



UNIVERSITY OF CAPE TOWN

STA5093W: Data Science Minor Dissertation

Literature Review

---

# Quantifying Pressing Effectiveness and Its Impact on Formations

---

*Student:*

Kenneth Ssekimpi

*Supervisor:*

Neil Watson

August 27, 2024

Student Number: SSKKEN001

## Table of contents

<b>1. Introduction</b>	<b>3</b>
1.1. Purpose and Scope of Literature Review . . . . .	3
1.2. The Importance of Pressing Effectiveness and its Relationship to Formations in Football . . . . .	3
1.3. Key Themes and Areas of Focus . . . . .	4
<b>2. Data Analysis in Football Analysis</b>	<b>4</b>
2.1. The Role of Data Analysis in Football Performance Evaluation . . . . .	4
2.2. The Use of Statistical Methods, Machine Learning Techniques, and Data Visualisation Tools in Football Analysis . . . . .	4
2.3. Recent Advances in Data-Driven Approaches to Studying Pressing Effec- tiveness and Formation Dynamics . . . . .	4
<b>3. Pressing Analysis in Football</b>	<b>4</b>
3.1. How is Pressing Analysed in Football? . . . . .	4
3.2. Different Types of Pressing Strategies . . . . .	5
3.2.1. High Press . . . . .	5
3.2.2. Low-Block Defence . . . . .	5
3.2.3. Midfield Press . . . . .	5
3.2.4. Counter-pressing . . . . .	5
<b>4. Formation Analysis and Gameplay Influence</b>	<b>6</b>
4.1. How are Formations Currently Analysed? . . . . .	6
4.2. Influence of Formations on Attacking and Defensive Strategies in Football .	6
4.3. How Formations Impact Player Roles, Defensive Shape, Pressing Strategies. and Overall Gameplay . . . . .	6
4.4. Commonly Used Formations in Football . . . . .	6
<b>5. Gap in Existing Literature: Pressing and Formations</b>	<b>6</b>
<b>6. Conclusion and Proposal Contribution</b>	<b>6</b>
<b>Bibliography</b>	<b>7</b>

## 1. Introduction

### 1.1. Purpose and Scope of Literature Review

The following literature review aims to provide a comprehensive understanding of the existing body of knowledge on the concept of pressing in football, its effectiveness, and its relationship to formations. It aims to identify key findings, methodologies, and gaps in the current research to justify the need for this research undertaking. This study will establish the theoretical foundation and context for this research, ensuring that it is rooted in the existing football knowledge base by reviewing relevant literature.

The scope of the literature review is broad and multifaceted. The review will begin by exploring the role that data analysis plays in football, particularly how it aids in evaluating performance and informing tactical decisions related to pressing and formations. Next, the review will delve into how pressing is analysed in football, focusing on metrics that measure its success, the roles of players, and the various tactical approaches. Additionally, the review will discuss the different types of pressing strategies, examining their unique characteristics and the scenarios in which they are most effective.

This will be followed by a review of the analysis of formations, looking at how they shape both attacking and defensive strategies, as well as player positioning and overall game-play.

Finally, the review will identify the gaps in existing research, specifically the lack of a quantitative link between formations and pressing effectiveness. By addressing these gaps, this study aims to contribute valuable insights for domain experts, such as coaches and analysts, in order to optimise pressing tactics based on team formations.

While peer-reviewed journal articles form the backbone of this literature review, supplementary insights from conference papers and credible blog posts have been included in order to provide contemporary insights and practical applications of formation analysis and, particularly, pressing in football.

### 1.2. The Importance of Pressing Effectiveness and its Relationship to Formations in Football

Pressing is a defensive strategy where the team without possession aggressively attempts to regain the ball. It disrupts the opponent's build-up play, forces errors, and facilitates quick transitions to offence, making it a cornerstone of modern football (Chambers, Toby 2022; Morgan, Will 2018).

Understanding pressing effectiveness is crucial in football as it directly impacts team performance (Modric et al. 2022; Modric, Gabrilo, and Sekulic 2023). Research shows that successful team pressing influences team technical-tactical performance (TTP) significantly, leading to increased actions like shots on target, passes, key passes, crosses, dribbles, and entries into the final third and penalty area (Modric et al. 2022; Modric, Gabrilo, and Sekulic 2023). Moreover, the co-operative and well-organized interaction between players during pressing plays a more vital role in TTP than pure physical performance (Modric, Gabrilo, and Sekulic 2023). Individual actions, such as pressing, are fundamental in modern football, with higher praxeological parameters of these actions correlating with better sports results and team performance (Modric, Gabrilo, and Sekulic 2023). Therefore,

analysing pressing effectiveness and its relationship with formations can provide invaluable insights for coaches to optimise team strategies and player performance on the field.

### **1.3. Key Themes and Areas of Focus**

## **2. Data Analysis in Football Analysis**

### **2.1. The Role of Data Analysis in Football Performance Evaluation**

Football is an inherently dynamic and unpredictable sport, requiring complex and multifaceted strategies for success (Herold et al. 2019). Traditionally, performance analysis in football has relied on statistics derived from notational analysis based on observational match events such as team possession, shots on targets, successful passes (Plakias, et al. 2024; Rein and Memmert 2016; Herold et al. 2019). Match event data is typically collected from video footage and assists coaches and analysts evaluate past football matches and prepare for future games (Herold et al. 2019). However, these metrics often discard critical contextual information necessary for comprehensive tactical analysis (Rein and Memmert 2016).

The dearth of knowledge on how various factors such as technical skill, individual physiology, and team formations hampers our understanding of how these factors affect tactical decision-making (Rein and Memmert 2016).

### **2.2. The Use of Statistical Methods, Machine Learning Techniques, and Data Visualisation Tools in Football Analysis**

Machine learning applications in men's professional football have been instrumental in enhancing attacking play. Studies have shown that expected goals (xG) models developed using machine learning techniques like Logistic Regression and Gradient Boosting can accurately predict xG probability values for players based on shots taken during matches (Hewitt and Karakuş 2023). Additionally, the analysis of key performance indicators related to attacking play in football has been a common practice among coaches and analysts, emphasizing the importance of leveraging data-driven insights to improve offensive strategies in professional football (Herold et al. 2019).

### **2.3. Recent Advances in Data-Driven Approaches to Studying Pressing Effectiveness and Formation Dynamics**

## **3. Pressing Analysis in Football**

### **3.1. How is Pressing Analysed in Football?**

Pressing in football is currently analysed through various methods. Studies have shown that successful defensive plays exhibit higher defensive pressure, especially towards the end of a defensive sequence and closer to the ball (Forcher et al. 2022). Automated detection of pressing strategies, like counterpressing, has been achieved using machine learning models, saving time and standardising the analysis process (Bauer and Anzer 2021). Computational approaches have been proposed to estimate pressure relationships during a game, visualising defending players' pressure on the ball and opponents, aiding in detailed analysis of team tactics (Andrienko et al. 2018; Andrienko et al. 2017). Research

also indicates that successful team pressing positively influences team technical-tactical performance, emphasizing the importance of co-ordinated player interaction in pressing strategies (Modric, Gabrilo, and Sekulic 2023). These findings collectively highlight the significance of defensive pressure analysis in understanding and optimising team performance in football.

## **3.2. Different Types of Pressing Strategies**

### **3.2.1. High Press**

In football, two primary pressing strategies are commonly employed: high-press defending and deep-defending. Research by (Low et al. 2021) compared these strategies. High-press defending involves players pressing the opposition closer to their goal, aiming to win the ball back quickly and disrupt the opponent's build-up play. On the other hand, deep-defending sees players defending deeper on the field, often closer to their own goal, focusing on maintaining defensive shape and limiting space for the opposition to exploit. The study (Low et al. 2021) found that high-press defending can lead to closer centroid distances, more regular movement patterns, decreased synchronisation patterns of effective playing space, lower physical demands in terms of distance covered, and player velocity, as well as reduced heart rates compared to deep defending.

### **3.2.2. Low-Block Defence**

Low-block defence in football impacts the opponent's strategy by creating challenges in breaking through the defensive line efficiently. The use of low block defence can restrict the opponent's ability to penetrate the defence due to the compact structure and reduced space available for attacking manoeuvres.

### **3.2.3. Midfield Press**

The midfield press in football significantly influences the opponent's strategy by applying pressure and disrupting their build-up play. Overall, the midfield press serves as a tactical tool to unsettle opponents, control play, and create scoring opportunities.

### **3.2.4. Counter-pressing**

Counter-pressing in football significantly influences the opponent's strategy by disrupting their transition play and creating immediate offensive opportunities (Bauer and Anzer 2021). This strategic approach involves quickly regaining possession after losing the ball, pressuring the opponent to make hasty decisions, and potentially leading to turnovers. By automatically identifying and analysing counter-pressing situations through machine learning techniques, teams can assess the effectiveness of this tactic in terms of winning the ball back swiftly, generating scoring chances, and determining key success factors. The ability to adjust the counter pressure exerted on the opponent based on the forward pressure applied by the pressing team enhances the effectiveness of this strategy, creating a dynamic and adaptive defensive approach. Additionally, utilising counter-pressing can have defensive and offensive consequences for both teams, impacting the flow and outcome of the game.

## **4. Formation Analysis and Gameplay Influence**

### **4.1. How are Formations Currently Analysed?**

### **4.2. Influence of Formations on Attacking and Defensive Strategies in Football**

Tactical situations and playing styles are crucial performance indicators in soccer, influencing team strategies and outcomes. Research has shown significant differences in attack styles between European and South American teams, with European teams excelling in fast and positional attacks, while South American teams focus more on shots from outside the box and off-target shots . Additionally, a study comparing different age groups in football found that First teams demonstrate more final third entries, passes, crosses, and build-up play in wide areas compared to younger teams, highlighting the evolution of playing styles with age and experience (Dayus, Jacob et al. 2021). Moreover, the impact of external factors like the COVID-19 pandemic has led to changes in performance indicators over the years, resulting in a more passive game with tighter results, emphasizing the need for teams to adapt their playing styles accordingly

### **4.3. How Formations Impact Player Roles, Defensive Shape, Pressing Strategies. and Overall Gameplay**

### **4.4. Commonly Used Formations in Football**

## **5. Gap in Existing Literature: Pressing and Formations**

## **6. Conclusion and Proposal Contribution**

## Bibliography

- Andrienko, Gennady, Natalia Andrienko, Guido Budziak, Jason Dykes, Georg Fuchs, Tatiana von Landesberger, and Hendrik Weber. 2017. "Visual Analysis of Pressure in Football." *Data Mining and Knowledge Discovery* 31 (6): 1793–1839. <https://doi.org/10.1007/s10618-017-0513-2>.
- Andrienko, Gennady, Natalia Andrienko, Guido Budziak, Tatiana von Landesberger, and Hendrik Weber. 2018. "Exploring Pressure in Football." In, 13. AVI '18. New York, NY, USA: Association for Computing Machinery. <https://doi.org/10.1145/3206505.3206558>.
- Bauer, Pascal, and Gabriel Anzer. 2021. "Data-Driven Detection of Counterpressing in Professional Football." *Data Mining and Knowledge Discovery* 35 (5): 2009–49. <https://doi.org/10.1007/s10618-021-00763-7>.
- Chambers, Toby. 2022. "Different Types of Presses in Football: 4 Variations." <https://soccersourcecoaching.com/different-types-of-presses-in-football/>.
- Dayus, Jacob, Callaway, Andrew, Ellis, Shelley, and Butterworth, Andrew. 2021. "Analysis of Playing Style Across Different Developmental Stages in Football: International Journal of Performance Analysis in Sport: Vol 21, No 6." *International Journal of Performance Analysis in Sport* 21 (6): 934–52. <https://doi.org/10.1080/024748668.2021.1963106>.
- Forcher, Leander, Leon Forcher, Stefan Altmann, Darko Jekauc, and Matthias Kempe. 2022. "The Keys of Pressing to Gain the Ball – Characteristics of Defensive Pressure in Elite Soccer Using Tracking Data." *Science and Medicine in Football* 0 (0): 1–9. <https://doi.org/10.1080/24733938.2022.2158213>.
- Herold, Mat, Floris Goes, Stephan Nopp, Pascal Bauer, Chris Thompson, and Tim Meyer. 2019. "Machine Learning in Men's Professional Football: Current Applications and Future Directions for Improving Attacking Play." *International Journal of Sports Science & Coaching* 14 (6): 798–817. <https://doi.org/10.1177/1747954119879350>.
- Hewitt, James H., and Oktay Karakuş. 2023. "A Machine Learning Approach for Player and Position Adjusted Expected Goals in Football (Soccer)." *Franklin Open* 4 (September): 100034. <https://doi.org/10.1016/j.fraope.2023.100034>.
- Low, Benedict, Robert Rein, Dominik Raabe, Sebastian Schwab, and Daniel Memmert. 2021. "The porous high-press? An experimental approach investigating tactical behaviours from two pressing strategies in football." *Journal of Sports Sciences* 39 (19): 2199–2210. <https://doi.org/10.1080/02640414.2021.1925424>.
- Modric, Toni, Goran Gabrilo, and Damir Sekulic. 2023. "Influence of Team Pressing on Match Performance in Highest-Level Soccer; Preliminary Report." *Kinesiology Slovenica* 29 (1): 138. <https://doi.org/10.52165/kinsi.29.1.138-148>.
- Modric, Toni, James J. Malone, Sime Versic, Marcin Andrzejewski, Paweł Chmura, Marek Konefał, Patrik Drid, and Damir Sekulic. 2022. "The Influence of Physical Performance on Technical and Tactical Outcomes in the UEFA Champions League." *BMC Sports Science, Medicine and Rehabilitation* 14 (1): 179. <https://doi.org/10.1186/s13102-022-00573-4>.
- Morgan, Will. 2018. "How StatsBomb Data Helps Measure Counter-Pressing." <https://statsbomb.com/articles/soccer/how-statsbomb-data-helps-measure-counter-pressing/>.
- Plakias, Spyridon, Tsatalas, Themistoklis, Armatas, Vasileios, Tsaopoulos, Dimitris, and Giakas, Giannis. 2024. "Tactical Situations and Playing Styles as Key Performance Indicators in Soccer." *Journal of Functional Morphology and Kinesiology* 9 (2): 88.

<https://doi.org/https://doi.org/10.3390/jfmk9020088>.

Rein, Robert, and Daniel Memmert. 2016. "Big Data and Tactical Analysis in Elite Soccer: Future Challenges and Opportunities for Sports Science." *SpringerPlus* 5 (1): 1410. <https://doi.org/10.1186/s40064-016-3108-2>.