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ORIGINAL ARTICLE

STUDY OF SUCCESSFUL SOCCER TEAMS ON FIFA WORLD CUP 2010

Abstract

A notational analysis provides opportunities to analyze the intrinsic characteristics of the teams in order to improve the quality of the training and quality of the opponent's observation. The main objective of this study was to analyze the performance parameters and characterize the most successful teams on FIFA World Cup 2010, in order to describe the most relevant parameters that can improve the efficacy of the teams. Analyzes of variance among groups of teams were made in order to characterize the performance parameters and find differences that can explain the efficacy of the teams on competition. Regarding to results of this study is possible to verify that the most successful teams score more goals per game, existing significant differences between them ($F_{(3;28)}$ = 6.591; p-value = .002). Specifically the differences were found among teams that played 7 and 3 matches throughout competition (p-value = .006). With regard to the ways of how the goals were scored, is possible verify that most successful teams scored more goals through open play, verifying statistical differences among groups ($F_{(3;28)}$ = 3.059; p-value = .044). Analyzing medium passes, is possible verify that most successful teams have most frequency of these passes than other teams, differing statistically ($F_{(3;28)}$ = 3.992; p-value = .017). Specifically the differences were found among teams that played 7 and 3 matches throughout competition (p-value = .046). The results demonstrate that most successful teams confirm some parameters that characterize the efficacy of the teams in line with the literature. Parameters as passes completed, areas of the shots made, attacking zones or zones of goals suffered are indicators that characterize the efficacy of the most successful teams on FIFA World Cup 2010.

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Key Words: *Match analysis, team performance, soccer, offensive indicators, defensive indicators*.

INTRODUCTION

Notational analysis has focused traditionally on team and match-play sports, studying the interactions between players and the movements and behaviors of individual team members. Therefore notational analysts have focused on general match indicators, tactical indicators and technical indicators and have contributed to our understanding of the physiological, psychological, technical and tactical demands of many sports (Hughes and Bartlett, 2002).

The main objective of the notational analysis of the game includes optimizing feedback to the performer and coach to improve the performance (Liebermann, et al., 2002). Therefore 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, et al., 2005). Therefore performance parameters researched are one of the most important factors to provide quality to analyze.

To analyze the collective performance of the teams is important understand and determine the relevant parameters to achieve the main goals of the observation (Clemente, et al., 2012). In this way, is important determine specific parameters or indicators that can give important information to the analysts. 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 and Bartlett, 2002). Therefore effective evaluation of these components requires knowledge of the contextual factors that can potentially affect performance (Taylor, et al., 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 and 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 and Bartlett, 2002; Taylor,

et al., 2008). Hence the purpose of the present study was to analyze the performance parameters and characterize the most successful teams on FIFA World Cup 2010, in order to describe the most relevant parameters that can improve the efficacy of the teams.

MATERIAL AND METHODS

SAMPLE

The data used on our study was obtained through official website of FIFA World Cup 2010 (http://www.fifa.com/worldcup/archive/southafrica2010/index.html). More specifically, we obtained the data of the 32 international teams during 208 matches over the competition for the dependent variables of offensive phase and defensive phase.

ANALYZED VARIABLES

For the present study were analyzed four types of teams that constitute the independent variables: *i*) teams that played 3 matches (group stage); *ii*) teams that played four games (round of 16); *iii*) teams that played five matches (quarter-finals); and *iv*) teams that played seven matches (semi-finals and finals). Considering these groups, we analyzed two types of dependent variables: *i*) offensive variables; and *ii*) defensive variables.

List of offensive variables:

- attacking per match;
- attacks from left;
- attacks from centre;
- attacks from right;
- goals for;
- penalty goal;
- own goals for;
- open play goals;
- goals scored in penalty area;
- goals scored from outside of penalty area;

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- passes completed;

- short passes, short passes completed;

- medium passes, medium passes completed;

- long passes, long passes completed;

- short passes, medium passes, long passes rate.

For the defensive phase were considered:

- goals against;

- goals conceded in penalty area;

- goals conceded from outside of penalty area.

STATISTICAL PROCEDURES

Means and standard deviations are given as descriptive statistics and the one-way ANOVA to establish the statistically significant differences between groups of teams, for each dependent variable. The assumption of normality distribution of one-way ANOVA was investigated using the Kolmogorov-Smirnov test with correction Lillefors. It was found that the distributions are not normal in the dependent variable. Although it was not normal, since n ≥ 30, using the Central Limit Theorem (Maroco and Bispo, 2003; Pedrosa and Gama, 2004) we assumed the assumption of normality (Akritas and Papadatos, 2004). The analysis of homogeneity was carried out using the Levene test. All analysis were executed in SPSS for Windows version 19.0 and the statistical significance was set at p-value < .05.

RESULTS

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

Our results indicated that it is possible to analyze the teams that achieved more

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games in the competition performed more attacks per game. The teams that reached the seven game of the competition performed on mean more attacks than the other teams. However, among groups, no statistically significant differences were found ($F_{(3,28)}$ = .779; p-value = .516).

The analysis shows that teams tend to do more attacks from the right side during the games. The most successful teams, on average, attack from the sides more than the center. The statistical results not show statistically significant differences between groups regarding the attack on the left ($F_{(3,28)}$ = .731; p-value = .542), center ($F_{(3,28)}$ = .523; p-value = .670) and right ($F_{(3,28)}$ = .506; p-value = .681).

Table 1. Descriptive statistics of attack

Dependent Variable	Matches	Mean	Minimum	Maximum	Dependent Variable	Matches	Mean	Minimum	Maximum
Attacking per Match	3	9.94	4	17	Attacks from centre per Match	3	3.13	0	6
	4	11.22	8	16		4	3.34	2	6
	5	11.85	8	14		5	4.10	1	6
	7	12.00	10	15		7	3.61	2	5
	Total	10.75	4	17		Total	3.36	0	6
Attacks from Left per Match	3	3.17	1	6	Attacks from right per Match	3	3.65	1	6
	4	3.78	2	5		4	4.09	3	5
	5	3.45	2	4		5	4.30	3	6
	7	3.96	3	4		7	4.43	3	5
	Total	3.46	1	6		Total	3.94	1	6

Through analyzing the results it is possible to see that the most successful teams score more goals per game, existing significant differences between them ($F_{(3;28)}$ = 6.591; p-value = .002). Specifically the differences were found among teams that played 7 and 3 matches throughout competition (p-value = .006).

As for goals conceded it can be seen that the most successful teams in the competition had suffered fewer goals per match. However, no statistically significant differences were found between groups ($F_{(3;28)}$ = 1.709; p-value = .188).

With regard to goals from penalties no statistically significant differences were found ($F_{(3;28)}$ = 0.243; p-value = .866). The same results are found for goals scored through own

goals of other teams ($F_{(3;28)}$ = 2.354; p-value = .093).

Table 2. Descriptive statistics of goals

Dependent Variable	Matches	Mean	Min.	Max.	Dependent Variable	Matches	Mean	Min.	Max.	Dependent Variable	Matches	Mean	Min.	Max.
Goals for per match	3	.71	0	1	Own Goals for per match	3	.00	0	0	Goals scored from outside of penalty area per match	3	.19	0	1
	4	1.16	1	2		4	.00	0	0		4	.19	0	1
	5	1.35	1	2		5	.05	0	0		5	.30	0	1
	7	1.68	1	2		7	.04	0	0		7	.43	0	1
	Total	1.02	0	2		Total	.01	0	0		Total	.23	0	1
Goals Againts per match	3	1.46	0	4	Open play goals per match	3	.58	0	1	Goals conceded in penalty area per match	3	1.21	0	4
	4	1.19	0	2		4	.81	0	2		4	.84	0	2
	5	.80	0	1		5	.95	0	2		5	.60	0	1
	7	.75	0	1		7	1.32	1	2		7	.54	0	1
	Total	1.22	0	4		Total	.78	0	2		Total	.96	0	4
Penalty Goal per match	3	.06	0	0	Goals Scored in penalty area per match	3	.52	0	1	Goals conceded from outside of penalty area per match	3	.23	0	1
	4	.09	0	0		4	.97	1	2		4	.31	0	1
	5	.10	0	0		5	1.05	0	2		5	.20	0	0
	7	.04	0	0		7	1.25	1	2		7	.21	0	0
	Total	.07	0	0		Total	.79	0	2		Total	.24	0	1

With regard to the ways of how the goals were scored, is possible verify that most successful teams scored more goals through open play, verifying statistical differences among groups ($F_{(3;28)}$ = 3.059; p-value = .044).

By analyzing the areas where goals were scored, it is possible to verify statistically significant differences between groups on goals scored inside of penalty area ($F_{(3;28)}$ = 4.087; p-value = .016). Most successful teams scored more goals inside penalty area than other groups. As for scored goals from outside of the penalty area, it appears that the most successful teams score more goals than other groups but not differ significantly from them ($F_{(3;28)}$ = 1.605; p-value = .210).

Through the results, is possible analyze that the most successful teams have fewer goals suffered inside and outside the penalty area. However, no their statistically significant differences between the groups to conceded goals inside ($F_{(3;28)}$ = 1.807; p-value = .169) and outside of the penalty area ($F_{(3;28)}$ = .322; p-value = .809).

Table 3. Descriptive statistics of passes

Dependent Variable	Matches	Mean	Min.	Max.	Dependent Variable	Matches	Mean	Min.	Max.
Passes per Match	3	458.27	364	556	Passes Completed per Match	3	321.52	221	407
	4	476.28	369	544		4	334.56	223	400
	5	532.60	473	605		5	387.45	311	459
	7	553.79	438	679		7	400.82	270	543
	Total	484.00	364	679		Total	342.93	221	543
Short Passes per Match	3	105.44	69	151	Short Passes Completed per Match	3	78.00	44	121
	4	104.28	89	123		4	76.66	63	91
	5	127.65	103	155		5	93.75	66	119
	7	125.61	112	155		7	89.25	71	125
	Total	110.45	69	155		Total	81.04	44	125
Medium Passes per Match	3	258.52	193	323	Medium Passes Completed per Match	3	198.29	131	256
	4	275.19	201	323		4	208.78	131	258
	5	315.10	275	369		5	248.45	201	297
	7	334.14	243	422		7	261.57	163	354
	Total	279.21	193	422		Total	215.09	131	354
Long Passes per Match	3	94.31	78	113	Long Passes Completed per Match	3	45.23	34	60
	4	96.81	80	114		4	49.13	29	65
	5	89.85	82	95		5	45.25	41	53
	7	94.04	83	101		7	50.00	37	64
	Total	94.35	78	114		Total	46.80	29	65

Through the results is possible to see that most successful teams realized more passes per match than other teams. These results are confirmed statistically ($F_{(3;28)}$ = 3.321; p-value = .034). As for passes completed, is possible verify that are the most successful teams that realized more completed passes although not differentiating statistically ($F_{(3;28)}$ = 2.161; p-value = .115).

Regarding to short passes, is possible observe that most successful teams have most frequency of these kind of passes than other teams, however not differing statistically ($F_{(3;28)}$ = 2.449; p-value = .084). As for short passes completed, is possible verify that are the most successful teams that realized more completed short passes although not differentiating statistically ($F_{(3;28)}$ = 1.095; p-value = .368).

Analyzing medium passes, is possible verify that most successful teams have most frequency of these passes than other teams, differing statistically ($F_{(3;28)}$ = 3.992; p-value = .017). Specifically the differences were found among teams that played 7 and 3 matches throughout competition (p-value = .046). As for medium passes completed, is possible verify

that are the most successful teams that realized more completed short passes although not differentiating statistically ($F_{(3;28)}$ = 2.807; p-value = .058).

Contrary to the previously described, are less successful teams that perform more long passes, not differing statistically ($F_{(3;28)}$ = .398; p-value = .755). As for long passes completed, is possible verify that are the most successful teams that realized more completed short passes although not differentiating statistically ($F_{(3;28)}$ = .537; p-value = .661).
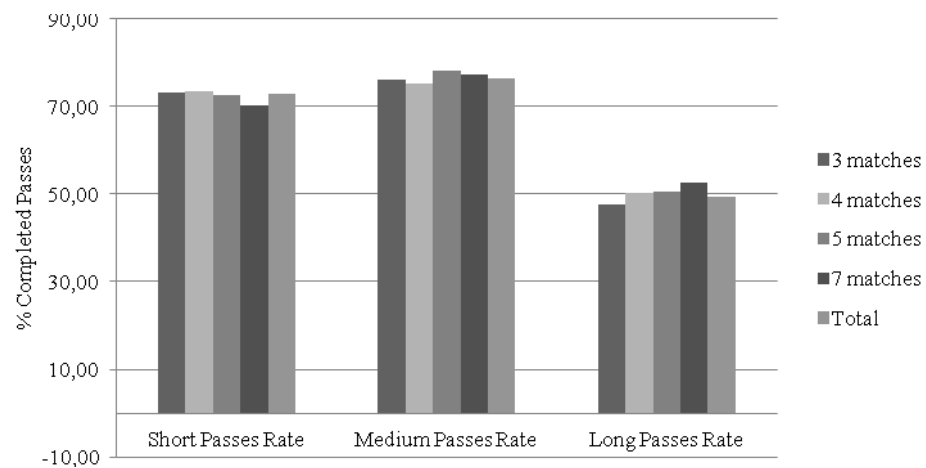
Figure 1. Rate of Completed Passes

Regarding to short passes rate, is possible observe that most successful teams have less rate of these passes than other teams, however not differing statistically ($F_{(3;28)}$ = .414; p-value = .744). Analyzing medium passes rate, is possible verify that most successful teams have most frequency of these passes than other teams, not differing statistically ($F_{(3;28)}$ = .364; p-value = .779). As for long passes rate, is possible verify that are the most successful teams that realized more successful long passes although not differentiating statistically ($F_{(3;28)}$ = .857; p-value = .475).

DISCUSSION

The main objective of the present study was to identify performance indicators that discriminate the most successful teams on FIFA World Cup 2010. Summarily three important factors were considered: i) attacks of the teams; ii) shots of the teams; and iii) passes of the

teams.

With regard to the space used for the offensive phase, was verified an option for greater recourse to the side areas of the field by the successful teams, possibly to counteract the agglomeration of opposing central areas of the field of play (Garganta, 1997). Another possible explanation could be related to the option for cross the ball to exploit opponents' defense. The crosses are identified as relevant factors for the success of teams (*e.g.*, Partridge and Franks, 1989a; Partdridge and Franks, 1989b). Through the study of Miller (1994) it was verified that teams in the FIFA World Cup 1986, 28.8% of goals scored by crossbreeding. In the same study, the author states that in the UEFA EURO 1988, 67% of the Dutch team goals resulted from crosses.

Nevertheless the idea that the crossings are critical to success is contradicted by some studies (*e.g.*, Cabezón and Fernandez, 1996, *cit in* Garganta, 1997; Hughes, et al., 1988) that analyzed the Spanish League on 1993-1994 and FIFA World Cup 1986, respectively. In the study of Cabezón and Fernandez (*1996*; *cit in* Garganta, 1997), the authors analyzed that the most goals arise from the center of the playing field. In the same way Hughes et al (1988) notes that the successful teams attack from the center of the field, unlike the less successful team that attacking from the sides.

However, the evolution of football may have led to a better use of the lateral areas of the field. In this sense, the data from our study may indicate that the successful teams move to side of the pitch to avoid the concentration of opponents in the central area and also to expand the opposing defensive lines, creating more offensive penetration spaces.

In football, scoring goals is the main determinant of success and as a result received extensive consideration in research (*e.g.*, James, et al., 2004; Lago and Martín, 2007). In this way, the goals and the processes that generate goals need to be a focus of the analyses of the notational analysis.

According to Dufour (1993), shots from 30 m or more have a scoring rate of nearly 0%, while shots from within 16.5 m and 5.5 m have a scoring rate of 10% and 15%, respectively. At the FIFA World Cup 2002 the majority of the goals (37%) were scored from

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inside the penalty area, specifically the area between the edge of the 5.5 meters and the penalty spot (Carling, et al., 2005). The second area where scored more goals (29%) is between line of goal and 5.5 meters. In third place the area where scored more goals (18%) is between 11 and 16.5 meters, decreasing considerably with the increasing distance to the goal line. In our study is possible to verify that the majority of the goals occur inside of penalty area. Additionally the most successful teams scored most goals inside of penalty area than other teams. These results show the relevance of achieve the penalty area in order to improve the opportunity to score. Therefore possession with a high degree of ball control inside penalty area has the potential for producing quality shots (Tenga, et al., 2010).

Regarding for suffered goals is possible to see that most successful teams conceded fewer goals inside and outside of penalty area. However every group's of teams suffered more goals inside of penalty area. These results are relating to goals scored by the teams. Therefore is possible to affirm that the penalty area is an important place where the goals are made, and the most successful teams are more impermeable on this zone.

Different models of the game can represent the collective tendency to be more or less 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 (Clemente, et al., 2012).

Some studies (*e.g.*, Bate, 1988; Carling, et al., 2005; Reep, et al., 1971) showed that goals occurred when teams played with direct method (*i.e.*, goals occurs with less sequence of passes). The approach had proved successful with some teams in the lower divisions of the English League (Hughes and Franks, 2004) and at some competitions of FIFA World Cup (Carling, et al., 2005). Our study doesn't analyze the provenance from the goals, however is possible analyze that most successful teams plays with more short and medium passes than long passes and less successful teams perform more long passes. The results of completed passes are interesting. In fact, although most successful teams perform less long passes than other teams, achieve better levels of efficacy. Inversely the rates of efficacy of short passes are slightly higher on less successful teams. One explanation may relate to the proximity of the opponent at the time of the pass. At same time that the most successful teams performed

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considerably more short passes, exposed themselves to the greatest number of lost ball due to the opponent's proximity.

CONCLUSION

The main objective of this study was analyze the performance parameters of the most successful teams in order to characterize them. The results demonstrate that most successful teams confirm some parameters that characterize the efficacy of the teams in line with the literature. Parameters as passes completed, areas of the shots made, attacking zones or zones of goals suffered are indicators that characterize the efficacy of the most successful teams on FIFA World Cup 2010.

PRACTICAL APPLICATION

Regarding to results of this study is possible to verify that the most successful teams on attacking phase used more times the external side of the pitch in order to open the defensive line of the opponents. In the same way, the most successful teams take advantage to the penalty area of the opponent to make more shots and increase the opportunity to score. Concerning to passes made by teams, the most successful teams shows the tendency to make more short and medium passes than long passes, and shows more efficacy on the quality of the passes. Therefore the efficacy of the teams may relate to the quality to maintain the ball possession making short passes in order to decrease the unpredictability of the long and medium passes. Equally the most successful teams show more shots inside the penalty area. These results may relate to the proximity of the target, trying reducing the distance of the shot in order to increase the opportunity to score.

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) or tactical metrics (*e.g.*, team centroid, team surface area, team stretch index) are described that may be able to overcome this limitation of notational analysis (Lees, 2002). Therefore notational analyses need to be complemented with new methods in order to understand the tactical dynamic of the teams (Clemente, et al., 2012). In fact, these kinds of

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information are vital to improve the knowledge of the game, quality of training and intervention of the coach.

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