



NETWORK ANALYSIS OF PORTUGUESE TEAM ON FIFA WORLD CUP 2014

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Introduction

Match analysis has been using in football case to identify properties and patterns of teams (Sarmiento et al., 2014). From the regular notational analysis until the most recent computational tactical metrics, a lot of different outcomes can be possible to extract from a single match (Clemente, Couceiro, Martins, & Mendes, 2015). In the specific case of football, the cooperation among team-members is one of the main factors that contribute for a better performance (Grund, 2012). Thus, to analyse such cooperation the Social Network Analysis have been used to identify how team-members are connected and if there are cooperation tendencies inside the team (Clemente et al., 2015). The prominent players have been also analysed in order to identify the central players in the team (Clemente, Couceiro, Martins, & Mendes, 2014).

Objectives

Therefore, using the social network analysis approach the aim of this study was to analyse the centrality levels of Portuguese positional roles during the FIFA World Cup 2014 and to identify the prominent tactical positions that determined the moments with ball.

Method

Sample

Three official matches from Portugal in FIFA World Cup 2014 tournament were analysed in this study. A total of 295 adjacency matrices were generated based on the teammates' interactions. A total of 1131 passes were analysed.

Data Collecting

Adjacency matrices were built per each unit of attack (sequence of passes without interruption). In those matrices it is recorded the connection direction among team-members. Per each pass between nodes it was give a code of 1 (one) and for no passes between teammates it was give a code of 0 (zero). The players were codified by their tactical position and the classification was: 1 – GK (goalkeeper); 2 – ED (external defender); 3 – CD (central-defender); 4 – CM (Central midfielder); 5 – ST (striker).

Network Metrics

Two centrality metrics based on weighted and direct graphs were used in this case: i) IDC (in-degree centrality); and ii) ODC (out-degree centrality). For the ODC metric it was used the following algorithm:

$$C^{w}_{(D-out)}(n_i) = \frac{k_i^{w,out}}{\sum_{i=1}^n \sum_{j=1, j \neq i}^n a_{ij}}, \quad (1)$$

For the case of IDC it was used the following algorithm:

$$P^w_D(n_i) = \frac{k_i^{w,in}}{\sum_{i=1}^n \sum_{j=1, j \neq i}^n a_{ij}}, \quad (2)$$

Results and discussion

The one-way ANOVA for the factor tactical position found statistical differences in the dependent variables of %IDC ($F_{(5,27)} = 11.181$; $p\text{-value} = 0.001$; $\eta^2 = 0.674$; *Large Effect Size*) and %ODC ($F_{(5,27)} = 8.268$; $p\text{-value} = 0.001$; $\eta^2 = 0.605$; *Large Effect Size*). The post hoc results can be found in the following table 1.

Table 1. Mean and standard deviation values of tactical positions.

	%IDC	%ODC
GK	2.99 ± 0.71 ^{b,c,d,e}	5.12 ± 0.37 ^d
ED	9.02 ± 0.44 ^a	9.94 ± 0.85 ^f
CD	7.75 ± 2.70 ^{a,d}	9.58 ± 3.23
CM	11.49 ± 2.11 ^{a,c,f}	11.96 ± 2.33 ^{a,e,f}
EM	11.21 ± 2.00 ^{a,f}	7.63 ± 2.21 ^d
ST	6.60 ± 3.19 ^{d,e}	4.72 ± 1.57 ^{b,d}

Statistically different of GK^a; ED^b; CD^c; CM^d; EM^e; e ST^f for a $p\text{-value} < 0.05$

The results found in this study showed that central midfielders of Portuguese team are the prominent players in the attacking building process. In the case of IDC values, it was possible that the biggest values were observed in CM and EM being the players that team-members most recruits. These results are in line with previous studies that analysed the entire units of attack (Clemente et al., 2014). In fact, in particular studies that only focused in specific units of attack (such as counter-attacks) the strikers or forwards assumes bigger prominence (Malta & Travassos, 2014). In the case of ODC it was observed that the greater values are associated with ED, CD and CM thus suggesting that the attacking building starts from the defenders and midfielders. Once again, those results are in line with previous studies in professional football (Clemente et al., 2014). Such values suggest that the style of play is based on passing sequences and not counter-attacks where midfielders do not assumes the prominence in the attacking building.

Conclusions

Using network measurements it is possible to classify the patterns of interactions among team-members. It is also possible to identify the tendencies of interactions and the style of play of teams.

Bibliography

- Clemente, F. M., Couceiro, M. S., Martins, F. M. L., & Mendes, R. S. (2014). Using network metrics to investigate football team players' connections: A pilot study. *Motriz*, 20(3), 262–271.
- Clemente, F. M., Couceiro, M. S., Martins, F. M. L., & Mendes, R. S. (2015). Using Network Metrics in Soccer: A Macro-Analysis. *Journal of Human Kinetics*, 45, 123–134.
- Grund, T. U. (2012). Network structure and team performance: The case of English Premier League soccer teams. *Social Networks*, 34(4), 682–690.
- Malta, P., & Travassos, B. (2014). Characterization of the defense-attack transition of a soccer team. *Motricidade*, 10(1), 27–37.
- Sarmiento, H., Marcelino, R., Anguera, M. T., Campaniço, J., Matos, N., & Leitão, J. C. (2014). Match analysis in football: a systematic review. *Journal of Sports Sciences*, 32(20), 1831–1843.