



# How do Elite Soccer Teams Perform to Ball Recovery? Effects of Tactical Modelling and Contextual Variables on the Defensive Patterns of Play

by

Tiago Fernandes<sup>1</sup>, Oleguer Camerino<sup>2</sup>, Júlio Garganta<sup>1</sup>, Raúl Hileno<sup>2</sup>,  
Daniel Barreira<sup>1,3</sup>

*Researchers in soccer match analysis have been using limited procedures to express the dynamics of the game and mainly focus on the attack. Therefore, the aims of this paper were to detect the successful teams' ball recovery defensive patterns of play and study the influence of tactical modelling, halves, match status, opponent quality and stage competition on those patterns. The sample consisted of 1323 situations of defensive ball possession of the semi-finalist teams from the 2014 FIFA World Cup play-offs, which was collected by a valid and reliable observational instrument (Soccer-Defence). The Kruskal-Wallis H, Mann-Whitney U, Chi-square, Z-, multinomial logistic regression tests and sequential analysis ( $p < .05$ ;  $z > 1.96$ ) were used accordingly to test the differences and associations among and within teams of tactical modelling, tactical-technical behaviours and contextual variables to ball recovery. We found that among teams ball recovery differed in duration;  $H(3) = 14.958$ ,  $p = .002$ . Germany were more likely to perform ball recovery by the goalkeeper than Argentina ( $p = .04$ ; OR = 0.47) or the Netherlands ( $p < .05$ ; OR = 0.50). Nevertheless, Brazil was the least likely to concede a shot off goal. Teams facing lower-ranked opponents were 0.63 times less likely to perform ball recovery by interception ( $p < .001$ ). Additionally, sequential analysis illustrated that teams varied between central and lateral high-pressure zones before ball recovery in lower zones of the field. Finally, coaches could use such findings to design training exercises, create their own style of play, and set strategies.*

**Key words:** match analysis, defensive phase, tactics, style of play, multinomial logistic regression, sequential analysis.

## Introduction

The variability of actions in the complex soccer system emerges from the dynamic interactions between teams to control space and time (Garganta, 2009). That author maintains that observation and measurement are needed to better understand the complex dynamics of soccer, not only to improve team strategies, but also training quality. Indeed, team sports ecological dynamics and representative-task learning are becoming prominent in research and practice, where information about the competitive environment is essential to efficiently replicate

competition in training exercises (Davids et al., 2013).

Nevertheless, it appears that a substantial problem in soccer is the lack of a reliable theoretical model and operational definitions to understand the phenomena (Garganta, 2009; Mackenzie and Cushion, 2013). In line with this perspective, some authors have outlined an organisational model using defensive and attacking dynamics according to phases of the game (Barreira et al., 2014). According to Barreira et al. (2014), information interpretation of behaviours about the tactical organisation model

<sup>1</sup> - Centre of Research, Training, Innovation and Intervention in Sport (CIFI2D), Faculty of Sport, University of Porto, Porto, Portugal.

<sup>2</sup> - National Institute of Physical Education of Catalonia (INEFC), University of Lleida, Lleida, Spain.

<sup>3</sup> - Futbol Club Barcelona, Barcelona, Spain.

is fundamental since the tactics and strategies of team sports attempt to anticipate the opponent's attacking and defensive actions. Also, it appears that modern soccer strategies and tactics are more focused on defensive aspects (Bangsbo and Peitersen, 2002). These authors believe that defensive organisation is related to offence building, arguing that a good defence is the best base for the attack. However, defensive strategies more often receive negative critiques, such as the public expression '*parking the bus in front of the goal*'.

Controversially, the systematic review of Mackenzie and Cushion (2013) reveals that researchers have generally focused on the attacking process. Exceptionally, some studies centered on aspects of the defensive phase. Liu et al. (2015), for example, detected that in the group stage of the 2014 FIFA World Cup, performing more tackles increased the chances of winning, compared to yellow cards or red cards. Furthermore, Delgado-Bordonau et al. (2013) observed that successful teams in the 2010 FIFA World Cup had lower values of goals against, total shots against and shots on goal against. Despite these results, Casal et al. (2016) specifically analysed the defensive transition success in the 2010 FIFA World Cup teams and suggested further research on how teams' play before recovering the ball.

Considering the stated limitation of traditional notational analysis about discarding contextual information (e.g., quality of opponent) (Mackenzie and Cushion, 2013), there has been an increase of interest by researchers to explore the influence of situational variables in statistics (Almeida et al., 2014; Sarmiento et al., 2018). For instance, Almeida et al. (2014) found that a tackle compared to interception was more likely to be executed against similar-ranked teams than lower-ranked teams. Moreover, Vogelbein et al. (2014) verified that top-ranked teams recovered the ball quicker than bottom-ranked teams when winning and had slower reaction times than in-between or bottom-ranked teams when losing.

This type of analysis highly influences the identification of results, particularly in defining patterns of play (Garganta, 2009). In this domain, multinomial logistic models estimate the probabilities of a discrete outcome according to a set of explanatory variables (Almeida et al., 2014),

and sequential analysis provides insights into the probabilities of a specific chain of game behaviours, both retrospectively and prospectively (Barreira et al., 2013). However, to date and to our knowledge, no studies have focused on the defensive phase using sequential analysis.

The aims of this study were to: 1) identify and discriminate between the defensive patterns of play among and within successful teams of the 2014 FIFA World Cup to the End of the Defensive Phase (EDP), and 2) explore the influences of tactical defensive modelling and contextual variables (i.e., opponent quality, stage competition, match status and halves) in the teams' defensive patterns.

## Methods

### Participants

For this study, we collected tactical and technical data from the play-off matches of the four semi-finalist teams of the 2014 FIFA World Cup (Germany, Argentina, the Netherlands and Brazil), all known as successful teams (Delgado-Bordonau et al., 2013). For each team, four observations were analysed through the regular time of play (90 minutes plus injury time) of 12 matches and 16 observations were analysed equally distributed among teams, resulting in 1323 non-ball possession situations (Germany,  $n = 357$ ; Argentina,  $n = 332$ ; the Netherlands,  $n = 297$ ; Brazil,  $n = 337$ ). No sequences were excluded in regular time. However, we did not include extra-time as in previous works (Barreira et al., 2015).

### Measures

For data collection, the Soccer-Defence (SOC-DEF) Theoretical Dynamic System Model was used (Figure 1). The selected criteria and categories are shown in Table 1, and their definitions are accessible in the supplementary material (Table S1). Validity and reliability are presented elsewhere (Fernandes et al., 2019). This instrument was implemented using Lince 1.4 recording software (Gabin et al., 2012). Two types of visual footage (tactical and broadcast cameras), provided by the FIFA database, were used simultaneously to prevent data exclusion and to clarify ambiguous actions.

### Design and Procedures

Following the procedures of systematic observation (Chacon-Moscoso et al., 2018), the

study's observational design was nomothetic (i.e., the unit is plural), followed-up (i.e., diachronic temporal character) and multidimensional (i.e., several levels of response), which was the fourth quadrant of observational methodology. The sample's inter-session comprised the play-offs' matches of semi-finalist teams, and intra-session, all sequences of non-possession of the ball, according to Barreira et al.'s (2014) definitions of the beginning and the end of the phase (Figure 1). Multi-codes of behaviours at three consecutive observation moments: the first touch, the moment after three touches and/or the last touch (Fernandes et al., 2019), were recorded.

A soccer performance analyst with eight years of soccer match analysis/coach/player experience and with the highest level of the Third National League coded the data of all matches. Although the operator was aware of the study, a commitment to procedures of the instrument protocol was followed so as not to interfere with the results and to ensure measurement blinding.

#### **Statistical analysis**

Descriptive statistics, Kolmogorov-Smirnov and Chi-square tests were performed as exploratory analysis. Kruskal-Wallis H and Chi-square tests were performed to check differences among teams. Mann-Whitney U and Z tests were used as post-hoc analysis. The contribution of independent variables (e.g., opponent quality), to the variance of the multiple response dependent variable (i.e., EDP), was verified by multinomial logistic regression analysis (Hosmer and Lemeshow, 2000).

To select the variables, we applied the thumb rule of five events per variable ( $47/5 = 8$ ) to avoid overfitting (Vittinghoff and McCulloch, 2007). Multiple Chi-squares of dependent variables permitted inspection of zero cells and Spearman correlation verified the degree of the relationship between variables. For  $\rho > .70$ , a variable was excluded (Dormann et al., 2013) before a purposefulness selection (Hosmer and Lemeshow, 2000).

The likelihood ratio, Wald, goodness-of-fit, pseudo-R-squared and classification rate accuracy statistics were computed to assess model assumptions (Hosmer and Lemeshow, 2000). Model diagnostics consisted in outliers' detection using studentised residuals ( $>3$ ) calculated from logistic regression (Osborne and Overbay, 2004),

multicollinearity detection through the variance inflation factor ( $VIF > 10$ ) (Dormann et al., 2013), and perturbation analysis (Hendrickx, 2015). The reference category was EDP by Tackle (FEDs), since studies have shown statistical relationships in winning the match (e.g., Liu et al., 2015). Then, a retrospective five-lag choice (Barreira et al., 2013) sequential analysis of the criteria behaviour of EDP was applied to determine the probability of successive and concurrent occurrences (i.e., patterns of play).

Statistical significance was set as  $p < .05$  and adjusted residual values,  $-1.96 < z < 1.96$ . The odds ratio (OR) and 95% confidence intervals (CI) were reported as the magnitude of significant effects for association tests. Moreover, for statistical difference tests, Chi-square and Z tests were used to compute effect size  $r$  (Rosenthal and DiMatteo, 2001), converted to Cohen's  $d$  (Borenstein et al., 2009) and interpreted as follows: trivial (0–0.19), small (0.20–0.49), medium (0.50–0.79) and large ( $>0.80$ ) (Cohen, 1992). Excel v.2013, SPSS v.24 and R v.3.5.1 were used simultaneously for descriptive, inferences, model fitting, and diagnostics analysis. SDIS-GSEQ v5.1 (Bakeman and Quera, 1995) was used for sequential analysis and ConceptDraw PRO 11 for graphics.

## **Results**

*Do successful teams differ in the number of sequences, multi-events, events and sequences' duration?*

Teams did not differ in the number of sequences among them,  $\chi^2(3) = 5.650$ ,  $p = .130$ . However, they did differ in the number of sequences in different types of match status,  $\chi^2(12) = 613.880$ ,  $p < .01$ ; or stage competition,  $\chi^2(6) = 330.050$ ,  $p < .01$ . On the other hand, they were similarly distributed in halves,  $\chi^2(3) = 9.96$ ,  $p = .130$ ; or by the type of opponent quality,  $\chi^2(3) = .917$ ,  $p = .821$ . Teams were differentiated in mean ranks of time spent in defensive sequences,  $H(3) = 14.958$ ,  $p = .002$ ; and multi-events,  $H(3) = 7.257$ ,  $p = .048$ . Despite these differences, the events' median was similar among teams,  $H(3) = 7.896$ ,  $p = .064$ . The Netherlands had multi-events and sequence duration medians greater than Germany ( $U = 46567.0$ ,  $p = .007$ ,  $d = .2$ ;  $U = 44204.5$ ,  $p < .001$ ,  $d = .29$ ) and Brazil ( $U = 44953.5$ ,  $p = .027$ ,  $d = .18$ ;  $U = 43034.5$ ,  $p < .01$ ,  $d = .24$ ). Additionally, the Netherlands had greater sequence duration than Argentina ( $U = 43355.5$ ,  $p = .009$ ,  $d = .21$ ). Table 2

exhibits descriptive statistics and statistical differences between contextual variables.

#### **Bivariate analysis**

EDP by Goal Conceded (FIg), EDP by Offside (FEfj) and EDP by Shot Blocked (FErb) were excluded because the minimum expected count by cell was violated (Table S2). Notwithstanding this, teams statistically differed in the types of EDP among them,  $\chi^2_{1258}(21) = 33.819$ ;  $p = .038$ . Differences were not found, however, when facing worse (i.e., Tier 2),  $\chi^2_{1258}(21) = 28.794$ ,  $p = .119$ ; or similar opponents (i.e., Tier 1),  $\chi^2_{1258}(21) = 25.188$ ,  $p = .239$ .

The German national team had the highest values for EDP by Heading (FEda,  $n = 64$ ) and EDP by Goalkeeper Technique (FEtg,  $n = 37$ ). However, only the values of FEtg were statistically greater than for Argentina ( $n = 16$ ,  $z = 2.76$ ,  $p = .006$ ,  $d = .22$ ) and the Netherlands ( $n = 18$ ,  $z = 2.68$ ,  $p = .007$ ,  $d = .22$ ). Argentina had the highest values for EDP by Shot on Goal Conceded (FIrb,  $n = 13$ ) and EDP by Interruptions and Laws Infractions (FEil,  $n = 79$ ), but only FEil was statistically greater than for Brazil ( $n = 54$ ,  $z = 2.36$ ,  $p = .018$ ,  $d = .19$ ). To the contrary, Brazil had the highest values for EDP by Interception, Ball Carrier Error and Tackle (FEi,  $n = 62$ ; FEep,  $n = 43$ ; and FEeds,  $n = 60$ ), showing significant differences from Argentina for FEeds ( $n = 42$ ,  $z = 2.02$ ,  $p < .04$ ,  $d = .16$ ). Unexpectedly, the lowest frequencies for EDP by Shot off Goal Conceded (FIrf) were found in Brazil ( $n = 9$ ), which was significantly different from Argentina ( $n = 20$ ,  $z = 2.06$ ,  $p < .04$ ,  $d = .16$ ) and the Netherlands ( $n = 20$ ,  $z = 2.39$ ,  $p < .02$ ,  $d = .20$ ).

#### **Univariate and multivariate analysis**

Due to the large number of comparisons and variable estimates, we focused on statistically significant results (Table 3). Nevertheless, all the results are available in the supplementary material (Table S3 and Table S4).

#### *Model assessment*

The final model provided satisfactory predictions of the dependent variable as the null hypothesis was rejected –  $H_0$ : there was no difference between the null model and the final model,  $\chi^2(56) = 157.161$ ,  $p < .001$ . The Hosmer and Lemeshow test showed that the model adequately fitted the data,  $\chi^2(56) = 50.4$ ,  $p = .69$ . The values of pseudo-R-squared indicated that the independent variables explained 11.7-12.0% of the variance of

the dependent variable. In addition, the model proved useful because chance accuracy criteria of 23.1% ( $1.25 * (0.1552 + 0.1722 + 0.126 + 0.1822 + 0.2032 + 0.0772 + 0.0332 + 0.0532) * 100$ ) were lower than the classification accuracy rate of 25.6%.

Accordingly, each independent variable revealed statistically significant relationships with the dependent variable ( $p < .05$ ). Multicollinearity diagnostics and perturbation analysis revealed no flagged variables, as VIF were less than 10 and most of the minimum and maximum coefficients remained into the 95% CI range of coefficients, respectively (Table 3).

#### *Defensive transition more associated with a shot on goal conceded*

In Transition-State Attack/Defence (i.e., DTSd), successful teams were 1.10 times more likely to concede a shot on goal (FIrb,  $p = .03$ , 95% CI = 1.01-1.20) and 0.91 times less likely to perform FEda ( $p = .01$ , 95% CI = 0.85-0.98) compared to FEeds. Also, univariate analysis revealed that in Non-Possession of the Ball after Transition-State Attack/Defence (i.e., DNpt), FEda was 0.97 times less likely to occur against FEeds ( $p = .04$ , 95% CI = 0.93-0.99).

#### *Forcing an opponent to play the first touch causes ball carrier error and controlling space induces tackles.*

The chances of successful teams were 1.10 times higher to FEep against FEeds as a unit increase of Delay (i.e., TSaa) ( $p = .02$ , 95% CI = 1.01-1.20), and 0.84 times lower when defenders controlled the space (i.e., TSce) by a unit more ( $p = .01$ , 95% CI = 0.74-0.96). In univariate analysis, it seems that by comparing FEda and FIrf to FEeds, the odds of FEda decreased 0.94 and 0.95 times, and the FIrf increased 1.07 and 1.05 times as a unit of Controlling Space and Delay subphases (i.e., TSce and TSaa) were enforced, respectively ( $p < .05$ ). Likewise, the more Forcing the Opponent Direction/Reducing the Space (i.e., TSfd) was required, the more likely the teams were to recover the ball by FEeds rather than another type of effective EDP,  $p < .05$  (Table 3).

#### *Influence of the opponent quality on the defensive patterns of play.*

Univariate analysis revealed that when facing worse opponents (i.e., Tier 2), successful teams were 1.86 and 1.64 times more likely to FEda ( $p < .001$ , 95% CI = 1.25-2.77) and FEep ( $p = .01$ , 95% CI = 1.07-2.51), respectively. On the other hand, successful teams were 0.63 times less likely

to make FEi ( $p < .001$ , 95% CI = 0.43-0.92) compared to FEEds. Similar results were found in multivariate analysis for FEEda ( $p = .01$ , OR = 1.74, 95% CI = 1.16-2.61) and FEi ( $p = .02$ , OR = 0.62, 95% CI = 0.42-0.92).

*The impact of goalkeeper technique in the 2014 FIFA World Cup Champion.*

Argentina and the Netherlands were 0.47 and 0.50 times less likely to FEtg than to FEEds, compared to Germany ( $p < .05$ ). However, significant results were not found between Germany and Brazil or any team in univariate analysis ( $p > .05$ ).

*Brazil was less likely to concede a shot off goal.*

Univariate and multivariate analysis showed that Argentina, Germany and the Netherlands were 3.17-3.04, 2.50-2.64, 2.96-2.94 times more likely to F1rf compared to FEEds, respectively, than Brazil,  $p < .05$  (Table 3). In addition, both statistics evidenced that Argentina was 3.04 and 3.01 times more likely to receive a shot on goal than Brazil ( $p < .05$ ).

### Sequential Analysis

All the  $z$ -values, significance levels and effect sizes of the relationships found ( $-1.96 < z > 1.96$ ,  $p < .05$ ) through the five lags are exhaustively listed in the supplementary material (Table S5 to Table S8). The values with more probable occurrence (i.e.,  $z > 1.96$ ) in a timescale (i.e., lag), opponent's behaviour (i.e., ball field zones), and task (i.e., tactical-technical behaviours) are illustrated in Figures 2 and 3. Those reflect the sequential patterns with the multi-events that fulfilled the above requirements, which are numbered and identified by codes and  $z$ -values. The circles, meticulously, represent the ball field zone in a lag; the solid lines represent the direction of the ball trough time; the dashed line represents the defender coupled to the ball (i.e., discriminated by a triangle, diamond and square). In each shape, the codes and  $z$ -values of the tactical modelling and tactical-technical behaviours probable to occur are positioned nearest to their specific lag. Ball recovery is represented by an arrow and randomly numbered from top to bottom. The type of ball recovery with contextual variable codes linked by an asterisk is described in each numbered pattern. When a pattern is counted twice, it means that it started and ended equally, under the same conditions (i.e., contextual variables), but could have

different paths. For example, the patterns 1, 2, 4 and 5 in Figure 3d represent the sequential pattern of FEep in the drawn matches of the playoffs (excluding the third-place match) that most likely begin two moments before ball recovery (i.e., lag is -2) in the field zone 8 (B5) through DTsd and TSaa. The ball is then likely to remain in field zone 8 or progress to field zone 6 (B6). In both situations, the first defender and the second defender are probably in field zone 8 and 6, respectively, with the latter most probably doing the tactical-technical action of contention (DSc). Lastly, FEep is likely to be performed in either field zone 4 or field zone 6.

*How did successful teams generally perform to recover the ball?*

As shown in Figure 2, we found sequential patterns for FEEda in Brazil, the Netherlands and Germany. Furthermore, Brazil and Argentina showed a pattern of FEEds and FEi, respectively. Germany did not show patterns of FEep, in contrast to the other three teams. However, Germany was the only one that presented a sequential pattern for FEtg. Lastly, FEil patterns were seen in all the teams.

*Did successful teams play a defensive style according to the tactical modelling?*

The Netherlands was the only team that evidenced sequential patterns related to a type of development of defensive play; specifically, Development by Non-Possession of the Ball (i.e., DNpb) in FEEda and Development by Transition-state Attack/Defence (i.e., DTsd) coupled with the sub-phase of delay (i.e., TSaa).

*Did the successful teams present self-similar patterns by halves?*

Germany showed a self-similar pattern, i.e., part can be interpreted as a reduced scale of the whole (Mandelbrot, 1967), with a pattern of FEEda and FEil in the first and the second half (i.e., FH and SH), respectively. Argentina also showed a self-similar pattern for the latter type of ball recovery in the first half. Similarly, both teams showed patterns of FEil in the second half, which ceased to appear in full matches.

**Table 1**  
*Soccer Defence (SOC-DEF) Observational System: Criteria and Categories.*

Criteria	Categories	Code		
<b>Match Status</b>	Winning > one goal difference	Rwm1		
	Winning by one goal difference	Rw1		
	Draw	Re		
	Losing by one goal difference	Rl1		
	Losing > one goal difference	Rlm1		
<b>Opponent Quality</b>	Tier 1 (semi-finalists teams)	To		
	Tier 2 (teams who lost in the eight-or quarterfinals)	Tt		
<b>Halves<sup>a</sup></b>	First Half <sup>a</sup>	FH		
	Second Half <sup>a</sup>	SH		
<b>Type and Stage of Competition</b>	Play-offs excluding Third Place and Final	Csk		
	Third Place game <sup>a</sup>	Cdk		
	Final	Cf		
<b>Type of Development</b>	Transition-state Attack/Defence	DTSD		
	Non-Possession of Ball after Transition-State	DNpt		
	Attack/Defence	DNpb		
	Non-Possession of the Ball	DNpb		
<b>Type of Subphase</b>	Delay	TSaa		
	Forcing the opponent direction/Reducing space	TSfd		
	Controlling space	TSce		
<b>Defenders Tactical- Technical Actions</b>	<b>First Defender (DD)</b>	Pressure	cp	
		Temporisation	ct	
	<b>First(DD) / Second (DS) / Third Defender (DT)</b>	Player Marking	mh	
		Aerial Duel	da	
		Unsuccessful Tackle	tr	
		Intervention without success	is	
		Goalkeeper Tactical-Technical Action	ag	
		Close Longitudinal Spaces	el	
		Close Transversal Spaces	et	
		Zonal Cover with player marking	cz	
		Control or Balance Positioning	pe	
		Displacements of Recovering	dr	
		Goalkeeper Positioning	gp	
		<b>Second (DS) / Third Defender (DT)</b>	Contention	c
			Cover	cb
	<b>Centre of the game</b>	Numerical Equality without Pressure	SPi	
		Numerical Equality Pressure	Pi	
		Relative Numerical Superiority	Pr	
		Absolute Numerical Superiority	Pa	
Relative Numerical Inferiority		SPr		
Absolute Numerical Inferiority		SPa		
<b>Field Zones (see figure 1)</b>	Field Zones of Ball	B1-B14		
	Field Zones of 1 <sup>st</sup> Defender	D1-D14		
	Field Zones of 2 <sup>nd</sup> Defender	S1-S14		
	Field Zones of 3 <sup>rd</sup> Defender	T1-T14		
<b>End of Defensive Phase</b>	<b>Effective</b>	Tackle	FEds	
		Interception	FEi	
		Ball Carrier Error	FEep	
		Heading	FEda	
		Interruptions and Laws Infractions	FEil	
		Offside	FEfj	
	<b>Ineffective</b>	Goalkeeper Technique	FEtg	
		Shot Blocked Conceded	FErb	
		Shot on Goal Conceded	Flrb	
		Shot off Goal Conceded	Flrf	
		Goal Conceded	Flg	

*Note. Criteria/category added.*

**Table 2**  
*Number of Sequences and Median (Interquartile Range) of Events, Multi-events and Duration by Team, Halves, Match Status, Opponent Quality and Stage of Competition.*

	Argentina				Brazil				Germany				Netherlands				Total			
	S	Mu	E	D	S	Mu	E	D	S	Mu	E	D	S	Mu	E	D	S	Mu	E	D
	n	Mdn (IQR)	Mdn (IQR)	Mdn (IQR)	n	Mdn (IQR)	Mdn (IQR)	Mdn (IQR)	n	Mdn (IQR)	Mdn (IQR)	Mdn (IQR)	n	Mdn (IQR)	Mdn (IQR)	Mdn (IQR)	n	Mdn (IQR)	Mdn (IQR)	Mdn (IQR)
FH*	160	9.0 (12.5)	88.0 (122.0)	61.5 (61.5)	161	9.0 (10.0)	81.0 (90.0)	61.0 (59.0)	181	8.0 (10.0)	76.0 (92.0)	54.0 (55.0)	140	11.5 (13.0)	108.5 (127.5)	71.5 (61.5)	642	9.0 (11.0)	89.0 (106.0)	61.0 (60.0)
SH	172	8.5 (10.5)	79.0 (98.0)	56.0 (60.0)	176	9.0 (8.5)	81.5 (83.5)	52.5 (56.5)	176	9.0 (11.0)	85.0 (112.0)	59.0 (50.0)	157	9.0 (13.0)	81.0 (119.0)	65.0 (64.0)	681	9.0 (11.0)	81.0 (105.0)	60.0 (58.0)
Rlm1					117	10.0 (11.0)	91.0 (109.0)	64.0 (64.0)									117	10.0 (11.0)	91.0 (109.0)	64.0 (64.0)
Rl1					26	8.5 (8.0)	84.5 (82.0)	60.5 (52.0)					29	7.0 (8.0)	63.0 (76.0)	61.0 (42.0)	55	8.0 (9.0)	72.0 (80.0)	61.0 (54.0)
Re*	250	9.0 (11.0)	85.0 (105.0)	63.0 (63.0)	98	7.0 (10.0)	69.5 (89.0)	51.5 (61.0)	207	7.0 (8.0)	62.0 (78.0)	52.0 (57.0)	183	10.0 (13.0)	87.0 (123.0)	72.0 (62.0)	738	8.0 (10.0)	77.5 (102.0)	60.5 (62.0)
Rw1*	82	9.0 (13.0)	79.5 (129.0)	52.5 (51.0)	83	9.0 (8.0)	81.0 (72.0)	57.0 (54.0)	90	11.0 (10.0)	100.0 (101.0)	57.5 (50.0)	18	9.5 (7.0)	89.0 (69.0)	45.5 (64.0)	273	10.0 (10.0)	88.0 (93.0)	54.0 (51.0)
Rwm1*					13	11.0 (5.0)	102.0 (48.0)	37.0 (38.0)	60	13.5 (15.5)	127.5 (156.0)	66.5 (47.0)	67	13.0 (15.0)	123.0 (140.0)	71.0 (62.0)	140	13.0 (14.0)	120.5 (143.0)	65.5 (53.0)
To*	152	12.0 (18.0)	108.0 (168.0)	70.0 (70.5)	153	9.0 (11.0)	90.0 (106.0)	65.0 (63.0)	164	10.0 (14.0)	92.5 (134.0)	65.5 (57.0)	145	13.0 (14.0)	121.0 (147.0)	71.0 (61.0)	614	11.0 (14.0)	100.0 (140.0)	68.0 (64.0)
Tt*	180	7.0 (8.0)	68 (72.5)	54.0 (48.0)	184	8.0 (8.0)	77.5 (77.5)	50.5 (55.0)	193	8.0 (8.0)	72.0 (76.0)	52.0 (52.0)	152	8.0 (10.0)	77.5 (99.0)	69.5 (64.0)	709	8.0 (8.0)	73.0 (79.0)	55.0 (55.0)
Csk*	246	9.0 (11.0)	80.0 (103.0)	61.0 (59.0)	262	8.5 (9.0)	81.0 (87.0)	53.5 (59.0)	274	9.0 (10.0)	86.5 (96.0)	55.0 (51.0)	216	9.0 (11.5)	85.0 (113.5)	70.5 (61.0)	998	9.0 (10.0)	83.0 (101.0)	60.0 (57.0)
Cf	86	11.0 (14.0)	104.5 (132.0)	56.0 (64.0)					83	8.0 (12.0)	70.0 (121.0)	58.0 (66.0)					169	9.0 (13.0)	85.0 (124.0)	57.0 (63.0)
Cdk*					75	9.0 (10.0)	90.0 (106.0)	62.0 (67.0)					81	12.0 (13.0)	113.0 (122.0)	71.0 (64.0)	156	10.0 (14.0)	98.5 (128.5)	65.0 (65.0)
<b>Total*</b>	332	9.0 (11.0)	83.5 (106.8)	60.0 (61.0)	337	9.00 (9.00)	81.0 (88.5)	57.0 (61.0)	357	9.0 (10.5)	84.0 (100.0)	56.0 (54.0)	297	10.0 (14.0)	91.0 (127.5)	71.0 (62.0)	132	9.0 (11.0)	85.0 (105.0)	60.0 (59.0)

Notes. Mdn = Median; IQR = Interquartile range; S = Sequences; Mu = Multi-events; E = Events; D = Duration of Sequences in seconds; A = Argentina; B = Brazil; G = Germany; Ne = Netherlands; \*  $p < .05$ , z-test for proportions applied to sequences and Kruskal-Wallis H-test and Mann-Whitney U-test to Events, Multi-events and Duration of Sequences; FH = First Half; SH = Second Half; Rwm1 Winning more than one goal difference; Rw1 = Winning by one goal difference; Re = Draw; Rl1 = Losing by one goal difference; Rlm1 = Losing more than one goal difference; To = Tier 1 (semi-finalists teams); Tt = Tier 2 (teams who lost in the eight-or quarterfinals); Csk = Play-offs excluding Third Place and Final; Cdk = Third Place game; Cf = Final.

\*Statistical differences at  $p < .05$  in the following conditions: FH - Mu: Ne>B,G; E: Ne>B,G; D: Ne>B,G. Re - S: B<A,G,N; A>G,Ne; Mu: G<A,Ne; E: G<A,Ne; D: Ne>B,G; A>G. Rw1 - S: Ne<A,B,G. Rwm1 - S: G>B; D:B<G,Ne. To - Mu: Ne>B,G,E; Ne>B. Tt - D: Ne>A,B. Csk - D:Ne>A,B,G. Cdk - Mu: Ne>B; E: Ne>B. Total - Mu: Ne>B,G; D:Ne>A,B,G.

**Table 3**  
*Significant Variable Estimates and Fitting Diagnostics of the Multinomial End of Defensive Phase Logit Models.*

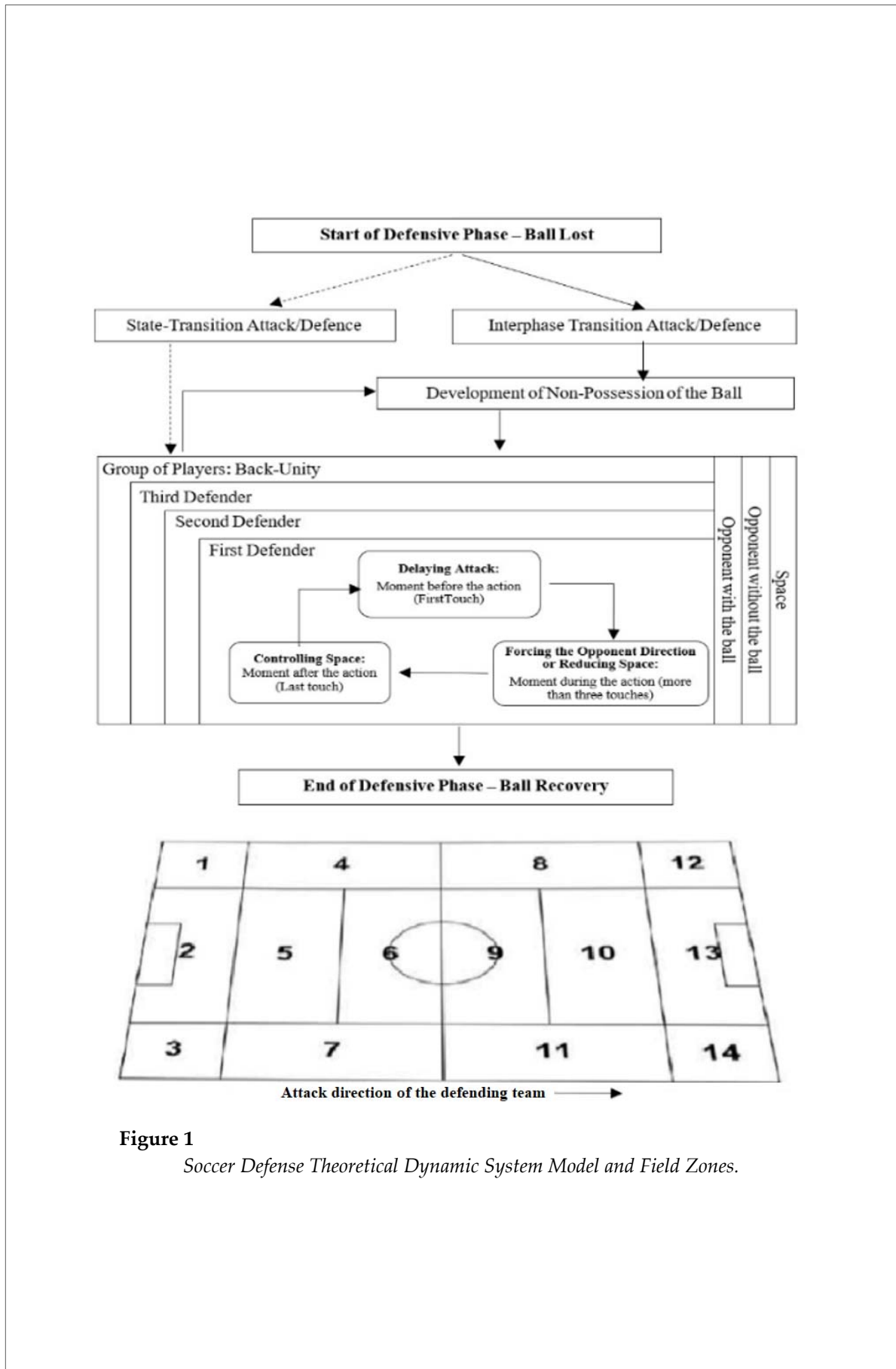
	Reference	B	SE	B 95%CI		Perturbation		Wald	Sig.	Exp(B)	Exp(B) 95%CI		
				Lower	Upper	Min	Max				Lower	Upper	
<b>Univariate<sup>a</sup></b>													
FEda	DNpt	-0.03	0.01	-0.05	-0.01	-0.03	-0.02	4.15	0.04	0.97	0.95	0.99	
FEda	Tier 2	0.62	0.20	0.29	0.96	0.29	0.92	9.36	0.00	1.86	1.25	2.77	
FEda	TSaa	-0.05	0.03	-0.09	-0.02	-0.06	-0.04	4.03	0.04	0.95	0.90	0.99	
FEda	TSce	-0.06	0.03	-0.11	-0.02	-0.08	-0.03	3.90	<.05	0.94	0.88	0.99	
FEda	TSfd	-0.55	0.08	-0.67	-0.42	-0.55	-0.28	50.58	0.00	0.58	0.50	0.67	
FEep	Tier 2	0.49	0.22	0.13	0.85	0.11	0.74	5.10	0.02	1.64	1.07	2.51	
FEep	TSce	-0.09	0.04	-0.15	-0.04	-0.11	-0.06	6.04	0.01	0.91	0.85	0.98	
FEep	TSfd	-0.49	0.08	-0.62	-0.35	-0.49	-0.21	35.55	0.00	0.62	0.52	0.72	
FEi	Tier 2	-0.47	0.20	-0.79	-0.14	-0.68	-0.10	5.64	0.02	0.63	0.43	0.92	
FEi	TSfd	-0.33	0.06	-0.43	-0.23	-0.33	-0.16	27.57	0.00	0.72	0.64	0.81	
FEil	Argentina	Brazil	0.74	0.27	0.30	1.77	0.42	0.97	7.58	0.01	2.09	1.24	3.53
FEil	TSfd		-0.34	0.06	-0.44	-0.24	-0.36	-0.18	31.18	0.00	0.71	0.63	0.80
Flrb	Argentina	Brazil	1.13	0.53	0.22	1.99	0.43	1.67	4.49	0.03	3.10	1.09	8.80
Flrf	TSaa		0.05	0.03	0.02	0.09	0.04	0.06	4.25	0.04	1.05	1.00	1.11
Flrf	TSce		0.07	0.03	0.03	0.12	0.05	0.09	5.07	0.02	1.07	1.01	1.14
Flrf	Argentina	Brazil	1.16	0.45	0.42	1.89	0.48	1.73	6.62	0.01	3.17	1.32	7.65
Flrf	Germany	Brazil	0.92	0.45	0.17	1.66	0.17	1.67 <sup>†</sup>	4.11	0.04	2.50	1.03	6.06
Flrf	Netherlands	Brazil	1.09	0.45	0.35	1.82	0.37	1.63	5.90	0.02	2.96	1.23	7.12
<b>Multivariate<sup>b</sup></b>													
FEda	DTSd		-0.09	0.04	-0.15	-0.03	-0.12	-0.04	6.23	0.01	0.91	0.85	0.98
FEda	Tier 2		0.55	0.21	0.21	0.89	0.18 <sup>†</sup>	0.76	7.09	0.01	1.74	1.16	2.61
FEep	TSaa		0.10	0.04	0.03	0.17	0.01	0.13	5.32	0.02	1.10	1.01	1.20
FEep	TSce		-0.17	0.06	-0.28	-0.06	-0.20	-0.02	6.94	0.01	0.84	0.74	0.96
FEi	Tier 2		-0.48	0.20	-0.81	-0.15	-0.71	-0.07 <sup>†</sup>	5.75	0.02	0.62	0.42	0.92
FEil	Argentina	Brazil	0.73	0.27	0.29	1.17	0.38	0.98	7.35	0.01	2.08	1.22	3.52
FEtg	Argentina	Germany	-0.76	0.37	-1.37	-0.15	-1.20	-0.29	4.25	0.04	0.47	0.23	0.96
FEtg	Netherlands	Germany	-0.70	0.36	-1.29	-0.12	-1.14	-0.30	3.87	<0.05	0.50	0.25	0.99
Flrb	Argentina	Brazil	1.10	0.54	0.22	1.99	0.25	1.99	4.19	0.04	3.01	1.05	8.65
Flrb	DTSd		0.10	0.05	0.02	0.17	0.04	0.13	4.53	0.03	1.10	1.01	1.20
Flrf	Argentina	Brazil	1.11	0.45	0.36	1.86	0.48	1.73	5.97	0.01	3.04	1.25	7.40
Flrf	Germany	Brazil	0.97	0.46	0.22	1.72	0.34	1.53	4.55	0.03	2.64	1.08	6.46
Flrf	Netherlands	Brazil	1.08	0.45	0.34	1.82	0.37	1.63	5.75	0.02	2.94	1.22	7.11

Notes. <sup>†</sup> the value of perturbation analysis is out of 95% confidence interval range so careful interpretations should be done. The reference category is FE<sub>ds</sub> (End of defensive phase by tackle); FE<sub>da</sub> = End of defensive by Heading; FE<sub>ep</sub> = End of defensive phase by Ball carrier error; FE<sub>i</sub> = End of defensive phase by Interception; FE<sub>il</sub> = End of defensive phase by Interruptions and laws infractions; FE<sub>tg</sub> = End of defensive phase by Goalkeeper technique; Fl<sub>rb</sub> = End of defensive phase by Shot on Goal; Fl<sub>rf</sub> = End of defensive phase by Shot off Goal; DN<sub>pt</sub> = Non-possession of ball after transition-state attack/defence; DT<sub>sd</sub> = Transition-state attack/defence; Tier 2 = teams who lost in the eight-or quarterfinals; TS<sub>aa</sub> = Delay sub-phase; TS<sub>ce</sub> = Controlling space sub-phase; TS<sub>fd</sub> = Forcing the opponent direction/Reducing space sub-phase; LL = Log-Likelihood; VIF = Variance inflation factor; df = degrees of freedom; Pseudo R Squared(Cox and Snell/ Nagelkerke); Classf = Classification accuracy; X<sup>2</sup> = Likelihood Ratio Tests.

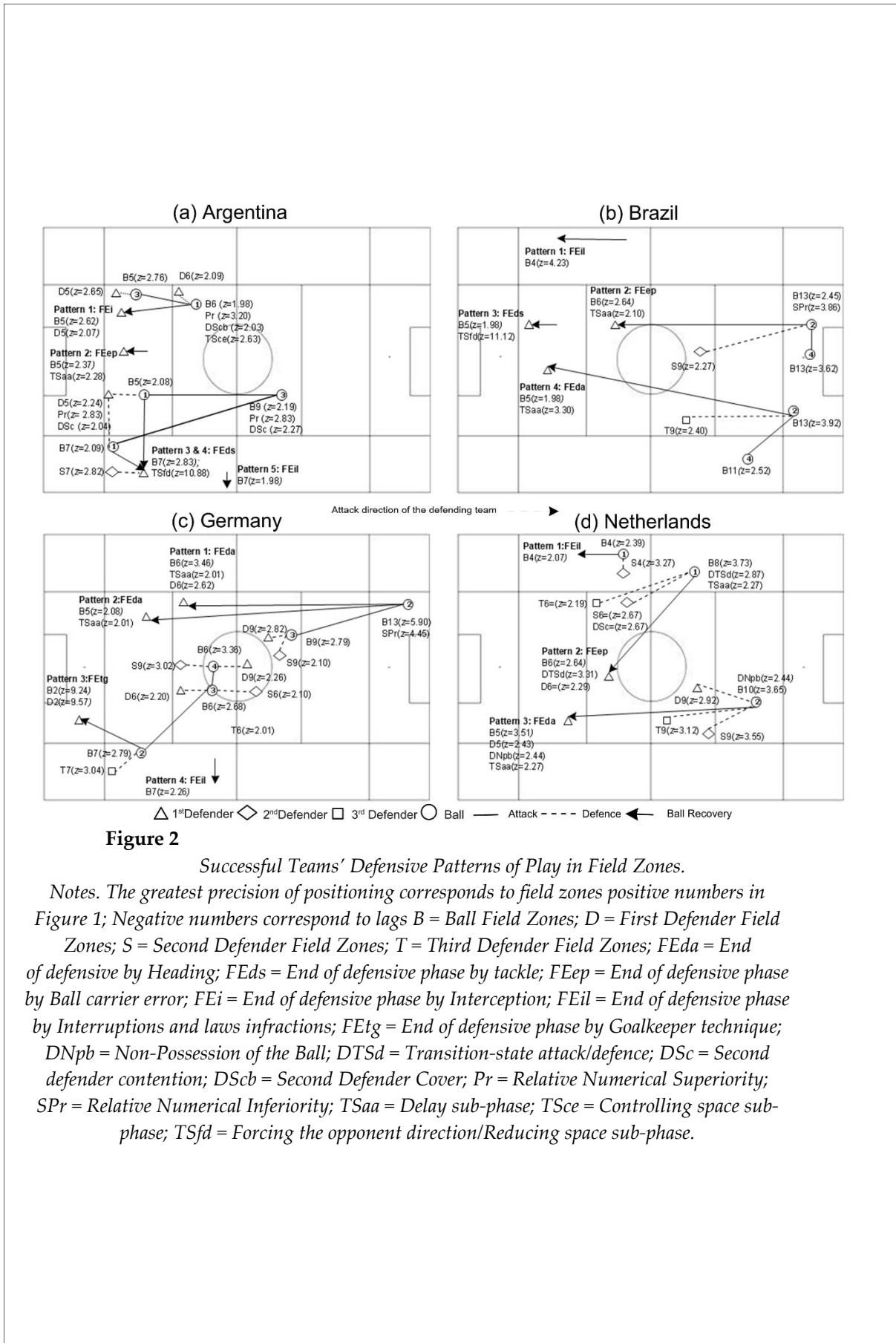
a. DN<sub>pb</sub>: -2LL = 705.7, X<sup>2</sup>(7) = 18.3, p = 0.01, Pseudo R<sup>2</sup> = .014/.015, Classf. = 20.3%; DN<sub>pt</sub>: -2LL = 673, χ<sup>2</sup>(7) = 14.6, p = 0.04, Pseudo R<sup>2</sup> = .012/.012, Classf. = 20.9%; DT<sub>sd</sub>: -2LL = 540.5, χ<sup>2</sup>(7) = 13.8, p = 0.06, Pseudo R<sup>2</sup> = 0.111/.011, Classf. = 21.0%; Halves: -2LL = 86.7, χ<sup>2</sup>(7) = 6.6, p = 0.47, Pseudo R<sup>2</sup> = .005/.005, Classf. = 20.3%; Opponent Quality: -2LL = 123.1, χ<sup>2</sup>(7) = 43.2, p = .00, Pseudo R<sup>2</sup> = .034/.034, Classf. = 22.6%; Teams: -2LL = 174.8, χ<sup>2</sup>(21) = 34.6, p = .03, Pseudo R<sup>2</sup> = .027/.028, Classf. = 21.1%; TS<sub>aa</sub>: -2LL = 781.8, χ<sup>2</sup>(7) = 34.4, p = .00, Pseudo R<sup>2</sup> = .027/.028, Classf. = 20.0%; TS<sub>ce</sub>: -2LL = 545.1, χ<sup>2</sup>(7) = 37.9, p = .00, Pseudo R<sup>2</sup> = .030/.030, Classf. = 0.8%; TS<sub>fd</sub>: -2LL = 389, χ<sup>2</sup>(7) = 108.3, p = .00, Pseudo R<sup>2</sup> = .082/.084, Classf. = 22.9%.

b. DN<sub>pb</sub>: -2LL = 4382, χ<sup>2</sup>(7) = 20, p = .011, VIF = 1.00; DT<sub>sd</sub>: -2LL = 4383.7, χ<sup>2</sup>(7) = 21.6, p = .00, VIF = 1.04; Teams: -2LL = 4396.8, χ<sup>2</sup>(21) = 34.8, p = 0.03, VIF = 2.09; Opponent Quality: -2LL = 4395.7, χ<sup>2</sup>(7) = 33.7, p = .00; VIF = 1.95; TS<sub>aa</sub>: -2LL = 4382.6, χ<sup>2</sup>(7) = 20.6, p = .00, VIF = 5.22; TS<sub>ce</sub>: -2LL = 4384.2, χ<sup>2</sup>(7) = 22.1, p = .00, VIF = 5.31; Final Model: -2LL = 4362.7, χ<sup>2</sup>(56) = 157.1, p = .00, Hosmer and Lemeshow test = 50.4, p = 0.69, Pseudo R<sup>2</sup> = .117/.120, Classf. = 25.6%.





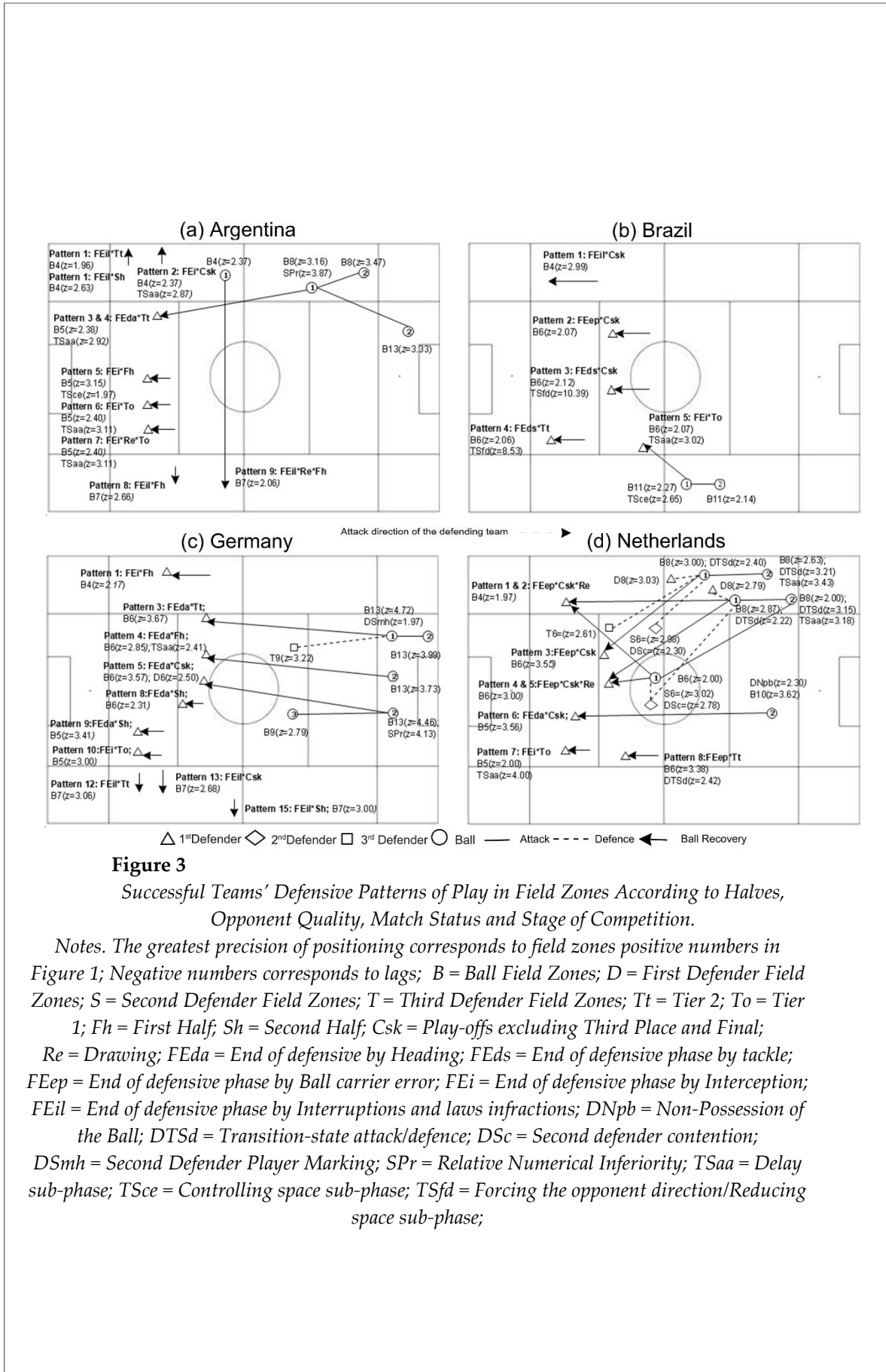
**Figure 1**  
*Soccer Defense Theoretical Dynamic System Model and Field Zones.*



**Figure 2**

*Successful Teams' Defensive Patterns of Play in Field Zones.*

*Notes. The greatest precision of positioning corresponds to field zones positive numbers in Figure 1; Negative numbers correspond to lags B = Ball Field Zones; D = First Defender Field Zones; S = Second Defender Field Zones; T = Third Defender Field Zones; FEda = End of defensive by Heading; FEds = End of defensive phase by tackle; FEep = End of defensive phase by Ball carrier error; FEi = End of defensive phase by Interception; FEil = End of defensive phase by Interruptions and laws infractions; FEtg = End of defensive phase by Goalkeeper technique; DNpb = Non-Possession of the Ball; DTSD = Transition-state attack/defence; DSc = Second defender contention; DScb = Second Defender Cover; Pr = Relative Numerical Superiority; SPPr = Relative Numerical Inferiority; TSaa = Delay sub-phase; TSce = Controlling space sub-phase; TSfd = Forcing the opponent direction/Reducing space sub-phase.*



**Figure 3**  
 Successful Teams' Defensive Patterns of Play in Field Zones According to Halves, Opponent Quality, Match Status and Stage of Competition.

Notes. The greatest precision of positioning corresponds to field zones positive numbers in Figure 1; Negative numbers corresponds to lags; B = Ball Field Zones; D = First Defender Field Zones; S = Second Defender Field Zones; T = Third Defender Field Zones; Tt = Tier 2; To = Tier 1; Fh = First Half; Sh = Second Half; Csk = Play-offs excluding Third Place and Final; Re = Drawing; FEda = End of defensive by Heading; FEds = End of defensive phase by tackle; FEep = End of defensive phase by Ball carrier error; FEi = End of defensive phase by Interception; FEil = End of defensive phase by Interruptions and laws infractions; DNpb = Non-Possession of the Ball; DTSd = Transition-state attack/defence; DSc = Second defender contention; DSmh = Second Defender Player Marking; SPr = Relative Numerical Inferiority; TSaa = Delay sub-phase; TSce = Controlling space sub-phase; TSfd = Forcing the opponent direction/Reducing space sub-phase;

*Were the successful teams' patterns related to the opponent's quality?*

Argentina and Germany performed more FEil and FE<sub>da</sub> when facing teams that lost in the eight- or quarterfinals (Tt), i.e., worse teams, but more FE<sub>i</sub> when facing the other semi-finalists' teams (To), which were of similar quality. The Netherlands and Brazil also demonstrated this last association. The Netherlands and Brazil were associated to FE<sub>ep</sub> and FE<sub>ds</sub>, respectively, when they played against worse opponents.

*Did the competition stage influence the sequential patterns?*

The patterns of play to FE<sub>ep</sub>, FE<sub>da</sub>, FE<sub>ds</sub>, and FE<sub>il</sub> of Brazil, Germany and the Netherlands in the matches excluding the third-place (Csk) and final matches, were self-similar. However, the pattern of FE<sub>il</sub> of Argentina was not stable, as the final match disturbed the pattern.

*Did the successful teams defend differently when losing, drawing or winning?*

None of the teams showed patterns for any type of ball recovery in different match status, with the exception of the Netherlands and Argentina, which showed patterns of play to FE<sub>ep</sub> and FE<sub>il</sub> when drawing and drawing in the first half (i.e., Re and Re\*FH), respectively.

## Discussion

The aims of this study were to identify the statistical differences and associations of EDP patterns among and within successful teams of the 2014 FIFA World Cup, according to tactical modelling and contextual variables such as halves, match status, opponent quality and stage competition.

Our findings of defensive sequence duration indicate differences between successful teams in time spent to EDP. Despite different methods, Vogelbein et al. (2014) showed similar results with respect to time to directly recover the ball. They found that defensive time reactions segregated top teams from in-between and bottom teams. However, defensive transition in this study resulted in fewer shots off goal in Brazil (i.e., fourth-placed). This partly contradicts the findings of Delgado-Bordonau et al. (2013), who found that shots received on target and off target were higher among losing teams. Thus, more complex approaches are required in addition to the analysis of specific tasks (Garganta, 2009).

Moreover, the Netherlands team had the most time on defence. A possible explanation could be the use of three/five defenders by this team. For instance, studies like Bradley et al. (2011) found that players in a 1-4-5-1 formation compared to 1-4-4-2 and 1-4-4-3 formations achieved more very-high intensity running when their teams were not in possession. Similar designs and the addition of formations with three/five defenders, should be encouraged when studying the defensive phase.

The main finding in this study is the prominence of goalkeeper's technique in the World Cup 2014 Championship. Liu et al. (2015) found that high-level goalkeepers in the Spanish First Division performed fewer ball recoveries than intermediate and low-level teams. These differences could be explained by our study's exclusive selection of high-level teams. Regardless of that, this emphasizes the importance of considering the goalkeeper in team play, and in research analysis, which sometimes is excluded (for a review see Sarmiento et al., 2018).

Another finding of this study was that the defender's timing to perform a tactical-technical behaviour against the ball carrier (i.e., delay) was associated with more effective ball recoveries. Related to this, sequential analysis showed that successful teams performed more interceptions when facing similar quality teams. Both findings demonstrate the importance of not only training players' perception and decision-making (Roca et al., 2018), but also the coordination of their interactions (Davids et al., 2013; Ribeiro et al., 2017).

The sequential analysis results showed ball recovery patterns (i.e., FE<sub>da</sub>, FE<sub>ds</sub>, FE<sub>i</sub>, FE<sub>il</sub>, FE<sub>ep</sub>, FE<sub>tg</sub>). Additionally, as seen in Figure 2(a), a pattern for tackles (i.e., numbers 3 and 4) was found for Argentina, whose ball recovery occurred in the right strip and lower defensive midfield sector. Interestingly, this pattern started in lower zones and advanced into higher and lateral ones. If we then consider the different types of defending styles, such as low-high pressing and low-medium-high defensive blocks (Bangsbo and Peitersen, 2002; Fernandez-Navarro et al., 2016), it seems plausible to infer that, in this specific pattern, Argentina demonstrates a low defensive block style as it forces the opponent to retreat from an advantageous zone for goal

scoring. Here, this zone is mentioned as number 10 for the attacking team, while in other studies it is Zone 14 (Taylor et al., 2002). These findings could help coaches recognize certain particularities of defensive play, to create their own team playing style, and design training exercises in Positioning or Game Training (O'Connor et al., 2017).

Nevertheless, it may be insufficient to consider only the exact moment that the ball is regained to infer defensive styles. For instance, it is apparent that teams performed a central high-pressure or lateral high-pressure (e.g., pattern number 2 in Figure 2d) before recovering the ball in their defensive midfield. This demonstrates the importance of using more holistic methods (Garganta, 2009; Ribeiro et al., 2017; Sarmiento et al., 2018). Despite this, the results of ball recovery zones are consistent with previous works that considered the same competition with the same teams (Maleki et al., 2016), and the 2010 World Cup (Barreira et al., 2014).

In a study identical to ours, Almeida et al. (2014) used a multinomial model to analyse the different types of ball recovery in the UEFA Champions League teams. Both studies found that playing against lower-ranked teams increased the chances of recovering the ball by a tackle versus interception. Likewise, studies have found that tackling in the 2014 World Cup had a positive effect for winning teams (Liu et al., 2015).

## Acknowledgements

The authors are thankful to the FIFA Films database archive for providing the public footages of matches and to Dr. John Hendrickx for helping with the perturbation analysis of multinomial logistic regression models. Finally, the authors gratefully acknowledge the support of INEFEC (National Institute of Physical Education of Catalonia) and the support of two Spanish government projects (Ministerio de Economía y Competitividad): (1) La actividad física y el deporte como potenciadores del estilo de vida saludable: Evaluación del comportamiento deportivo desde metodologías no intrusivas (Grant number DEP2015-66069-P); (2) Avances metodológicos y tecnológicos en el estudio observacional del comportamiento deportivo (PSI2015-71947-REDP); and the support of the Generalitat de Catalunya Research Group, Research group and innovation in designs (GRID). Technology and multimedia and digital application to observational designs. (Grant number 2017 SGR 1405).

## References

- Almeida CH, Ferreira AP, Volossovitch A. Effects of match location, match status and quality of opposition on regaining possession in UEFA Champions League. *J Hum Kinet*, 2014; 41: 203-214. doi:10.2478/hukin-2014-0048
- Bakeman R, Quera V. *Analyzing interaction: Sequential Analysis with SDIS & GSEQ*. Cambridge: Cambridge University Press; 1995

This implies that even if teams adopt a defensive style of play, they should be adaptive to the constraints of the environment (Davids et al., 2013) and consider having or switching the rule of exercise in training (Ishii et al., 2018).

On the other hand, because of lower frequencies in match status, stage competition and in ineffective EDP, the results of our study require careful interpretation. It is also challenging to generalize the teams' performances from one competition alone. For a more comprehensive knowledge of teams' defensive patterns of play, further research should emphasize the relationship across competitions (e.g., domestic competitions), and increase the number of EDP types.

The methods used in this study are believed to give pertinence and meaning to the practical context of soccer and coaches could use the findings either to generally prepare their defensive style of play or set strategies of the attack. In conclusion, successful defence in soccer seems to be associated with regularity and repeatability, and also flexibility, as different patterns in successful teams in the 2014 FIFA World Cup were found in halves, match status, and opponent quality, revealing the importance of not only consolidating the defensive play, but also including tasks and environment constraints in practice.

- Bangsbo J, Peitersen B. *Defensive soccer tactics*. Champaign: Human Kinetics; 2002
- Barreira D, Garganta J, Castellano J, Machado J, Anguera MT. How elite-level soccer dynamics has evolved over the last three decades? Input from generalizability theory. *Cuadernos de Psicología del Deporte*, 2015; 15(1): 51-62. doi:10.4321/S1578-84232015000100005
- Barreira D, Garganta J, Guimarães P, Machado J, Anguera MT. Ball recovery patterns as a performance indicator in elite soccer. *Proc Inst Mech Eng P J Sport Eng Technol*, 2014; 228(1): 61-72. doi:10.1177/1754337113493083
- Barreira D, Garganta J, Machado J, Anguera MT. Effects of ball recovery on top-level soccer attacking patterns of play. *Braz J Kinathrop Hum Perform*, 2013; 16(1): 36-46. doi.org/10.5007/1980-0037.2014v16n1p36
- Borenstein M, Hedges LV, Higgins JPT, Rothstein HR. *Introduction to Meta-Analysis*. Chichester: Wiley; 2009.
- Bradley PS, Carling C, Archer D, Roberts J, Dodds A, Di Mascio M, Paul D, Gomez-Diaz A, Peart D, Krustup P. The effect of playing formation on high-intensity running and technical profiles in English FA Premier League soccer matches. *J Sports Sci*, 2011; 29(8): 821-830. doi:10.1080/02640414.2011.561868
- Casal C, Andujar M, Losada J, Ardá T, Maneiro R. Identification of defensive performance factors in the 2010 FIFA World Cup South Africa. *Sports*, 2016; 4(4): 54. doi:10.3390/sports4040054.
- Chacon-Moscoso S, Sanduvete-Chaves S, Anguera MT, Losada JL, Portell M, Lozano-Lozano JA. Preliminary checklist for reporting observational studies in sports areas: content validity. *Front Psychol*, 2018; 9: 291. doi:10.3389/fpsyg.2018.00291
- Cohen J. A power primer. *Psychol Bull*, 1992; 112(1): 155-159. doi.org/10.1037/0033-2909.112.1.155
- Davids K, Araújo D, Vilar L, Renshaw I, Pinder R. An Ecological Dynamics Approach to Skill Acquisition: Implications for Development of Talent in Sport. *Talent Dev Excell*, 2013; 5(1): 21-34
- Delgado-Bordonau JL, Domenech-Monforte C, Guzmán JF, Méndez-Villanueva A. Offensive and defensive team performance: relation to successful and unsuccessful participation in the 2010 Soccer World Cup. *J Hum Sport Exerc*, 2013; 8(4): 894-904. doi:10.4100/jhse.2013.84.02
- Dormann CF, Elith J, Bacher S, Buchmann C, Carl G, Carré G, et al. Collinearity: a review of methods to deal with it and a simulation study evaluating their performance. *Ecography*, 2013; 36(1): 27-46. doi:10.1111/j.1600-0587.2012.07348.x
- Fernandes T, Camerino O, Garganta J, Pereira R, Barreira D. Design and Validation of an Observational System for Defence in Soccer based on the Dynamical Systems Theory. *Int J Sports Sci Coach*, 2019; 14(2):138–152. doi: 10.1177/1747954119827283
- Fernandez-Navarro J, Ford PR, McRobert AP, Fradua L, Zubillaga A. Attacking and defensive styles of play in soccer: analysis of Spanish and English elite teams. *J Sports Sci*, 2016; 34(24), 2195-2204. doi:10.1080/02640414.2016.1169309
- Gabin B, Camerino O, Anguera MT, Castañer M. Lince: Multiplatform Sport Analysis Software. *Procedia Soc Behav Sci*, 2012; 46: 4692-4694. doi.org/10.1016/j.sbspro.2012.06.320
- Garganta J. Trends of tactical performance analysis in team sports: bridging the gap between research, training and competition. *Revista Portuguesa de Ciências do Desporto*, 2009; 9(1): 81-89. doi:10.5628/rpcd.09.01.81
- Hendrickx J. perturb: Tools for evaluating collinearity. *R package version 2.05*, 2015. Available at <https://CRAN.R-project.org/package=perturb> accessed on 23.04.2020
- Hosmer WH, Lemeshow S. *Applied Logistic Regression* (2 ed.). New York: John Wiley & Sons Inc; 2000
- Ishii K, Hayashi T, Takiyama K. Influence of switching rule on motor learning. *Sci Rep*, 2019; 8. doi:10.1038/s41598-018-31825-4
- Liu H, Gomez MA, Lago-Peñas C. Match Performance Profiles of Goalkeepers of Elite Football Teams. *Int J Sports Sci Coach*, 2015; 10(4): 669-682. doi.org/10.1260/1747-9541.10.4.669
- Liu H, Gomez MA, Lago-Peñas C, Sampaio J. Match statistics related to winning in the group stage of 2014 Brazil FIFA World Cup. *J Sports Sci*, 2015; 33(12): 1205-1213. doi:10.1080/02640414.2015.1022578
- Mackenzie R, Cushion C. Performance analysis in football: a critical review and implications for future research. *J Sports Sci*, 2013; 31(6): 639-676. doi:10.1080/02640414.2012.746720

- Maleki M, Dadkhah K, Alahvisi F. Ball Recovery Consistency as a Performance Indicator in Elite Soccer. *Braz J Kinathrop Hum Perform*, 2016; 18(1): 72-81. doi: 10.5007/1980-0037.2016v18n1p72
- O'Connor D, Larkin P, Williams AM. Observations of youth football training: How do coaches structure training sessions for player development? *J Sports Sci*, 2018; 36(1): 39-47. doi:10.1080/02640414.2016.1277034
- Osborne JW, Overbay O. The Power of Outliers (and Why Researchers Should Always Check for Them). *Pract Assess Res Eval*, 2004; 9(6): 1-8. doi.org/10.7275/qr69-7k43
- Ribeiro J, Silva P, Duarte R, Davids K, Garganta J. Team Sports Performance Analysed Through the Lens of Social Network Theory: Implications for Research and Practice. *Sports Med*, 2017; 47(9): 1689-1696. doi:10.1007/s40279-017-0695-1
- Roca A, Ford PR, Memmert D. Creative decision making and visual search behavior in skilled soccer players. *PLoS One*, 2018; 13(7): e0199381. doi:10.1371/journal.pone.0199381
- Rosenthal R, DiMatteo MR. Meta-analysis: recent developments in quantitative methods for literature reviews. *Annu Rev Psychol*, 2001; 52(1): 59-82
- Sarmiento H, Clemente FM, Araújo D, Davids K, McRobert A, Figueiredo A. What Performance Analysts Need to Know About Research Trends in Association Football (2012-2016): A Systematic Review. *Sports Med*, 2018; 48: 799-836. doi.org/10.1007/s40279-017-0836-6
- Taylor S, Ensum J, Williams M. A quantitative analysis of goals scored. *Insight*, 2002; 5(4): 28-31.
- Vittinghoff E, McCulloch CE. Relaxing the rule of ten events per variable in logistic and Cox regression. *Am J Epidemiol*, 2007; 165(6): 710-718. doi:10.1093/aje/kwk052
- Vogelbein M, Nopp S, Hokelmann A. Defensive transition in soccer - are prompt possession regains a measure of success? A quantitative analysis of German Fussball-Bundesliga 2010/2011. *J Sports Sci*, 2014; 32(11): 1076-1083. doi:10.1080/02640414.2013.879671

**Corresponding author:****Tiago Fernandes**

Centre of Research, Training, Innovation and Intervention in Sport (CIFI2D),  
Faculty of Sport, University of Porto, Portugal  
Address: R. Dr. Plácido da Costa 91, 4200-450 Porto, Portugal  
Phone number: +351 964257893  
E-mail: Tiagomgfernandes@outlook.com