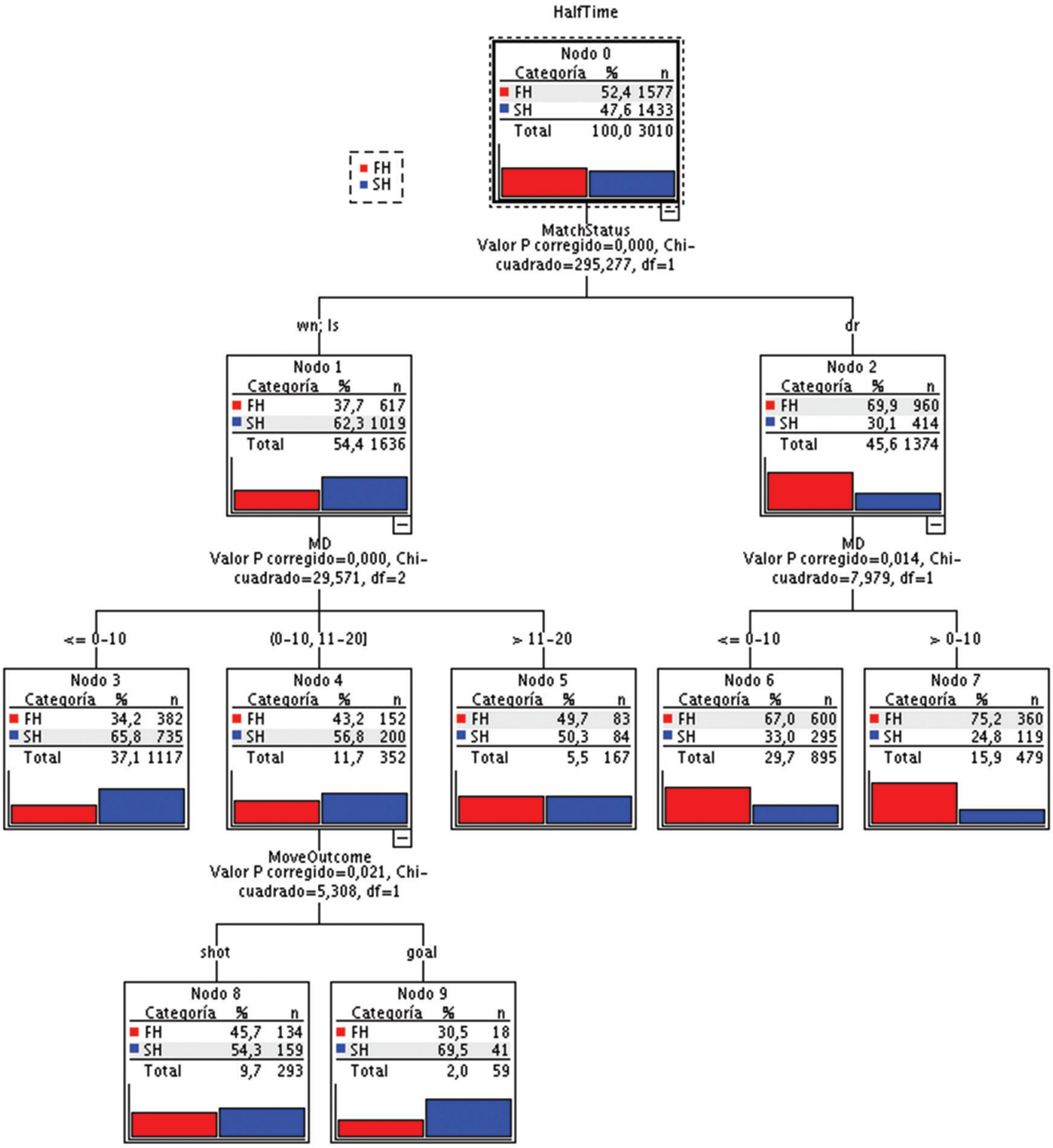
MODEL SUMMARY		
Specs	Growth method	CHAID
	Dependent criterion	Half time
	Independent criteria	*Clasification phase, start form, interaction context, intention, MD, MO, ZC, Time Posssession, Passess, Move Outcome, Match Status, Final Score*
	Validation	Sample division
	Maximum depth	3
	Minimum cases in parent node	100
	Minimum cases in child node	50
Results	Dependent criteria included	*Match Status, MD, Passess, Move Outcome, ZC, Intention*
	Number of nodes	9
	Number of terminal nodes	5
	Depth	3

Table 4. Classification of the model

Classification				
Sample	Observed	Predicted		
		FH	SH	Percent correct
Training	FH	1160	467	71.3%
	SH	561	875	60.9%
	Overall percentage	56.2%	43.8%	66.4%
Contrast	FH	1100	445	71.2%
	SH	641	814	55.9%
	Overall percentage	58.0%	42.0%	63.8%
Growing methods: CHAID Dependent criterion: HalfTime				

Table 5. Risk of the predictive model

Risk		
Sample	Estimate	Típ. Error
Training	.336	.009
Contrast	.362	.009
Growing methods: CHAID Dependent criterion: HalfTime		



Note. Nodo: node; Valor P corregido: corrected p-value; categoría: category; chi cuadrado: Chi squared.

Figure 1. Representation of the decision tree model for the attack in women's football.

bility of the attacks taking place in the second part decreased as the MD variable increased. On the other hand, node 2 also included the MD criterion as the one that presented the greatest information gain (χ^2=7.97; p=.014), and a greater probability was observed that the possessions carried out through a partial result of "drawing", took place in the first part. This node branches off into two terminal nodes (node 6 and node 7). In node 6 it was found that possessions lasting less than 10 seconds in their own half occurred mainly in the first half (67%), and in the same way, the probability that an attack lasting more than 10 seconds in their own field and developed in the partial result of "drawing" took place in the first part was 75.2% (node 7, n=479). Finally, the last criterion that presented the greatest information gain from node 4 was "final result" (χ^2=5.30; p=0.02), which branches into two terminal nodes (node 8 and node 9). For node 8, the data revealed that the attacks that ended by a shot on goal occurred predominantly in the second part (54.3%); in the same way as in node 9: those possessions that ended with a goal scored occurred mainly in the second half (69.5%), both nodes under the influence of the MD criterion (10-20 seconds) and the "partial result: winning or losing".

Discussion and conclusions

The main objective of this study was to find out which criteria may be modulating the effectiveness of the attack in women's football depending on the particular part of the match. For this, the statistical analysis focused on the search for a classification model based on the creation of a decision tree that provides validation tools for the exploratory and confirmatory classification analysis, assigning an adequate level of measurement to all the variables of analysis.

In general terms, it is possible to affirm that the available results corroborate the alternative of the teams that bet on an offensive style of play, as the best option to score a goal or to shoot on goal. In addition, it is possible to affirm that, despite the fact that there are more attacks or offensive phases during the first parts, the highest efficiency rates in terms of goals scored were found in the second parts. In applied terms, it is plausible to think that the teams attack more in the first parts, but with less success, being the second ones where there is an imbalance in the scoreboard. In addition, offensive success is not based on a gradual construction of the attack, but the available data advocates for a quick attack, of less than 20 seconds from the recovery of possession. Specifically, seven out of 10 goals were scored in the second half, with attacks that did not exceed 20 seconds and with the match score winning or losing for the executing team. One of the possible explanations for a higher rate of efficacy in the second half may be associated with the physical exhaustion of the players of the lower-level teams (Krustrup, Mohr, Ellingsgaard, & Bangsbo, 2005), the inability to maintain established tactical standards set previously by the coaches, or to the great differences in performance between the best and not so good teams, as has already been evidenced in recent works (Iván-Baragaño, et al., 2022b).

Broadly speaking, these results corroborate the results of previous studies on men's soccer (Fernández-Navarro, Fradua, Zubillaga, & McRobert, 2018; Sgrò, Aiello, Casella, & Lipoma, 2017; Tenga, Holme, Ronglan, & Bahr, 2010), as well as on women's football (Iván-Baragaño, et al, 2021, 2022b). The success of the attack in football, regardless of the gender of players, is based on brief actions, with a quick transition towards the rival goal and mainly carried out in the second parts of the matches.

In the absence of more research that makes it possible to have more scientific evidence, the success of the attack in women's football does not present great differences in terms of its male counterpart in its general construction. This opens a new path towards the tactical understanding of women's football in its offensive phase and complements other previous recommendations based on technical (Soroka & Bergier, 2010) and physical or physiological aspects (Casanova, Travassos, Ferreira, Garrido, & Costa, 2020; Krustrup, et al, 2005).

The present study was proposed with the objective of predicting and classifying which were the variables or criteria that may be modulating the attack in women's soccer from the perspective of a particular part of the match. The available results highlight the value of short-duration attacks preferably in the second parts of the matches. These tips could help teams increase their potential offensive success during matches.

References

Anguera, M.T. (1979). Observational typology. *Quality and Quantity*, *13*(6), 449-484.

Anguera, M.T. & Hernández-Mendo, A. (2016). Avances en estudios observacionales en Ciencias del Deporte desde los *mixed methods.* [Advances in observational studies in sports sciences from the mixed methods.] *Cuadernos de Psicología del Deporte, 16*(1), 17-30.

Anguera, M.T., Blanco-Villaseñor, A., Hernández-Mendo, A., & Losada, J.L. (2011). Diseños observacionales: ajuste y aplicación en psicología del Deporte. [Observational designs: Adjustment and application in sport psychology.] *Cuadernos de Psicología del Deporte*, *11*(2), 63-76.

Anguera, M.T., Blanco-Villaseñor, A., Losada, J.L., & Sánchez-Algarra, P. (1999). Análisis de la competencia en la selección de observadores. [Analysis of the competition in the selection of observers.] *Metodología de las Ciencias del Comportamiento*, *1*(1), 95-114.

Anguera, M.T., Camerino, O., Castañer, M., & Sánchez-Algarra, P. (2014). Mixed methods en la investigación de la actividad física y el deporte. [Mixed methods in physical activity and sport research.] *Revista de Psicología del Deporte, 23*(1), 123-130.

Anguera, M.T., Magnusson, M.S., & Jonsson, G.K. (2007). Instrumentos no estándar. [Non-standard instruments.] *Avances en Medición, 5*(1), 63-82.

Bakeman, R. (1978). Untangling streams of behavior: Sequential analysis of observation data. In G.P. Sackett (Ed.), *Observing behaviour*, Vol. II: Data collection and analysis methods (pp. 63-78). University Park Press.

Beare, H., & Stone, J.A. (2019). Analysis of attacking corner kick strategies in the FA women's super league 2017/2018. *International Journal of Performance Analysis in Sport*, *19*(6), 893-903. doi: 10.1080/24748668.2019.1677329

Borms, J. (2008). *Directory of sport science: A journey through time: The changing face of ICSSPE*. Human Kinetics.

Casanova, N.R., Travassos, B.R., Ferreira, S.S., Garrido, N.D., & Costa, A.M. (2020). Concentration of salivary cortisol and testosterone in elite women football players: Analysis of performance in official matches. *Kinesiology*, *52*(1), 1-9. doi: 10.26582/k.52.1.1

Castañer, B.M., Camerino, F.O., & Anguera, A.M.T. (2013). Mixed methods in the research of sciences of physical activity and sport. *Apunts. Educació Física i Esports*, *2013*(112), 31-36.

de Jong, L.M., Gastin, P.B., Angelova, M., Bruce, L., & Dwyer, D.B. (2020). Technical determinants of success in professional women's soccer: A wider range of 248 variables reveals new insights. *PloS One*, *15*(10), 249. doi: 10.1371/journal.pone.0240992

Fernández-Navarro, J., Fradua, L., Zubillaga, A., & McRobert, A.P. (2018). Influence of contextual variables on styles of play in soccer. *International Journal of Performance Analysis in Sport, 18*, 423-436. doi: 10.1080/24748668.2018.1479925

Fleiss, J.L., Levin, B., & Paik, M.C. (2003). *Statistical methods for rates and proportions*, (3rd ed.) Hoboken: John Wiley & Sons.

Garganta, J. (1997). *Modelaçao táctica do jogo de Futebol. Estudo da organizaçao da fase ofensiva em equipas de alto rendimiento.* [Tactical modeling of the football game. Study of the organization of the offensive phase in high performance teams.] (Doctoral thesis, Universidad de Oporto).

Greve, H.R., Nesbø, J., Rudi, N., & Salikhov, M. (2020). Are goals scored just before halftime worth more? An old soccer wisdom statistically tested. *PloS One*, *15*(10), e02404. doi: 10.1371/journal.pone.0240438.

Hernández-Mendo, A., Castellano, J., Camerino, O., Jonsson, G., Blanco-Villaseñor, A., Lopes, A., & Anguera, M.T. (2014). Programas informáticos de registro, control de calidad del dato, y análisis de datos. [Observational software, data quality and data análisis.] *Revista de Psicología del Deporte, 23*(1), 111-121.

Iván-Baragaño, I. (2022). *Análisis de la fase ofensiva en fútbol femenino: hacia una comprensión del proceso ofensivo desde el paradigma de métodos mixtos.* [Analysis of the offensive phase in women's soccer: Towards an understanding of the offensive process from the mixed methods paradigm.] (Doctoral thesis, Universidade da Coruña).

Iván-Baragaño, I., Maneiro, R., Losada, J.L., & Ardá, A. (2022a). Posesión de balón en fútbol femenino: el juego de las mejores selecciones. [Ball possession in women' s football: The game of the best teams.] *Retos*, *44*, 1155-1161. doi: 10.47197/retos.v44i0.92584

Iván-Baragaño, I., Maneiro, R., Losada, J.L., & Ardá, A. (2022b). Tactical differences between winning and losing teams in elite women's football. *Apunts Educación Física y Deportes*, *147*, 45-54. doi: 10.5672/apunts.2014-0983.es.(2022/1).147.0

Iván-Baragaño, I., Maneiro, R., Losada, J.L., & Ardá, A. (2021). Multivariate analysis of the offensive phase in high-performance women's soccer: A mixed methods study. *Sustainability*, *13*, 6379. doi: 10.3390/su13116379

Kirkendall, D.T. (2007). Issues in training the female player. *British Journal of Sports Medicine, 41*, 64-67. doi: 10.1136/bjsm.2007.036970

Kirkendall, D.T., & Krustrup, P. (2022). Studying professional and recreational female footballers: A bibliometric exercise. *Scandinavian Journal of Medicine and Science in Sports*, *32*, 12-26. https://doi.org/10.1111/sms.14019

Krustrup, P., Mohr, M., Ellingsgaard, H.E.L.G.A., & Bangsbo, J. (2005). Physical demands during an elite female soccer game: Importance of training status. *Medicine and Science in Sports and Exercise*, *37*(7), 1242.

Lago, I., Lago-Peñas, S., & Lago-Peñas, C. (2022). Waiting or acting? The gender gap in international football success. *International Review for the Sociology of Sport*, *57*(7), 1139-1156. doi: 10.1177/10126902211060727

Lee, J., & Mills, S. (2021). Analysis of corner kicks at the FIFA Women's World Cup 2019 in relation to match status and team quality. *International Journal of Performance Analysis in Sport*, 21(5), 679-699. doi: 10.1080/24748668.2021.1936408

Maneiro, R., Casal, C.A., Ardá, A., & Losada, J.L. (2019). Application of multivariant decision tree technique in high performance football: The female and male corner kick. *PloS One*, *14*(3), e0212549. doi: 10.1371/journal.pone.0212549

Maneiro, R., Losada, J.L., Casal, C.A., & Ardá, A. (2020). The influence of match status on ball possession in high performance women's football. *Frontiers in Psychology*, *11*, 487. doi: 10.3389/fpsyg.2020.00487

Maneiro, R., Losada, J.L., Casal, C.A., & Ardá, A. (2021). Identification of explanatory variables in possession of the ball in high-performance women's football. *International Journal of Environmental Research and Public Health*, *18*(11), 5922. doi: 10.3390/ijerph18115922

Mara, J., Wheeler, K., & Lyons, K. (2012). Attacking strategies that lead to goal scoring opportunities in high level women's football. *International Journal of Sports Science and Coaching, 7*(3), 565-577. doi: 10.1260/1747-9541.7.3.565

Pic, M., Lavega-Burgués, P., & March-Llanes, J. (2019). Motor behaviour through traditional games. *Educational Studies, 45*, 742-755. doi: 10.1080/03055698.2018.1516630

Scanlan, M., Harms, C., Cochrane Wilkie, J., & Ma'ayah, F. (2020). The creation of goal scoring opportunities at the 2015 Women's World Cup. *International Journal of Sports Science and Coaching*, *15*(5-6), 803-808. doi: 10.1177/17479541209420

Sgrò, F., Aiello, F., Casella, A., & Lipoma, M. (2017). The effects of match-playing aspects and situational variables on achieving score-box possessions in Euro 2012 Football Championship. *Journal of Human Sport and Exercise, 12*(1), 58-72. doi: 10.14198/jhse.2017.121.05

Soroka, A., & Bergier, J. (2010). Actions with the ball that determine the effectiveness of play in women's football. *Journal of Human Kinetics*, *26*(1), 97-104.

Soto, A., Camerino, O., Iglesias, X., Anguera, M.T., & Castañer, M. (2019). LINCE PLUS: Research software for behavior video analysis. *Apunts. Educació Física i Esports*, *3*(137), 149-153. doi: 10.5672/apunts.2014-0983.es.(2019/3).137.11

Tenga, A., Holme, I., Ronglan, L.T., & Bahr, R. (2010b). Effect of playing tactics on goal scoring in Norwegian professional soccer. *Journal of Sports Sciences, 28*, 237-244. doi: 10.1080/02640410903502774

Williams, J., Pope, S., & Cleland, J. (2021). 'Genuinely in love with the game' football fan experiences and perceptions of women's football in England. *Sport in Society*, published online ahead of print. doi: 10.1080/17430437.2021.2021509

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Correspondence to:
Rubén Maneiro, Ph.D.
Pontifical University of Salamanca
37007 Salamanca, Spain
Phone: 923125027-207
E-mail: rmaneirodi@upsa.es; rubenmaneirodios@gmail.com

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