Technical performance profiles in the European Football Championship 2016

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Published online: December 28, 2016

(Accepted for publication December 15, 2016)

DOI:10.7752/jpes.2016.04207

Abstract

The main aim of this study was to analyse the differences amongst the technical performance profiles of the teams involved in the 2016 European Football Championship. A k-means cluster analysis was preliminarily performed to identify the close matches of that tournament. Then, the team-match statistics gathered from the official website of the Union of European Football Championship (UEFA) were grouped into three categories: variables related to shots, variables related to possessions and passes, and variables related to defensive processes. Furthermore, the level of strength of each team was estimated by means of FIFA ranking coefficients (i.e., the situational variable), and this was used as a dependent variable in further analysis. Technical performance profiles according to the team's level of strength were established by using the median and the upper and lower quartiles of convenient team-match statistics. Several team-match statistics related to the shots and to the possessions and passes were statistically different between high- and low-level teams, with the effect size of these differences ranging from small to moderate. The differences between high- and intermediate-level teams and between intermediate- and low-level teams were less consistent in magnitude (i.e., the effects size of the differences are small). Indeed, the technical performance profiles analysed here seem to suggest that the level of strength reflects the level of technical efficiency of the teams, and this evidence is primarily related to the technical elements of the offensive processes (i.e., shoots, passes and possessions). This information could be useful for supporting coaches during the design of training sessions according to an evaluation of the performance of the next opponent.

Keywords: EURO 2016; team-match statistics; reliability analysis; technical proficiency; UEFA official data.

Introduction

Nowadays, the coaching process is deeply influenced by the use of scientific methodologies for the assessment and evaluation of a team's match performance. The aforementioned methodologies are based on the use of convenient digital aids to acquire several data on a single performer or overall teams. These data are then used for singular analysis (i.e., movement trajectory, peak of acceleration or metabolic power) or for collecting match statistics (i.e., number of relevant performance indicators for each sport discipline).

From practitioners' point of view, coaches are usually interested in the analysis of the performance profiles of their own players and those of opposing teams because they better reflect the in-field characteristics of the players' performance, the technical level of proficiency and the tactical behaviours. In this respect O'Donoghue (2013) suggested that performance profiles can be defined by gathering and combining valid and reliable data related to sport-specific performance indicators, but those data have to be acquired from multiple matches. Indeed, although several sport disciplines are characterised by highly complex and dynamic systems due to the sport-specific nature (i.e., soccer), adequate performance profiles could be represented by applying statistical analysis to sufficient match observations. Specifically, teams' performance profiles in football and their variations can be obtained by applying medians and quartiles to team-match indicators (O'Donoghue, 2005).

Considering the relevant role of performance profiles for soccer science and coaching, several studies have addressed convenient performance aspects in different professional football tournaments (Eugster, 2012; Liu, Yi, Gimenez, Gómez, & Lago-Peñas, 2015; Liu, Gómez, Gonçalves, & Sampaio, 2016). Of note, Eugster (2012) and Liu and colleagues (2015) have underlined how the performance profiles obtained by means of combining different team-match statistics have seemed adequate for assessing the technical performance of players and teams. Accordingly, they have properly defined a technical performance profile and have suggested that as representatives for improving the practical application of research evidence (Liu, et al., 2016). Concurrently, variations in the technical performance profiles of elite teams are influenced by situational variables, such as the strength of the team and its opposition, the level of tournament, match outcomes and match location (Taylor, Mellalieu, James, & Barter, 2010). Specifically, previous studies have assessed the influence of the aforementioned situational variables on the technical and tactical performance of international elite teams at

the behavioural level (Taylor, et al., 2010; Gómez, Lago-Peñas, & Pollard, 2013) by analysing the variations of technical team-match statistics related to scoring and offensive and defensive processes. Lago (2009) suggested that statistics related to scoring and offensive processes seem to be strictly related to the level of strength in elite football teams. However, the evidences on the link between performance profiles and situational variables are limited (Liu et al., 2015), but it seems to be warranted towards improving the level of knowledge about national teams' performance in football (Sgrò, Aiello, Casella, & Lipoma, 2016). For what concerns the team-match statistics, several studies accounted for the data obtained by means of notational analysis processes and supported those by discussing the results of reliability analysis related to the observations of two or more skilled notational analysts involved in the aforementioned processes (Sgrò, Barresi, & Lipoma, 2015), while others directly used data provided by specialists and commercial companies (e.g., Sportsdata Spain Company). Team-match statistics are now provided, without any restriction or payment, by the official websites of international tournaments (e.g., UEFA Euros, Fédération Internationale de Football Association (FIFA) World Cups) as well. However, these sources of data have not been previously used for gathering data processed in any scientific study, though they could represent an interesting resource for researchers of performance analysis in soccer. Of note, a reliability analysis of those data has to be performed before their usage in research studies.

Regarding football tournaments in Europe, the European Football Championships (EUROs) are the main tournaments for national teams, and the last edition was played last summer (EURO 2016). At this time, the performance of the teams involved in that tournament has not been analysed; however, several studies have addressed, from different points of view and with different research approaches, the team-match performances of the previous edition of the same championship (EURO 2012) (e.g., Collet, 2013; Sgrò, et al., 2015; Moura, Santana, Vieira, Santiago, & Cuhna, 2015; Sgrò, et al., 2016). Thus, the amount of available research seems to suggest significant relevance in the performance of this tournament and justifies new studies towards providing evidence on team-match performance related to EURO 2016.

Therefore, the main aim of the current study was to assess the differences amongst team performance profiles according to the teams' level of strength. In this respect we have hypothesised that the team-match statistics of high-level teams would show significant differences in comparison with the ones of the teams grouped in the low levels of strength.

Method

Sample

The performances of the 24 teams involved in European Football Championship 2016 were analysed, and we gathered data related to the fifty-one matches played throughout the competition. According to a previous study (Sgrò et al., 2016), we removed the data of five matches because they ended due to injury time and/or penalties. Furthermore, in agreement with the indications provided in previous studies about the relevant role of close games in a study related to performance analysis in soccer (Gómez, Gómez-Lopez, Lago, & Sampaio, 2012; Liu et al., 2015), a k-means cluster analysis was preliminarily performed to identify a cut-off value for the goal differences for each match of the tournament and, accordingly, to classify the matches as close or unbalanced. In this respect the results of the analysis revealed two clusters: the first included 42 close games, with a difference of less than 3 goals ($n=84$ observations), and the second included 4 unbalanced games, with a difference of more than 3 goals. Only the data of the first cluster were processed in further statistical analysis. The Ethics Committee of the University of Enna approved the research methodology proposed in this study.

Performance and situational variables

The performance-related match events gathered from the UEFA's official website were divided into three groups: (1) variables related to shots: total attempts, attempts on target, attempts off target, attempts blocked and attempts on post; (2) variables related to pass and possession processes: corners, possessions (%), passes and passes completed; and (3) variables related to defensive processes: clearances, balls recovered, blocks and tackles. Moreover, the strength of the teams was also identified as a situational variable. In this respect the FIFA season club coefficients, retrieved from the FIFA's website at the end of the tournament (11 August 2016), were used for identifying three levels of strength: The teams were of the high level if their coefficients ranged from 1401 to 1155, the intermediate level if their coefficients ranged from 1137 to 915 or the low level if their coefficients ranged from 875 to 656.

Reliability of Data Source

In order to verify the reliability of the data gathered from the UEFA's official website, we performed a reliability analysis by using the data hosted on the public access website "whoscored.com" as criteria. Indeed, the reliability of the tracking system (OPTA Client System) used for collecting the football match statistics provided by that website was verified in a previous study (Liu, Hopkins, Gomez, & Molinuevo, 2013). In regard to the current data, the correspondences between the variable names on the UEFA and "whoscored.com" sites, respectively, and the results of the aforementioned analysis are provided in Table 1.

Table 1 – Reliability analysis of technical variables.

UEFA technical variable	“Whoscored.com” technical variable	ICC Coefficient
Total Attempts	Total Shots	.993
Attempts on target	Shots on target	.989
Attempts off target	Shots off target	.974
Attempts blocked	Shots blocked	.965
Attempts on woodwork	Shots on post	.962
Corner	AccuracyCorner + InaccuracyCorner	.993
Possession	Possession%	.604
Passes	Total Passes	.993
Passes Completed	AccurateShortPasses + AccurateLongPasses	.994
Clearances	Clearances	.911
Balls Recovered	Saves+Intercepts	.306
Tackles	Total Attempted Tackles	.131
Block	PassesBlocked	.369

Note: ICC – Inter-Class Correlation

According to the interpretation provided by Fleiss (1986), the reliability of the UEFA technical variable is excellent if the ICC coefficient is $> .75$, modest if it ranges from $.40$ to $.74$, and poor if it is less than 0.40 .

Data Analysis

The first step of the current analysis was to verify whether the distributions of the performance variables were normal or not. According to previous studies (O'Donoghue, 2005; Liu, et al., 2015), typical teams' performance profiles, variations and spreads can be represented by averages and standard deviations if the performance variables are normally distributed or by median, lower and upper quartile if those variables are not normally distributed. Then, for identifying the differences of the performance profiles amongst the teams grouped according to their levels of strength, the performance variables were tested by means of one-way analysis of variance and independent sample T-test with Bonferroni-Holm correction for multiple comparisons in the first case (normally distributed) and Kruskal-Wallis H and Mann-Whitney U tests with Bonferroni-Holm corrections for multiple comparisons in the second case, respectively. Finally, in order to compare the profiles' characteristics of the teams grouped by the three levels of strength by means of the same radar chart, the performance variables were estimated as Z-scores and were then unified within the same scale by means of the following formula: $T=20Z+50$ (Barriopedo and Muniesa, 2012). The magnitude of the differences of the performance profiles amongst the levels of strength were evaluated by considering the effect size measure estimated, for each comparison, with Cohen's d or with the following formula: $r=Z/\sqrt{N}$, where Z was obtained by means of the Mann-Whitney test and N was the overall observations for parametric or nonparametric data, respectively. The effect size measures were interpreted with the following criteria: $.00-.20$, trivial; $.21-.49$, small; $.50-.79$, moderate; $>.80$, large (Cohen, 1977). SPSS 20.0 for Mac OS X (IBM Statistics, Armonk, NY: IBM Corp.) was used for performing the parametric and nonparametric analyses, while Microsoft Excel 2011 (Redmond, WA: Microsoft) was used for drawing the radar chart. The significance level was set to $p<0.05$ for all analyses.

Results

The analysis of the normality of the performance variables' distributions, performed by means of the Kolmogorov-Smirnov test, revealed that many of the variables were not normally distributed. In this respect further analyses were performed with nonparametric tests. Moreover, only the variables with a reliability coefficient larger than poor were processed. The descriptive statistics of each performance variable according to the relevant level of strength are shown in Table 2.

Table 2. Descriptive statistics of performance profiles of teams grouped in three levels of strength.

Variable	High-level (n=26)		Intermediate-level (n=24)		Low-level (n=34)	
	M	[L, U] Quar.	M	[L,U] Q	M	[L,U] Q
Total attempts	17.0	[17.0, 21.0]	13.5	[9.0, 18.0]	9.0	[6.0, 13.25]
Attempts on target	5.5	[3.0, 7.0]	4.5	[2.2, 6.0]	3.0	[2.0, 4.0]
Attempts off target	6.5	[4.7, 8.2]	5.0	[3.0, 7.7]	4.0	[2.0, 6.0]
Attempts blocked	4.0	[3.0, 6.2]	3.0	[2.0, 4.7]	2.0	[1.0, 4.0]
Attempts on post	0.0	[0.0, 1.0]	0.0	[0.0, 0.0]	0.0	[0.0, 1.0]
Corner	7.0	[6.0, 9.0]	4.0	[2.2, 7.0]	4.0	[2.0, 5.0]
Possession (%)	57.0	[46.7, 60.7]	53.0	[45.0, 57.7]	43.5	[37.7, 51.5]
Total Passes	523.0	[418.0, 613.0]	406.0	[325.2, 520.7]	312.5	[251.2, 408.0]
Passes completed	457.5	[333.7, 560.7]	347.5	[259.2, 456.2]	248.0	[186.5, 334.2]
Clearances	16.0	[11.75, 21.50]	18.0	[15.0, 26.0]	19.0	[13.75, 26.50]

Note: M= Median; [L, U] Q = Lower and Upper Quartiles. Results are counts except for Possession.

The analyses of the differences for each performance variable amongst the levels (Kruskall-Wallis H test) are shown in Table 3.

Table 3. Differences among performance profiles of teams grouped in three levels of strength.

Variable	High-level Mean Rank	Intermediate-level Mean Rank	Low-level Mean Rank	χ^2	df	p
Total attempts	57.3	45.7	28.9	20.57	2	.000
Attempts on target	55.6	45.3	30.5	16.20	2	.000
Attempts off target	52.5	44.8	33.2	9.68	2	.008
Attempts blocked	53.5	42.8	33.9	9.77	2	.008
Attempts on post	49.5	38.3	40.0	4.83	2	.089
Corner	62.7	37.3	30.7	27.09	2	.000
Possession (%)	53.7	46.4	31.1	13.51	2	.001
Total Passes	59.8	43.1	28.9	23.69	2	.000
Passes completed	60.0	43.6	28.3	24.89	2	.000
Clearances	37.2	43.1	46.0	1.94	2	.378

Note: χ^2 : Chi-squared statistics; df: Degrees of Freedom.

Considering the overall significance of the differences in almost all performance variables, Mann-Whitney tests, with Bonferroni-Holm correction for multiple comparisons, were performed to address the differences in the performance variables between the levels in pairs of two. In this respect significant differences were found for: total attempts between high-level and low-level ($U=151.5$, $p<.001$, moderate difference) and between intermediate-level and low-level ($U=237.5$, $p<.05$, small difference); attempts on target between high-level and low-level ($U=184.0$, $p<.001$, moderate difference) and between intermediate-level and low-level ($U=259.5$, $p<.05$, small difference); attempts off target between high-level and low-level ($U=242.5$, $p<.05$, small difference); attempts blocked between high-level and low-level ($U=241$, $p<.01$, small difference); corners between high-level and low-level ($U=95$, $p<.001$, moderate difference) and between high-level and intermediate-level ($U=134.5$, $p<.01$, moderate difference); percentage of possessions between high-level and low-level ($U=209.5$, $p<.01$, small difference) and between intermediate-level and low-level ($U=254$, $p<.05$, small difference); number of passes between high-level and low-level ($U=131.5$, $p<.001$, moderate difference), high-level and intermediate-level ($U=173$, $p<.05$, small difference) and intermediate-level and low-level ($U=255$, $p<.05$, small effect); passes completed between high-level and low-level ($U=123.5$, $p<.001$, moderate difference), high-level and intermediate-level ($U=176$, $p<.05$, small difference) and intermediate-level and low-level ($U=244$, $p<.05$, small difference). Finally, the differences in the performance profiles amongst the levels of strength are shown in Figure 1.

Figure 1. Difference of the performance profiles among the three levels of strength.

Note: a=significant difference between High- and Intermediate-level; b=significant difference between High- and Low-level; c=significant difference between Intermediate- and Low-level.

Discussion

The aim of this study was to provide the first analysis of the match performance of the teams involved in the last European Football Championship (EURO 2016). In this respect we gathered data related to team-match statistics from the UEFA's website, and we defined three groups of variables: the first group included the variables related to shots, the second included the variables related to passes and possessions, and the third group included the match statistics related to defensive processes. Furthermore, we defined a situational variable (i.e., the level of strength) by grouping the teams into three levels of strength according to their coefficients in the FIFA ranking, available online at the end of the tournament. In this respect we verified the reliability of the data acquired from the UEFA's website and whether the team-match statistics related to the technical level were different amongst the teams grouped by their levels of strength.

Reliability analysis of the match-event statistics gathered from the UEFA's official website was performed considering data provided by the website "whoscored.com" as the reference values. The results of the current analysis provided a mixed level of reliability; in detail, according to the interpretation provided by Fleiss (1986), the levels of inter-class correlation coefficients ranged from high to modest for all the variables related to shots and passes, as well as for the clearance variables, while the coefficients of the other variables related to the defensive processes were poor. Therefore, we can state that several of the match statistics gathered from the UEFA's website and analysed in this study could be considered reliable for studying team-match performance. The current analyses and graph revealed that performance indicators related to offensive processes (i.e., shots, passes and possession) were significantly different between the high-level and low-level teams, while the differences between the contiguous levels were less consistent and clear. The clearances variable was not statistically different amongst the teams grouped according to the level of strength. These results seem to reflect the grouping process according to the level of strength and confirm the relevant role of the situational variables in the analysis of team-match performance in soccer (Taylor et al., 2010; Lago-Peñas, 2012). Furthermore, they are in agreement with previous studies because the variables related to the offensive processes have been previously indicated as the most relevant elements for describing the differences between teams considering the relative level of strength (Lago, 2009) or the match outcomes (Sgrò, et al., 2015; 2016).

The teams grouped in the high-level exhibited consistent differences in the indicators related to shots with the teams grouped in the low-level, and the size effect of these differences ranged from small to moderate. In detail, the total attempts and the attempts on target revealed the highest differences, while the differences related to the attempts off target and the blocked attempts were less substantial. Regarding the possession and pass variables, the differences between the aforementioned levels seemed to be broader than those of the shot group. Overall, the aforementioned analysis seemed to suggest that the high-level teams played with possession play strategies more broadly than the low-level teams. This strategy seemed to be more adequate for producing scoring opportunities, and this evidence is in agreement with the findings obtained in previous studies (Collet, 2013), as well as with reference to previous European Football Championships (Sgrò et al., 2016).

Considering the performance profiles of high- and intermediate-level teams, the passes variables were significantly different, though their effects were small. In this respect the teams of these levels seemed to produce similar scoring opportunities, but the high-level teams seemed to use more passes than the intermediate-level teams for performing their offensive processes; accordingly, the number of corners performed by the high-level teams was significantly higher than for intermediate-level teams. Indeed, the high-level teams seemed to be more technically and strategically prepared than the other teams. This result is in agreement with the differences in technical profiles of the teams involved in the UEFA Champions League (Liu et al., 2015), even if the previous study did not provide the results of the post hoc comparison amongst the levels of strength for any performance indicators. Of note, the low number of parameters statistically different between these levels of strength identified the need for a more in-depth analysis for addressing, with a high level of accuracy, the differences between teams with very similar levels of strength.

Finally, the current analysis revealed that the differences between the performance profiles of intermediate- and low-level teams were identified by two variables related to the shot group (i.e., total attempts and attempts on target) and by three variables related to the possession and passes group (i.e., possession, and total and completed passes, respectively). In this respect the intermediate-level teams seemed to produce more scoring opportunities than the low-level teams by performing offensive processes with possession strategy, and this result could be related to the differences in technical proficiency amongst the teams grouped by different levels of strength. However, the effect size measure of these differences was small for each variable, and this confirmed again the need to conduct further analyses for better explaining the differences between the patterns of play performed by these teams. In this respect the analysis of the smallest worthwhile differences amongst the performances is warranted.

The current findings are limited by several elements. First, we did not provide comparison with other situational variables (e.g., level of tournament, match status), which need to be accounted for in further studies to improve the results of the current analysis. Second, we did not analyse the interactions between the performance indicators and the situational variable, but those interactions need to be considered to verify if and how the performance profiles could change throughout the tournament.

In conclusion, to the best of the authors' knowledge, the current results represent the first analysis of the team-match performance of EURO 2016, and this could signify a first step towards providing several findings about this tournament. Moreover, we have provided a reliability analysis of the data gathered from the official UEFA website, and this could be used for choosing these data for further match-analysis studies. Regarding the practice implications of these results, we have identified that the teams at the high level seem to be more technically and strategically prepared than the other teams because they produce more scoring opportunities and they seem to prefer a possession strategy for their offensive processes. These differences in the pattern of play are consistent, and with a moderate effect, in the comparison between high- and low-level teams, while the comparison between contiguous levels of strength revealed limited difference effects. In this respect coaches could prepare their teams while keeping in mind how the playing strategies of opponent national teams, in the analysed tournament, seem to be strictly related with their level of strength.

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