

## The analysis of discriminant factors related to team match performances in the 2012 European Football Championship.

FRANCESCO SGRO<sup>1</sup>, MATTEO BARRESI<sup>2</sup>, MARIO LIPOMA<sup>1</sup>

<sup>1</sup>Human and Society Sciences Faculty, University of Enna “Kore”

<sup>2</sup> University of Cassino, ITALY

Published online: September 28, 2015

(Accepted for publication september 09, 2015)

DOI:10.7752/jpes.2015.03069;

### Abstract:

The aim of this work was to identify the indicators related to team match performances (i.e., the scoring opportunities and offensive and defensive strategies) that could discriminate between winning or losing teams in the matches played in the 2012 European Football Championship. In order to achieve such an objective, we have analyzed the matches did not end in a draw within the regulation time by means of the notational analysis approach. The one-way analysis of the performance indicators revealed that the scoring opportunities (i.e., goals, number of shots, and effectiveness) and the number of assists were the significant differing indicators between the winning and losing teams. The discriminant analysis returned a cross-validated model with a classification accuracy of about 80%. Goals and assists were the discriminants that are most significant for the explanation of the match's result. This work provides specific technical and tactical insights that may be useful for coaches and trainers in the preparation of high-level and short-duration competitions.

**Key Words:** EURO 2012, notational analysis, scoring-opportunities indicators, offensive-defensive indicators, multivariate analysis.

### Introduction

During high-level and short-duration competition, such as the European Football Championship and the Football World Cup, the mission of a coach is to identify the key elements of the opponent teams' performances in order to properly train his or her own team for success. The notational analysis has been defined as a valid and reliable methodology with which to study the performances of the teams involved in high-level competitions of different sports (Hughes & Franks, 2004). The objective analysis of the performances allows each coach to gather useful indications related to the strengths and weaknesses of the next opponents (Carling, Reilly, & Williams, 2009). The validity of a notational analysis system, however, is deeply tied to the choice of appropriate performance indicators, which have to be defined by objectively combining uniquely identifiable elements in the events under analysis (Hughes & Bartlett, 2002). As such, the arrangement of the indicators is closely related to the sport's characteristics.

In football, the number of goals is the main element that is used to describe the result of a match. For this reason, it has been deeply investigated in previous studies (Hughes & Franks, 2005; Yiannakos & Armatas, 2006; Tenga, Holme, Ronglan, & Bahr, 2010; Clemente, Couceiro, Martins, & Mendes, 2012; Njororai, 2013). Besides the number of goals, a meaningful parameter is the result of a match, which also been widely discussed in several studies (Barreira, Garganta, & Anguera, 2011; Castellano, Casamichana, & Lago, 2012; Delgado-Bordonau, Domenech-Monforte, Guzmán, & Mendez-Villanueva, 2013). The performance indicators that were proposed in the aforementioned studies can be grouped into three broad categories: a) scoring opportunities, such as goals, shots on goal, and shots effectiveness; b) offensive indicators, including possession, type of action, free kicks, penalties, and corners; c) defensive indicators, such as shots against, shots on goal against, fouls, corners against, yellow cards, and valid offsides. The findings of these studies have suggested that: a) the indicators that are directly related to the scoring opportunities (i.e., the number of goals, shots on goal, and shot effectiveness) are statistically the most significant for explaining the differences between winning and losing teams; b) the indicators related to the offensive actions (i.e., assists, number of passes, and types of possession) are meaningful in differentiating the outcomes of the scoring opportunities, but with a smaller discriminant level; c) the role of the defensive actions needs to be better addressed in future studies. Castellano and colleagues (2012) have also achieved similar findings considering multivariate analysis models, which they used to analyze the interaction of such indicators with the result of the matches.

In previous studies about the 2012 European Football Championship (EURO 2012) (Leite, 2013; Njororai, 2014), the indicators related to the aforementioned offensive strategies and the frequency of goals in each period of the matches have been addressed to identify a relationship of these parameters with the number of goals. The

findings of these studies have confirmed the importance of scoring opportunities for explaining the difference in the match results (Leite, 2013), particularly if such opportunities led to goals in the last 15 minutes of the match (Njororai, 2014). However, previous studies suggested that, in short-duration competition, the goal is not a good criterion if the notational analysis approach has been used (Tenga, *et al.*, 2010). Furthermore, the analysis of the one-by-one relationship between the goals and their determinants (i.e., the performance indicators) has been specified as a methodological limit for such type of research (Castellano, *et al.*, 2012).

According to the previous considerations, this study could serve as a continuum on the study of the team match performances during EURO 2012 and aimed at identifying the technical and tactical parameters could be useful in explaining the result of the matches. To this purpose, the assumption under analysis was the identification of the indicators that best discriminate between winning and losing teams in high-level and short-duration competitions.

## Material & Methods

### *Participants and Procedures*

Sixteen teams whose ranking level has been considered more or less the same played in the EURO 2012 competition. From the matches of this competition, we have analyzed the twenty-four ones that did not end up in a draw in the regular time (90 minutes plus any injury time). The videos of the matches were acquired from the website [www.raisport.rai.it](http://www.raisport.rai.it) and were downloaded to one hard disk for the off-line evaluation. The LongoMatch software has been used for playing the videos, while the notational analysis of the matches has been performed by using an electronic datasheet. This datasheet has been implemented following the methodological indications provided by Hughes and Franks (2004). An operator with certified expertise in notational analysis analyzed all matches twice, with a minimum interim of three weeks between the two evaluation sessions.

### *Performance indicators*

According to the aforementioned assumptions, the dependent variable that was used to investigate the discriminants of the team match performance was the result of the match, which was codified at two levels: winning and losing. The independent variables related to the team-match performances have been grouped into three different categories (Table 1). The macro-categories and the related indicators were in agreement with the methodological approach proposed in previous studies (Lago-Peñas, Lago-Ballesteros, Dellal, & Gómez, 2010; Castellano, *et al.*, 2012; Delgado-Bordonau, *et al.*, 2013).

Table 1. The team-match performance indicators analyzed in the EURO 2012 competition.

Groups of indicators	Performance indicators	Description
<b>Indicators related to the scoring opportunities</b>	Goals	Number of goals in a match.
	Total shots	Number of shots that lead to a goal or to a scoring opportunity in a match.
	Effectiveness	Effectiveness of the shots, estimated using the following formula: $\text{Goals} \times 100 / \text{Total shots}$ (Lago-Peñas, <i>et al.</i> , 2010).
<b>Indicators related to the offensive strategies</b>	Assists	Number of passing that lead to a goal.
	Offsides	Number of offsides identified during an offensive action.
	Corners	Number of corners identified during an offensive action.
	Free kicks	Number of free kicks that lead to a goal or to a scoring opportunity.
	Actions in pre-offensive zone	Number of offensive actions (e.g., shot on goal) ended up in the zone of the pitch between the line of midfield and $\frac{3}{4}$ of the pitch according to the direction of attack (Figure 1 - Zone c).
	Actions in offensive zone	Number of offensive actions (e.g., shot on goal) ended up in the zone of the pitch between $\frac{3}{4}$ of the pitch and the goal line according to the direction of attack (Figure 1 - Zone d).
<b>Indicators related to the defensive strategies</b>	Corners against	Number of corners identified during a defensive action.
	Free kicks against	Number of kicks identified during a defensive action.

Actions in pre-defensive zone	Number of offensive actions (e.g., shot on goal against) ended by the opponent team in the zone of the pitch between the line of midfield and $\frac{3}{4}$ of the pitch opposite to the direction of attack (Figure 1 - Zone b).
Actions in defensive zone	Number of offensive actions (e.g., shot on goal against) ended by the opponent team in the zone of the pitch between $\frac{3}{4}$ of the pitch and the goal line opposite to the direction of attack (Figure 1 - Zone a).

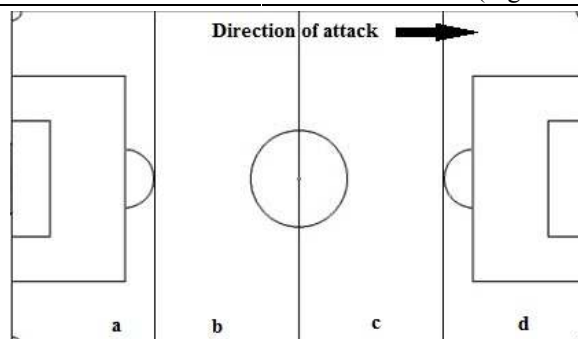


Figure 1. The playing pitch divided in four main zones: (a) Defensive zone; (b) Pre-defensive zone; (c) Pre-offensive zone; (d) Offensive zone. (Gréhaigne, Mahut, & Fernandez, 2001).

#### Statistical Analysis

The reliability of the intra-operator observations has been verified by means of the inter-class correlation coefficient; it was estimated on the data of five matches that were randomly chosen between those under analysis. Afterwards, we performed the descriptive analysis of the data (i.e., the mean, standard deviation, and median), and the analysis of normality through the Shapiro-Wilk test and the visual inspection of the skewness and kurtosis indexes. Considering that the distributions were non-normal, the one-way effect of the performance indicators on the dependent variable was studied through the non-parametric Kruskal-Wallis H test. The discriminant analysis was finally performed to identify which of the proposed performance indicators may be considered discriminant for the results of the matches. The results of the discriminant analysis have been studied considering the power of the discriminants and rate of correct classification of the matches with respect to the levels of the dependent variable. The discriminants have been interpreted considering the values of the structure coefficients (SC) that are greater than or equal to .30 (Tabachnick & Fidell, 2007). A cross-validation process has been also performed in order to verify the ability of the discriminant function to correctly classify new data (Sampaio, Janeira, Ibáñez, & Lorenzo, 2006). The statistical analyses have been performed using the SPSS software (SPSS, ver. 21, IBM), while the level of significance was set to  $p < .05$ .

#### Results

The rates of the intra-operator reliability, which was estimated by using the inter-class correlation coefficient, are reported in Table 2.

Table 2. The results of the inter-class correlation analysis.

Parameters	Formula	Result
Error rate	(Disagreements observations / total number of events) x100	4 %
Reliability Coefficient	100% – error rate	96 %

The error rate value (4%) could be considered adequate for the performance evaluations achieved by means of the notational analysis approach (Hughes, Lipoma, & Sibilio, 2010). Table 3 presents the results of the descriptive analysis and the Kruskal-Wallis H test for the game-related statistics of winning and losing teams.

Table 3. Differences between winning and losing teams in the game statistics from EURO 2012.

Variables	Winning			Losing			p*
	M	SD	Median	Mean	SD	Median	
<b>Indicators related to scoring opportunities</b>							
Goal	2.17	1.04	2.00	.58	.71	.00	<.01
Total shots	5.75	2.80	5.00	3.38	1.66	3.50	<.01
Effectiveness	41.19	17.65	33.3	15.34	19.06	0.00	<.01
<b>Indicators related to offensive strategies</b>							
Assists	1.54	1.02	1.50	.46	.65	.00	<.01

Offsides	2.29	1.70	2.00	1.50	1.88	1.00	.06
Corners	5.50	2.96	5.38	5.54	3.67	5.00	.83
Free kicks	.83	1.01	.05	.46	.72	.00	.18
Actions in pre-offensive zone	52.71	9.95	51.00	51.08	11.78	51.00	.63
Actions in offensive zone	63.54	10.98	63.00	66.50	12.06	65.50	.36
<b>Indicators related to defensive strategies</b>							
Corners against	5.33	3.00	5.00	5.54	3.67	5.00	.88
Free kicks against	.46	.72	0.00	.83	1.01	.50	.18
Actions in pre-defensive zone	51.13	11.76	51.50	52.63	9.95	51.00	.66
Actions in defensive zone	66.50	12.07	65.50	63.50	11.04	63.00	.37

The analysis of the univariate differences for the indicators related to the scoring opportunities showed a clear and significant difference between winning and losing teams. The number of goals [ $\chi^2(1)=22.95$ ,  $p<.01$ ] and the effectiveness [ $\chi^2(1)=15.19$ ,  $p<.01$ ] were the most significant, even if the difference in the number of the total shots [ $\chi^2(1)=9.12$ ,  $p<.01$ ] was statistically significant as well.

Considering the indicators related to the offensive actions, only the difference in the number of assists was statistically significant [ $\chi^2(1)=15.22$ ,  $p<.01$ ], while the number of the offside was clearly higher for the winning teams than the losing ones, even if slightly and not statistically significant [ $\chi^2(1)=3.51$ ,  $p=.06$ ]. Of note, in this group the mean and median values of the winning teams are always higher than the losing ones, except for the number of actions that ended up in the pre-offensive zone.

The differences of the performance indicators related to the defensive actions were not statistically significant. However, the frequency of these indexes was higher for the losing teams than for the winning ones, with the only difference for the number of actions ended up in the pre-defensive zone.

The discriminant analysis was performed to verify the presence of possible discriminants of the dependent variable. Considering the assumptions of the aforementioned analysis, the violation of the assumption of the normality was not a limit (Lachenbruch, 1975). Since Box's M-test was not statistically significant, the covariance matrices of the two levels of the dependent variable were assumed to be equals and, therefore, the heteroskedasticity assumption was verified. Furthermore, the effectiveness parameter was excluded from the analysis because it is closely related to the goals and the total shots indicators, so it was considered as a multivariate outlier. The discriminant function highlighted a significant level of association between the dependent variable and the performance indicators, accounting for 61% of the matches' result variability. The model of this function had the following characteristics: Wilks's  $\lambda=.39$ ,  $\chi^2(12)=37.69$ ,  $p=.00$ , eigenvalue=1.56, canonical correlation=.78. A closer analysis of the structure matrix revealed that the significant predictors with the highest score were goals scored (SC=.71), assists (SC=.51), and the number of shots (SC=.42). The classification results revealed that the matches were correctly classified in 91.7% of the cases in the original model, with the losing result classified with an accuracy level that was higher (95.8%) than the winning result (87.5%). The results of cross-validation have been characterized by a lower accuracy (79.2%), with the winning team better classified than the losing ones. Table 4 shows the classification results of the discriminant function.

Table 4. Classification results of the discriminant analysis.

	Match Result	Predicted Group membership (%)	
		Winning	Losing
Original	Winning	87.5	12.5
	Losing	4.2	95.8
Cross-Validated	Winning	83.3	16.7
	Losing	29.2	70.8

## Discussion

This study aimed to identify the indicators that are related to team match performances which were able to explain the differences between winning and losing teams in the EURO 2012 tournament. Of note, the hypothesis that was verified was whether the indicators were able to discriminate the match result. In this respect, we used a methodological approach that has been widely adopted by several researchers in similar studies related to football (Lago-Peñas, *et al.*, 2010; Castellano, *et al.*, 2012) or other sports (O'Donoghue & Ingram, 2001; Hughes & Franks, 2004; Sampaio, *et al.*, 2006; Lupo, Tessitore, Minganti, & Capranica, 2010; Lupo, Condello, Tessitore, 2012). Likewise, the use of the match result as a criterion was already proposed in several works related to high-level and short-duration competitions (Barreira, *et al.*, 2011; Castellano, *et al.*, 2012; Delgado-Bordonau, *et al.*, 2013). EURO 2012 teams' performances were already addressed in previous studies. Some of those research efforts assessed the relationship between the time evolution of the match and the determinants of the scoring opportunities and the strategies that led to the goals (Leite, 2013; Njororai, 2014). Others researchers looked for the key elements of the performance of a selected group of teams (i.e., those that qualified for the quarter-finals) (Shafizadeh, Taylor, & Lago-Peñas, 2013). In agreement with the indications provided in a previous study about the analysis of the team performances in a tournament with similar

characteristics as the EURO 2012 (e.g., teams with the same ranking level, short duration) (Tenga, *et al.*, 2010), and unlike the previous research related to EURO 2012, the indicators we used were not directly or exclusively related to the goals scored.

Concerning this study, the relation between the matches' result, the scoring opportunities, and the play strategies are in agreement with a previous study (Castellano, *et al.*, 2012). Likewise, the winning teams showed higher frequency scores in the indicators related to the scoring opportunities and the offensive strategies than the losing teams, while this trend was reversed for the indicators related to the defensive strategies.

In detail, the results related to the scoring opportunities indicators revealed that the goals, the total shots, and the effectiveness are higher for the winning teams than for the losing ones. Similar results have been reported in previous studies (Grant, Williams, Reilly, & Borrie, 1999; Hughes & Churchill, 2005; Yiannakos & Armatas, 2006; Lago-Peñas, *et al.*, 2010; Leite, 2013).

The results related to the offensive actions showed statistically significant differences only in the assists although, even if not significant, the offsides were also meaningful. These findings were in agreement with the results obtained by Lago-Peñas and colleagues (2010), who have found that the performances of winning teams are characterized by a larger number of assists than the losing ones. The same study also determined that there were statistically significant differences in the offside and cross indicators. Concerning the assists, Armatas and colleagues provided similar results (Armatas, Yiannakos, Zaggelidis, Papadopoulou, & Fragkos, 2009). The current analysis of the pitch zones where the offensive actions ended provided results that supported those obtained regarding Euro 2004 by Yiannakos and Armatas (2006), while the results on the effectiveness of the corners and the free kicks were partially in agreement with the aforementioned study.

The indicators related to the defensive strategies showed differences of absolute means and medians between winning and losing teams that were lower than the ones obtained for the offensive strategies. None of these performance indicators resulted in statistically significant differences with respect to the match result. This finding partially disagreed with the results of previous studies related to the Spanish League (Lago-Peñas, *et al.*, 2010) and to the comparison of the three editions of the Football World Cup (Castellano, *et al.*, 2012). A possible explanation for these differences accounted for the analyzed sample (which referred to the number of events under analysis) and the levels of the dependent variable (the draw was also considered as a match result in the other studies). The authors of the study on the Spanish League (Lago-Peñas, *et al.*, 2010) had a total number of events that were significantly higher than the one in this study, and they also considered the draw as a possible level of the dependent variable. Of note, the authors did not provide the results of the post-hoc test between the three levels of the dependent variable. In the study on the three editions of the World Cup (Castellano, *et al.*, 2012), the results of post-hoc tests regarding the indicators of the defensive strategies showed that the most significant differences concerned the relationship of the win or loss with the draw result. However, we believe that the choice of different indicators related to the defensive strategies should be the subject of further studies.

The results of the discriminant analysis show that several indicators related to the scoring opportunities and the offensive strategies are able to discriminate between the match results in EURO 2012. This finding confirms the hypothesis addressed in this study. The discriminants model confirmed the significant role of the performance indicators concerned with the scoring opportunities and the offensive strategies in winning the game. This finding is supported by other studies related to EURO 2012 in which the indicators directly related to the goals have been suggested as a key element for the one-by-one statistical investigation of teams' performance (Leite, 2013; Njororai, 2014). Of note, the results of the present study confirmed these findings by also using a methodological approach based on multivariate analyses. The cross-validated level of the classification accuracy is a satisfying result for the purposes of this study and it is a valid starting point for future studies related to new and different discriminants' performance indicators.

The results obtained in the present study may provide useful elements for the technicians and the trainers of high-level national teams because we have identified several key elements of the team match performances that could serve as the main components of physical and tactical workouts. However, these results were conditioned by the following limits, which shall be the subjects of further studies: 1) the number of the analyzed events was relatively small, so an highest number of events, for example addressing more competitions of the same type (i.e., more editions of World and European championships), shall be necessary to validate the discriminant model that is proposed here; 2) some indicators related to the offensive and defensive strategies were not significant, hence their definition will be more accurate and objective (Hughes & Bartlett, 2002). Furthermore, the indicators must account for other elements of the team match performances, as well the type of the offensive strategies (e.g., possession or direct play), the space (i.e., the pitch zones) and the time (i.e., the first and second halves) playing aspects (Olsen & Larsen, 1997). The relation between the strategies and the time and space playing aspects needs to be addressed, as well.

### Conclusions

The aim of this work was to determine which indicators are the most useful to characterize the match results of the teams that participated in EURO 2012. The current results show that the indicators that are directly related to the scoring opportunities and the offensive strategies are the most important for winning the match. These results can affect the mission of the coaches toward the accurate training of the playing patterns related to the offensive strategies. At the same time, they represent useful elements for planning the right defensive strategies related to

the different opponents. Moreover, starting with these results, it is possible to research new or different indicators that could explain with greater accuracy and validity the team match performances in high-level and short-duration tournaments.

## References

- Armatas, V., Yiannakos, A., Zaggelidis, G., Papadopoulou, S., & Fragkos, N. (2009). Goal scoring patterns in Greek top leveled soccer matches. *Journal of Physical Education and Sport*, 23(2), 1-5.
- Barreira, D., Garganta, J., & Anguera, T. (2011). In search of nexus between attacking game-patterns, match status and type of ball recovery in European Soccer Championship 2008. In Hughes M., Dancs H., & Nagyvaeadi N. (Eds.), *Research Methods and Performance Analysis*, 226, 226-237.
- Carling, C., Reilly, T., & Williams, A. (2009). *Performance assessment for field sports*. London: Routledge.
- Castellano, J., Casamichana, D., & Lago, C. (2012). The Use of Match Statistics that Discriminate Between Successful and Unsuccessful Soccer Teams. *Journal of Human Kinetics*, 31, 137-147.
- Clemente, F., Couceiro, M., Martins, F., & Mendes, R. (2012). Team's performance on FIFA U17 World Cup 2011: Study based on notational analysis, *Journal of Physical Education and Sport*, 12(1), 13-17.
- Delgado-Bordonau, J.L., Domenech-Monforte, C., Guzmán, J.F., & Méndez-Villanueva, A. (2013). Offensive and defensive team performance: relation to successful and unsuccessful participation in the 2010 Soccer World Cup. *Journal of Human Sport & Exercise*, 8(4), 894-904.
- Gréhaigne, J. F., Mahut, B., & Fernandez, A. (2001). Qualitative observation tools to analyse soccer. *International Journal of Performance Analysis in Sport*, 1(1), 52-61.
- Grant, A. G., Williams, A. M., Reilly, T., & Borrie, T. (1999). Analysis of the goals scored in the 1998 World Cup. *Journal of Sports Sciences*, 17(10), 826-827.
- Hughes, M.D., & Bartlett, R.M. (2002). The use of performance indicators in performance analysis. *Journal of Sports Sciences*, 20(10), 739-754.
- Hughes, M., & Franks, I.M. (2004). *Notational analysis of sport: Systems for better coaching and performance in sport*. Abingdon: Routledge.
- Hughes, M., & Churchill, S. (2005). Attacking profiles of successful and unsuccessful teams in Copa America 2001. In Reilly T., Cabri J., & Araújo D. (Eds.) *Science and Football V*, 219-224, London and New York: Routledge.
- Hughes, M., & Franks, I. (2005). Analysis of passing sequences, shots and goals in soccer. *Journal of Sports Sciences*, 23(5), 509-514.
- Hughes, M., Lipoma, M., & Sibilio, M. (2010). *Performance analysis: elementi di base e aspetti applicativi in campo educativo e integrativo*. Milano: Franco Angeli.
- Lachenbruch, P. A. (1975). *Discriminant analysis*. NY: Hafner.
- Lago-Peñas, C., Lago-Ballesteros, J., Dellal, A., & Gómez, M. (2010). Game-related statistics that discriminated winning, drawing and losing teams from the Spanish soccer league. *Journal of Sports Science & Medicine*, 9(2), 288-293.
- Leite, W.S. (2013). Euro 2012: analysis and evaluation of goals scored. *International Journal of Sports Science*, 3(4), 102-106.
- Lupo, C., Tessitore, A., Minganti, C., & Capranica, L. (2010). Notational analysis of elite and sub-elite water polo matches. *The Journal of Strength & Conditioning Research*, 24(1), 223-229.
- Lupo, C., Condello, G., & Tessitore, A. (2012). Notational analysis of elite men's water polo related to specific margins of victory. *Journal of sports science & medicine*, 11(3), 516-525.
- Njororai, W.W.S. (2013). Analysis of goals scored in the 2010 world cup soccer tournament held in South Africa. *Journal of Physical Education and Sport*, 13(1), 6-13.
- Njororai, W.S.S. (2014) Timing of Goals Scored in Selected European and South American Soccer Leagues, FIFA and UEFA Tournaments and the Critical Phases of a Match. *International Journal of Sports Science*, 4(6A), 56-64.
- O'Donoghue, P., & Ingram, B. (2001). A notational analysis of elite tennis strategy. *Journal of Sports Sciences*, 19(2), 107-115.
- Olsen, E. & Larsen, O. (1997). Use of match analysis by coaches. In T. Reilly, J. Bangsbo, & M. Hughes (Eds.), *Science and Football III*, 209-220. London: E & FN SPON.
- Sampaio, J., Janeira, M., Ibáñez, S., & Lorenzo, A. (2006). Discriminant analysis of game-related statistics between basketball guards, forwards and centres in three professional leagues. *European Journal of Sport Science*, 6, 173-178.
- Shafizadeh, M., Taylor, M., & Lago-Peñas, C. (2013). Performance consistency of international soccer teams in Euro 2012: A time series analysis. *Journal of Human Kinetics*, 38, 213-226.
- Tabachnick, B.G., & Fidell, L.S. (2007). *Using Multivariate Statistics* (5th ed), Boston, MA: Allyn & Bacon.
- Tenga, A., Holme, I., Roglan, L.T., & Bahr, R. (2010). Effect of playing tactics on goal scoring in Norwegian professional soccer. *Journal of Sports Sciences*, 28(3), 237-244.
- Yiannakos, A., & Armatas, V. (2006). Evaluation of the goal scoring patterns in European Championship in Portugal 2004. *International Journal of Performance Analysis in Sport*, 6(1), 178-188.