Journal of Physical Education and Sport ® (JPES), 12(1), Art 3, pp. 13 - 17, 2012
online ISSN: 2247 - 806X; p-ISSN: 2247 – 8051; ISSN - L = 2247 - 8051 © JPES

Original Article

Team's Performance on FIFA U17 World Cup 2011: Study based on Notational Analysis

FILIPE CLEMENTE[1], MICAEL COUCEIRO[2], FERNANDO M. L. MARTINS[3 4], RUI MENDES[3 5]
[1]*RoboCorp, Faculty of Sport Sciences and Physical Education – University of Coimbra, PORTUGAL*
[2]*RoboCorp, Engineering Institute of Coimbra – Polytechnic Institute of Coimbra, PORTUGAL*
[3]*RoboCorp, Coimbra College of Education – Polytechnic Institute of Coimbra, PORTUGAL*
[4]*Instituto de Telecomunicações (Covilhã), PORTUGAL*
[5]*Interdisciplinary Centre for the Study of Human Performance – Lisbon Technical University, PORTUGAL*

Published online: March 31, 2012
(Accepted for publication March 08 2012)

Abstract
The main objective of the notational analysis of the game includes optimizing feedback to the performer and coach to improve performance (Liebermann, Katz, Hughes, Bartlett, McClements & Franks, 2002). The main objective of this work was to analyze the profile of the teams that competed on FIFA U-17 World Cup at 2011, most exactly, trying understanding the offensive profile of the most successful teams. In this way we applied the test of correlation to verify if the goals for average are related to number of matches (i.e., more successful teams). There is statistical evidence to assert that the pairs (wins and goals) are positively moderating related ($p = 0.001$). In fact it appears that there is a directly intimacy between pairs (since the linear correlation coefficient $r(24) = 0.774$), i.e., how much more goals for average, more wins happens. Through the analysis of dependent variables is possible to say that teams who wins more games, have a superior mean of goals per match but, in the case of goals against, the teams that achieve the higher level in competition have higher mean of the goals against. However are the teams that play more matches that show higher level of goals for average.
Key words: Notational Analysis, team performance, football, goals scored.

Introduction

Performance analysis refers to the objective of recording and analyze of behavioral events that happens during sporting competition on individual players or teams (Carling et al., 2005; Dellal, et al., 2010; Lago-Peñas & Dellal, 2010). The main objective of the notational analysis of the game includes optimizing feedback to the performer and coach to improve performance (Liebermann, Katz, Hughes, Bartlett, McClements & Franks, 2002). However, the information given to the coach, need to be an important and relevant information to understand the reality. A well-designed system provides the coach with accurate and reliable information that is easily gathered and has an impact on subsequent practice and performance (Carling, Williams & Reilly, 2005). In this way, the performance parameters researched are one of the most important factors to provide quality to analyze. A performance indicator is a selection, or combination, of action variables that aims to define some aspects of a performance in a given sport and, these performance indicators, should relate to successful performance or outcome (Hughes & Bartlett, 2002). Therefore effective evaluation of these components requires knowledge of the contextual factors that can potentially affect performance (Taylor, Mellalieu, James & Shearer, 2008).

The targeting of lines of investigation has expanded its field of analysis to the notational analysis and, most recently, developing the time-motion analysis, through which it seeks to identify in detail the number, type and frequency of motor tasks performed by the players or teams over game (Garganta, 2001). Notational analysts have focused on general match indicators, tactical indicators and technical indicators (Hughes & Bartlett, 2002). This kind of analysis is commonly used to investigate the technical aspects of football performance through recording behaviour incidence and outcomes (e.g., Hughes & Bartlett, 2002; Taylor, Mellalieu, James & Shearer, 2008).

Investigating of notational analysis in football has generally been focused upon goal scoring and patterns of build-up play leading to shots (Hughes and Franks, 2005; Jones et al., 2004; Lago-Peñas, Lago-Ballesteros, Dellal & Gómez, 2010). Studies shows that scoring goals is the ultimate determinant of success in football and has thus received considerable attention in the specific literature (Jones, James, & Mellalieu, 2004; Lago, 2009). Therefore, in football, one aspect of a team's performance may be appraised by the ratio of goals scored to shots attempted by the team (Hughes & Bartlett, 2002). In this way, two main findings arose from the analyses of Reep, Pollard and Benjamin (1971): 1) approximately 80% of goals resulted from a sequence of three passes or less and; 2) a goal is scored every 10 shots. Through this studies several coaches used these results to evolve a

Corresponding Author: Filipe Clemente: *Email:* Filipe.clemente5@gmail.com

simple tactical approach to football, which was to maximize the ''chance'' elements of the game in favour of their teams (Hughes & Franks, 2005).

Different models of the game can represent the collective tendency to be offensive or defensive, to act in order to attack most fast or more slowly. In fact, the model of the game and the context can influence the typology of the performance resulting at changes of the performance indicators. For example, some studies (e.g., Bate, 1988) showed that goals happens when teams played with direct method (i.e., goals happens with less sequence of passes). The approach had proved successful with some teams in the lower divisions of the English League (Hughes & Franks, 2004). However, with the evolution of the professional football, other styles of play have emerged, with more sequence of passes before the shot, i.e., teams try to find the best moment to attack with efficacy, maintaining the ball and the control of the game, waiting for the mistake or equilibrium break of the opponent. Actually exist different styles of play where happens more or less opportunities to shot and to make a goal. However the fundamental on competition is win. In this way is important understand how the offensive attempts and goals (i.e., efficacy) are related with the classification of the team on competition.

The main objective of this work was to analyze the profile of the teams that competed on FIFA U-17 World Cup at 2011, most exactly, trying understanding the offensive profile of the most successful teams.

Methodology

Sample

The data used on our study was obtained through official website of FIFA U-17 World Cup 2011 (http://www.fifa.com/u17worldcup/index.html). More specifically, we obtained the data for the dependent variables of: 1) goals for; 2) goals against; 3) goals for average; 4) matches played; 5) shots; 6) shots per match; 7) shots on goal; 8) shots on goal per match; 9) shots wide; 10) shots wide per match; 11) efficacy; 12) wins; 13) draws; 14) losses.

Main Questions of the Study

With this study we try analyzed the relationship between offensive variables trying characterizing the most successful teams in competition and how dependent variables relate to each other. In this way we propose to analyze the next questions:

i) Numbers of matches wins are related with the number of shots?
ii) Numbers of matches wins are related with the goals for average?
iii) Numbers of matches wins are related with the goals for?
iv) Numbers of matches' losses are related with the goals against?
v) Numbers of matches wins are related with the level of efficacy?
vi) Goals are related to number of shots?

Statistical Procedures

For the correlation analysis, we used the parametric Pearson's r test. Tests for linear correlation of Pearson apply when intended to test whether the relationship between two variables exists.

Results

To the interpretation of the results is important to consider that the teams that play more matches represent the teams that achieved the higher classification, winning more games.

Through the analysis of dependent variables is possible to say that teams who wins more games, have a superior mean of goals per match but, in the case of goals against, the teams that achieve the higher level in competition have higher mean of the goals against. However are the teams that play more matches that show higher level of goals for average. In this way we applied the test of correlation to verify if the goals for average are related to number of matches (i.e., more successful teams). There is statistical evidence to assert that the pairs are positively moderating related ($p = 0.001$). In fact it appears that there is a directly intimacy between pairs (since the linear correlation coefficient $r(24) = 0.774$), i.e., how much more goals for average, more wins happens.

Table 1. Descript statistics of sample

	Matches Played	Goals for per match	Goals Against per Match	Goals for average	Shots per Match	Shots on Goal per match	Shots Wide per Match	Efficacy%	Wins	Draws	Losses
3	Mean	0.8	0.6	0.6	11.4	4.6	6.8	5.8	0.1	1.0	1.9
	Std. Deviation	0.5	0.4	0.4	2.8	1.8	2.0	4.3	0.4	0.8	0.6
	Median	1.0	0.7	0.7	12.0	4.0	7.0	6.5	0.0	1.0	2.0
	Minimum	0.0	0.0	0.0	8.0	2.0	4.0	0.0	0.0	0.0	1.0
	Maximum	1.0	1.0	1.0	15.0	8.0	9.0	13.0	1.0	2.0	3.0
4	Mean	1.1	1.1	1.1	12.1	5.1	7.1	9.5	1.1	0.8	2.1

	Std. Deviation	0.4	0.3	0.6	4.2	1.8	2.8	3.7	0.4	0.5	0.4
	Median	1.0	1.0	1.0	13.5	5.0	8.5	8.5	1.0	1.0	2.0
	Minimum	1.0	0.7	0.5	6.0	3.0	2.0	6.0	1.0	0.0	2.0
	Maximum	2.0	1.8	2.5	19.0	9.0	10.0	17.0	2.0	1.0	3.0
5	Mean	2.3	1.9	2.0	13.5	6.3	7.3	15.5	2.5	1.3	1.3
	Std. Deviation	0.5	0.4	0.4	2.6	0.5	2.2	5.3	0.6	1.0	0.5
	Median	2.0	1.8	1.8	13.0	6.0	7.0	14.0	2.5	1.5	1.0
	Minimum	2.0	1.6	1.8	11.0	6.0	5.0	11.0	2.0	0.0	1.0
	Maximum	3.0	2.5	2.6	17.0	7.0	10.0	23.0	3.0	2.0	2.0
7	Mean	2.5	2.6	2.4	16.0	7.3	8.8	14.8	5.5	0.3	1.3
	Std. Deviation	0.6	0.6	0.8	1.2	0.5	1.5	5.7	1.3	0.5	1.0
	Median	2.5	2.5	2.3	16.0	7.0	9.0	13.0	5.5	0.0	1.5
	Minimum	2.0	2.1	1.6	15.0	7.0	7.0	10.0	4.0	0.0	0.0
	Maximum	3.0	3.4	3.4	17.0	8.0	10.0	23.0	7.0	1.0	2.0
Total	Mean	1.4	1.3	1.3	12.8	5.5	7.3	10.1	1.8	0.8	1.8
	Std. Deviation	0.8	0.8	0.8	3.4	1.7	2.2	5.8	2.0	0.7	0.7
	Median	1.0	1.0	1.0	13.5	5.5	8.0	9.0	1.0	1.0	2.0
	Minimum	0.0	0.0	0.0	6.0	2.0	2.0	0.0	0.0	0.0	0.0
	Maximum	3.0	3.4	3.4	19.0	9.0	10.0	23.0	7.0	2.0	3.0

Is important to analyze if the teams that shots more frequently are related with more successful, i.e., if an offensive teams are related with the opportunities to win. Is simultaneously important verify if the number of shots are related with the number of goals.

There is statistical evidence to assert, in the case of relation among teams shots and wins, that the pairs are positively moderating related ($p = 0.001$). In fact it appears that there is a directly intimacy between pairs (since the linear correlation coefficient $r(24) = 0.882$), i.e., how much more shots, more wins happens. In the case of relation between number of shots and number of goals is possible to say that pairs are positively moderating related ($p = 0.001$). In fact it appears that there is a directly intimacy between pairs (since the linear correlation coefficient $r(24) = 0.869$), i.e., how much more shots, more goals happens.

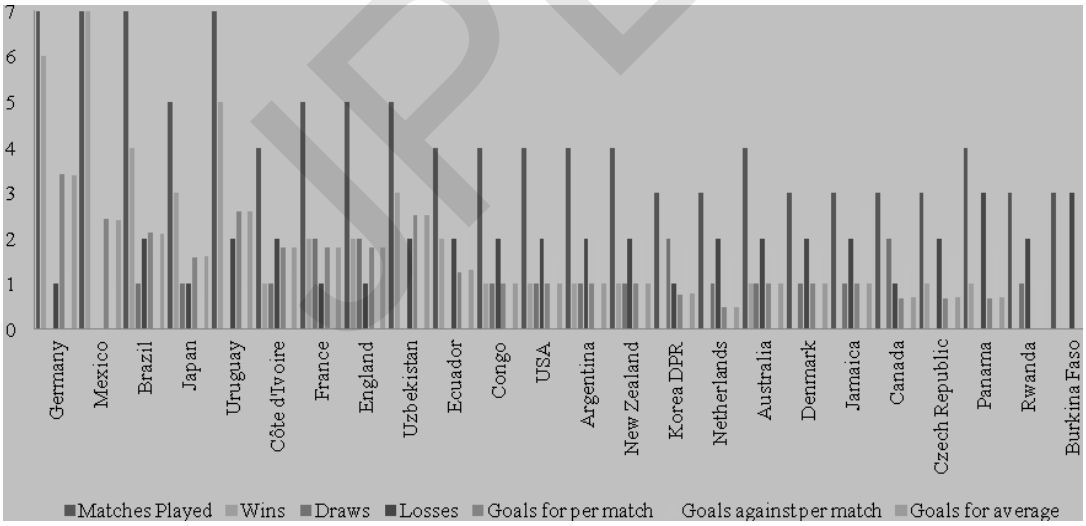

Figure 1. Graphical representation of sample

In order to shows the importance of the goals for and against, we analyzed the relation among wins and goals for and after, the relation between goals against and losses. The results showed the correlation among wins and goals but an intimacy relation among losses and goals against.

There is statistical evidence to assert, in the case of relation among teams goals for and wins, that the pairs are positively moderating related ($p = 0.001$). In fact it appears that there is a directly intimacy between pairs (since the linear correlation coefficient $r(24) = 0.903$), i.e., how much goals for, more wins happens. However, in the case of relation between number of goals against and number of losses is possible to say that pairs are positively small related ($p = 0.830$). In fact it appears that there is a directly between pairs (since the linear correlation coefficient $r(24) = 0.046$).

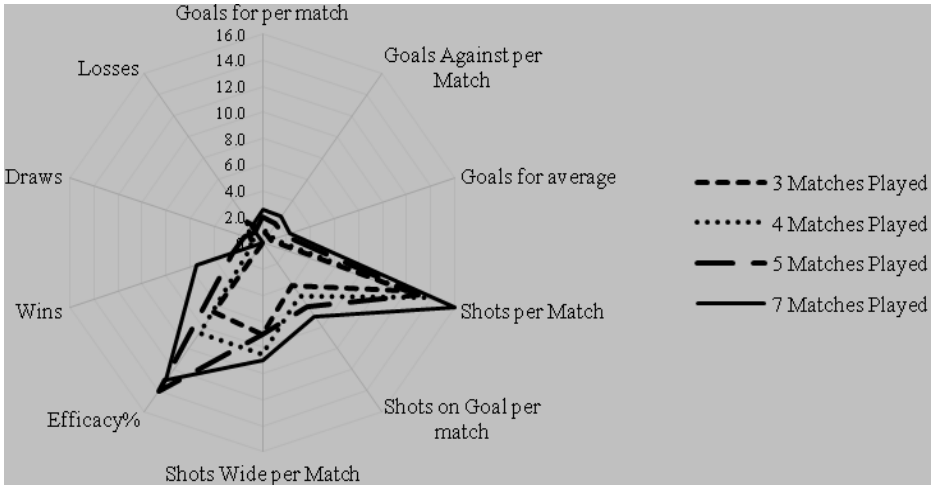

Figure 2 Radar chart of median on dependent variables per match for groups of the teams that played the same number of matches

In order to analyze if the efficacy (number of goals divided by the number of shots) is an important factor to determine the winners teams we relate this two variables. There is statistical evidence to assert, in the case of relation among teams efficacy and wins, that the pairs are positively moderating related ($p = 0.002$). In fact it appears that there is a directly intimacy between pairs (since the linear correlation coefficient $r(24) = 0.604$), i.e., how much efficacy, more wins happens.

Discussion

It is very difficult to identify precisely the victory and defeat factors in football owing to its variably nature and unpredictable environment factors (Szware, 2004). However the notational analyses describe performance descriptors in order to achieve conclusions that can be useful to improve the quality and efficiency of the game.

Some studies (e.g., Szware, 2004) shows that the most important factors in competition among teams of the highest sports competence is to score a goal and then to prevent the loss of the ball with the use of the simplest and most effective techniques. Our study confirms that the teams with more wins have a most successful attack, i.e., the level of efficacy and rate of goals is highest. Obtained correlation was confirmed this sentence. However the suffered goals don't show the strong relationship, i.e., the most important factor are goals for. Nevertheless these correlations can't allow understand how teams have this scores and how teams behave to obtain a best performance overcoming the difficulties imposed by the opposing teams.

The information should be of value such that there is a clear link between the analysis undertaken and the coaching process (Carling, Williams & Reilly, 2005). Most of notational analysis research is based on a research design that compares frequency of successful teams and unsuccessful teams, assuming that frequency and comparative differentials are decisive factors in game performance (Suzuki & Nishijima, 2004).

However, quantitative analysis is not suitable for establishing the characteristics of the whole skill, but new methods, such as the use of artificial neural networks (e.g., Passos, et al., 2011), are described that may be able to overcome this limitation (Lees, 2002). In this way notational analysis can't inform about the tactical performance and dynamical of the teams. However, these kinds of information are vital to improve the knowledge of the game, quality of training and intervention of the coach. In this way is fundamental develop new methods and metrics to analyze the collective behavior of the team, increasing the quality and efficiency of the results obtained. Therefore new metrics have been designed to better assess the collective performance of the teams based on players' tactical dynamic (e.g., Frencken & Lemmink, 2008; Bourbousson, Sève & McGarry, 2010; Frencken, Lemmink, Delleman & Visscher, 2011) however these kind of methods are just begun and require more time to increase the robustness.

Conclusion

The main objective of this work was to analyze the profile of the teams that competed on FIFA U-17 World Cup at 2011, most exactly, trying understanding the offensive profile of the most successful teams. Our results show a strong relation among wins and goals scored. In this way the offensive teams have most proximity with the success in competition. However this kind of information is low to improve the quality of the game. In this way, is important to make some changes in order to improve the quality of analyzes about the teams. Therefore, new tactical metrics and network among players will be a most powerful method to improve the efficacy of the match analysis.

References

Bourbousson, J., Sève, C., & McGarry, T. (2010). Space-time coordination dynamics in basketball: Part 2. The interaction between the two teams. *Journal of Sports Sciences*, 28(3), 349-358.

Carling, C., Williams, A. M., & Reilly, T. (2005). Handbook of soccer match analysis: A systematic approach to improving performance. Abingdon, UK: Routledge.

Dellal, A., Wong, D. P., Moalla, W., & Chamari, K. (2010). Physical and technical activity of soccer players in the French first league – with special reference to their playing position. *International SportMed Journal*, 11, 278-290.

Frencken, W., & Lemmink, K. (2008). Team kinematics of small-sided soccer games: A systematic approach. In T. Reilly, & F. Korkusuz (Eds.), *Science and Football VI* (pp. 161-166). London and New York: Routledge.

Frencken, W., Lemmink, K., Delleman, N. & Visscher, C. (2011). Oscillations of centroid position and surface area of soccer teams in small-sided games. *European Journal of Sport Science*, 11(4), 215-223.

Garganta, J. (2001). A análise da performance nos jogos desportivos. Revisão acerca da análise do jogo. *Portuguese Journal of Sport Sciences*, 1(1), 57-64.

Hughes, M., & 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 – a review of the literature. In M. Hughes & I.M. Franks (Eds.), *Notational Analysis of Sport: Systems for better coaching and performance in sport* (pp. 59-106). New York: Routledge.

Hughes, M., & Franks, I. M. (2005). Analysis of passing sequences, shots and goals in soccer. *Journal of Sports Sciences*, 23(5), 509-514.

James, N., Mellalieu, S. D., & Holley, C. (2002). Analysis of strategies in soccer as a function of European and domestic competition. *International Journal of Performance Analysis in Sport*, 2, 85-103.

Lago, C. (2009). The influence of match location, quality of opposition, and match status on possession strategies in professional association football. *Journal of Sports Sciences*, 27(13), 1463-1469.

Lago-Peñas, C., & Dellal, A. (2010). Ball Possession Strategies in Elite Soccer According to the Evolution of the Match-score: the Influence of Situational Variables. *Journal of Human Kinetics*, 25, 93-100.

Lago-Peñas, C., Lago-Ballesteros, J., Dellal, A., & Gómez, M. (2010). Games-related statistics that discriminated winning, drawing and losing teams from the Spanish soccer league. *Journal of Sports Science and Medicine*, 9, 288-293.

Lees, A. (2002). Technique analysis in sports: a critical review. *Journal of Sports Sciences*, 20(10), 813-828.

Liebermann, D. G., Katz, L., Hughes, M. D., Bartlett, R. M., McClements, J., & Franks, I. M. (2002). Advances in the application of information technology to sport performance. *Journal of Sports Sciences*, 20(10), 755-769.

Passos, P., Davids, K., Araújo, D., Paz, N., Minguéns, J., & Mendes, J. (2011). Networks as a novel tool for studying team ball sports as complex social systems. *Journal of Science and Medicine in Sport*, 14, 170-176.

Reep, C., Pollard, R., & Benjamin, B. (1971). Skill and chance in ball games. *Journal of the Royal Statistical Society*, A, 134, 623-629.

Suzuki, K., & Nishijima, T. (2004). Validity of a Soccer Defending Skill Scale (SDSS) Using Game Performances. *International Journal of Sport and Health Science*, 2, 34-49.

Szware, A. (2004). Effectiveness of Brazilian and German teams and the teams defeated by them during the 17th FIFA World Cup. *Kinesiology*, 1, 83-89.

Taylor, J. B., Mellalieu, S. D., James, N., & Shearer, D. A. (2008). The influence of match location, quality of opposition, and match status on technical performance in professional association football. *Journal of Sports Sciences*, 26(9), 885-895.