# **EDITORIAL**

## Uniting science and the art of football

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Uniting Edson Arantes do Nascimento's (Pele's) "the beautiful game" with David Beckham's "bending the ball" (talented players apply the laws of physics to the ball) is the major motivation of the 6th.World Congress on Science and Football. From Chinese *tsu chu* to today's modern football games, science was and will be an important part of this excellent sport (http://www7.nationalgeographic.com/ngm/0606/feature1/index.html).

The congress encourages all scientific aspects of football including soccer (1848) including Australian rules (1866), Rugby (1845), American football (1876), Gaelic football (1884) and Canadian football (1882). Issues such as Biomechanics, Nutrition, Psychology, Academies, Talent identification, Medical aspects, Injuries, Special Population, Coaching, Physiology, Testing, Referee, Fair play, Hooliganism, Management, Economics and Skill learning will be discussed during this congress.

Research is as significant as the coach, team and player in competition. Any player can aspire to become a superstar. Encouraging all participants and steak holders will take them to new places where no one has ever dreamt of. Are we close to these dreams? The answer to this question depends on what and how much we sacrifice for science and education. From science and education information should flow into the field. The decisive elements of the game are the referees, trainers, players and supporters. Their approach creates the "climate". They can end or start a war. Football is the sport that leads. It's no miracle but it promotes passion and love. If you are committed, you may even change the world. Football encompasses millions of players, coaches, scientists, administrators, physical education teachers, politicians and inevitably parents of young players. This "simple" game that requires a ball and a goal is not only the game of heroes but also of those who bear a childish enthusiasm that makes dreams come true. Skills include heading, tapping, passing and shooting but each of the football codes has its own unique skills. From Ronaldhinho's "elastico" (stretching an opponent one way and pass him on the other at top speed) to Zidane's "roulette" (360-degree turn at high-speed to dribble past an opponent) watching the game is more exciting than any other entertainment on the planet. The average number of viewers that watched the 2002 World Cup final exceeded 1.3 billion; the Superbowl final later this month and the Rugby Union World Cup in September 2007 will be watched live worldwide. Isn't there a passion involved; a passion that expands from the suburbs of Rio de Janeiro to the ivory league of the rich? Scientists cannot control all the variables involved but may measure the social, psychological and physical strength of the players. Still a trainer armed with information may go through the challenge with small and/or no losses.

The profound beauty of football in any of its codes lies in the fact that football requires power, accuracy and coordination. Unlimited options are assessed, decisions are taken and action is conducted in less than seconds during the course of every game whether it is played in a street or in a stadium that holds hundred thousands. This is not only done by "the black antelopes" of Angola but also by children of age five to veteran adult players of 75 years. The scale of association football, for example, is evident in more than 200 nations; *Federation Internationale de Football Association* (FIFA) has 207 members as of 2006 whereas United Nations has 191 members: Involvement of a natural instinct!

Preventing injuries by training is equally important as the Brazilian samba, the German and Japanese efficiency, the Italian defence and the English fast players. Social and psychological aspects are apparent at world cups, whether soccer, rugby league or rugby union. Besides those who stock their food and beverage at home throughout the month of games, many others can easily find a seat in their favourite restaurant if they wish to take the risk of the waiter pouring wine over them at the moment of a score. More likely is that food will accompany the wine when you are in a Mediterranean country or even in Australia.

This supplement of abstracts of the 6<sup>th</sup> World Congress on Science and Football will hopefully serve as a creative and dynamic source of education and science for football. We would like to thank the Journal of Sports Science and Medicine (www.jssm.org) for making this dream come true. We also thank the Scientific and Technological Research Council of Turkey, Turkish Football Federation and Turkish Red Crescent Society Middle East Technical University Branch for their support to this congress. Being the symbol of unity, we agree with Mr. Gündüz Tekin Onay, who believes that we should all keep "the ball" close to our hearts. We hope to touch the future of football through science and education.

ACKNOWLEDGMENT The author thanks Dr. Thomas Reilly for his contribution and comments.

# **ORAL PRESENTATIONS**

## 1. ANALYSIS OF WORLD CUP 2006

### O-001 Diachronic analysis of interaction contexts in '06 World Championship

#### Julen Castellano Paulis<sup>1</sup>, Abigail Perea<sup>1</sup> 🖂 and Antonio Hernandez Mendo<sup>2</sup>

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**OBJECTIVES** Observing how interaction in a concurrent and competitive situation happens can help to design better trainings. From this viewpoint, the information about the physiological aspects of the game results incomplete in terms of coaching whereas knowledge about the interaction processes generated by the relations with partners and against opponents happens to show an outstanding relevancy. This study detected behaviour patterns in the matches which were played during the 06' World Cup.

**METHODS** A continuous registration of events was done, without time gaps, in order to be able to use a lag technique for the sequence analysis. The sequential order as a time characteristic was used to describe the evolution of events during the match. Six matches of the second phase of the '06 World Cup were continuously registered. SDIS –GSEQ Software was used to analyze the data using lag sequential analysis, keeping maximum requirements of data quality (Kappa-Cohen association index over 0.85).

**RESULTS** Results showed more than 70 playing patterns. Z sum values allowed estimating triggering categories in relation to a focal category. The succession of interaction contexts did not occur by chance but according to an internal logic, which could be explained by certain offensive contexts that appeared to be closer to scoring opportunities, and by other more propitious ball recovering situations.

**DISCUSSION** In agreement with other sport studies which use the Observational Methodology, we propose new guides to describe, and, if possible, to predict the networks of endogenous interactions into this field of play-motricity situations.

KEY WORDS Observation, interaction behaviour, diachronic, World Championship, soccer.

# O-002 Performance profiles of soccer players in 2006 UEFA Champions League and 2006 FIFA World Cup Tournaments

#### Marc Rowlinson and Peter O'Donoghue

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**OBJECTIVE** There have been many speculations over recent years arguing that the UEFA Champions League tournament is a more quality competition than the FIFA World Cup; "I think the European Champions Cup is now bigger than the World Cup. All the best players are in Europe now" (Sir Alex Ferguson). The purpose of the current investigation was to explore such beliefs objectively by undertaking a performance analysis of a set of 8 players who competed in both tournaments in 2006.

**METHODS** A manual notational analysis system was developed to record positive and negative applications of a set of defensive and offensive skills. A reliability investigation revealed a total percentage error of 3.2% (Hughes et al., 2004). Performance of these 8 players was analysed during 3 UEFA Champions League performances and 3 FIFA World Cup performances each.

**RESULTS** Wilcoxon signed ranks tests revealed no significant difference between FIFA World Cup competition and the UEFA Champions League for the percentage of defence (77.7+/-16.5% v 82.4+/-7.9%, z = 0.3, P = 0.799), offensive (88.3+/-3.6% v 88.2+/-2.1%, z = 0.1, P = 0.889) or all events (86.6+/-3.5% v 88.0+/-2.7%, z = 0.8, P = 0.401) that were performed positively.

**DISCUSSION** There was much greater variability between player performances at the FIFA World Cup than during the UEFA Champions League. The current study does not provide sufficient evidence to support the view that there is difference in quality of the players' performances between the two tournaments.

#### REFERENCE

Hughes et al. (2004) Analysis of notation data: reliability, In: *Notational analysis of sport.* 2nd Edition. Eds: Hughes, M. and Franks, I.M. London: Routledge., 189-204.

KEY WORDS Soccer, invariant behaviour, match analysis.

## O-003 Analysis of goals in 2006 FIFA World Cup

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**OBJECTIVE** The world cup is the greatest prize in football. In football, scoring a goal is the ultimate determinant of a successful team and has subsequently received considerable attention in notation research (Rep & Benjamin, 1968). Most people believe that the beauty of football will be completed by goals and each goal has its own beauty and specific characteristics. The aim of this study was to analyse goals which was scored by players in the 2006 FIFA World Cup 2006 in Germany.

**METHODS** Detailed analysis of goals was conducted on 44 games in the 2006 world cup. All of the 44 games were analyses using a TV and video. All information was recorded on data entry forms which were provided for this study. Further information was obtained via FIFA site.

**RESULTS** In 64 games played 143 goals were scored, in average 2.23 goals per match which 52.4% of those scored by forward players. Sixty one percent of goals were gained by direct shots which 47% of those were via short pass. Regarding the number of shots towards opponent's goals significant differences were found between the winners and losers (P<0.05) as the winners had highest number of shots (Table 1).

Actions	Percent (%)
Average number of shot per game	11.1
Average number of shot towards goal per game	5.5
Average number of fouls committed per game	5.9
Average number of free kicks per game	2.9
Average number of offside per game	18.1
Average number of vellow cards per game	2.6
Average number of red card per game	0.2

Table 1. Analyses of matches in 2006 FIFA World Cup.

**CONCLUSION** In conclusion, since highest number of goal was scored from the penalty zone (62%) and by the direct shots coaches should pay more attention to this area of the pitch and also on shots as well.

#### REFERENCES

Reep et al. (1968) Journal of Royal Statistics Society 131, 580-585.

KEY WORDS Football, goal, World cup, Germany.

## O-004 Analysis of goals scored in 2006 World Cup

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**OBJECTIVE** The most identified components of the performance in soccer games are the scored goals. An analysis of how goals are scored can reveal critical factors that will help determine the most appropriate attacking strategy, briefly to obtain winning formula. The purpose of this study was to conduct the technical and quantitative analysis of the scored goals, during the World Cup 2006, Germany.

**METHODS** The software MUNA was used for the analysis of 64 matches and 147 scored goals in the World Cup 2006, Germany.

**RESULTS** According to the analysis of the 147 scored goals, they had resulted from; 63% (92 goals) mature attacks, 16% (24 goals) free-kicks, 9% (13 goals) penalty-kicks, 8% (12 goals) corner kicks, and %4 (6 goals) throw-in.

CONCLUSION Results f this study demonstrated similarities with previous Wold cup data.

KEY WORDS Analysis, goals, soccer.

# O-005 Recurrence plot analysis of successive passing sequences in 2006 World Championship

#### **Birol Cotuk** 🖂 and Eyup Yavuz

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**OBJECTIVE** The analysis of football in the framework of dynamical systems enhances the comprehension of the time dependent, non-linear and complex interactions which structure the game (Eckmann et al., 1987). In this context detection of transitions in system dynamics by Recurrence Plot Analysis (RPA) may convey crucial information about the changing states of play (Grehaigne et al., 1997). As the struggle for ball possession is a key element of play strategy/tactics in elite football matches, analysis of the non-linear evolution and transitions of passing sequences of teams may yield information about their play organization. Therefore this study tried to identify sequential passing patterns and transitions between these patterns by RPA in the World Championship 2006.

**METHODS** A one dimensional time series of passing sequences (total 650) was constructed by counting the number of successive passes of one team (France) until ball loss. The time series was embedded in M-dimensional phase space by construction of state vectors using lagged values of the scalar counts. Recurrence plots were constructed by calculating the Euclidean distances between all pairs of vectors (Grehaigne et al., 1997).

**RESULTS** Means (p > 0.05, one-way ANOVA), standard deviations and maximum pass counts for successive passing sequences of France in five games are shown (Table 1). The recurrence plot constructed by appending all passing sequences of the five games shows stationary periods (white squares) and sharp transitions (dark black lines) in the system dynamics, which correspond to variable periods in the games.

France against	Mean (SD)	Max
Italy	2.5 (2.0)	9
Portugal	2.2 (2.5)	11
Brazil	2.4 (3.0)	16
Spain	1.9 (2.5)	19
Switzerland	2.8 (3.3)	21
Total	2.4 (2.7)	21

 Table 1. Comparison of successive passing counts of France in five games.

**DISCUSSION** By application of RPA to time series of passing sequences in football we were able to identify variable periods of ball possession with stationary system dynamics. Sharp transitions in successive passing dynamics were also detected. Thus, this study implied that RPA was able to identify 'historical epochs and events' of team dynamics in football, which could be scrutinized by detailed expert analysis.

#### REFERENCES

Eckman et al. (1987) *Europhysics Letters* **4**, 973-979. Grehaigne et al. (1997) *Journal of Sports Science* **15**, 137-149.

KEY WORDS Recurrence plot, dynamic systems, nonlinear, tactics, time series.

## O-006 Technical analysis of 2006 World Cup soccer champion Italy

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**OBJECTIVE** World Cup Soccer matches refer to the level of designations of improvement. Especially, the World Champion team's technical analysis would prove to designate the necessity of the level of soccer that is being played in the world. On these purposes, the 2006 World Champion Italian soccer teams' games against Ghana, The USA, Czech

Republic, Australia, Ukraine, Germany and France were analysed by scores, and also, some certain criteria had been terminated from broadcasting data.

**METHODS** The MUNA entitled software had been useful for the Turkish National Soccer Team and even for some Turkish 1st. Level Professional League's participants. During those analysis : the short-pass, long-pass, challenge gains, defensive heading, successful crosses, the shoots, fouls and the time of possessing balls as whole team, had been handled as criteria.

**RESULTS** Italy's successful short passes, in average (SD) were 283.0 (55.4) attempts, however, the opposing team's were, in average,  $310.0\pm62.6$ , that is showing a meaningful superiority over loosing teams. No significant differences were found against to other teams regarding short and long passes, ball gaining and loosing, the total shoots and ball possession times. Other values were in the favour of Italy's.

**DISCUSSION** It can be stated that this study proved that the Italian National Soccer Team, had consistent scores in general as other teams. However they also possessed superiority in the defensive actions, which had brought considerable achievements in wining the world cup.

KEY WORDS Analysis, Wold Cup.