

A Comparison of Individual and Unit Tactical Behaviour and Team Strategy in Professional Soccer

Joseph B. Taylor, Stephen D. Mellalieu and Nic James

Department of Sports Science, Vivian Tower, University of Wales Swansea, Singleton, Swansea, SA2 8PP, United Kingdom.

Abstract

Individual player and positional unit tactical behaviours were assessed and compared to team strategy within a professional soccer team. Twenty-two matches were sampled from the 2003-04 domestic season of the British Nationwide League team and notated post-event. Tactical behaviours were measured through a combination of technical and spatial indicators relating to the performance of on the ball behaviours. Chi-square analyses highlighted distinct individual and unit tactical behaviours indicative of role-specific responsibilities. Qualitative and quantitative assessment of overall team strategy indicated an attacking bias through the right side of the pitch and a corresponding defensive weakness on the left. Similarities were also observed between the tactical behaviours of individuals, their respective units and team strategy. The findings of the present study provide detailed information regarding the measurement of tactical behaviour in soccer and supply a methodology for researchers to consider more accurately the contribution of individuals and their respective units to team performance. They also suggest the demands on soccer players are multi-levelled and may lead to conflicting individual and positional roles.

Keywords: Soccer, Strategy, Tactical Behaviour, Technical, Spatial.

1 Introduction

Amongst the notational analysis literature examining soccer performance there has been particular interest in the strategies and tactics adopted by teams (see Hughes and Franks, 2004). However, existing studies have been limited by a number of conceptual and methodological issues. For example, at an operational level little distinction is made between the terms 'strategy' and 'tactics' despite representing differing constructs (Grehaigne et al., 1999). Strategy refers to the general plan devised to achieve a specific aim whereas tactics are the particular actions performed to fulfil the required strategy (Robertson, 2000). In addition, despite the fact that strategies and tactics tend to be unique to individual teams (Hughes, 1999), previous research has tended to consider to the characteristics of successful and unsuccessful performances by analyzing teams collectively leading to the subtleties of each individual team's performance becoming indistinguishable. One way to overcome these issues is to adopt alternative methodological designs, such as case studies, which allow examination of how particular strategies and tactics function within individual teams (cf. Gargantua et al.,

1997; James et al., 2002). One example of the utilisation of an idiographic methodology is James et al.'s (2002) study of the differing strategies employed by a British soccer team between European and domestic league matches. Using technical and spatial data (pitch areas) a greater incidence of play was found to occur in defensive areas during European matches at the expense of offensive areas, suggesting the adoption of a more defensive strategy by the team. This was also reflected in the performances of individual players with a central midfielder and the right fullback exhibiting a greater number of behaviours nearer to their own goal during the European matches.

The consideration of a team's constituent parts in relation to overall team strategy is novel in the soccer based notational analysis research, yet coaching literature has repeatedly stated the importance of individual player and positional unit (defence, midfield, forward) contributions (Hughes, 1999; Kormelink and Seeverens, 1999). Indeed, James et al. (2002) concluded that tactics and strategy are evident at both individual player and team levels. Furthermore it was suggested that individual players appear to operate within the confines of their respective positional units. Despite the utility of these findings, James et al.'s investigation was primarily based at a team level and lacked the necessary detail to describe the performance of individual players, employing a limited number of pitch areas for identifying the location of behaviours and assessing only a small number of technical indicators.

The individual level tactics and strategies identified by James et al. (2002) were suggested to be related to player roles and support Grehaigne et al.'s (1999) suggestion that individual player strategic and tactical performances are essentially the manifestation of the particular role that they are assigned. Nevertheless, caution is required with this notion as roles are explicitly defined as the expected behaviour for a specific position within a particular context (Katz & Kahn, 1978) whereas data provided by notational analysis only describes observed behaviours. Therefore, we recommend that information gleaned from notational analysis concerning individual player and positional unit tactics or overall strategy is referred to as 'tactical behaviour'. In this study we examine tactical behaviour in the context of an amalgamation of both technical and spatial aspects of behaviour (James et al., 2002).

Although there have been few attempts to examine individual player or positional unit tactical behaviour the technical and spatial components of soccer performance have been studied, albeit independently. For example, the technical requirements of positional units were described by Dunn et al. (2003) and Williams et al. (2003), with the defensive, midfield and forward units observed to perform the greatest number of clearances, dribbles and shots respectively. However these studies utilised small match samples ($n < 6$), did not report reliability or validation procedures, and lacked statistical comparisons. Taylor et al. (2004) attempted to address these particular concerns by analysing the technical data of 22 matches from the domestic season of a nationwide soccer side using a rigorous notation system. As well as confirming Dunn et al. (2003) and Williams et al. (2003) findings, Taylor et al. (2004) also reported technical differences amongst individual players within each playing position. For example, two midfielders were identified as either being predominantly attacking or defensive orientated in nature due to disparities in the frequencies of crosses, dribbles, passes, tackles and shots on goal they attempted (cf. James et al., 2002). These differences suggest that research should not solely be confined to positional units but also extended to individual players within each position.

Limited research currently exists with regard to individual player and positional unit spatial functioning. A methodology for delineating a players 'action zone' or effective work area has been proposed by Grehaigne et al. (1996) who recorded their location on the pitch via 40 precise areas, at 30 second intervals. From this data it was determined that each player had a distinctive area of operation. However, due to a lack of reliability data there was no indication of how accurately the defined action zones represented actual performance. Grehaigne et al. (1996) also failed to consider the spatial operation of positional units, while some indication of the arrangement of players in relation to each other was alluded to by combining the focal point of each player's action zone, termed the 'barycentre', this only provided a single point to represent each player's spatial performance and subsequently provided little more than a depiction of team formation.

The introduction of notational analysis into research and coaching structures has provided an objective methodology for the assessment of soccer performance with strategy and tactics being a particular area of interest. However, in addition to the conceptual and methodological issues highlighted there has been a paucity of investigation into individual player and positional unit contributions to overall team strategy. This study aimed to examine individual and unit tactical behaviours within a professional soccer team and compare them with overall team strategy. The first objective was to examine the nature of individual player tactical behaviour within the playing positions of fullback, centre back, midfield and forward. Previous research examining individuals has suggested differing technical and spatial demands upon each player (Grehaigne et al., 1996; Taylor et al., 2004). Therefore, in line with the findings of Taylor et al. (2004), it was hypothesised that each player's tactical behaviour would provide an indication of specific responsibilities or roles (target man, defensive-midfielder etc.). The second objective was to investigate the tactical behaviour of positional units. Studies of the technical behaviours performed in soccer have consistently reported that the defence, midfield and forward units perform the greatest number of clearances, dribbles and shots respectively (Dunn et al., 2003; Williams et al., 2003; Taylor et al., 2004). Therefore, it was hypothesised that the technical aspect of unit tactical behaviour would support these findings. As the spatial aspect of unit performance has not previously been considered an exploratory hypotheses was generated that predicted the defensive, midfield and forward units would perform the majority of their behaviours within the defensive, midfield and attacking thirds of the pitch respectively. The final objective of the study was to compare individual player and positional unit tactical behaviours in relation to overall team strategy. Although James et al. (2002) have concluded that links are apparent between individual players and the overall team strategy there is a dearth of literature attempting to establish such associations. Consequently, an exploratory hypothesis was forwarded which predicted that individuals and positional units would exhibit a profile of tactical behaviours that would be related to the overall strategy of the team.

2 Methodology

Design

Twenty-two matches played by a professional British soccer team during the 2003-04 domestic league season were observed post-event using the Noldus Observer Video Pro 4.1 behavioural measurement package. A combination of on the ball technical indicators

and spatial information, defined via the pitch areas within which behaviours were exhibited, were used as the basis for data collection. Subsequent data analysis was completed with regard to the tactical behaviours of individual players within each playing position and between positional units. Team strategy was assessed using technical and spatial data together with direct communication from the manager and coaching staff of the team.

Participants

Eleven home and eleven away matches comprising 8 wins, 8 losses and 6 draws were sampled for analysis based on the availability of videotape footage from the participating soccer club. For individual analysis only players who had made at least five full appearances ($n=14$) were selected due to the potential problems associated with analysing small data sets (cf. Bracewell, 2003). In the case of positional unit analysis all outfield players who had made at least one appearance were included ($n=30$, mean age= 24.0 ± 4.5 years, mean appearances= 8.8 ± 6.0). Due to its specialised and pronounced technical nature the playing position of goalkeeper was omitted from all analyses (Hughes, 1999).

Procedure

Approval for the study was granted by the ethics committee of the researcher's university and informed consent obtained from the manager, coaches and players of the participating team. Match recordings were acquired directly from the team's manager and notated using the Noldus Observer Video Pro 4.1 behavioural measurement package. Data collection was based upon two detailed soccer-specific instruments which allowed technical and spatial data to be recorded. Accordingly, player name, behaviour performed and pitch location were inputted into the computer system by the first author before being imported into SPSS (SPSS inc., 2003) for statistical analysis.

Measures

Measures of tactical behaviour were developed in three stages using technical and spatial data. First, a comprehensive list of technical behavioural indicators was identified via a thorough review of soccer-based notational analysis literature spanning the last thirty-seven years. Here, all the technical indicators used in the existing soccer studies were collated and grouped into relevant themes or categories. The resultant indicators included the variables of aerial challenges, clearances, crosses, dribbles, fouls committed, goals scored, interceptions, losses of control, times deemed offside, passes, shots on goal, tackles made and tackled received. For the purposes of standardisation and objectivity each indicator was then assigned an explicit operational definition. For example, an aerial challenge was defined as 'at least one player from each team directly competing in an attempt to contact an aerial ball with their head'. A review of the definitions was then conducted by a professional soccer manager and his assistant (ex-international players with over 40 years combined professional coaching experience) and three notational analysis researchers (over 35 years experience in total). The subsequent feedback was used to establish finalised versions of the operational definitions and served to ensure the content validity of the technical indicators. For the second stage of tactical behaviour development a grid system consisting of 36 equal sized areas was produced (Figure 1) to identify where on the pitch the technical behaviours were being performed, termed the 'action area' (cf. Grehaigne et al., 1996).

The final stage of the measure development consisted of a pilot study whereby the first author coded and analysed five randomly sampled professional soccer matches from the English Premiership and Nationwide Leagues to substantiate all aspects of the data collection procedures. Following the pilot study no further issues were found to exist with the operational definitions, the grid classification or data entry into the computer system.

Reliability

Verification of the accuracy of the system and the consistency of data entry was undertaken through intra- and inter-operator reliability testing procedures. Intra-operator reliability was completed via the first author coding five randomly selected matches from the sampled soccer team on two occasions, separated by a three week period to negate possible learning effects. The data sets were then compared through calculation of percentage errors at the level of analysis (Hughes et al., 2002). In line with previous behavioural assessment research, a 5% error level was deemed acceptable for each variable except for pitch areas where the level was extended to 10% due to the difficulties associated with accurate spatial identification (Wilson and Barnes, 1998). Inter-reliability testing followed a similar procedure, but two experienced soccer notational analysts coded each of the five sampled matches once, allowing their data to be compared to that of the first author. All variables surpassed the required error levels in both intra- and inter-reliability testing procedures.

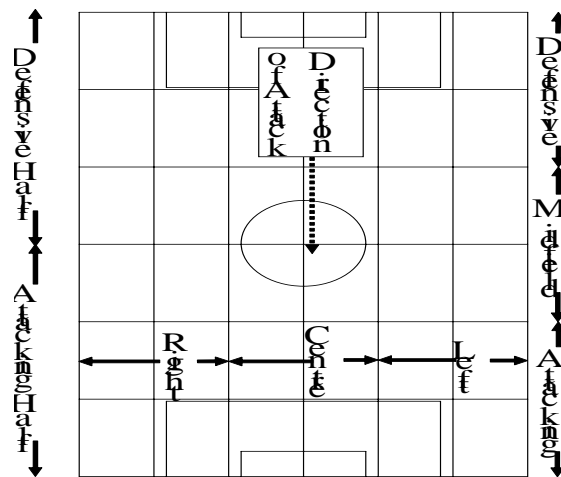


Figure 1. Pitch divisions used for the collection and description of spatial data.

Data Transformations for Performance Duration

Although a soccer match is 90 minutes in duration individual players may compete for a shorter period due to factors such as substitution, injury and sendings-off. As a result research has attempted to approximate incomplete data sets to previously observed values for full performances (Bracewell, 2003). While no standard method has yet been established for undertaking such data transformations it has been recommended that simple time-rate conversions should be avoided as they lead to inappropriate

estimations, especially for performances of particularly short durations (James et al., 2005). This can be illustrated by considering the example of a soccer midfielder who plays for only 15 minutes before getting injured and leaving the field but makes a total of 3 crosses. Using a time-rate transformation this equates to an unlikely 18 crosses over 90 minutes. To overcome this limitation, James et al. (2005) developed a formula to adjust for player appearances of reduced length which has subsequently been adapted for use in soccer (Taylor et al., 2004):

$$\text{Transformation} = F \left(\sqrt{\frac{90}{n}} \right) \left(\log_{10} \frac{90}{n} + 1 \right)$$

Where F equals the actual frequency of the technical/spatial indicator and n the number of minutes played. Applying the transformation to the above example produces a figure of 13.07 crosses is achieved for the individual for the whole game. Although this transformation still accentuates the frequencies of actions performed as the time scales become smaller it was apparent in this study that of the 191 appearances made by the players selected for individual analysis there were only 12 instances of the appearance being less than 30 minutes. Extreme results were therefore likely to be a minor issue within the sample.

Data Analysis

Data analysis comprised six stages. First, individual behavioural profiles (Taylor et al. 2004) were constructed for each selected player within the positions of fullback, centre back, midfield and forward. In line with James et al. (2005) these profiles were developed using population medians and associated 95% confidence limits for each technical indicator performed. This particular approach was adopted as data collected in notational analysis exhibits a non-normal distribution, medians therefore represent the most appropriate measure of central tendency while confidence intervals establish limits between which the population average were likely to occur, providing a more suitable measure of performance than a single fixed value (Hughes et al., 2002; James et al., 2005). For the second stage of analysis each individual player's action area was created by summing the total number of behaviours performed within each pitch area, sorting them into rank order and then calculating quintiles respectively. To facilitate presentation of the spatial data a pattern was designated to each quintile to fill appropriate areas on a pitch diagram. Comparisons of the behavioural profiles and action areas was completed using chi-square tests with alpha levels set at $p < 0.05$ (Nevill et al., 2002). The third and fourth stages of analysis assessed the behavioural profiles and action areas of the defence, midfield and forward units respectively. The same protocol was utilised as for the individual player analysis but in this case data from all players who played within each unit were included (defensive unit $n=12$, midfield unit $n=12$, forward unit $n=6$). The fifth stage of analysis combined spatial data from all players ($n=30$) to produce an overall team action area, indicating where on the pitch the team performed its technical behaviours. Finally, in order to evaluate the team action areas in relation to the expected overall strategy, the team's management and coaching staff were requested to respond to a questionnaire containing series of open ended and scaled items concerning their general game plan. Specifically, the management and coaching personnel were asked to describe the team strategy, explain how this affected the performance of individual players and positional units and the extent to which there was a bias towards certain pitch areas during attacking and defensive phases of play.

3 Results

3.1 Individual Player Comparisons

Behavioural profiles and action areas for each selected player within the positions of fullback, centre back, midfield and forward were used to construct individual tactical behaviours. Analysis of the behavioural profiles revealed a number of disparities between the players in each position (Table 1). For example, although the frequencies of fouls made by the three fullbacks were similar (medians of 1, 0.5 and 1 respectively) there were differences in the number of aerial challenges made, with Fullback 2 having a median over twice that of Fullback 3 (7.8 and 3.8 respectively). Further discrepancies were also noted between the fullbacks for the frequencies of clearances, crosses, dribbles passes and tackles performed. The behavioural profiles of the three centre backs were found to differ for all technical indicators except crosses, goals scored, losses of control, times deemed offside and shots on goal. For the playing position of midfield differences were discovered between the players for all the measured behaviours except goals scored and times adjudged as offside. Differences were also apparent in the forwards' behavioural profiles with regard to the number of aerial challenges, clearances, crosses, dribbles, fouls committed, passes, tackles made and times tackled. Further examination of the behavioural profiles revealed that goals scored and times deemed offside were the only variables that failed to reach significance within all playing positions.

With regard to the individual action areas all players performed behaviours in visually and statistically different areas of the pitch (Figure 2). For example, although Midfielder 2 and Midfielder 5 performed the majority of their behaviours on the pitch left (50.1% and 49.4% respectively; $p > 0.05$) differences were apparent when the pitch thirds were considered. Specifically, Midfielder 2 performed 37.2% of their behaviours in the defensive pitch third, 47.4% in the midfield third and 15.4% in the forward third whereas the corresponding values for Midfielder 5 were 15.4%, 43% and 41.7% ($p < 0.01$).

3.2 Unit Comparisons

Analysis of the behavioural profiles of the defensive, midfield and forward positional units revealed differences in the frequencies of the behaviours performed (Table 2). The defensive and forward units were found to perform more aerial challenges than the midfield unit, which was characterised by a greater incidence of dribbles and crosses. While interceptions, passes and tackles made were performed significantly more by the defensive and midfield units, higher frequencies of goal scored, shots on goal, losses of control and times tackled were observed for the midfield and forward units. Clearances were predominantly executed by the defensive unit, with forwards occupying offside positions more than any other unit.

Distinct action areas were evident when the collective tactical behaviours of the defensive, midfield and forward units were considered (Figure 3). Specifically, the defensive unit performed a similar number of behaviours within the defensive and midfield thirds (44% in both), with only 12% undertaken in the attacking third ($p < 0.01$). Conversely, the majority of the midfield units behaviours were located within the midfield and attacking thirds (45% and 36% behaviours respectively) with only 19% behaviours occurring in the defensive third ($p < 0.01$). The forward unit differed from the

defensive and midfield units as it predominantly performed its behaviours within a single third of the pitch. Specifically, 60% of the forward unit behaviours occurred in the attacking third with 37% and 3% in the midfield and defensive thirds respectively ($p < 0.01$). The defence and midfield units were also seen to perform a greater incidence of behaviours on the right side of the playing field whereas the forwards performed the highest number of behaviours within central areas ($p < 0.01$).

Table 1. Individual player behavioural profiles based on medians and 95% confidence limits (CL).

	Sig. diff.	Fullback			Centre Back			Midfielder						Forward	
		1	2	3	1	2	3	1	2	3	4	5	6	1	2
Aerial Challenge	f,c,m,s	5.5	7.8	3.8	11.0	7.5	13.0	2.0	6.3	2.8	2.0	2.0	2.5	27.8	4.0
+CL		7.8	11.0	5.0	15.0	15.0	16.6	4.0	9.0	8.0	5.0	2.7	7.0	32.0	8.0
-CL		1.1	3.8	2.9	8.0	4.0	8.0	1.0	3.0	2.0	0.0	1.0	0.0	22.0	3.0
Clearance	f,c,m,s	7.0	10.0	6.0	8.0	10.3	7.5	1.0	3.0	2.0	0.0	2.0	2.0	0.0	0.0
+CL		9.3	11.0	10.0	9.0	15.0	13.0	2.0	5.0	5.0	1.0	3.0	4.0	1.0	0.0
-CL		3.0	4.3	5.0	4.1	7.3	4.0	0.0	1.0	0.0	0.0	1.0	0.0	0.0	0.0
Cross	f,m,s	3.0	0.0	1.1	0.0	0.0	0.0	2.0	0.0	2.0	6.0	2.0	2.0	0.0	2.0
+CL		7.0	2.0	3.0	0.0	0.0	0.0	5.0	1.0	3.0	12.0	3.5	5.0	0.0	4.0
-CL		0.0	0.0	1.0	0.0	0.0	0.0	1.0	0.0	1.0	3.0	1.0	2.0	0.0	1.0
Dribble	f,c,m,s	3.0	2.1	3.5	4.0	1.7	3.0	15.0	3.0	5.1	12.5	12.0	11.0	2.0	12.0
+CL		13.0	3.0	5.0	7.0	5.0	4.0	17.0	7.0	8.0	20.0	14.3	13.0	3.0	14.0
-CL		2.0	0.0	1.0	1.0	0.0	1.0	10.0	0.0	3.0	6.0	9.0	6.0	0.0	10.9
Foul	c,m,s	1.0	0.5	1.0	1.0	0.0	1.0	0.0	1.0	1.0	0.0	1.1	1.0	2.0	2.0
+CL		3.0	1.0	2.0	1.0	1.0	3.0	1.0	1.1	2.0	1.0	2.0	3.0	3.0	2.0
-CL		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	1.2	1.0
Goal	NS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
+CL		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	1.0	0.0	1.0
-CL		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Interception	c,m	1.0	1.0	1.0	4.0	2.0	1.8	2.0	1.0	2.5	0.5	2.0	2.0	0.0	0.0
+CL		4.0	1.9	2.0	5.0	4.0	3.0	3.0	3.0	6.0	2.0	3.0	5.0	0.0	0.0
-CL		0.0	0.0	0.0	2.0	1.0	0.0	1.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
Loss of Control	m	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	1.0	1.0	1.0	1.2	3.7
+CL		3.0	1.0	1.0	1.0	1.0	1.0	2.0	1.0	2.0	2.0	1.0	2.0	3.0	5.0
-CL		0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0	2.0
Offside	NS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
+CL		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0	2.0
-CL		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pass	f,c,m,s	29.0	19.0	30.9	34.0	21.0	24.0	25.0	22.1	51.0	17.4	24.8	35.0	21.0	14.0
+CL		56.0	34.9	48.5	44.0	28.0	28.0	31.0	29.0	64.0	23.0	28.1	41.0	26.0	18.0
-CL		23.0	12.5	25.0	27.0	17.0	18.0	22.0	17.0	35.8	11.0	21.0	26.0	18.0	11.0
Shot	m	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	1.0	2.0	2.4	1.0	2.4	4.0
+CL		5.9	0.0	1.0	1.0	0.0	1.0	2.0	1.0	2.0	4.1	4.1	3.0	3.0	5.0
-CL		0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	1.0	2.0	0.0	1.0	3.0
Tackle	f,c,m,s	9.5	7.6	6.5	8.0	6.5	7.5	6.0	11.0	16.5	5.5	8.0	8.0	3.0	2.0
+CL		14.8	11.0	9.0	12.0	10.0	10.5	8.0	14.2	26.0	7.2	9.2	11.0	6.0	4.0
-CL		1.1	5.0	3.0	5.0	4.0	6.0	4.0	9.0	8.0	1.9	7.0	4.0	1.0	2.0
Tackled	c,m,s	0.0	0.0	1.0	0.0	0.0	0.5	3.0	2.0	2.0	2.0	3.0	3.0	2.0	5.0
+CL		0.0	1.0	2.0	1.0	0.0	1.0	4.0	2.0	3.0	3.0	3.5	5.0	3.0	7.3
-CL		0.0	0.0	0.0	0.0	0.0	0.0	2.0	1.0	0.0	1.0	2.0	0.0	1.0	2.0

f = $p < 0.05$ between fullbacks, c = $p < 0.05$ between centre backs, m = $p < 0.05$ between midfielders, s = $p < 0.05$ between forwards, NS = no significant difference between individuals within each analysed playing position

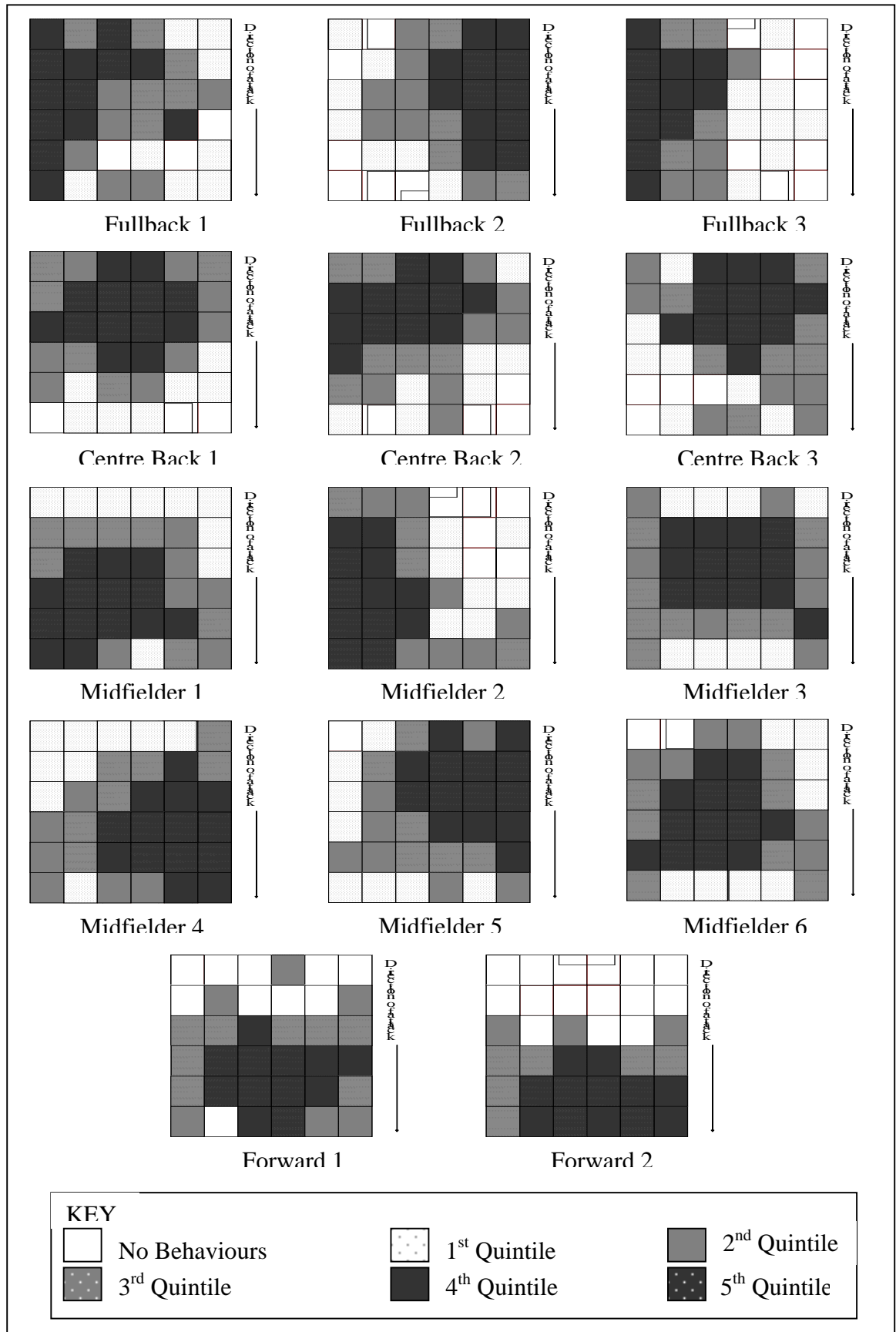


Figure 2. Individual player action areas based on frequency of behaviours performed within each pitch location.

Table 2. Unit behavioural profiles based on medians and 95% confidence limits (CL).

	Defensive Unit			Midfield Unit			Forward Unit		
	M	<i>+CL</i>	<i>-CL</i>	M	<i>+CL</i>	<i>-CL</i>	M	<i>+CL</i>	<i>-CL</i>
Aerial Challenge*	28.5	36.0	23.0	17.5	22.0	8.0	30.5	35.0	25.0
Clearance*	29.5	37.0	22.0	10.5	12.0	5.0	1.0	1.0	0.0
Cross*	3.0	7.0	2.0	13.0	14.0	9.0	2.0	3.0	1.0
Dribble*	13.0	21.0	8.0	41.5	42.0	35.0	13.5	15.0	4.0
Foul	3.0	5.0	2.0	3.5	4.0	2.0	3.5	4.0	2.0
Goal*	0.0	0.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0
Interception*	8.0	10.0	5.0	7.0	9.0	5.0	1.0	1.0	0.0
Loss of Control*	1.0	2.0	1.0	5.0	5.0	3.0	4.0	5.0	3.0
Offside*	0.0	0.0	0.0	0.0	1.0	0.0	2.0	4.0	1.0
Pass*	100.0	136.0	85.0	105.0	129.0	91.0	37.0	39.0	34.0
Shot*	1.5	2.0	1.0	6.5	8.0	5.0	5.0	7.0	3.0
Tackle*	29.5	33.0	22.0	34.5	39.0	30.0	5.5	7.0	3.0
Tackled*	2.0	3.0	1.0	10.0	12.0	8.0	7.0	9.0	3.0

p<0.01

3.3 Team Action Area and Distribution of Behaviours Performed

Analysis of the team's action area found that 26% of the teams' total behaviours occurred in the defensive third of the pitch, 43% in the midfield third and 31% in the attacking third (p<0.01). Additional analyses revealed that within the defending half of the playing field there were a significant number of behaviours performed in the pitch centre whereas in the attacking half a bias existed to the pitch right (p<0.01; Figure 4). In particular, a higher incidence of passes, dribbles, crosses and times deemed offside were found to occur on the pitch right within the attacking half, and a greater incidence of tackles were executed on the left hand side of the pitch within the defending half (p<0.05). Clearances and interceptions were performed significantly more within central areas of the team's defending half of the pitch with a greater frequency of shots on goal and goal scored occurring in the centre of the attacking half (p<0.05). Similarly, aerial challenges were dominant in central areas of the playing field but no discrepancies were observed between the pitch halves. No differences were reported across pitch areas when fouls committed, losses of control or players being tackled were considered.

Assessment of Team Strategy by the Manager and Coaching Staff

Analysis of responses regarding the team's overall strategy and tactics from the manager and coaching staff suggested that their attacking strategy was biased towards playing the ball into the right hand side areas of the attacking half of the pitch. This attacking tendency was reported by the coaches to be due to the utilisation of a non-symmetrical formation which employed a player in the wide right pitch areas but did not

include a comparable position on the left (Figure 5). Furthermore the coaches noted that as a result of this strategy certain players, particularly those in the midfield unit, were also being drawn towards the right hand side of the pitch. The manager indicated in his responses that this subsequently produced defensive problems for his side as opposition teams would immediately counter-attack through the exposed left pitch side upon regaining possession of the ball.

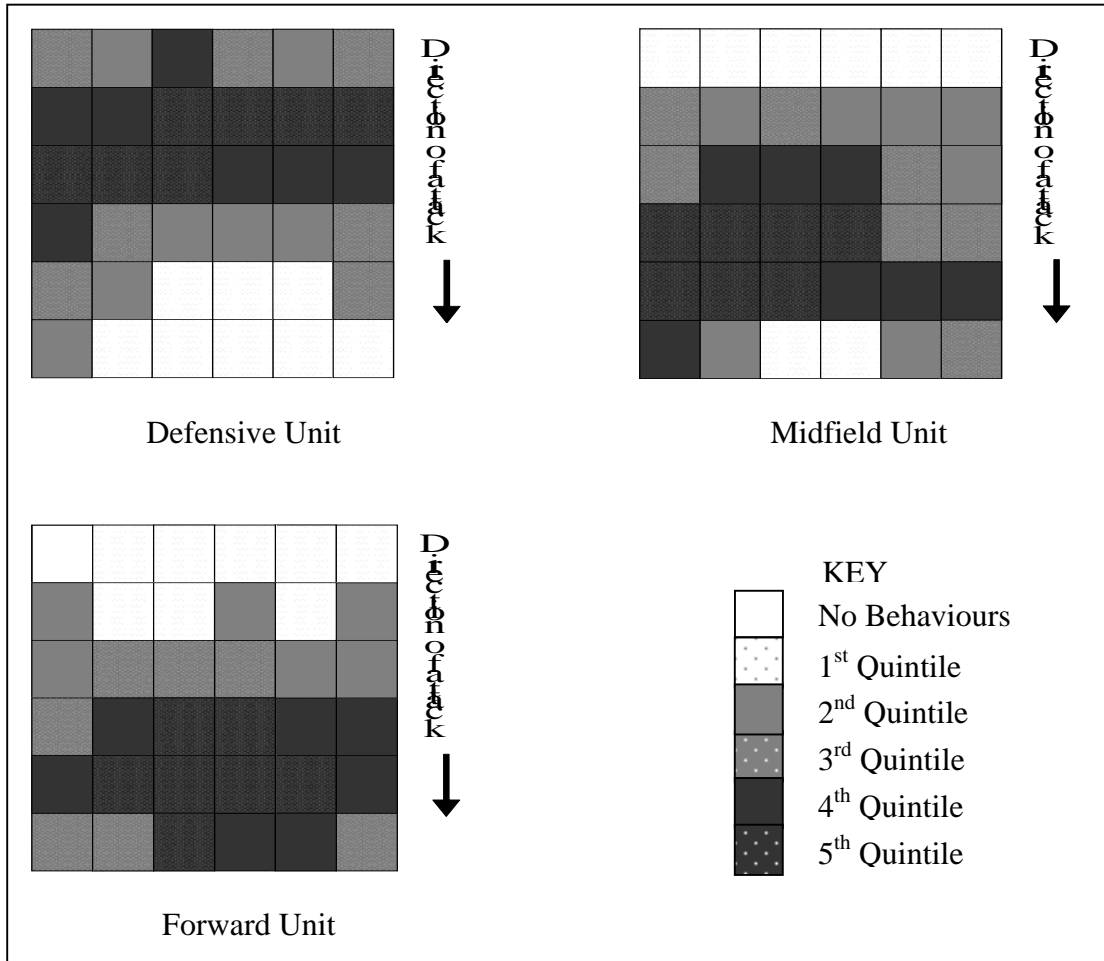


Figure 3. Individual player action areas calculated from the frequency of behaviours performed within each pitch location.

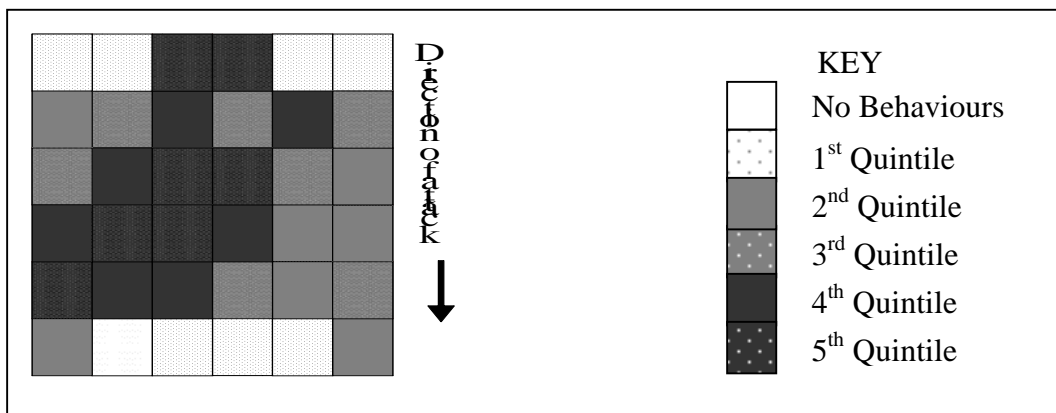


Figure 4. Team action area calculated from the frequency of behaviours performed within each pitch location.

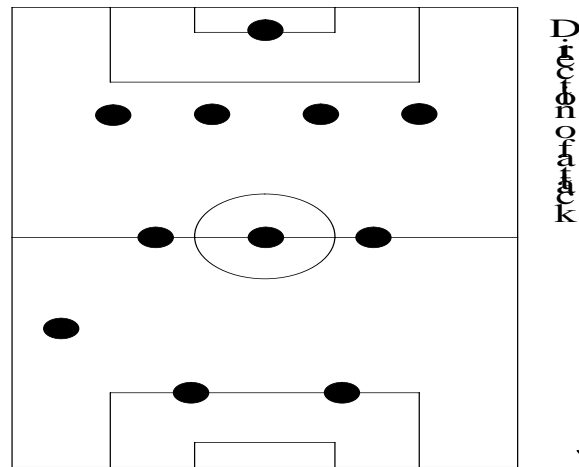


Figure 5. Representation of the team’s formation based upon feedback obtained from the management and coaching staff.

4 Discussion

The aim of this study was to construct measures of individual player and unit tactical behaviours within a professional soccer team and compare them with overall team strategy. This was achieved through the use of two objective measurement tools that provided technical and spatial information (Grehaigne et al., 1996; Taylor et al., 2004) and via direct communications with the team’s manager and coaching staff.

Analysis of the tactical behaviours performed within the playing positions of fullback, centre back, midfielder and forward indicated distinctive tactical behaviours, providing support for previous soccer research that has suggested a unique nature to individual player technical and spatial performance (Grehaigne et al., 1996; Taylor et al., 2004). In addition, as hypothesised, the tactical behaviours appear to provide an indication of individual player roles (Grehaigne et al., 1996; James et al., 2002; Taylor et al., 2004). For example, in our study Midfielder 4 performed a high frequency of dribbles and crosses within an action area that was concentrated to the wide right areas of the pitch and consistent with the responsibility of a ‘winger’ or ‘outside midfielder’ (cf. Wiemeyer, 2003). Differences were also evident between the tactical behaviours of the two forwards. Specifically, Forward 1 mainly operated between the halfway line and the front edge of the opposition’s penalty area, executing a high number of aerial challenges and passes, whereas Forward 2 performed a greater incidence of dribbles and had an action area focused predominantly within the attacking third. These tactical behaviours may suggest that Forward 1 acts as a ‘target man’, attempting to play the ball to Forward 2, whose primary responsibility is to advance into positions where shots can be executed and goals scored (cf. Taylor et al., 2004).

Examination of the tactical behaviours of the sampled team’s defensive, midfield and forward units revealed disparities comparable to those described in previous literature (e.g. Dunn et al., 2003; Williams et al., 2003; Taylor et al., 2004). Specifically, the defensive unit was characterised by large frequencies of aerial challenges, clearances and tackles, while the midfield unit executed the most crosses and dribbles. Surprisingly, however, in contrast to existing research the midfield unit, as opposed to the forward unit, was found to attempt the most shots on goal (Dunn et al., 2003; Taylor et al., 2004). While this difference may be due to strategic and tactical

differences between the teams analysed it may also be due to the fact that the behavioural profiles presented here were based on medians as opposed to means. Specifically, the mean is sensitive to extreme scores, therefore if for example a team's forward unit had one particular match where they doubled the normal number of shots taken then this would inflate the mean. As the median simply represents the middle or typical score (50th percentile) it is not affected by extreme scores and therefore best represents all other scores (James et al., 2005; Vincent, 2005).

With regard to action areas, while each unit performed behaviours within all of the areas of the pitch some distinctive patterns of operation were observed. For example, the majority of defensive unit behaviours occurred in the midfield and defensive thirds of the field while the midfield unit operated predominantly within the midfield and attacking thirds of the pitch. Both the defensive and midfield units also displayed a bias towards the right of the playing field. Conversely, the focal point of the forward unit behaviours was located within the central areas of the forward third of the field. Despite these patterns of spatial operation, however, all three units performed a large frequency of behaviours within the midfield third of the pitch, highlighting the strategic importance of this particular area in linking defence and attack (James et al., 2002). Interestingly, the differences noted in the tactical behaviours performed by some of individual players within each playing position contrasted with the behaviours exhibited by the respective positional unit. For example, the behavioural profile of Midfielder 2 was characterised by a large number of aerial challenges and a low number of dribbles and shots together with an action area that was focused within the midfield and defensive pitch thirds. This particular tactical behaviour appears to be more indicative of defensive unit tactical behaviour than the midfield unit and signifies, to a certain extent, that the performance demands on soccer players are multi-levelled and may require them to fulfil conflicting individual and positional roles (Kormelink and Seeverens, 1999; Taylor et al., 2004). This finding also appears to contradict James et al.'s (2002) suggestion that players operate within the confines of their respective positional units.

The final objective of the study was to assess potential relationships between individual player and unit tactical behaviour with regard to overall team strategy. Qualitative feedback provided by the team manager and coaching staff revealed an attacking strength through the pitch right and an associated defensive weakness on the pitch left. These assertions were supported by the findings from the analysis of the technical data and the examination of the behaviours exhibited in the team's overall action area. Specifically, a significant number of dribbles and crosses were executed on the right side of the field in the attacking half and a larger incidence of tackles were observed on the pitch left in the defensive half. Within the sampled team, these behaviours were primarily performed by the midfield unit, which suggests that they may have a central role in the accomplishment of team strategy (James et al., 2002). Indeed, this unit was highlighted by the team manager and coaching staff as containing a number of players who had an effect on the balance of the team. For example, the 'right winger' (Midfielder 4) and Midfielder 1 appeared to accentuate the right side attacking bias with the majority of their behaviours occurring on this side of the pitch, particularly within the attacking half of the field. Conversely, Midfielder 2 performed a high frequency of defensive behaviours such as aerial challenges, clearances and tackles in his own half and the pitch left hand side. This may suggest a responsibility of Midfielder 2 to provide extra support to the left fullback and compensate for the defensive weaknesses highlighted by the team manager. While these tendencies may only be relevant to the sampled team they do demonstrate the forms of association

between individual and unit tactical behaviours and subsequent team strategy likely to be evident within all teams (James et al., 2002).

The method employed within the current study has a number of practical applications. First, as behavioural performance remains the focal point of player assessment by coaches the concept of tactical behaviours can be adopted to objectively evaluate observed performance in relation to expected performance (Eys et al., in press). In particular tactical behaviours provide information concerning the technical actions players are performing and the zones within which they operate. The simple but meticulous nature of the action area diagrams also provide a tool that can be used alongside traditional visual presentation media, such as tactics boards, to outline precise zones of operation to individuals and units. The scouting process may also benefit from this detailed form of analysis, allowing the tactical behaviours of opposition players and respective units' to be monitored and their associated strengths and weaknesses assessed. Similarly, the method can be applied within the talent identification system to evaluate the tactical and technical abilities of potential players with regards to their aptitude for fulfilling certain roles, congruent to the interested team or manager. The utilisation of tactical behaviours in the scouting and talent identification process could also be further enhanced by accounting for the outcomes of the behaviours performed such as success rates of passes, tackles made and shots on goal (cf. Taylor et al., 2004).

While a methodology has been developed that can be used in investigations of tactical behaviours it is acknowledged that several limitations and areas for future investigation exist. Firstly, the sole focus upon on the ball behaviours represents only a proportion of each player's technical actions (Dufour, 1993). Due to limited camera angles within match videos our methodology did not consider non-possession behaviours such as marking, supporting runs, and creating space. The challenge for future research therefore is to determine how off the ball behaviours of all players can be accurately and efficiently measured throughout a match. In addition, although the tactical behaviours presented within this study offer a comprehensive description of individual player and positional unit technical and spatial performance soccer is a dynamic sport, thus there is a requirement for future research to investigate the complex interactions between all players on the pitch (see Grehaigne et al. 1996, Grehaigne, 2001). Finally, there is a need to examine the influence upon tactical behaviours of potential confounding variables, such as game location and score-line that have been suggested to affect the strategies and tactics adopted by teams (Sasaki et al., 1999; Bloomfield et al., 2004).

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