**Strategy, tactics and home advantage in team sports**

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**Summary**

One of the most intriguing effects of home advantage in team sports is how coaches, teams, and players prepare strategically and tactically depending on whether competing at home and away. This is reflected in the different approaches that coaches may use for home matches (e.g., more overall pressure aggressive defense, quicker attacks and more collective tactical behaviour during ball possession), thereby increasing the intensity and tactical assertiveness players. Besides, coaches have evolved their decision-making, following knowledge based on pre-match research (e.g., studying the strengths and weakness of their opponents and how they depend on match venue) and in-match situations (e.g., substitutions or tactical changes), where information transfer is a critical issue for improving the chances of winning at home. This chapter will attempt to understand the concept of home advantage under the lens of strategy and tactics in team sports.

1. **Performance in Team Sports - from the static to the dynamic complexity approach**

One of the biggest challenges in sports science is to search for performance determinants that help to optimise the coaching process and, ultimately, the competition outcome (McGarry, 2009). The discipline of performance analysis has supported this role, focused on measuring the actual sports performance by gathering valid, accurate, and reliable information during competitive environments and using the information to improve individual and collective performance (O'Donoghue, 2014). Under this circumstance, the term “performance indicator” was objectively established to measure valid and essential performance aspects. A performance indicator could be either a single variable or a combination of variables, directly or indirectly associated – i.e., having a mediator effect – to a performance outcome (Hughes & Franks, 2004).

As one of the traditional methods to analyse performance in team sports, the notational analysis seeks to obtain indicators of discrete actions and/or on-ball events by using advanced statistical procedures (Carling et al., 2009; Hughes & Franks, 2004, 2007). This approach provides answers about the static complexity of performance and has been presented as a robust framework to produce an accurate and reliable description and characterisation of teams’ performance (Liu et al., 2016; Sampaio et al., 2015). More specifically and for example in association football, performance indicators such as the number of shots and successful passes have been used to explain why some teams are more successful than others (Castellano et al., 2012; Lago-Penas et al., 2010; Mike & Ian, 2005). These static analysis permit the use of massive datasets and correlate a wide range of variables, and it has been implemented in probabilistic models considering the outcome of actions at the success of possession to quantify their value (Van Roy et al., 2020). However, this process provides only a discrete description of players’ actions and therefore focuses more on performance outcomes rather than the underpinning behaviours that lead to them. In other words, the assessment method is based on the consequences of performance (outcomes). Consequently, the information about their causes (behaviours) is still somehow unknown because the process addresses only a partial description of the team’s behaviour.

Despite this, other models have considered additional information from the context to quantify the risk and reward of actions and or the value of possession (Power et al., 2017). The advances provided by extra-contextual information to evaluate players’ actions do not allow to characterize the environment or game situation under which individual behaviours or possession value increases. Thus, the notational analysis or probabilistic model, considering or not the surrounding context determined by teammates and opponent behaviour, provides scarce information to explain why and how players, and obviously teams, dynamically regulate their actions under specific space and time demands, to achieve a common goal (Travassos et al., 2013).

Team sports activities are seen as an example where competition and collaboration forces interact to continuously improve performance in mutual tasks and in which an understanding of the individual parts does not convey a sense of the whole system’s behaviour, due to their nonlinear characteristics (Hristovski & Balagué, 2020). Here, the principles of complex dynamical systems appear to seek understanding on how groups’ working parts are connected and how they continuously adapt over time (Grehaigne et al., 1997; McGarry et al., 2002). The true nature of cooperative and competitive interaction tendencies is likely to constrain individuals to perform as a group, displaying intra- and inter-group spatiotemporal movement couplings relations (Duarte et al., 2012; McGarry et al., 2002). These approaches identified determinants of collective movement behaviour that improve the individuals’ ability to attune their decisions with teammates, leading to interdependent and complex behaviours and, therefore, improve performance (Coutinho et al., 2018; Duarte et al., 2012; Folgado et al., 2018; Gonçalves et al., 2017a; Gonçalves et al., 2018; Gonçalves et al., 2016; Gonçalves et al., 2014; Hristovski et al., 2011; Ric et al., 2016a). Acknowledging and understanding the principles that underlie these group-emerging relations, may allow creating self-awareness tasks that lead to optimised collective behaviour (Gonçalves et al., 2017b; Ric et al., 2017; Sampaio et al., 2014; Santos et al., 2018; Travassos et al., 2012). Nevertheless, there is a current lack of investigation aiming to identify variables that may capture this collective and exploratory principles of behaviour to improve collective performance.

A breakthrough into this topic has been made by using advanced technology to collect continuous data of players’ positioning in their natural environments, allowing to develop new possibilities to complement the understanding of performance (Folgado et al., 2014; Gonçalves et al., 2018; Gudmundsson & Horton, 2017; Memmert et al., 2016). This data offers information about players’ spatiotemporal relationships in respect of the individual and collective principles of play, the opponents’ behaviour and the contextual circumstances. Accordingly, new visuals, instruments, procedures and processing techniques may be incorporated into the performance analysis scope, instigating new questions related to the dynamical aspects of performance. For example, Gonçalves et al. (2019) explored how the team behavioural dynamics were modified according to the quality of opposition during elite matches. The authors used the positional data from confronting teams and the ball to extract spatial-temporal features (e.g., duration of the ball possession, game area considering all the 20 outfield players, and the distance from the last attacker to the opponents' goal) that may assist coaches in the design of representative tasks. This type of information is crucial for coaches as may allow them to adjust the training tasks, for example, as result of the space that the team uses according to the different quality of the opponents (e.g., vs top teams: ~38x44m length x width; vs bottom: ~37x48m length x width).

1. **Strategy & Tactics and the effects of the environment constraints on decision making**

Analysing team sports without considering the cooperative-opposition and dynamical dimensions of the match reduce the understanding of performance. To overcome this limitation, several authors have approached performance analysis in team sports by collecting and analysing players and team’s tactical behaviour during the match. Tactics in team sports can be seen as the temporal adaptations to new configurations of play as match situations dynamically change mainly promoted by the adaptation to the opposition (Grehaigne & Godbout, 1995; Ric et al., 2016b; Ric et al., 2017). For example, a football team attacking in the system of play 1-3-4-3 and facing an opponent that decides to press with three players to create numerical balance may afford one of the midfielders from the team in possession to drop down and assist the three back players (tactical adaptation), leading to a local numerical superiority (4vs3) that allow the team to overcome the pressure and progress on the field. This concept is complementary to strategy, which is described as the elements of play that are planned after considering the impact of the available information (Grehaigne & Godbout, 1995; Hibbs & O’Donoghue, 2013) and the positions to be covered according to particular instructions each player receives in training. For instance, by analysing the opponent’s movement patterns during the goal kick phase (using the analysis of the opponents’ last matches), the coach may emphasize in training a specific way to pressure the opponents to win the ball in a zone close to the target (e.g., by identifying the right central defender as the player with low technical ability - the pressing team may be positioned in a way that affords the goalkeeper to pass to the right central defender, and, after the pass, all the defensive team move collectively to press the space surrounding the central defender). The fundamental difference between strategy and tactics is thus their relations to time. The strategy is often viewed as a coach-related task and allows for cognitive rigour in the decision-making process without time constraints, as it is prepared prior to the match (e.g., pressing opposing team goal kick). On the other hand, tactical decisions are player-related and made under strong time-pressure, as they continuously occur during the interactive dynamics of the game (e.g., midfielder deciding to drop down to assist the playing out from the back). As a consequence, tactical performance arises based on how the players can capture information from the environment (i.e., perceived affordances) and how spatiotemporal constraints allow them to act within the constraints of previous coach’s strategic decisions and short-term tactical adaptations. The performance is hence the outcome of a non-linear dynamic process encompassing different timescales: strategic decisions made before a match and tactical behaviours in the course of a match.

Under such dynamic context as team sports, information to be picked by players is continuously changing and for the team to coordinate as a whole in certain moments of the matches, it is necessary to have a collective idea that functionally integrates each player based on a common goal (Bourbousson et al., 2015; Passos et al., 2016; Sampaio et al., 2014). However, the individual’s behaviours emerge as a result of self-organization process that is bounded by everchanging constraints at a different level or timescales (Balagué et al., 2019). Thus, understanding the boundaries that shape the emergence of behaviour from a player seeking a stable state of the collective organization seems relevant. A constraint that has been negligible explored in the literature is the environment constraint that reflects the physical and social proprieties of the surrounding environment, such as the weather, the light conditions, the altitude, the pitch surfaces (physical factors), or the peers’ group support and cultural expectations (social factors). Actually, in team sports, one (key) environmental constraint that should be taken into consideration is the match location, since there is scarce scientific information on how teams and players differently deal with performance issues at home and away. Matches played at home were won more often (~67% more) than matches played away (Jamieson, 2010). This home advantage (HA) is consensual and has been identified in different ages (Staufenbiel et al., 2018), competitive levels (Pollard, 1986), countries (Lago-Peñas & Lago-Ballesteros, 2011; Pollard & Pollard, 2005) and types of competition (Goumas, 2017; Lago-Peñas et al., 2017; Pollard & Armatas, 2017). The climatic conditions/altitude (Williams, March), higher familiarity with the home playing facility (Clarke & Norman, 1995) (e.g., players seem to support their behaviour on the spatial references which may vary from pitch to pitch) or the crowd support (Goumas, 2014; Ponzo & Scoppa, 2016) are some of the factors that contribute to the HA. In fact, the crowd support seems to be a relevant fact, as a recent study explored how teams home performance was affected both before and after the Covid-19 suspensions in those leagues that were retaken after the first pandemic wave and found relatively worst performances (Jiménez Sánchez & Lavín, 2020). Also, support from the crowd seems to increase the levels of testosterone and motivation (Neave & Wolfson, 2003), contributing to the increase in aggressive offensive behaviour when playing at home.

One of the most crucial factors contributing to the HA is reflected in the different approaches that team sports coaches use for home matches (e.g., more overall pressure, with aggressive defence, quicker attacks and more players disrupting the opponents’ defensive organization), thereby increasing the intensity and tactical assertiveness of their players. This point-of-view has been supported by the available literature showing that coaches, when playing at home, are likely to use more offensive players, adopt a more offensive players’ substitution pattern and are less satisfied by a draw result (0-0) during the half-time (Staufenbiel et al., 2015a). Also, this higher offensive focus contributes to a higher percentage of ball possession when playing at home (Collet, 2013), which seems to be linked with strategical dominance and/or absence of fatigue, as the difference in the offensive indicators between teams (% of ball possession, successful touches and ball touches) are more clear during the beginning of the first half (Lago-Peñas et al., 2017). Coaches tend to start the match pressing and control the match pace to attempt to score an early goal during home matches. In contrast, away teams are likely to adopt a more conservative strategy, spending more time defending and leading to lower values of ball possession (Lago-Peñas et al., 2017), that may emphasize the HA (Pollard, 2006). Thus, the impact of HA in the strategic plan and tactical decisions seems evident in team sports, such as soccer and basketball, as teams adapt how they play depending on whether competing at home or away. However, apart from the strategical perspective (represented in the earlier examples by the attempt of pressing high and controlling the match flow when playing at home or defending in a low block by the away team), the tactical perspective also shapes players movement behaviour. For example, when a team is continually able to create offensive actions by a specific pitch zone (e.g., right corridor), may afford the players from the defending team to adjust their position and move towards that zone to decrease the offensive progression. The behaviour of one team will also constraint the way how the other team behave, contributing to specific tactical adaptations from the players (Duarte et al., 2013a). Furthermore, coaches in team sports have evolved their decision-making, following information based on pre-match research (e.g., studying the strengths and weakness of their opponents) and in-match situations (e.g., substitutions, tactical changes) where the information transfer is a critical issue for improving the chances of winning at home.

1. **Home advantage under the lens of strategy and tactics: examples**

The effects of playing at home have always been considered intriguing and, as such, can be found in the literature since all times (for historical refs see Luehring, 1923; Schwartz & Barsky, 1977). Playing at home constitute an advantage for the local team as a result of the crowd support, higher familiarity of the spatial references, levels of confidence but also from coaches’ strategical plan and players tactical adaptations. Coaches are aware of the HA phenomenon, so they tend to implement more proactive strategies when playing at home (Carron et al., 2005). The strategies often favour a more aggressive tactical behaviour, especially in the offensive aspects of the game and in the pressure that teams try to implement when playing at home (Campos et al., 2014; Dennis & Carron, 1999). Accordingly, coaches seem to use specific strategies to increase the chances of winning the match. Despite not changing the playing system, coaches select more offensive players (Staufenbiel et al., 2015b) and prepare the players to be positioned in zones closer to the opponents’ goal (Clemente et al., 2013), in an attempt to increase the likelihood of creating goal-scoring opportunities. As a result of this strategy, players are likely to increase their dispersion values when in possession (measured by positional variables such as stretch index, surface area and effective playing space) (Duarte et al., 2013b), which may allow understanding the lower values of distance covered when playing at home as this more audacious and risky strategy enable the team to control the game pace and decreasing the external load (García-Unanue et al., 2018). Also, the higher focus on the offensive process appears to contribute to the higher number of goals scored, shots on goal, attacking movements, crosses, assists, successful passes, successful dribbles and touches on the ball (Diana et al., 2017; Lago-Peñas et al., 2017; Lago-Peñas & Lago-Ballesteros, 2011). In Basketball, home team victories are commonly associated with a better field goal and free-throw percentages, more defensive rebounds and less committed fouls (García et al., 2014). In terms of game tactics, Harris and Roebber (2019) found that teams that make more two-point and free-throw shots see high advantages at home, reflecting that a different shot selection is essential when trying to maximize the HA factor.

However, these offensive behaviours appear to be transient as the main difference in the offensive performance between the home and away teams are more evident in the first half, and especially during the beginning of the football match (Clemente et al., 2013; Lago-Peñas et al., 2017). This evidence suggests a particular offensive style and dominant behaviour at the beginning of the match (strategical plan) that tend to decline with the course of the match, leading the players to adjust their positioning and movement patterns (tactical adaptation), which may result from the adaptations of the opposing team, fatigue or even due to pacing strategies (Duarte et al., 2013b). Past research has shown that players behaviours become more regular and predictable with the time course of the match (Duarte et al., 2013b). In basketball, game location also does not affect team performance the same way throughout the game. The analysis of point differences shows a different impact of this variable during the game, with home team accumulating most of the points advantage it had at the end of the game in the first quarter (Jones, 2007).

Without the ball possession and when playing at home, there is also evidence showing that the players tend to occupy positions closer to the opponents' goal when comparing to away matches (Santos et al., 2017). This may result as a strategy from the coach that intends to use the home effect to increase the players' willingness to press and recover the balls in zones closer to the opponents' goal and creating faster goal-scoring opportunities while decreasing the risk of suffering a goal. This higher pressure contributes to the higher number of tackles performed when playing at home and to the lower number of ball recoveries resulting from the goalkeeper intervention (Almeida et al., 2014; Lago-Peñas & Lago-Ballesteros, 2011). However, it also seems that this aggressive defensive behaviour may be more evident during the first half (Clemente et al., 2015), which may be possibly linked with adaptations from the opposing team. That is, while it is expected that home team analyse and explores the strengths and weakness points from the opposition during the first half to promote adjustments during the half-time, the same may be expected from the opposition. Under this perspective, the opposing players may adjust the way how they attack, leading the home team to retreat and defend closer to their own goal (tactical adaptations). As a consequence, the team decreases its dispersion during the second half compared to the first during home matches (Clemente et al., 2015).

Recently it has been demonstrated that the venue of the match also influences on the style of play in football association (Fernandez-Navarro et al., 2018). When playing at home, teams increased use in the high pressure, build-up possession, kept the ball more time in the last third, as well as the ball pace and crossing strategies. However, the direct play was mostly used by the away team. Also, when facing top teams, playing away resulted in a decrease in build-up play. This elaborated attacks, together with high pressure when defending, had a greater association with success, that is to win games (Castellano & Pic, 2019). Authors concluded that using the preferred style of play by each team, independently of the style, is also correlated with success. However, teams do not use their preferred style of play during all matches. The style of play seems to be influenced by the quality of opposition, match status or the venue of the match, as well as the interaction between teams’ styles of the play, ball possession strategy and team tactics (Castellano et al., 2013; Lago, 2009), and also playing style determined by on-ball action (Gomez et al., 2018). Concretely, these authors suggested that playing at home, teams perform more passes having a more considerable duration and percentage of ball possessions which finished with ending actions and they commit more faults than away teams.

Coaches and practitioners may consider the nestedness and relatedness of constrains acting at different levels and timescales (Pol et al., 2020). According to the previous results, it seems clear how supporter behaviours or playing with HA influence the coaches’ decisions (strategy), team behaviour (tactics), and players’ actions. The coaches need to consider the club characteristics in terms of culture as well as social traits from the fans or citizens. The use of an elaborated attack style of build-up strategies from the back in a team, where their supporters are afraid with the possibility to lose the ball closer to their own goal, can create some encouragement to play forward (long-ball playing approach), provoking player and team behaviours not trained and accounted. To end, the already demonstrated HA could be lost because the complex puzzle of intentions among the different levels of the organization (players’ actions, team’s behaviours, coach’s decisions, club culture) cannot be mounted.

Figure 1 illustrates an example of how strategy and tactics (according to the HA) may influence the performance of association football and highlights the main findings of this chapter. When playing at home, strategies often favour a selection of more offensive players and aggressive behaviour (i.e., a higher number of players in offensive zones) and higher pressure (high-block pressure without possession). This returns higher team dispersion values under possession, which may allow understanding the lower values of distance covered when playing at home as this more audacious and risky strategy enable the team to control the game pace and decreasing the external load. The higher aggressive offensive behaviour contributes to an increase in the players' predisposition to take risks, leading to a higher number of offensive performance indicators such as goals, passes, crosses and dribbles. Within, support from the crowd seems to increase the levels of testosterone and motivation, contributing to the more aggressive offensive behaviour. Contrarily, when playing away, coaches tend to use conservative strategies when preparing the games with a selection of more defensive players and playing structures and the adoption of a more counter-attack playing approach. Higher defensive strategy leads to defending close to the target and with lower values of distance between players (inter and intra sectorial). Defending closer to the target allows the away team to have space when regaining the possession, contributing to the higher values at high intensity, that reflects the counter-attack strategy playing style. From individual actions point of view, playing away leads to a higher commitment with defensive behaviours, contributing to a higher number of ball clearances. Finally, a large audience and the related noise may imbalance referee decisions, leading to more faults and yellow/red cards by the away team.

\*\*\*figure 1 near here\*\*\*

Figure 1. An example of how strategic and tactics (according to the HA) may influence the performance of association football.

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