Ovidius University Annals, Series Physical Education and Sport / SCIENCE, MOVEMENT AND HEALTH
Vol. XXIII, ISSUE 2 Supplement, 2023, Romania
The journal is indexed in: ERIH PLUS, Ebsco, SPORTDiscus, INDEX COPERNICUS JOURNAL MASTER LIST, DOAJ DIRECTORY OF OPEN ACCES JOURNALS, Caby, Gale Cengage Learning, Cabell's Directories

Science, Movement and Health, Vol. XXIII, ISSUE 2 Supplement, 2023
September 2023, 23 (2): 409-412
Original article

NOTATIONAL ANALYSIS SUPPORT FOR THE DEVELOPMENT OF ELITE FOOTBALL

MELENCO IONEL[1], TEODOR DRAGOS FLORIN[1]

Abstract

Problem statement. In sport, field notational analysis is used by coaches and sport scientists to collect data and interpret results on the athletes performance. At the elite level of football, performance analysis has become a defining part of the coaching staff, providing the coach with important information about upcoming opponents, providing key details during a match or at half-time about the efficiency of the team or of the players individually. This information can improve the performance of the team or the players and obtain a competitive advantage.

This study presents how contribute the notational analysis to the development of the football game.

It is proven that the notational analysis supports the development of the football game. Specialists in the field of analysis recommend that in the future, the analysis of the football game requires the construction of observation tools that integrate the study of the criteria related to the interaction with the opponent.

Keywords: game analysis; performance; player analysis, football.

Introduction

Sports performance in team sports, and football in particular, can only be understood from a multifactorial approach (psychological, sociological, physiological, technical-tactical), which is the product of the dynamic interaction between competitors through play actions (Preciado et al., 2019).

To better understand the details that promote the sport success, match analysis has assumed a critical role in high sports. According to reviews of the literature on performance analysis (Mackenzie and Cushion, 2013; Sarmento et al., 2014), the future of game analysis in soccer requires the development of observation instruments that integrate the study of criteria related to the interaction with the opponent. The goal of soccer performance analysis is to provide accurate, clear, and objective information to players, coaches and clubs to improve future team performance (McGarry, 2009). In this sense, the development of new technological systems [e.g., Global Positional System (GPS), Prozone-STATS, and OPTA] has contributed to increase the quantitative based knowledge in this sport.

Charles Reep is considered to be the first football data analyst, whose dodgy statistics encouraged managers for decades to play long-ball football. With his bungle, England failed to qualify for the World Cup in 1994 (http://www.xfbanalytics.hu/blog/blog-post/31). Reep's work initiated the machinery that is today an ecosystem of video analysis software, data providers, analysts, academia, data-influenced management decisions, and redefined coaching processes that constitute a key piece of modern football. The approaches he introduced have significantly evolved since Reep's first notational analysis in 1950. Technologies and analytical frameworks developed since the 1990s have facilitated the emergence of video analysis and data collection systems to improve athlete performance. From the foundation of Prozone in 1995, which offered high-quality video analysis, to the appearance of Opta Sports or Statsbomb as global data providers capturing millions of data points per match, the field of notational and performance analysis in football has evolved in line with the technological revolution of the last few decades. The growing desire for data-driven objectivity has become an important priority within professional clubs when aiming to gain the competitive advantage in a game with increasingly tight margins
(https://www.sportperformanceanalysis.com/article/history-of-performance-analysis-the-controversial-pioneer-charles-reep).

Defining the concept

In sport, field notational analysis is used by coaches and sport scientists to collect data and interpret results on the athlete` performance. Tactics, technique, individual athlete movement and, work-rate can all be analyzed, enabling coaches and athletes to learn more about performance and gain a competitive advantage (Franks I., et al., 2004).

Performance analysis (PA) is defined as an opportunity to objectively interpret performances within complex sport environments (Fernandez-Echeverria et al., 2017) to improve the performance of individual athletes and team behavior through the delivery of meaningful and purposeful feedback (Nicholls et al., 2018).

Notational analysis is the identification and analysis of critical patterns and events in a performance that lead to a successful outcome. Hughes (2004) defined notational analysis as "a procedure that could be used in any discipline that requires assessment and analysis of performance".

Blaze et al. (2004) discovered that the most popular method of obtaining objective information regarding performances for association football clubs, and their coaches, was through computerized analysis. The great development that football has achieved at the global level, the growing desire to win, has considerably increased the scientific interest in the analysis of the football game.

[1] Faculty of Physical Education and Sport, Ovidius University of Constanta, Romania E-mail: dragosteodor@yahoo.com

Ovidius University Annals, Series Physical Education and Sport / SCIENCE, MOVEMENT AND HEALTH
Vol. XXIII, ISSUE 2 Supplement, 2023, Romania
The journal is indexed in: ERIH PLUS, Ebsco, SPORTDiscus, INDEX COPERNICUS JOURNAL MASTER LIST, DOAJ DIRECTORY OF OPEN ACCES JOURNALS, Caby, Gale Cengage Learning, Cabell's Directories

The key is a equilibrium between the art of coaching and the application of scientific principles of athletic development and match-preparation. These objectives can be oriented in a positive way (things or number of things to try to achieve) or in a negative way (things or number of things to try to avoid), with a special reference to the offensive or defensive play (Lago and Martín 2007).

To optimize player preparation and meet the demands of the game, coaches must adopt a holistic approach that considers both tactical strategy and physical conditioning aspects of the game. For soccer coaches, the notational analysis can give essential information about how to design the training. This information may include the following:

- Data in the game context that helps the coach have a complete view and make the best decision;
- Linking physical and tactical demands: a better understanding of the game requirements;
- Improve training specificity: greater contextual understanding enables you to enhance the specificity of your training prescription.
- Integrated drill library: consider developing a drill library that encompasses tactical, technical, and physical targets in conjunction with each other.

Hughes and Franks (1997) suggested that all computerized notational systems should be tested for intra-observer reliability (repeatability). Also, selecting matches from a one-off tournament means that the selected teams (successful and unsuc-cessful) are not balanced in terms of the strength of opposition and number of matches played.

A large part of recent literature in soccer notational analysis has focused on studying offensive performance indicators such as the starting zone, number of passes, duration or type of attack, and their influence on offensive performance (Hughes and Franks, 2005).

For example Lago and Martín (2007) noted that one of the most robust findings in match analysis of soccer is the correlation between the ability to retain possession of the ball for prolonged periods and success. This conclusion is in agreement with the findings of previous literature (Bate, 1988; Carmichael; James et al., 2004). Successful passing has been identified as a key aspect in soccer performance in the dual sense of preventing its use by the opposition team and reducing the latter's chances of scoring, and providing a source of attacking plays culminating in shots at goal (Oberstone, 2009).

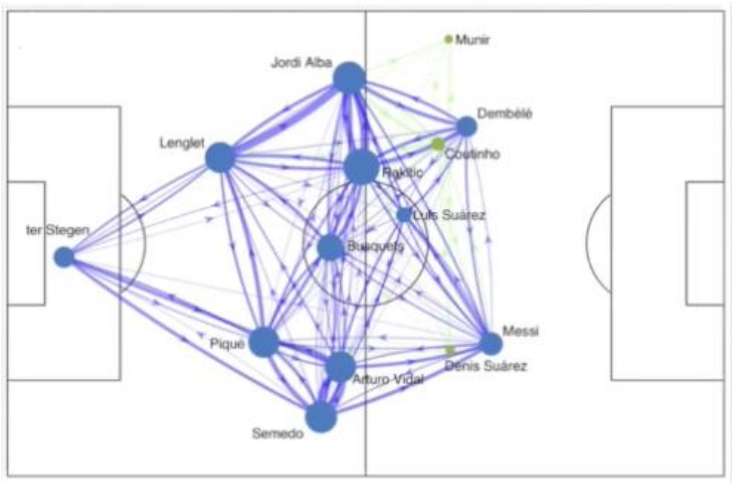

Figure 1. Passing Network between FC Barcelona players
(*Source: Javier Martin Buldu at FC Barcelona Sports Tomorrow*)

A complex system approach to football analysis would, for example, look at the link created between two or more players when they pass the ball between them (Figure1). These types of passing networks are increasingly common in football match analysis and team reports, as they clearly illustrate information about how a team played during a match, where its players were most frequently located on the pitch and how they interacted with each other. Because matrices are the mathematical extraction of a network, this information can be drawn onto a diagram of a football pitch to plot the position of players during defensive actions. The size of each node in this network indicates the time that an attacking player was being defended. By using these marking networks, analysts can clearly visualize the interactions and efforts of attacking and defending players during a football match (Buldu, J. M., et al., 2019).

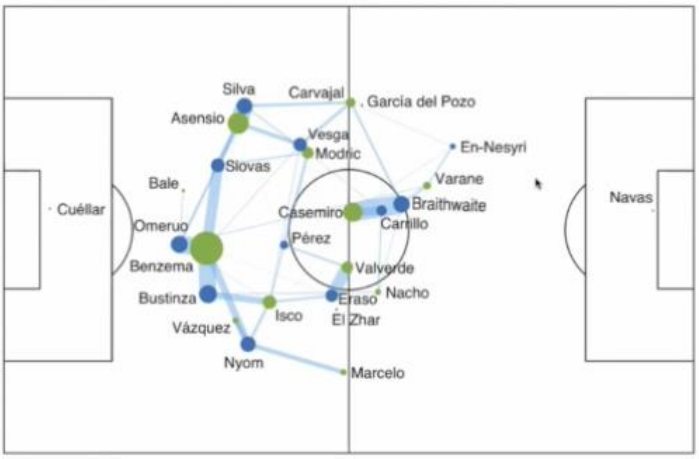

Figure 2. Player marking network between Real Madrid and Leganes
(*Source: Javier Martin Buldu at FC Barcelona Sports Tomorrow*)

For example (Figure2) Barcelona's strategy to keep the ball generally leads to control of the game by creating a dynamic context and an increase in scoring opportunities (Buldu, J. M., et al., 2019). The network developed by Buldu follows ball movement between different areas of the pitch. By constructing an entire ball moving network during a match, analysts can then identify which are the most important sections of the pitch for their teams and assess how to exploit different sections in the opposition's side in order to create dangerous opportunities (Figure3). (https://www.sportperformanceanalysis.com/article?tag=Academic+Research)

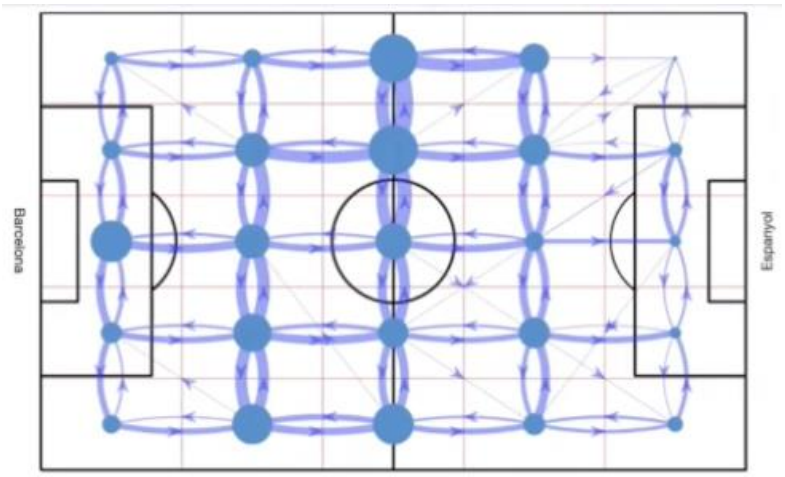

Figure 3. Ball flow network for a match between FC Barcelona and Espanyol
(*Source: Javier Martin Buldu at FC Barcelona Sports Tomorrow*)

Javier Martin Buldu is an expert on the analysis who, collaborating with organisations such as the Centre of Biomedical Technology in Madrid, La Liga, ESADE Business School, IFISC research institute and the ARAID Foundation, he has been able to combine various theories to construct networks using positional tracking data of a football match (https://www.sportperformanceanalysis.com/article?tag=Academic+Research).
After systematic reviews, specialists recommend that in the observational strategy for complex informations all coaches must include the observation and analysis of the game analysis, especially the use of video technology and specific software. In football scouting activity notational analysis can provide valuable information about a player's performance. The conclusions of another study (Reeves, M. et al., 2013) suggest that within elite youth football, three areas are key considerations when thinking about video-based performance analysis:

a) impact of video-based PA upon team and individual performance;
b) video-based PA as a tool for reflection, and
c) psychological implications associated with video-based PA.

In a systematic review of Sarmento H. et al. (2018) suggest common topics of the player analysis was:

1. Task constraints: specificity and volume of practice;
2. Performers' constraints: psychological factors, technical and tactical skills, anthropometric and physiological factors;
3. Environmental constraints: relative age effect, sociocultural influences;

4. Multidimensional analysis.

In his research, the results indicate that the most successful players present technical, tactical, anthropometric, physiological and psychological advantages that change non-linearly with age, maturational status and playing positions. He recommends the need for coaches and scouts to consider the players' technical and tactical skills combined with their anthropometric and physiological characteristics scaled to age (Sarmento H. et al. 2018).

Conclusions

It is proven that the notational analysis supports the development of the football game. Specialists in the field of analysis recommend that in the future the analysis of the football game requires the construction of observation tools that integrate the study of the criteria related to the interaction with the opponent.

In the observational strategy for complex information all coaches and scouts must include the observation and analysis of the game analysis, especially the use of video technology and specific software. In football scouting activity notational analysis can provide valuable information about a player's performance.

References:

Aranda R, González-Ródenas J, López-Bondia I, Aranda-Malavés R, Tudela-Desantes A, Anguera MT. "REOFUT" as an Observation Tool for Tactical Analysis on Offensive Performance in Soccer: Mixed Method Perspective. Front Psychol. 2019 Jun 28;10:1476. doi: 10.3389/fpsyg.2019.01476. PMID: 31316433; PMCID: PMC6610999.

Bate R. Football chance: Tactics and strategy. In T Reilly, A Lees, K Davids, W Murphy (eds): Science andfootball. London: E & FN Spon, 1988, pp 293-301.

Blaze, A., Atkinson, G., Harwood, C., & Cale, A. (2004). Prevalence and perceptions of performance analysis in the English Premier Association Football League. In M. Hughes (Ed.), *Performance analysis of sport 5* (pp. 79–83). University of Wales Institute. [Google Scholar]

Buldu, J. M., Busquets, J., & Echegoyen, I. (2019). Defining a historic football team: Using Network Science to analyze Guardiola's FC Barcelona. *Scientific reports*, *9*(1), 1-14. Link to article.

Fernandez-Echeverria, C., Mesquita, I., González-Silva, J., Claver, F., & Moreno, P. (2017). Match analysis within the coaching process: A critical tool to improve coach efficacy. *International Journal of Performance Analysis in Sport*, 17(1–2), 149–163. https://doi.org/10.1080/24748668.2017.1304073

Franks, I., & Hughes, M. (Eds.). (2004). Notational Analysis of Sport: Systems for Better Coaching and Performance in Sport (2nd ed.). Routledge. https://doi.org/10.4324/9780203641958

http://www.xfbanalytics.hu/blog/blog-post/31

https://www.sportperformanceanalysis.com/article/history-of-performance-analysis-the-controversial-pioneer-charles-reep

https://www.sportperformanceanalysis.com/article?tag=Academic+Research

Hughes M., Franks I. (2005). Analysis of passing sequences, shots and goals in soccer. J. Sports Sci. 23 509–514. 10.1080/02640410410001716779 [PubMed] [CrossRef] [Google Scholar]

Hughes MD, Franks I. Notational Analysis of Sport. London: Taylor and Francis, 1997

James N, Jones PD, Mellalieu SD. Possession as a performance indicator in soccer. Int J Perform Anal Sport,2004; 4: 98-102.

Mackenzie R., Cushion C. (2013). Performance analysis in football: a critical review and implications for future research. *J. Sport Sci.* 31 639–676. 10.1080/02640414.2012.746720 [PubMed] [CrossRef] [Google Scholar]

McGarry T. (2009). Applied and theoretical perspectives of performance analysis in sport: scientific issues and Challenges. *Int. J. Perform. Anal. Sport* 9 128–140. 10.1080/24748668.2009.11868469 [CrossRef] [Google Scholar]

Nicholls, S. B., James, N., Bryant, E., & Wells, J. (2018). Elite coaches' use and engagement with performance analysis within Olympic and Paralympic sport. International Journal of Performance Analysis in Sport, 18(5), 764–779. https://doi.org/10.1080/24748668.2018.1517290 [Taylor & Francis Online], [Web of Science ®], [Google Scholar]

Oberstone J. Differentiating the top English Premier League Clubs from the rest of the pack: Identifying the keysto success. J Quant Anal Sports, 2009; 5(3): Article 10

Preciado, M., Anguera, M. T., Olarte, M., and Lapresa, D. (2019). Observational studies in male elite football: a systematic mixed study review. Front. Psychol. 10:2077. doi: 10.3389/fpsyg.2019.02077

Reeves, Matthew & Roberts, Simon. (2013). Perceptions of Performance Analysis in Elite Youth Football. International Journal of Performance Analysis in Sport. 13. 10.1080/24748668.2013.11868642.

Sarmento H, Anguera MT, Pereira A, Araújo D. Talent Identification and Development in Male Football: A Systematic Review. Sports Med. 2018 Apr;48(4):907-931. doi: 10.1007/s40279-017-0851-7. PMID: 29299878.