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Factors associated with home advantage in English and Scottish soccer matches

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Using the results from the end-of-season (1992–93) league tables, overall home advantage was confirmed in the eight major divisions of the English and Scottish football leagues. The degree of home advantage was found to vary significantly across the divisions. Furthermore, these divisional differences in home advantage were found to be significantly associated with the mean attendance of each division. In an attempt to understand these findings, every occurrence of two influential events (either a sending-off or penalty scored) reported in a national Sunday newspaper was recorded. The overall frequency of both sendings-off and penalties scored favoured the home side, but again this was not constant across the divisions. In divisions with large crowds, the percentage of home sendings-off was relatively small (30%), compared with no difference (50%) in divisions with smaller crowds. Similarly, the percentage of penalties scored by home sides in divisions with the largest crowds was large (> 70%), in contrast to little or no advantage in divisions with smaller crowds. Two possible explanations for these findings were proposed. Either larger crowds were able to provoke the away player into more reckless behaviour (real fouls), or influence the referee into believing that the away player had committed more fouls (perceived fouls).

Keywords: Crowd size, mean attendance, penalties scored, sendings-off.

Introduction

Courneya and Carron (1992) defined home advantage as 'the consistent finding that home teams in sports competitions win over 50% of the games played under a balanced home and away schedule'. The existence of home advantage has been well documented (Schwartz and Barsky, 1977; Varca, 1980; Snyder and Purdy, 1985; Pollard, 1986; Courneya and Carron, 1992). However, the extent of home advantage varies significantly across sports (reports range between 53 and 70% home wins for English county cricket and professional soccer, respectively), but within a sport there is considerable homogeneity (Rosenthal and Rubin, 1982). What is not so well documented is why it exists.

In order to begin to understand the underlying mechanisms, research needs to focus on factors associated with home advantage to identify 'when' and 'why' such an advantage exists (Courneya and Carron, 1992). In respect of 'when', one major line of research has focused on crowd size factors, with some studies showing that this is significantly related to home wins. For example, Schwartz and Barsky (1977) found that home winning percentages in Major League Baseball increased from 48% when crowd density was low to 57% when crowd density was high. However, studies of the effect of absolute crowd size (Dowie, 1982) and of crowd density (Pollard, 1986) on home wins in soccer have found no significant differences.

In respect of 'why', it has been suggested (Agnew and Carron, 1994) that it may be important to examine the behaviour of officials who have to make subjective decisions during a match (e.g. whether a particular foul was severe enough to warrant the sending-off of the offender). Previous research has shown that officials do make more subjective judgements in favour of home teams – or against visiting teams (e.g. Glamser, 1990; Greer, 1983; Varca, 1980).

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Within the context of English and Scottish soccer, the aims of the present study were to (1) confirm the existence of home advantage in the English and Scottish football leagues, (2) confirm that the size of the crowd was *not* associated with the degree of home advantage, and (3) identify quantifiable aspects of the impact of officials' behaviour (sendings-off and penalties scored) that might be associated with home advantage.

Method

The results and mean attendance of the English and Scottish football (soccer) leagues for the season 1992–93 were used as the basis for this study. The end-of-season frequency of home wins was used to investigate home advantage (excluding draws) in the major English (Premier, First, Second and Third Divisions, plus G.M. Vauxhall) and Scottish (Premier, First and Second Divisions) football leagues. Previous research has defined home advantage using two alternative approaches, either including or excluding drawn (tied) games. However, since the Football League's decision to award three points for a win, one for a draw and none for a loss, the calculation of home advantage using points including drawn games would become problematic; that is, consider the extreme example of a league in which every match was drawn except for two games that resulted in one home and one away win. Using points including draws, the league's home winning percentage would be only marginally greater than 33%, but theoretically the league's home winning percentage should be exactly 50%.

In order to measure aspects of officials' behaviour which might be associated with home advantage, two of the most influential decisions made by the referee were used, 'sendings-off' and 'awarding penalties'. Both are easily quantifiable, provided in the case of penalties the penalty is converted, and are likely to influence the match outcome. Hence using the comprehensive results section of one of the national Sunday newspapers, every incidence of a sending-off or a penalty scored by either the home or away side was recorded. A total of 280 sendings-off and 365 penalties scored were recorded in league games for the 1992–93 season.

A chi-squared goodness-of-fit test was used to confirm the existence of overall home advantage in the eight major divisions of the English and Scottish football leagues. The chi-squared test of independence was used to investigate whether the degree of home advantage (in wins, sendings-off and penalties scored) varied across each division, and the chi-squared test for trend (see Fleiss, 1981) was used to assess whether any differences in home advantage across divisions (in wins, sendings-off and penalties scored) were associated with crowd size using divisions ranked by their mean attendance.

Results

The existence of home advantage

Table 1 gives the frequency of home wins, draws and away wins for the major English and Scottish leagues at the end of the 1992–93 season. The overall home advantage (excluding draws) was confirmed at 60%, which was found to be significant ($\chi^2_8 = 61.4$, $P < 0.001$). Note that in order to carry out this chi-squared test of significance, the expected frequency of wins taken under the assumption of 'no home advantage' was (home wins + away wins)/2 for each division and the degrees of freedom were 8 rather than the usual 7 ($k - 1$), since the total observed and expected frequencies were not required to be the same.

Home advantage and its relationship to crowd size

A major contribution to the above result was the greatly increased percentage of home wins recorded in leagues

Table 1 Frequency of home wins, draws and away wins (% excluding draws) and mean attendance by the English and Scottish leagues/divisions for the 1992–93 season

League/division	Home wins (%)	Draws	Away wins (%)	Total played	Mean attendance (rank)
English Premier	214 (64)	130	118 (36)	462	21720 (1)
English First	263 (65)	147	142 (35)	552	10191 (2)
English Second	259 (64)	146	147 (36)	552	6512 (4)
English Third	209 (60)	111	142 (40)	462	3214 (5)
G.M. Vauxhall	183 (55)	132	147 (45)	462	1174 (7)
Scottish Premier	112 (59)	73	79 (41)	264	9542 (3)
Scottish First	115 (58)	67	82 (42)	264	2302 (6)
Scottish Second	105 (51)	68	100 (49)	273	523 (8)
Total	1460 (60)	874	957 (40)	3291	

where crowd sizes were relatively large. In contrast, in the two leagues (G.M. Vauxhall League and the Scottish Second Division) where crowd sizes were small, home advantage was greatly reduced if not absent ($\chi^2_2 = 2.01$, $P > 0.10$).

As suggested above, the percentage of home and away wins varied considerably across the different leagues. A chi-squared test of independence confirmed this imbalance ($\chi^2_7 = 19.02$, $P < 0.01$) (see Table 2). Indeed, based on the mean attendance rank for each division, the trend of home winning percentage was found to be significant, increasing from 51% in the Scottish Second Division (attendance rank 8) to 65% in the English First Division (attendance rank 2) ($\chi^2_1 = 15.15$, $P < 0.001$). By subtracting these two chi-squared values, the residual variation between leagues was found to be non-significant ($\chi^2_6 = 3.87$, $P > 0.10$). Hence, contrary to the expectation outlined in the Introduction, the observed variation between leagues in winning percentage can be attributed to the linear trend based on mean crowd attendance.

Quantifiable aspects of play associated with home advantage in soccer

In order to investigate certain influential factors (aspects of play) that may be associated with the observed imbalance of home advantage, every incidence of a sending-off or a penalty scored by either the home or away side was recorded for the 1992–93 season. These events (sendings-off or penalties scored) are categorized in Tables 3 and 5, respectively, by the various leagues and by either the home or away side.

The frequency of sendings-off and penalties scored favoured the home side. However, as with home advantage in games won, this home advantage in sendings-off and penalties scored was not constant throughout the eight divisions. The percentage of sendings-off for home sides in divisions with the largest crowd sizes was only approximately 30%, in contrast to approximately 50% in divisions with smaller crowd sizes. Similarly, the percentage of penalties scored by home sides in divisions with the largest crowd sizes was 70% or more, in contrast to approximately 50% in divisions with smaller crowd sizes. Once again, based on the mean attendance ranks, the chi-squared test for trend was significant for both the frequency of home sendings-off ($\chi^2_1 = 6.48$, $P = 0.011$) and the frequency of home penalties scored ($\chi^2_1 = 9.90$, $P < 0.01$) (see Tables 4 and 6, respectively), leaving the residual variations between divisions non-significant in both cases. Hence, as with home advantage with games won, the observed variation in the frequency of sendings-off and penalties scored between leagues can be associated with the linear trend based on mean crowd attendance.

The degree of association between these events (percentage of home sendings-off and home penalties scored) and the percentage of home advantage in games won, observed in the eight leagues described in Tables 1 and 2, was confirmed using correlation. The Spearman rank-order correlation between the percentage of home wins and the percentage of home sendings-off was found to be significant ($r = -0.850$, $P < 0.01$). Similarly, the correlation between the percentage of home wins and percentage of home penalties scored was also found to be significant ($r = 0.857$,

Table 2 Chi-squared test of independence and test for trend on the frequency of home and away wins (proportions) by the eight divisions (ranked by mean attendance)

Source of variation	χ^2	d.f.	P
χ^2 test for trend	15.15	1	< 0.001
Residual	3.87	6	> 0.10
χ^2 test of independence	19.02	7	< 0.01

Table 3 Frequency (%) of home and away sendings-off by the eight English and Scottish divisions for the 1992–93 season

League/division	Sendings-off			
	Home (%)	Away (%)	Total	Attendance rank
English Premier	6 (33)	12 (67)	18	1
English First	12 (29)	29 (71)	41	2
English Second	13 (33)	26 (67)	39	4
English Third	15 (37)	26 (63)	41	5
G.M. Vauxhall	18 (46)	21 (54)	39	7
Scottish Premier	10 (31)	22 (69)	32	3
Scottish First	13 (39)	20 (61)	33	6
Scottish Second	20 (54)	17 (46)	37	8
Totals	107 (38)	173(62)	280	

Table 4 Chi-squared test of independence and test for trend on the frequency of home and away sendings-off (proportions) by the eight divisions (ranked by mean attendance)

Source of variation	χ^2	d.f.	P
χ^2 test for trend	6.48	1	< 0.011
Residual	1.18	6	> 0.10
χ^2 test of independence	7.66	7	> 0.10

$P < 0.01$). The magnitude of these relationships support the importance of such refereeing decisions on the outcome of soccer matches and the association of such decisions on the degree of home advantage.

Discussion

The results of the present study confirm the existence of home advantage in English and Scottish League football (soccer). Additionally, the degree of home advantage would appear to vary across the different leagues and be related to crowd size, with those divisions where crowd sizes are particularly small showing a significantly reduced home advantage. These findings conflict with the results of the studies by Dowie (1982) and Pollard (986), who both reported only small variations in home advantage between the *four* English divisions (prior to the introduction of the Premier League). The fact that the present study includes the G.M. Vauxhall League and the three Scottish leagues where crowd sizes are considerably smaller, may help to explain these conflicting findings. In support of this, Pollard (1986) did acknowledge little evidence of home advantage with games of less importance (i.e. F.A. Sunday Cup games), when attendances would have been relatively small. Thus, in answer to Courneya and Carron's rhetorical question, ' "when" does home advantage occur in English and Scottish soccer?', we now have evidence to suggest that home advantage is more evident when crowd sizes are relatively large. This does not explain 'why' this observed association exists.

Acknowledging the limitation that the number of penalties scored will not be an exact reflection of the number of penalties awarded, the frequency of the important decisions made by the referee, that of sending a player off and awarding a penalty that was subsequently converted, favoured the home side. Since there is a strong relationship (high correlation) across the eight divisions of the English and Scottish leagues between the percentage of home wins and both the percentage of sendings-off and penalties scored, these important decisions were confirmed as having a strong relationship with the degree of home advantage.

Where crowds tend to be the smallest, the home side would appear to obtain no advantage in the number of players sent off. In all other divisions, there is a definite advantage for the home side that is greater in the higher divisions where crowds tend to be larger. Similarly, the (home) advantage observed in the number of penalties scored also favours the home side, but this advantage was least favourable for teams performing in front of smaller crowds. However, these associations with crowd size are not always linear nor monotonic since, for example, the home side advantage in penalties scored is quite favourable in the G.M. Vauxhall League, which has a relatively low average attendance.

One possible explanation for the imbalance in the number of sendings-off and penalties scored may be that the larger home crowds are able to heighten the away players' psychological state (e.g. arousal and/or anxiety), which may lead to an increase in their reckless behaviour on the pitch. Although not unanimous (see

Table 5 Frequency (%) of home and away penalties scored by the eight English and Scottish divisions for the 1992–93 season

League/division	Penalties			
	Home (%)	Away (%)	Total	Attendance rank
English Premier	34 (71)	14 (29)	48	1
English First	43 (81)	10 (19)	53	2
English Second	40 (71)	16 (29)	56	4
English Third	32 (60)	21 (40)	53	5
G.M. Vauxhall	28 (60)	19 (40)	47	7
Scottish Premier	17 (57)	13 (43)	30	3
Scottish First	14 (47)	16 (53)	30	6
Scottish Second	25 (52)	23 (48)	48	8
Total	233 (64)	132 (36)	365	

Table 6 Chi-squared test of independence and test for trend on the frequency of home and away penalties scored (proportions) by the eight divisions (ranked by mean attendance)

Source of variation	χ^2	d.f.	*P*
χ^2 test for trend	9.90	1	< 0.01
Residual	7.40	6	> 0.10
χ^2 test of independence	17.30	7	0.016

Courneya and Carron, 1992), a number of authors have recognized that differences in aggressive behaviour may well influence the degree of home advantage (e.g. Varca, 1980). Thirer and Rampey (1979) observed that during normal crowd behaviour, visiting teams were penalized for committing more 'infractions' (fouls and turnovers) than the home side, supporting the findings of Varca (1980). However, during antisocial crowd behaviour (i.e. chanting obscenities, throwing objects and fighting), home teams were penalized for committing more infractions. This observation may help to explain the unexpected large number of sendings-off for home sides with small crowd support. As such, the crowd supporting the home team, although relatively small, may become over-enthusiastic, and hence become antisocial in their behaviour in order to make their voices heard. This may cause the home side to commit more reckless fouls, which are subsequently penalized with more home players being sent off.

An alternative explanation for the imbalance of the away side being penalized more frequently than the home side as the crowd sizes increase, might be due to the referee's perception of the away side committing more fouls than the home side (i.e. officiating bias caused by the crowd influencing the referee's judgement, and hence his decisions). Thus, for example, in studying college basketball, Jurkovac (1985) found that players acknowledged that they 'tried to get away with more' at home because they felt that officials were intimidated by the crowd to award more calls to the home team. Lehman and Reifman (1987), observing the number of fouls called against both star and non-star players in basketball during home and away games, found that the star players were penalized for significantly fewer fouls at games played at home compared with games played away from home. In contrast, no significant differences were observed for the non-star players. Lehman and Reifman concluded that the crowd had influenced the officials to be more lenient towards the home team.

Finally, we can only speculate as to the cause of the unexpected anomaly, that of a reduced home advantage in the English Premier League compared with the English First Division where crowd sizes were considerably less. This may have been due to those players and referees in the English Premier League, known to be the best players and, in particular, the most experienced referees in the country, being less influenced by the larger crowds attending Premier League games.

In summary, the results show that there is an overall home advantage in games won, sendings-off and penalties scored. What was not anticipated was how home advantage and the proportion of the crucial events – sendings-off and penalties scores – varied depending on crowd size. Where crowd sizes were smaller, the home advantage in penalties scored was negligible and, in the case of sendings-off, was actually reversed in favour of the away side where crowd size was smallest. Where crowd sizes were larger, the away sides appear to be penalized consistently more often than the home side. Since this imbalance was found to be significant for both the frequency of sendings-off and penalties scored, these results are unlikely to have occurred by chance and provide a possible answer to Courneya and Carron's rhetorical question, '"Why" does home advantage occur in English and Scottish soccer?' As such, two possible explanations could be proposed: (1) larger crowds are able to provoke away players into more reckless behaviour (real fouls), or (2) larger crowds are able to influence the referee into believing that away players have committed more fouls (perceived fouls). Since these findings are only based on the associations between mean attendance and the frequency of home wins, sendings-off and penalties scored, the proposed explanations are speculative and leave considerable scope for further research.

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