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Effect of playing tactics on achieving score-box possessions in a random series of team possessions from Norwegian professional soccer matches

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Abstract
Methods of analysis that include an assessment of opponent interactions are thought to provide a more valid means of team match performance. The purpose of this study was to examine the effect of playing tactics on achieving score-box possession by assessing opponent interactions in Norwegian elite soccer matches. We analysed a random series of 1703 team possessions from 163 of 182 (90%) matches played in the professional men's league during the 2004 season. Multidimensional qualitative data obtained from ten ordered categorical variables were used. Offensive tactics were more effective in producing score-box possessions when playing against an imbalanced defence (28.5%) than against a balanced defence (6.5%) ($P < 0.001$). Multiple logistic regression found that, for the main variable ''team possession type'', counterattacks were more effective than elaborate attacks when playing against an imbalanced defence (odds ratio: 2.69; 95% confidence interval: 1.64 to 4.43) but not against a balanced defence (odds ratio: 1.14; 95% confidence interval: 0.47 to 2.76). Assessment of opponent interactions is critical to evaluate the effectiveness of offensive playing tactics on producing score-box possessions, and improves the validity of team match-performance analysis in soccer.

Keywords: *Validity, opponent interaction, logistic regression, soccer playing effectiveness, match-performance analysis*

Introduction

Match-performance analysis is widely used systematically to observe and evaluate player and team performances in professional soccer, and could make coaching interventions more objective and decisive (McGarry & Franks, 2003) as well as enhance match performance. Thus, the validity of the data collected is crucial for effective match-performance analysis. Since the opposition is responsible for the ''unexpected'' in a match, requiring constant adaptation to constraints due to the confrontation between two teams (Elias & Dunning, 1966; Grehaigne, Bouthier, & David, 1997), match-performance analysis must consider the interactions between the two opposing teams.

It is therefore surprising that few studies have assessed, directly or indirectly, opponent interactions during match-performance analyses in soccer (Bloomfield, Polman, & O'Donoghue, 2005; Grehaigne, 1991; Harris & Reilly, 1988; Jones, James, & Mellalieu, 2004; Lago & Martin, 2007; Olsen & Larsen, 1997; Seabra & Dantas, 2006; Suzuki & Nishijima, 2004; Taylor, Mellalieu, James, & Shearer, 2008). However, although these studies showed promising effects of assessing opponent interactions, almost all of them are limited by small sample sizes and univariate data analyses.

To conduct a more appropriate assessment of opponent interactions, it is necessary to use designs that include an adequate sample size of randomly selected events. In addition, the use of multivariate logistic regression allows more complex comparisons of the effects of different variables and their interactions (Nevill, Atkinson, Hughes, & Cooper, 2002). Logistic regression analysis has been used rarely in the analysis of match performance in soccer (e.g. Ensum, Pollard, & Taylor, 2004; Pollard & Reep, 1997). Furthermore, to consider opponent interactions in the analysis, one has to analyse opposing relationships between two teams (or players), rather than two opposing teams (or players) individually in isolation from the match context. It is possible to analyse relationships between opponents when using

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a match-play situation as the basic unit of analysis rather than a team (or a player). Therefore, team possession was used as the unit of analysis in this study. Since such match-play situations emerge from the interplay of play and counter-play produced by the two teams (Grehaigne, Bouthier, & Godbout, 1999; Grehaigne & Godbout, 1995), they allow a breakdown of a match-play action without losing its confrontational nature.

Moreover, the use of multidimensional qualitative data instead of unidimensional frequency data improves our ability to describe soccer match-play (Grehaigne, Mahut, & Fernandez, 2001; Hughes & Bartlett, 2002; Suzuki & Nishijima, 2004). This is because multidimensional qualitative data permit the inclusion of data from the qualitative evaluation of different dimensions of performance involved in the opponent interaction. For example, a variable such as ''team possession type'' could be used to describe the two traditionally opposing offensive strategies, namely counterattack (''direct play'') and elaborate attack (''possession play''), by adopting categories indicating the degree of offensive directness. Similarly, the variable ''defensive pressure'' could be used to describe degrees of loose pressure to tight pressure in defensive balance, possibly through ordered categories of estimated pressing distances. Also, ordered categories indicating the number of passes per team possession could be used to describe degrees of ball possession. Hence, a multidimensional qualitative evaluation could be achieved by converting frequency data of different factors of match performance, widely recognized in practice, into ordered categorical data.

Thus, the aim of this study was to examine the effects of playing tactics, counterattack versus elaborate attack, on the probability of achieving score-box possession by assessing opponent interactions using a ''cohort-like design'' with a series of randomly selected team possessions from Norwegian elite soccer.

Methods

Materials

Videotapes of 163 of 182 (90%) matches played in the Norwegian men's professional league during the 2004 season were used. These videotapes were recorded from live TV broadcasts. The league involved 14 teams and followed a double round-robin competition format, which means that each team played 26 matches, 13 home and 13 away. To obtain a random sample of 3260 team possessions, we assigned each match a computer-generated random decimal number between 0 and 1, which was multiplied by 86 to indicate the beginning (in minutes) of a match period from which a total of 20 consecutive team possessions would be extracted. This was based on the assumption that 20 consecutive team possessions lasts 6.5 min on average, and that 2–3 min of extra time is added to each match. The sample obtained was then analysed for team possession type, namely counterattack, elaborate attack, and set-play attack. Finally, from the 3260 team possessions, a total of 1703 team possessions of the counterattack type ($n = 695$, 41%) and elaborate attack type ($n = 1008$, 59%) were collected and used to compare these playing tactics.

Team match-performance analysis

A team possession was used as the basic unit of analysis and was defined according to Pollard and Reep (1997):

> A team possession starts when a player gains possession of the ball by any means other than from a player of the same team. The player must have enough control over the ball to be able to have a deliberate influence on its subsequent direction. The team possession may continue with a series of passes between players of the same team but ends immediately when one of the following events occurs: a) the ball goes out of play; b) the ball touches a player of the opposing team (e.g. by means of a tackle, an intercepted pass or a shot being saved). A momentary touch that does not significantly change the direction of the ball is excluded; c) an infringement of the rules takes place (e.g. a player is offside or a foul is committed).

The following ten variables were used in this study: possession outcome (one dependent variable); team possession type, starting zone, pass number, pass length, pass penetration, and space utilization (six offensive independent variables); and zone-defence tactics including defensive pressure, defensive backup, and defensive cover (three defensive independent variables) (Table I). These ordered categorical variables were selected as the most relevant for the current study from 22 variables presented in an earlier study (Tenga, Holme, Ronglan, & Bahr, 2010). Their reliability based on inter-observer tests has been shown to be within acceptable limits, with very good kappa values according to Altman (1991) for four variables, good values for four variables, and fair values for two variables (for details of the methodological study, see Tenga, Kanstad, Ronglan, & Bahr, 2009). The dependent variable, possession outcome, had two primary values – score-box possession and no score-box possession.

Table I. Descriptions of variables and definitions of categories used in the team match-performance analysis.

Variables and categories
1. Team possession type
Definition: Degree of offensive directness by levels of utilization or creation of imbalance in the opponent's defence to achieve penetration (i.e. how quick penetration is attempted after ball winning). Penetration is achieved when a pass goes towards the opponent's goal past opponent player(s) while maintaining a high degree of control over the ball. High degree of control over the ball means enough space and time to make it easier to perform intended actions on the ball.
A. *Counterattack* (''direct play''): starts by winning the ball in play and progresses by either (a) utilizing or attempting to utilize a degree of imbalance from start to the end, or (b) creating or attempting to create a degree of imbalance from start to the end by using early (i.e. first or second, evaluated qualitatively) penetrative pass or dribble. Utilizing a degree of imbalance means seeking penetration in such a way that a defending team fails to regain a high degree of balance from start to the end of team possession. Counterattacks progress relatively quickly.
B. *Elaborate attack* (''possession play''): starts by winning the ball in play and progresses either (a) without utilizing or attempting to utilize a degree of imbalance, or (b) by creating or attempting to create a degree of imbalance by using late (third or later, evaluated qualitatively) penetrative pass or dribble. Not utilizing a degree of imbalance means seeking penetration in such a way that a defending team manages to regain a high degree of balance before the end of team possession. Elaborate attacks often progress relatively slowly.
2. Starting zone
Definition: Area across the playing field in which team possession starts.
A. *First third*: that third of the playing field estimated from own goal line to middle third.
B. *Middle third*: that third of the playing field estimated from end of the first third to final third.
C. *Final third*: that third of the playing field estimated from end of the middle third to the opponent's goal line, excluding score box.
D. *Score box*: prime scoring area in front of the opponent's goal defined as an imaginary prolongation of the penalty area from an estimated 16 m to 30 m distance from the opponent's goal line.
3. Pass number
Definition: Series of passes between players of the attacking team.
A. *Short possession*: one or two passes per team possession.
B. *Medium possession*: three or four passes per team possession.
C. *Long possession*: five or more passes per team possession.
4. Pass length
Definition: Long passes of 30 m or more estimated distance and shorter estimated distances for short passes.
A. *Long*: only long pass.
B. *Mixed*: combination of long and short passes.
C. *Short*: only short pass.
5. Pass penetration
Definition: Penetrative passes are passes towards the opponent's goal past opponent player(s) while maintaining control over the ball, or otherwise for non-penetrative passes.
A. *Penetrative*: only penetrative pass.
B. *Mixed*: combination of penetrative and non-penetrative passes.
C. *Non-penetrative*: only non-penetrative pass.
6. Space utilization
Definition: Space passes represent passes towards a space further than the receiver's immediate reach and foot passes represent passes towards a player, evaluated from the moment of making the pass.
A. *Space pass*: only space pass.
B. *Mixed*: combination of space and foot passes.
C. *Foot pass*: only foot pass.
7. Defensive pressure
Definition: Distance between a player with the ball (first attacker) and an immediate pressing opponent player(s) (first defender(s)), excluding the goalkeeper, at each moment of attempting to win or receive the ball.
A. *Loose* (''imbalanced''): only when first defender is estimated to be more than 1.5 m away.
B. *Mixed*: combination of tight and loose pressure.
C. *Tight* (''balanced''): only when first defender is estimated to be within 1.5 m.
8. Defensive backup
Definition: Immediate opponent player(s) supporting first defender often from behind (second defender(s)), excluding the goalkeeper, at each moment of attempting to win or receive the ball except in the ''war'' zone. ''War'' zone represents a group duel in front of the goal typically following a pass made towards the score box.
A. *Absent* (''imbalanced''): only without second defender within 5 m estimated distance from first defender.
B. *Mixed*: combination of with and without second defender.
C. *Present* (''balanced''): only with second defender within 5 m estimated distance from first defender.
9. Defensive cover
Definition: Opponent player(s) guarding space away from the ball often behind first defender(s) and/or second defender(s) (third defender(s)), excluding the goalkeeper, at each moment of attempting to win or receive the ball.

(*Continued*)

Table I. (*Continued*).

Variables and categories
A. *Absent* (''imbalanced''): only without third defender(s) behind first and/or second defender(s).
B. *Mixed*: combination of with and without third defender(s).
C. *Present* (''balanced''): only with third defender(s) behind first and second defender(s).
10. Team possession outcome
Definition: Degree of offensive success by ''score-box possession'' and ''no score-box possession'' and level of effectiveness.
A. *Score-box possession*: includes three discrete levels of effectiveness within the score box, namely goal scoring, scoring opportunity, and score-box possession.
(i) *Goal scoring*: scoring attempt ending in a goal approved by the referee.
(ii) *Scoring opportunity*: attempt on goal with a relatively high probability of scoring (e.g. from shorter distances, from wider angles, poor goalkeeper positioning), as well as near-scoring situations such as corner kick direct onto the crossbar.
(iii) *Score-box possession*: entry into score box with high degree of control over the ball or when a set play is given to the attacking team as a result of entry into score box. High degree of control over the ball means enough space and time to make it easier to perform intended action on the ball.
B. *No score-box possession*: includes four discrete levels of effectiveness outside the score box, namely not score-box possession, final third, middle third, and first third.
(iv) *Not score-box possession*: entry into score box with poor control over the ball. Poor control over the ball means lacking enough space and time thus making it more difficult to perform intended action on the ball.
(v) *Final third*: ending up in the final third of the playing field.
(vi) *Middle third*: ending up in the middle third of the playing field.
(vii) *First third*: ending up in the first third of the playing field.

Each team possession was given an overall score for each variable, offensively and defensively, taking all attempts to win or receive the ball in ball involvements from the start to the end of a team possession into consideration. The frequencies of each category in a team possession were then summed and used to characterize the entire team possession. For example, for the variable *defensive pressure*, a team possession was characterized as ''tight pressure'' when an estimated pressing distance of not more than 1.5 m was observed in all ball involvements throughout the entire team possession. In contrast, ''loose pressure'' was used to characterize a team possession when an estimated pressing distance(s) of more than 1.5 m was observed throughout the entire team possession. The category ''mixed'' characterizes team possessions when both ''tight pressure'' and ''loose pressure'' were observed in ball involvements within the team possession. For the variable *defensive backup*, the categories ''present backup'' and ''absent backup'' were used to characterize team possessions completely with or without a second defender within 5 m estimated distance from the first defender throughout the entire team possession, respectively. For the variable *defensive cover*, the categories ''present cover'' and ''absent cover'' characterize team possessions completely with or without a third or more defenders throughout the entire team possession, respectively. The category ''mixed'' characterizes team possessions when both ''present backup'' and ''absent backup'' for *defensive backup*, or ''present cover'' and ''absent cover'' for *defensive cover*, were observed in ball involvements within the team possession.

Video analysis

The video material in DigiBeta video-format was reviewed using a computer-controlled Sony DigiBeta video machine. Twenty consecutive team possessions were extracted from each of the 163 matches with the help of a G4 Mac machine using the software program FinalCut Pro version 9.0. A total of 3260 team possessions in Mac format were stored, and then converted from Mac format to WMV PC format to allow further analysis using Windows Media Player. A soccer coach/researcher (A.T.) experienced in match-performance analysis and a soccer coach/master's student (D.K.) each analysed about half of the team possessions based on ten variables used in the team match-performance analysis. The video analysis data were registered directly in SPSS (version 15.0, SPSS Inc., Chicago, IL). The study was approved by the Norwegian Social Science Data Services (NSD).

Statistical analysis

A total of 1703 team possessions of either the counterattack or elaborate attack type were estimated to detect a difference of 4% (Δ) in the proportions of the two playing tactics culminating in score-box possession, assuming an α of 0.05 and a β of 0.15. A difference (Δ) of 4% was estimated based on scoring probability data of international soccer (Pollard & Reep, 1997) and possession data of the Norwegian men's national soccer team (Olsen, Larsen, & Semb, 1994). From these studies, we estimated that between 6% and 10% (average 8%) of counterattack

and elaborate attack team possessions will produce score-box possessions. The null hypothesis, that there would be no difference in effectiveness between the two main playing tactics (counterattack vs. elaborate attack) for producing score-box possessions, was tested using a chi-square analysis to determine if there was an association between playing tactics and the probability of producing score-box possessions. To control for the effects of the degree of defensive balance, subgroup analyses were undertaken. The association between playing tactics and the probability of producing score-box possessions when playing against a balanced defence and against an imbalanced defence separately, excluding the remainder of the situations, was also tested by the chi-square method.

The null hypothesis was tested further by multiple logistic regression analysis in which the dependent variable was whether a score-box possession was or was not produced. We used six offensive tactics as independent variables, each with two categories: counterattack versus elaborate attack, final third versus first third, long possession versus short possession, long pass versus short pass, penetrative pass versus non-penetrative pass, and space pass versus foot pass. From this model, an odds ratio with 95% confidence limits was calculated. In univariate analyses, each of the six independent variables was tested separately and the association between the single variables and the probability of producing a score-box possession was assessed. In multivariate analyses, all six independent variables were entered and tested in a single step. In this way, we could investigate the relationship between each independent variable and the probability of producing a score-box possession, adjusted for the other independent variables. To control for the effects of the degree of defensive balance, subgroup analyses were again performed. Odds ratios were calculated for producing a score-box possession by one playing tactic versus the other playing tactic when playing against a balanced defence and against an imbalanced defence separately, deleting the rest of the situations. We used an alpha value of <0.05 in all tests.

Results

Descriptive analysis

A total of 1703 random series of team possessions using counterattack and elaborate attack types were analysed. The 14 teams examined performed a mean number of 122 team possessions (range = 103–149). Of 1703 team possessions, 262 (15.4%) produced score-box possessions. There were differences in the probability of producing score-box possessions between the playing tactics for all variables except the main variable ''team possession type''. For the three zone-defence variables combined (''overall defensive score''), playing against a balanced defence (6.5%) produced fewer score-box possessions than against an imbalanced defence (28.5%) (Table II).

Differences were observed in the probability of producing score-box possessions between the offensive tactics when subgroup analyses were undertaken. For the main variable ''team possession type'', counterattack (36.4%) and elaborate attack (24.4%) differed when playing against an imbalanced defence but not against a balanced defence. For the variable ''pass number'', short possession (4.6%), medium possession (7.8%), and long possession (15.8%) differed when playing against a balanced defence but not against an imbalanced defence. Otherwise, all offensive tactics had a higher probability of producing score-box possessions when playing against an imbalanced defence than against a balanced defence (Table III).

Logistic regression analyses

There were differences in the odds ratio (OR) for producing a score-box possession between the two offensive tactics in univariate and multivariate analyses. For the main variable ''team possession type'', counterattacks registered a higher odds ratio than elaborate attacks in multivariate analysis (OR = 2.39; 95% confidence interval: 1.66 to 3.45; $P < 0.001$) but not in univariate analysis (OR = 1.21; 95% confidence interval: 0.92 to 1.57; $P = 0.17$). For the variable ''pass length'', short passes registered a higher odds ratio than long passes in univariate analysis (OR = 2.63; 95% confidence interval: 1.43 to 4.76; $P = 0.002$) but not in multivariate analysis (OR = 0.88; 95% confidence interval: 0.43 to 1.79; $P = 0.71$) (Table IV).

Differences were observed in the odds ratio for producing a score-box possession between the offensive tactics when subgroup analyses were undertaken. In univariate analysis, the offensive tactics final third, long possession, and penetrative pass had higher odds ratios than their respective opposite tactics first third, short possession, and non-penetrative pass when playing against a balanced defence. Counterattack, final third, and penetrative pass registered higher odds ratios than their respective opposite tactics elaborate attack, first third, and non-penetrative pass when playing against an imbalanced defence. In multivariate analysis, only penetrative pass registered a higher odds ratio (OR = 11.0; 95% confidence interval: 3.6 to 33.8; $P < 0.001$) than the opposite tactic non-penetrative pass when playing against a balanced defence. Counterattack, final third, long possession, long

Table II. Numbers and percentages of score-box possessions for playing tactics according to offensive and defensive variables ($N = 1703$).

Variable	*N*	%	Score box	Score box %	*P**
Offensive variables					
Team possession type					0.17
Counterattack (''direct play'')	695	40.8	117	16.8	
Elaborate attack (''possession play'')	1008	59.2	145	14.4	
Starting zone					< 0.001
Final third	38	2.2	14	36.8	
Middle third	769	45.2	150	19.5	
First third	896	52.6	98	10.9	
Pass number					< 0.001
Short possession	820	49.2	75	9.1	
Medium possession	510	30.6	87	17.1	
Long possession	335	20.1	90	26.9	
Pass length					0.004
Long pass	188	11.3	13	6.9	
Mixed	661	39.7	107	16.2	
Short pass	815	49.0	132	16.2	
Pass penetration					< 0.001
Penetrative pass	130	7.8	39	30.0	
Mixed	916	55.1	186	20.3	
Non-penetrative pass	617	37.1	26	4.2	
Space utilization					0.001
Space pass	899	54.1	111	12.3	
Mixed	696	41.9	133	19.1	
Foot pass	66	4.0	7	10.6	
Defensive variables					
Defensive pressure					< 0.001
Loose (''imbalanced'')	454	27.3	43	9.5	
Mixed	1009	60.7	200	19.8	
Tight (''balanced'')	199	12.0	18	9.0	
Defensive backup					< 0.001
Absent (''imbalanced'')	1009	60.7	136	13.5	
Mixed	596	35.9	121	20.3	
Present (''balanced'')	56	3.4	4	7.1	
Defensive cover					< 0.001
Absent (''imbalanced'')	9	0.5	5	55.6	
Mixed	235	14.1	120	51.1	
Present (''balanced'')	1419	85.3	137	9.7	
Overall defensive score					< 0.001
Imbalanced defence	604	35.5	172	28.5	
Mixed	437	25.7	49	11.2	
Balanced defence	620	36.4	40	6.5	

Note: The variable ''overall defensive score'' reflects the combined probability scores of the three zone-defence variables.
*Pearson chi-square.

pass, and penetrative pass registered higher odds ratios than elaborate attack, first third, short possession, short pass, and non-penetrative pass when playing against an imbalanced defence (Table V).

Discussion

The main outcome of this study was that the assessment of opponent interactions in a random series of team possessions revealed differences in the probability of producing score-box possessions between offensive tactics. For the main variable ''team possession type'', counterattacks were more effective than elaborate attacks when playing against an imbalanced defence but not against a balanced defence. Indeed, the probability of producing a score-box possession was higher when playing against an imbalanced defence than against a balanced defence. Conversely, the tactics of balanced defence (tight pressure, present backup, and present cover) were more effective in preventing score-box possessions than the opposite tactics of imbalanced defence (loose pressure, absent backup, and absent cover). Thus, these findings show that the assessment of opponent interactions is critical to

Table III. Score-box possessions for playing tactics according to offensive variables when controlling for the effects of the degree of defensive balance ($N = 1224$).

	Imbalanced defence			Balanced defence		
Variable	*N*	Score box (%)	*P*⋆	*N*	Score box (%)	*P*⋆
Team possession type			0.002			0.91
Counterattack (“direct play”)	206	75 (36.4)		320	21 (6.6)	
Elaborate attack (“possession play”)	398	97 (24.4)		300	19 (6.3)	
Starting zone			<0.001			<0.001
Final third	13	9 (69.2)		14	3 (21.4)	
Middle third	320	102 (31.9)		282	27 (9.6)	
First third	271	61 (22.5)		324	10 (3.1)	
Pass number			0.24			0.013
Short possession	163	40 (24.5)		437	20 (4.6)	
Medium possession	229	62 (27.1)		116	9 (7.8)	
Long possession	208	67 (32.2)		38	6 (15.8)	
Pass length			0.11			0.17
Long pass	21	9 (42.9)		119	3 (2.5)	
Mixed	300	75 (25.0)		165	9 (5.5)	
Short pass	279	85 (30.5)		305	22 (7.2)	
Pass penetration			<0.001			<0.001
Penetrative pass	39	25 (64.1)		43	8 (18.6)	
Mixed	445	131 (29.4)		205	18 (8.8)	
Non-penetrative pass	116	13 (11.2)		341	8 (2.3)	
Space utilization			0.66			0.36
Space pass	257	74 (28.8)		409	20 (4.9)	
Mixed	331	93 (28.1)		149	12 (8.1)	
Foot pass	12	2 (16.7)		31	2 (6.5)	

⋆Pearson chi-square.

Table IV. Odds ratios (OR) for producing a score-box possession by the two playing tactics according to offensive variables.

	Univariate analysis		Multivariate analysis	
Variable	OR (95% CI)	*P*	OR (95% CI)	*P*
Team possession type				
Counterattack vs.	1.21 (0.92–1.57)	0.17	2.39 (1.66–3.45)	<0.001⋆
Elaborate attack[a]	1		1	
Starting zone				
Final third vs.	4.75 (2.38–9.49)	<0.001	6.58 (2.65–16.31)	<0.001⋆
First third[a]	1		1	
Pass number				
Long possession vs.	3.65 (2.60–5.12)	<0.001	6.07 (3.45–10.67)	<0.001⋆
Short possession[a]	1		1	
Pass length				
Short pass vs.	2.63 (1.43–4.76)	0.002	0.88 (0.43–1.79)	0.71
Long pass[a]	1		1	
Pass penetration				
Penetrative pass vs.	9.74 (5.66–16.77)	<0.001	11.38 (6.33–20.43)	<0.001⋆
Non-penetrative pass[a]	1		1	
Space utilization				
Space pass vs.	1.19 (0.53–2.66)	0.68	1.93 (0.79–4.70)	0.15
Foot pass[a]	1		1	

Note: The odds ratio reflects the chance of achieving score-box possession, compared with the reference category [a].
⋆Offensive tactics included in the model.

Table V. Odds ratios (OR) for producing a score-box possession by the two playing tactics according to offensive variables when controlling for the effects of the degree of defensive balance.

Variable	Univariate analysis		Multivariate analysis	
	OR (95% CI)	*P*	OR (95% CI)	*P*
Team possession type				
Counterattack vs.	1.04 (0.55–1.97)	0.91	1.14 (0.47–2.76)	0.78
Elaborate attack against balanced defence[a]	1		1	
Counter attack vs.	1.78 (1.23–2.56)	0.002	2.69 (1.64–4.43)	<0.001*
Elaborate attack against imbalanced defence[a]	1		1	
Starting zone				
Final third vs.	8.56 (2.06–35.55)	0.003	3.70 (0.38–35.53)	0.26
First third against balanced defence[a]	1		1	
Final third vs.	7.75 (2.31–26.02)	0.001	15.67 (3.31–74.12)	0.001*
First third against imbalanced defence[a]	1		1	
Pass number				
Long possession vs.	3.91 (1.47–10.42)	0.006	3.57 (0.80–15.87)	0.10
Short possession against balanced defence[a]	1		1	
Long possession vs.	1.46 (0.92–2.31)	0.106	5.15 (2.37–11.24)	<0.001*
Short possession against imbalanced defence[a]	1		1	
Pass length				
Long pass vs.	0.33 (0.10–1.13)	0.08	0.69 (0.18–2.70)	0.59
Short pass against balanced defence[a]	1		1	
Long pass vs.	1.71 (0.70–4.22)	0.24	4.21	0.029*
Short pass against imbalanced defence[a]	1		1	
Pass penetration				
Penetrative pass vs.	9.51 (3.36–26.92)	<0.001	11.02 (3.59–33.84)	<0.001*
Non-penetrative pass against balanced defence[a]	1		1	
Penetrative pass vs.	14.15 (5.91–33.85)	<0.001	18.93 (6.95–51.55)	<0.001*
Non-penetrative pass against imbalanced defence[a]	1		1	
Space utilization				
Space pass vs.	0.75 (0.17–3.35)	0.70	2.00 (0.37–10.64)	0.42
Foot pass against balanced defence[a]	1		1	
Space pass vs.	2.02 (0.43–9.45)	0.37	2.11 (0.38–11.78)	0.39
Foot pass against imbalanced defence[a]	1		1	

Note: The odds ratio reflects the chance of achieving score-box possession, compared with the reference category [a].
*Offensive tactics included in the model according to balanced and imbalanced defence subgroups.

evaluate the effectiveness of offensive playing tactics, and improve the validity of team match-performance analysis.

It should be noted that use of the variables ''defensive backup'' and ''defensive cover'', which have only fair inter-observer reproducibility (kappa correlation coefficients of 0.24 and 0.27, respectively), represents a limitation. However, the combined variable ''overall defensive score'', the variable used in the subsequent analysis, was still useful. In fact, these variables' relatively poor inter-observer reproducibility most probably stems from the observational limitations experienced when evaluating positions, distances, and angles between dynamically interacting players by using videotapes recorded from live TV broadcasts. In addition, all the team possessions included were taken from the Norwegian men's top professional soccer league, which clearly represents a lower standard of play than the top leagues in Europe. Consequently, the results obtained could be a reflection of the playing standard or style in this particular league. Even if the teams in the league varied in their playing styles and were included with a similar number of team possessions, care should be taken when extrapolating these results to other soccer leagues or playing standards.

The study also has strengths worthy of consideration. It included a large sample size and the team possessions were randomly extracted from matches played in the Norwegian professional league. Moreover, we used logistic regression analysis, the appropriate statistical method for comparisons of categorical differences associated with binary response variables (Nevill et al., 2002). The use of multidimensional qualitative evaluation allowed us in the current study to analyse different factors of match performance that usually are difficult to measure directly, as well as their interdependency.

The dependent variable, ''score-box possession'', was chosen as the outcome variable since it would simply not be feasible to use goal scoring as an

outcome variable because of the low probability of scoring in soccer (about 1% of team possessions). Shots originating from within the score box (i.e. estimated prime scoring area) are known to have higher quality in terms of accuracy on target and scoring potential than those from outside the score box (Bate, 1988; Dufour, 1993; Hughes, 1990; Pollard, 1986). For example, according to Dufour (1993), shots from 30 m or more (i.e. outside the score box) have a scoring rate of nearly 0%, while shots from within 16.5 m and 5.5 m (i.e. inside the score box) have a scoring rate of 10% and 15%, respectively. Thus, possession with a high degree of ball control inside the score box area has the potential for producing quality shots.

The differences in study design and variable types and their definitions make a direct comparison between studies that have assessed opponent interactions difficult. Despite this, previous studies generally support the current findings. Notably, similar results were reported in a separate analysis where we used goals scored during the same season as the main outcome variable. However, since goal scoring is an infrequent event, it was necessary to use a case-control design that compared all team possessions leading to a goal being scored with the random team possessions identified in the present study (Tenga et al., 2010). This study showed that counterattacks had a higher probability of scoring goals than elaborate attacks when playing against an imbalanced defence. However, there were too few goals scored against a balanced defence for a meaningful analysis to be done. The cohort design used in the current study is generally considered superior to a case-control design in terms of generalizability, but ''score-box possession'' is obviously a less relevant outcome variable in soccer than ''goals scored''. Nevertheless, the two studies produced similar results regardless of design and outcome variable used. Harris and Reilly (1988) showed that defence against attacks with a shot on target, compared with those without a shot, tended to involve higher attacker to defender ratios and greater average distances between the attacker in possession and the nearest defender throughout the attack. According to Grehaigne (1991), the overall attacking configuration with adequate space and time and the opponent's defence with its centre of gravity out of position had a positive effect on the scoring of 10 of 33 goals. Elsewhere, it was reported that the defending performances, directly measured through distances and angles between attackers and defenders and the number of players, were significantly related to delaying and diverting attacks, and covering attacking space (Suzuki & Nishijima, 2004). Seabra and Dantas (2006) reported a higher proportion of successful shooting attempts for ball receptions and shots originating from zones of low defensive confrontation than of high defensive confrontation. Moreover, although indirectly, Olsen and Larsen (1997) showed more scoring opportunities and goals from breakdown attacks (counterattacks) started when the opposition defence was imbalanced rather than balanced. Similarly, Jones et al. (2004), Bloomfield et al. (2005), Lago and Martin (2007), and Taylor et al. (2008) highlighted the influence of score-line status (winning, losing or drawing) and opposition quality on ball possession.

Whether ''possession play'' or ''direct play'' is more effective has long been disputed in the soccer community, including match-performance researchers (e.g. Bate, 1988; Hughes & Franks, 2005; Reep & Benjamin, 1968). For the purposes of this paper, the terms ''elaborate attack'' and ''counterattack'' are considered to be synonymous with ''possession play'' and ''direct play'', respectively. Our analysis shows no overall difference in effectiveness between counterattacks and elaborate attacks on the probability of producing a score-box possession. However, further univariate and multivariate analyses reveal that counterattacks were more effective than elaborate attacks when playing against an imbalanced defence. There was no difference between these two tactics when playing against a balanced defence. This should come as no surprise because the main objective of a counterattack is to exploit imbalances in the opponent's defence to achieve penetration. But, it might also be that teams choose to play directly precisely because they can take advantage of imbalances in the opponent's defence. That elaborate attacks were found to be less effective than counterattacks when playing against an imbalanced defence might also be due to differences in defensive balance that our variables failed to uncover.

Similarly, for the variable ''pass number'', the unadjusted overall analysis shows that long possessions were more effective than short possessions. However, further analyses show that while there was no difference between these two tactics when playing against an imbalanced defence, long possessions were more effective than short possessions when playing against a balanced defence. In contrast, multivariate analyses showed that long possessions were more effective than short possessions when playing against an imbalanced defence, but not against a balanced defence. These results suggest that exploiting imbalances in the opponent's defence is a more effective way to achieve score-box possession than creating space by dislocating defenders in a balanced defence.

The current finding that long possessions (five passes or more) are more effective than short possessions (two passes or less) in producing score-

box possessions is in contrast to that reported in some previous studies (e.g. Bate, 1988; Franks, 1988; Reep & Benjamin, 1968). Using data from the study of Reep and Benjamin (1968), Hughes and Franks (2005) demonstrated that more shots were indeed produced from shorter passing sequences, but also that there were many more of the shorter passing sequences than the longer ones. Thus, consistent with our results, longer passing sequences were considered to be more effective than shorter ones (Hughes & Churchill, 2004; Hughes & Franks, 2005; Hughes & Snook, 2006). However, the present study also reveals that long possessions were more effective than short possessions when playing against both a balanced defence and an imbalanced defence in univariate and multivariate analyses, respectively. It is also apparent that using short possessions and long possessions interchangeably with direct play and possession play, as did Hughes and Franks (2005), might be inappropriate. This is because simply counting the number of passes excludes other essential features in the analysis of these styles of attack (Franks, 1988; Olsen et al., 1994).

Furthermore, subgroup analyses showed no difference in effectiveness between long passes and short passes for ''pass length'', or between space passes and foot passes for ''space utilization''. However, these tactics were most effective in producing score-box possessions when used together, as indicated by the results of the category ''mixed'' for ''pass length'' and ''space utilization'' in Table II. Scoulding and colleagues (Scoulding, James, & Taylor, 2004) also failed to distinguish between space passes and foot passes performed by a successful and an unsuccessful team. However, multivariate analyses revealed that while there was still no difference between space passes and foot passes, long passes were more effective than short passes when playing against an imbalanced defence but not against a balanced defence. In contrast, for the variables ''starting zone'' and ''pass penetration'', subgroup analyses show that final third was more effective than first third and penetrative passes were more effective than non-penetrative passes when playing against both a balanced defence and an imbalanced defence. Bate (1988) and Hughes and Snook (2006) also reported the effectiveness of team possessions originating from the final third of the pitch. In addition, multivariate analyses show that while penetrative passes were still more effective than non-penetrative passes when playing against both a balanced defence and an imbalanced defence, final third was more effective than first third when playing against an imbalanced defence but not against a balanced defence.

It is important to realize that producing a score-box possession (a shooting opportunity) is the result of a combination of factors other than choice of playing tactics (Burwitz, 1997). Nevertheless, the tactical approach employed is an important factor. Future research should incorporate the time aspect in their analyses. This will enable researchers to evaluate the ability of offensive tactics to either create or increase penetrating potential presented at the beginning of a team possession (Harris & Reilly, 1988). Evaluation of the ability of defensive tactics to prevent or decrease penetrating potential should also be possible. Analysis of playing tactics in sequences rather than separately would also be fruitful. The analysis of sequences of actions appears to be more informative than that of isolated actions (Seabra & Dantas, 2006). As such, it makes sense to consider analysis of, for example, the offensive tactics long pass and space pass versus short pass and foot pass in sequence.

The current findings have some practical implications. The information obtained about the relative effectiveness of offensive playing tactics according to the degree of defensive balance can be used to improve a team's ability to produce and prevent a score box-possession (a shooting opportunity) effectively. This information can be used when coaches and players plan and practise how to take advantage of an opponent's choice of playing tactics in a competitive match.

Conclusions

This study shows that counterattacks were more likely to produce score-box possessions (shooting opportunities) than elaborate attacks when playing against an imbalanced defence but not against a balanced defence. Hence, the assessment of opponent interactions is crucial to evaluate differences in the probability of producing a score-box possession between different offensive playing tactics, and improves the validity of team match-performance analysis in soccer.

References

Altman, D. G. (1991). Some common problems in medical research. In D. G. Altman (Ed.), *Practical statistics for medical research* (pp. 403–409). London: Chapman & Hall.

Bate, R. (1988). Football chance: Tactics and strategy. In T. Reilly, A. Lees, K. Davids, & W. J. Murphy (Eds.), *Science and football* (pp. 293–301). London: E & FN Spon.

Bloomfield, J. R., Polman, R. C. J., & O'Donoghue, P. G. (2005). Effects of score-line on team strategies in FA premier league soccer. *Journal of Sports Sciences*, *23*, 192.

Burwitz, L. (1997). Developing and acquiring football skills. In T. Reilly, J. Bangsbo, & M. Hughes (Eds.), *Science and football III* (pp. 201–206). London: E & FN Spon.

Dufour, W. (1993). Computer-assisted scouting in soccer. In T. Reilly, J. Clarys, & A. Stibbe (Eds.), *Science and football II* (pp. 160–166). London: E & FN Spon.

Elias, N., & Dunning, E. (1966). Dynamics of group sports with special references to football. *British Journal of Sociology*, *17*, 388–402.

Ensum, J., Pollard, R., & Taylor, S. (2004). Applications of logistic regression to shots at goal in association football: Calculation of shot probabilities, quantification of factors and player/team. *Journal of Sports Sciences*, *22*, 504.

Franks, I. (1988). Analysis of association football. *Soccer Journal*, *33* (5), 35–43.

Grehaigne, J. F. (1991). A new method of goal analysis. *Science and Football*, *5*, 10–16.

Grehaigne, J. F., Bouthier, D., & David, B. (1997). Dynamic-system analysis of opponent relationships in collective actions in soccer. *Journal of Sports Sciences*, *15*, 137–149.

Grehaigne, J. F., Bouthier, D., & Godbout, P. (1999). The foundations of tactics and strategy in team sports. *Journal of Teaching in Physical Education*, *18*, 159–174.

Grehaigne, J. F., & Godbout, P. (1995). Tactical knowledge in team sports from a constructivist and cognitivist perspective. *Quest*, *47*, 490–505.

Grehaigne, J. F., Mahut, B., & Fernandez, A. (2001). Qualitative observation tools to analyse soccer. *International Journal of Performance Analysis in Sport*, *1* (1), 52–61.

Harris, S., & Reilly, T. (1988). Space, team work and attacking success in soccer. In T. Reilly, A. Lees, K. Davids, & W. J. Murphy (Eds.), *Science and football* (pp. 322–328). London: E & FN Spon.

Hughes, C. (1990). *The winning formula.* London: William Collins.

Hughes, M. D., & Bartlett, R. M. (2002). The use of performance indicators in performance analysis. *Journal of Sports Sciences*, *20*, 739–754.

Hughes, M., & Churchill, S. (2004). Attacking profiles of successful and unsuccessful teams in Copa America 2001. *Journal of Sports Sciences*, *22*, 505.

Hughes, M., & Franks, I. (2005). Analysis of passing sequences, shots and goals in soccer. *Journal of Sports Sciences*, *23*, 509–514.

Hughes, M., & Snook, N. (2006). Effectiveness of attacking play in the 2004 European Championships. In H. Dancs, M. Hughes, & P. G. O'Donoghue (Eds.), *Proceedings of the World Congress of Performance Analysis of Sport 7* (pp. 46–62). Cardiff: CPA UWIC Press.

Jones, P. D., James, N., & Mellalieu, S. D. (2004). Possession as a performance indicator in soccer. *International Journal of Performance Analysis in Sport*, *4* (1), 98–102.

Lago, C., & Martin, R. (2007). Determinants of possession of the ball in soccer. *Journal of Sports Sciences*, *25*, 969–974.

McGarry, T., & Franks, I. M. (2003). The science of match analysis. In T. Reilly & A. M. Williams (Eds.), *Science and soccer* (2nd edn., pp. 265–275). London: Routledge.

Nevill, A. M., Atkinson, G., Hughes, M. D., & Cooper, S.-M. (2002). Statistical methods for analysing discrete and categorical data recorded in performance analysis. *Journal of Sports Sciences*, *20*, 829–844.

Olsen, E., & Larsen, O. (1997). Use of match analysis by coaches. In T. Reilly, J. Bangsbo, & M. Hughes (Eds.), *Science and football III.* (pp. 209–220). London: E & FN Spon.

Olsen, E., Larsen, O., & Semb, N. J. (1994). *Effektiv fotball.* Norway: Gyldendal Norsk Forlag A/S.

Pollard, R. (1986). Soccer performance analysis and its application to shots at goal. *Research Bi-annual for Movement*, *4*, 19–27.

Pollard, R., & Reep, C. (1997). Measuring the effectiveness of playing strategies at soccer. *The Statistician*, *46*, 541–550.

Reep, C., & Benjamin, B. (1968). Skill and chance in association football. *Journal of the Royal Statistical Society A*, *131*, 581–585.

Scoulding, A., James, N., & Taylor, J. (2004). Passing in the soccer World Cup 2002. *International Journal of Performance Analysis in Sport*, *4* (2), 36–41.

Seabra, F., & Dantas, L. (2006). Space definition for match analysis in soccer. In H. Dancs, M. Hughes, & P. G. O'Donoghue (Eds.), *Proceedings of the World Congress of Performance Analysis of Sport 7* (pp. 30–45). Cardiff: CPA UWIC Press.

Suzuki, K., & Nishijima, T. (2004). Validity of a soccer defending skill scale (SDSS) using game performances. *International Journal of Sport and Health Science*, *2*, 34–49.

Taylor, J. B., Mellalieu, S. D., James, N., & Shearer, D. A. (2008). The influence of match location, quality of opposition, and match status on technical performance in professional association football. *Journal of Sports Sciences*, *26*, 885–895.

Tenga, A., Holme, I., Ronglan, L. T., & Bahr, R. (2010). Effect of playing tactics on goal scoring in Norwegian professional soccer. *Journal of Sports Sciences*, *28* (3), 237–244.

Tenga, A., Kanstad, D., Ronglan, L. T. & Bahr, R. (2009). Developing a new method for team match performance analysis in professional soccer and testing its reliability. *International Journal of Performance Analysis in Sport*, *9* (1), 8–25.