

**TITLE**

Comparative analysis of the top six and bottom six teams' corner kick strategies in the 2015/2016 English Premier League

**AUTHOR**

Strafford, B. W.; Smith, Adam; North, Jamie S.; et al.

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1 **Comparative analysis of the top six and bottom six teams' corner kick**  
2 **strategies in the 2015/2016 English Premier League**

3 *Ben William Strafford<sup>1</sup>, Adam Smith<sup>3</sup>, Jamie Stephen North<sup>4</sup> and Joseph*  
4 *Antony Stone<sup>1,2</sup>*

5  
6 <sup>1</sup>Centre for Sport Engineering Research, Sheffield Hallam University

7 <sup>2</sup>Academy of Sport and Physical Activity, Sheffield Hallam University

8 <sup>3</sup>Wigan Athletic Football Club

9 <sup>4</sup>Expert Performance and Skill Acquisition Research Group, Faculty of Sport, Health,  
10 and Applied Science, St Mary's University, Twickenham

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19 The datasets generated during and/or analysed during the current study are not  
20 publicly available but are available from the corresponding author on reasonable  
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22 Correspondence concerning this article should be addressed to Ben Strafford, Centre for  
23 Sport Engineering Research, Sheffield Hallam University, Broomgrove Teaching  
24 Block, 11 Broomgrove Road, Sheffield, S10 2LX.; E-mail: [b.strafford@shu.ac.uk](mailto:b.strafford@shu.ac.uk)

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28 **Comparative analysis of the top six and bottom six teams' corner kick**  
29 **strategies in the 2015/2016 English Premier League**

30

31 This study compared the corner kick strategies employed by the top six and  
32 bottom six teams across 120 matches of the 2015/2016 English Premier League  
33 Season. **In total, 2,303 corner kicks were examined by univariate analyses**  
34 **(individual  $\chi^2$ ) and bivariate analyses with contingency tables ( $\chi^2$  and association**  
35 **measures).** Top six teams favoured an outswinging delivery, whilst the bottom  
36 six teams favoured inswinging deliveries ( $p < 0.001$ ). Top six teams operated a  
37 dynamic attacking organisation during ball deliveries, ( $p < 0.001$ ), whereas the  
38 bottom six operated static and dynamic attacking strategies in equal measure. Top  
39 six teams took corner kicks frequently when winning or drawing, whereas bottom  
40 six teams took most corner kicks when losing or drawing (match status,  $p <$   
41  $0.001$ ). Bivariate analyses identified that goals were scored from corner kicks  
42 when attacking organisation was dynamic, two defenders were on the posts and  
43 the score line was level ( $p < 0.05$ ). Results supplement the design of practice  
44 tasks that afford successful corner kicks in training and game play scenarios.

45 Key Words: Soccer, Observational methodology, Performance analysis, Set  
46 pieces.

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## 55 **Introduction**

56 Performance analysis research in soccer has undergone rapid expansion over recent  
57 years, with studies investigating performance indicators related to possession, tactical  
58 behaviour, positional demands and the match location (Lago & Martin, 2007; Lago-  
59 Peñas, Lago-Ballesteros, Dellal, & Gómez, 2010; Yue, Broich, & Mester, 2014).  
60 During soccer matches, when the ball runs out of the playing area or play is stopped due  
61 to fouls, the game is restarted through set plays (e.g., penalty kicks, free kicks, corner  
62 kicks, and throw-ins). Set plays account for 30% to 40% of goals scored in elite soccer,  
63 highlighting these game events as critical components of successful offensive  
64 performance (Armatas, Yiannakos, & Sileloglou, 2007; Yinnakos & Armatas, 2006).

65         Despite being relatively low in frequency (an average of 10 corner kicks are  
66 taken per match, Pulling, 2015), corner kicks can be a determining factor in match  
67 outcome between teams of similar levels (Castelo, 2009). Casal et al. (2015) examined  
68 corner kicks across the FIFA 2010 World Cup, UEFA Champions League 2010-2011  
69 and UEFA Euro 2012, with results showing 26% of corner kicks resulted in an attempt  
70 at goal, 9.8% of which were directed on target, and 2.2% culminating in a goal being  
71 scored. Despite this relatively low frequency with which corner kicks resulted in goals  
72 being scored, in 76% of those matches where a goal was scored from a corner, it  
73 resulted in that team drawing or winning the match. Beyond simply collecting  
74 notational data on the characteristics of corner kicks, researchers have investigated the  
75 outcome of corner kicks relative to attempts at goal and goals scored (Pulling, Robins &  
76 Rixon, 2013) with regards to delivery type (Casal, Maneiro, Ardá, Losada, & Rial,  
77 2015), delivery area (Pulling, 2015), and match status (De Baranda & Lopez-Riquelme,  
78 2012).

79 Exploring the effect of delivery zone on corner kick outcome, Taylor, James and  
80 Mellalieu (2005) demonstrated that 41% of first attacking contacts and attempts at goal  
81 occurred 6-12 yards from the goal line, in line with the width of the goal area (20  
82 yards). These findings are supported by Schmicker (2013), who divided the penalty area  
83 into 66 distinct 3-yard by 4-yard boxes and found that corner kick deliveries played into  
84 the area 6 to 9 yards from the goal line and positioned centrally in front of the goal had  
85 a higher goal scoring rate compared to the other zones. In addition to demonstrating the  
86 importance of the zone of delivery, the organisation of attackers has also been identified  
87 as an important factor of corner success, with Casal et al. (2015) reporting corners are  
88 more successful when the attack organisation is dynamic (i.e., players moving) rather  
89 than static.

90 Researchers investigating the effectiveness of corner kicks have typically  
91 focused on examining matches at International level or European club level (e.g.,  
92 Champions League) (for exceptions see Pulling, 2015; Pulling & Newton, 2017).  
93 Furthermore, disparity also exists between teams in the same league, for example during  
94 the 2016/17 season West Bromwich Albion scored 16 out of their 43 goals from set-  
95 pieces (> 35.0% of their goals), whilst others obtained less than 7.0% of their goals  
96 from set-pieces (e.g., Sunderland scored 2 out of their 29 goals from set-pieces).  
97 However, this game selection criterion fails to consider if corner kick strategies are  
98 affected by changes in playing level across the top and bottom teams. Therefore,  
99 identifying the corner kick strategies used by more successful and less successful teams  
100 would have practical importance for football coaches across all levels of the game.  
101 Moreover, researchers investigating corner kicks to date have typically analysed data  
102 from a small sample of games ( $\mu = 65$ ) (Casal et al., 2015; De Baranda & Lopez-  
103 Riquelme, 2012; Pulling & Newton, 2017; Pulling, 2015; Pulling, Robins, & Rixon,

104 2013) and other than Pulling (2015) and Pulling and Newton (2017), previous  
105 researchers examining corner kicks have used games from 2012 or earlier and, with the  
106 ever-changing tactical strategies of soccer, analyses of more recent soccer seasons are  
107 required.

108 Power et al. (2018) have previously compared set pieces as a function of top and  
109 bottom 6 teams to investigate the notion of “set piece specialists”. On this basis, and  
110 with studies investigating expertise commonly employing within task criterion to  
111 differentiate upper and lower quartiles for the purpose of subsequent analyses, this  
112 analysis examined if corner kick strategies would differentiate ‘more successful’ versus  
113 ‘less successful’ teams. Given that an average set-piece taker will win a team 0.9 points  
114 while an elite set-piece taker will win 1.9 points (worth ~8% of a team's points for a  
115 bottom 6 team vs ~3.5% for a top 6 team) (Power et al., 2018), identifying the corner  
116 kick strategies used by more successful and less successful teams would have practical  
117 importance for football coaches. It is anticipated that this season long comparative  
118 analysis, exploring the corner kick strategies associated with the top six and bottom six  
119 teams in the 2015/2016 English Premier League (EPL) may identify those variables that  
120 are considered the most important for creating goal scoring opportunities from corner  
121 kicks. Therefore, the aims of this research were to first, describe how corner kicks were  
122 taken by the top six and bottom six teams placed in the 2015/2016 EPL table, and  
123 second, determine the effectiveness of these different types of corner kick and identify  
124 key variables associated with attempts on target and goal scoring.



150 both empirical research (e.g., Casal et al., 2015; Lames & McGarry, 2007; Pulling,  
151 2015; Pulling et al., 2013) and the expert declarative knowledge of the head  
152 performance analyst at an English Football League Championship club. Definitions of  
153 observation metrics are displayed in Table 2. Respecting the future directions identified  
154 in previous corner kick research (e.g., Pulling et al., 2013; Pulling, 2015), the goal area  
155 was divided into three different sections (goal area 1 = GA1, goal area 2 = GA2 and  
156 goal area 3 = GA3). The central space of the critical area (the width of the goal posts)  
157 was further divided into six separate areas (critical area 1 = CA1, critical area 2 = CA2,  
158 critical area 3 = CA3, critical area 4 = CA4, critical area 5 = CA5, and critical area 6 =  
159 CA6) (see Figure 1 for an illustration of these zones and areas of interest). For each  
160 corner, the area where a player first made contact with the ball, along with the corner  
161 outcome was then recorded along with the type of ball delivery as either: inswinging,  
162 outswinging, clipped or driven delivery. The lead observer worked for a professional  
163 football club as a performance analyst, having seven years' experience coding soccer  
164 matches during applied field research. The second observer had five years' experience  
165 coding soccer matches during applied field research. The video footage was scrutinised  
166 thoroughly using individual freeze frame functions to combat missed events as this  
167 allowed the cross-comparison of all the tactical actions against the operational  
168 definitions adapted from previous research (James, Taylor, & Stanley, 2007).

169 \*\*Figure 1 near here\*\*

170 \*\*Table 2 near here\*\*  
171

### 172 ***Reliability Testing***

173 Prior to the analyses, the two analysts participated in four training sessions on  
174 how to conduct the analysis. Information was also provided on the operational  
175 definitions of the corner kick outcomes, as well as on the areas of the goal area and



176 critical area (Pulling, 2015). Intra-observer analysis was verified through the  
177 reassessment of the same 151 tactical actions on two separate occasions, six-weeks  
178 apart by the primary researcher (Altman, 1990). A second analyst separately assessed  
179 the same 151 tactical actions for comparison to the primary researcher's first  
180 observation for inter-observer reliability. Intra- and inter-observer reliability of the  
181 notional analysis data was quantified through the calculation of Cohen's Kappa (Cohen,  
182 1960). **Intra- and inter-observer reliability of each key performance indicator are**  
183 **presented in Table 3**, with a mean kappa statistic of  $k = 0.92$  and  $k = 0.90$ ,  
184 corresponding to 'excellent' intra- and inter-observer agreement respectively (Fleiss,  
185 Levin, & Paik, 2003).

186

187

\*\*Table 3 near here\*\*

### 188 ***Data Analysis***

189 Descriptive analyses were employed in Microsoft Excel to calculate relative  
190 frequencies for each variable. The data were analysed further in SPSS (Version 24.00  
191 SPSS Inc., USA). A series of univariate descriptive analyses using individual chi-  
192 squares were employed to describe the tactical behaviours used by the top and bottom  
193 six teams during corner kick execution (frequency of kicks and tactics used) (Pulling,  
194 2015). Further, bivariate analyses with contingency tables ( $\chi^2$  and association measures)  
195 were employed to analyse the level of collective success of corner kicks taken by the  
196 twelve teams included in the analysis. For univariate analyses, relative frequencies  
197 were first calculated relative to the total number of corner kicks sampled, attempts on  
198 target, and goal. For bivariate analyses, relative frequencies for attempts on target, and  
199 goals were calculated using outcomes directly related to offensive play as the analyses  
200 focused on strategies that created an attempt on target, or a goal rather than the

201 defensive variables that prevent attempts at goal from occurring (Pulling et al., 2013;  
202 Serrano, Shahidian, Sampaio, & Leite, 2013). For bivariate analysis, effect sizes are  
203 presented as a measure for collective success using the contingency coefficient.

## 204 **Results**

### 205 *Descriptive Analysis*

206 A mean 10.6 ( $\pm 3.6$ ) corner kicks were taken per match (4-7 per team), 9.9% of  
207 offensive actions resulted in an attempt, 6.9% resulted in an attempt on target, and just  
208 3.1% resulted in a goal being scored. These goals contributed to a draw or a victory in  
209 69.0% of cases (in 48 out of 70 corners where a goal was scored it was delivered  
210 directly into the playing area towards an attacking player). The top six teams had a 2.9%  
211 success rate of scoring a goal from a corner in comparison to 3.3% for the bottom six  
212 teams ( $t(10) = 0.70, p > 0.05$ ). The top six teams scored  $9.3\% \pm 3.8\%$  of their total  
213 goals from corners, whereas goals from corners accounted for  $14.1\% \pm 4.0\%$  of the  
214 total goals scored by bottom six teams ( $t(10) = 2.13, p = 0.059$ ).

215 Table 4 displays the relative frequencies for each of the variables related to the  
216 execution of corner kicks analysed for the top six and bottom six teams. Based on these  
217 findings, the corner kick strategies used by the top and bottom six teams have the  
218 following characteristics. Top six teams were more varied in the foot used to deliver the  
219 ball (laterality of corner,  $\chi^2 = 77.85; p < 0.001$ ), selecting both the left side-right foot  
220 and left side-left foot combination the most, whereas bottom six teams used the right  
221 foot to deliver the ball regardless of corner position. Top six teams used more  
222 outswinging deliveries whereas the bottom six teams used more inswinging deliveries,  
223 but both frequently delivered the ball into the 18-yard box directly through the air  
224 (delivery type  $\chi^2 = 145.37; p < 0.001$ ). Top and bottom six teams both delivered more

225 corners to the GA1 and CA2 (delivery zone,  $\chi^2 = 48.00$ ;  $p < 0.001$ ) compared to other  
226 areas.

227 Top six teams operated frequently with a dynamic attacking organisation during  
228 ball deliveries, ( $\chi^2 = 73.58$ ;  $p < 0.001$ ), whereas the bottom six teams operated both  
229 static and dynamic attacking strategies in equal measure. Top six teams and bottom six  
230 teams commonly employed one intervening attacker (intervening attackers,  $\chi^2 = 18.39$ ;  
231  $p < 0.001$ ) relative to six or more defenders during ball deliveries (number of defenders,  
232  $\chi^2 = 11.20$ ;  $p = 0.01$ ). Top six teams and bottom six teams used mostly combined  
233 marking, although the top six teams also used man-to-man marking more frequently  
234 (type of marking,  $\chi^2 = 68.98$ ;  $p < 0.001$ ). Top six teams took corner kicks frequently  
235 when winning or drawing, whereas bottom six teams took most corner kicks when  
236 losing or drawing (match status,  $\chi^2 = 188.52$ ;  $p < 0.001$ ), however both had higher  
237 frequencies of corner kicks when drawing. There were no notable trends for time  
238 elapsed in the match ( $\chi^2 = 14.74$ ;  $p = 0.01$ ).

239

240 \*\*Table 4 near here\*\*

#### 241 ***Bivariate Analysis***

242 Bivariate analyses with contingency tables were employed to analyse the  
243 influence of variables on corner kick success, classified as ATTEMPT ON TARGET  
244 (EXCLUDING GOALS), or GOAL. The application of  $\chi^2$  and calculation of  
245 contingency coefficient revealed several variables associated with successful corner  
246 kicks.

247 Table 5 displays the results for ATTEMPTS ON TARGET (EXCLUDING  
248 GOALS). The following variables were associated with attempts on target (excluding  
249 goals): Position of corner ( $\chi^2 = 4.25$ ;  $p = 0.04$ ), delivery zone ( $\chi^2 = 48.18$ ;  $p < 0.001$ ),



275 0.51 and  $C = 0.28$ ). Corner kicks resulting in a goal occurred more frequently when the  
276 attacking organisation was dynamic (21.3%), operating a numerical inferiority (46.7%),  
277 whilst negating two defenders situated on the post (50.0%). Data also suggests that  
278 goals scored from corner kicks are more common when teams are drawing (33.3%).

279

280 \*\*Table 7 near here\*\*

281

282 Team position did not affect the strategy through which goals were scored from corner  
283 kicks, however, dynamics attack organisation (72.9%) with zero defenders on the posts  
284 (61.8%) were the most common when goals were scored (see Table 8).

285

286 \*\*Table 8 near here\*\*

## 287 **Discussion**

288 Our aim in this study was to compare attacking corner kick strategies employed  
289 by the top and bottom six teams of the 2015/2016 English Premier League season to  
290 determine the effectiveness of these corner kicks and identify variables associated with  
291 attempts on target and goals scored. Collectively, an average of 10.6 corner kicks were  
292 taken per match (4-7 per team), which is in line with previous reports that highlight  
293 corner kicks as being relatively infrequent in elite soccer (Casal et al., 2015; De  
294 Baranda & Lopez-Riquelme, 2012; Taylor et al., 2005). The outcome of the corners  
295 resulted in an attempt at goal 9.9% of the time, in which 6.7% were on target and 3.1%  
296 resulted in a goal. The importance of corners was further evidenced with goals scored  
297 from corner kicks contributing to team success, with the scoring team claiming a draw  
298 or victory in 67.0% of cases, supporting previous findings that although corners are  
299 relatively infrequent, they often have a decisive impact on the outcome of matches (e.g.,

300 Casal et al., 2015, Casal, Andujar, Losada, Ardá, & Maneiro, 2016; Pulling, 2015).  
301 Results demonstrate that corner kicks may be more important for lower level teams to  
302 create goals as 14.1% of their overall goals scored came from corner kicks, in  
303 comparison to 9.3% for the top level teams, although this difference was not statistically  
304 significant ( $p = .059$ ).

305         Despite the success rates between the top and bottom six teams not being  
306 statistically different, significant differences were observed in their delivery behaviours.  
307 The top six teams were more varied in the player's foot used to deliver the ball (i.e.,  
308 laterality of corner), whilst top teams also produced significantly more outswinging than  
309 inswinging deliveries in comparison to the bottom teams regardless of corner position  
310 (see Table 4). These findings supplement previous research, which has established that  
311 higher placed teams take corners frequently with the same foot as the side of the pitch  
312 (Casal et al., 2015; Taylor et al., 2005).

313         Similar to Pulling (2015), all teams delivered a higher frequency of corners into  
314 the zones directly in line with the front of the goal or goal post (GA1, GA2 and CA2),  
315 suggesting these are the most targeted areas for corner delivery. When examining the  
316 most effective zone to create overall attempts on target, zones GA1 (43.8%), CA1  
317 (47.1%), CA2 (56.0%) and inside middle (43.5%) were the most effective areas (see  
318 Figure 1 and Table 5), supporting previously published findings (e.g., Schmicker, 2013;  
319 Taylor et al., 2005). However, when considering delivery zones and attempts on target  
320 as a function of team level, significant differences emerged between the top and bottom  
321 six teams. For the bottom six teams 57.1% of their attempts on target (in comparison to  
322 33.3% for the top six teams) came from corners delivered in to zones CA1 (bottom six  
323 21.4% vs top six 13.7%), CA2 (bottom six 21.4% vs top six 15.7%), and CA3 (bottom  
324 six 14.3% vs top six 3.9%) in comparison to other zones. When combining deliveries in

325 to these zones with delivery style (i.e. bottom 6 teams favoured inswinging deliveries  
326 with the ball curling towards the goal), it is proposed the bottom teams were looking to  
327 swing the ball inwards towards the central goal area. In contrast, the top six teams  
328 demonstrated more variation in the zone of delivery with a reduced proportion of  
329 attempts at goal resulting from corners delivered in to these zones favoured by bottom  
330 six teams. Instead, a significantly greater proportion of attempts at goal for top six  
331 teams relative to bottom six teams came from corners delivered in to zones CA5 (top six  
332 13.7% vs bottom six 7.1%) and the front zone (top six 17.6% vs bottom six 0.0%). With  
333 top six teams also using significantly more outswinging deliveries (i.e. the ball curling  
334 away from the goal) than bottom 6 teams, this will have resulted in the ball swinging  
335 away from the goalkeeper, or towards outer sections of the box (CA5) to develop more  
336 complex passages of play to create goal scoring chances. Although delivery zone was  
337 important for creating an attempt at goal, this did not stand true for goal scoring. Hence,  
338 delivery zone is shown to be important for creating goal-scoring opportunities, but it  
339 may then be down to the skill of the attacking players to convert that chance into a goal,  
340 although future research would be required to confirm this suggestion.

341 Collectively, the use of dynamic attacking organisation resulted in significantly  
342 more attempts on target compared to a static organisation. However, the top six teams  
343 employed a dynamic attacking organisation (all players moving) significantly more  
344 frequently during delivery than the bottom six teams. This significant difference in  
345 attacking organisation between top and bottom six teams may also be linked to the  
346 delivery zone strategies employed. With there being significantly more attempts on  
347 target from the front zone by the top six teams in comparison to the bottom six, this  
348 front zone strategy could be linked with the dynamic attacking organisation. The top six  
349 teams may employ dynamic attacking organisation to attack the front zones to either

350 head the ball directly at goal or create space in deeper areas to ‘flick’ the ball in to for  
351 other attackers to run on to. In contrast, the bottom six teams may be looking for  
352 consistent inswinging deliveries to the central areas of the penalty area, and hence  
353 position themselves in more static positions where the corner kick taker can target  
354 delivery towards specific players or zones. Importantly, when examining the goals  
355 scored from total attempts (see Table 7), a dynamic attacking organisation resulted in  
356 significantly more goals being scored in comparison to static organisation. However,  
357 there were no significant differences between the top and bottom 6 teams, with both  
358 scoring more goals through dynamic attacking organisation. Hence, it is suggested that  
359 teams adopt a dynamic attacking organisation strategy regardless of other tactics being  
360 employed.

361         From an applied perspective, the dynamic attacking organisation may force the  
362 defensive unit/system to become disturbed and disorganised, which increases  
363 uncertainty in the defending players and allows attacking players to exploit free space  
364 (Silva et al., 2014). For example, during near post runs (GA1 and CA1) where attacking  
365 players are able to arrive on the ‘blind side’ of the zonal marker (usually situated in  
366 GA1) and challenge for the ball. These findings demonstrate how movements in space  
367 by one element (dynamic attacking organisation) of a coordinative system (i.e.,  
368 attackers and defenders), increase the chances of goal scoring (Vilar, Araújo, Davids, &  
369 Button, 2012). Applying theoretical principles of system organisation and pattern  
370 formation to learning design in soccer, this characteristic may be seen as a process of  
371 soft assembly in which emergent decisions and movements in one versus one situations  
372 (player movements within the box) are tailored to the immediate performance context to  
373 satisfy some general goal (produce a goal from the corner kick) (Ric et al., 2016).



374 In soccer, there is a common perception that defending teams should position a  
375 player on each of the goalposts during the corner kick. The data analysed and reported  
376 here reveals that this strategy was not typically employed with 46.8% of corners having  
377 zero defenders on the posts, 40.1% having one defender, and only 13.0% employing  
378 two defenders on the posts. Despite being used less frequently, when two defenders  
379 were employed on the posts this resulted in an attempt on target 85% of the time, which  
380 subsequently led to a goal being scored 50% of the time. However, there were no  
381 significant differences between the top and bottom six teams. Hence, our data supports  
382 the suggestion by Power, Hobbs, Ruiz, Wei, and Lucy (2018) that teams are actually  
383 more likely to concede goals when they have two players on the posts compared to  
384 when they do not.

385 It is important to acknowledge how match status influenced the corner kick  
386 strategy used by teams, with the bottom six teams having an increased proportion of  
387 their corners when losing the match (41.4% vs 19.2% respectively) and during the final  
388 15 minutes (21.4% vs 16.0% respectively). Hence, corners seem a common method for  
389 lower level teams to attempt to score in the final stages of the game while trying to  
390 overturn a losing position. However, overall, teams were significantly more likely to  
391 score from a corner while drawing (33.3%) or winning (20.7%) in comparison to being  
392 in a losing position (7.2%) (see Table 7).

393 Concerning the limitations of the current study, it is important to acknowledge  
394 that it represents an initial investigation to compare corner kick strategies as a function  
395 of team league placing and so findings should be treated with some caution. It is  
396 advisable that researchers seek to further this investigation by conducting similar  
397 comparisons across the different English leagues and also across different countries  
398 (e.g., La Liga, Ligue 1, Serie A, Bundesliga) as this would provide a broader

399 perspective of corner strategies. It would also potentially provide interesting insights in  
400 to how corner kick strategies are affected by not only level of success, but also how  
401 constraints such as level of competition and country of competition shape the strategies  
402 that are employed. Furthermore, these analyses focused solely on offensive corner kick  
403 strategies and future research should address the defensive corner kick strategies used  
404 by teams of similar and different levels to supplement the design of practice tasks and  
405 ensure they are representative of constraints specific to the defensive aspects of corner  
406 kick skill.

407         Aligned with the principles of representative learning design (see Pinder,  
408 Davids, Renshaw, & Araújo, 2011), soccer coaches should use the results of these  
409 analyses to inform practice tasks that promote a varied corner kick delivery, dynamic  
410 attacking organisation and adaptive variability, and advance decision-making  
411 capabilities in attacking players (Araújo, Davids, & Hristovski, 2006; Silva et al., 2016).  
412 Implementing these conditioned practice tasks would uphold a representative learning  
413 design in the practice environment and afford performers with opportunities to detect  
414 the affordances (opportunities for action) innate to the corner kick skill identified in  
415 these analyses (Pinder et al., 2011).

## 416 **Conclusions**

417         The conclusions from this study are 1) in the EPL corner kicks are uncommon  
418 and largely ineffective, but are influential in the final result of the match; 2) top teams  
419 are more dynamic and adaptive in execution and delivery of corner kicks than lower  
420 ranked teams; 3) more elaborate corner kicks, delivered directly, with a dynamic  
421 attacking organisation are more effective for goal scoring. However, future research is  
422 required to provide impetus on how balanced and unbalanced matches impact the

423 strategies exhibited by teams in professional football.

424

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521 Table 1. Top six and bottom six teams from the 2015/2016 EPL season (Retrieved from:  
522 <https://www.premierleague.com/tables>).  
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<b>Position Finished</b>	<b>Team</b>	<b>Total Points</b>	<b>Total Corners</b>	<b>Corners Meeting Inclusion Criteria</b>
1	Leicester City	81	197	165
2	Arsenal	71	224	218
3	Tottenham Hotspur	70	254	232
4	Manchester City	66	257	245
5	Manchester United	66	228	183
6	Southampton	63	220	213
15	Crystal Palace	42	216	208
16	Bournemouth	42	221	193
17	Sunderland	39	150	147
18	Newcastle United	37	159	154
19	Norwich	34	189	182
20	Aston Villa	17	167	162

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528 Table 2. Key performance indicators and operational definitions for the corner kick  
 529 outcomes. Adapted from Pulling Robins, and Rixon (2013), Casal et al. (2015) and  
 530 Pulling (2015).

Variable	Definition
Time	<b>Time on game video:</b> 0-15 minutes, 16-30 minutes, 31-45+ minutes, 46-60 minutes, 61-75 minutes, 76-90+ minutes.
Position of corner	Right or Left.
Laterality of corner	<b>Natural:</b> Right-foot kick from right wing or left-foot kick from the left wing. <b>Switched:</b> Right-foot kick from the left wing or left foot-kick from the right wing.
Delivery type	<b>Direct:</b> The ball is sent to the shot zone with just one touch. <b>Inswing:</b> Ball is spinning/curling towards the goal. <b>Outswing:</b> Ball is spinning/curling away from the goal. <b>Driven:</b> Ball is kicked at high speed, with no spin, with a flat trajectory. <b>Clipped:</b> Ball is kicked at low speed, with no spin, with a looping trajectory. <b>Indirect:</b> The ball is sent to the shot zone after several touches (If delivery into the box is made within a maximum of four passes, if corner exceeds this then it will be excluded as it becomes a possession in open play).
Delivery Zone	Delivery zone was defined as the location where a player first made contact with the ball, after the corner kick was taken. The location of each delivery zone is displayed in Figure 1.
Number of attackers	Players on the team being observed are attacking and in a position to receive the ball (2-3), (4-5) (6 or more).

Attacking organisation	<p><b>Static:</b> The players on the team being observed stay in their set positions during the corner kick.</p> <p><b>Dynamic:</b> The players on the team being observed vary from their set positions during the corner kick .</p>
Number of defenders	Four or five players on the team not being observed are defending and in a position to recover the ball (4-5) (6 or more). (I.e. In the box).
Type of marking	<p><b>Zonal marking</b> set-up was recorded when the majority of the defending players within the penalty box was positioned at a particular spatial sector prior to the corner kick being taken.</p> <p><b>Man-to-Man marking</b> set-up was recorded when the majority of the defending players within the penalty box was positioned against a specific member of the opposition prior to the corner kick being taken.</p> <p><b>Combined:</b> some next to defenders some next to the post.</p>
Number of defenders on the post	Positioning of defensive players at the goalposts (only a player on the near post; only a player on the far post; players positioned on both the near and far posts; or no defensive players on the goalposts) was recorded.
Interaction context	<p><b>Numerical inferiority:</b> The attacking team has fewer players than the defending team in the shot zone.</p> <p><b>Numerical equality:</b> The attacking team has the same number of players as the defending team in the shot finish zone.</p> <p><b>Numerical superiority:</b> The attacking team has more players than the defending team in the shot finish zone.</p>



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Corner kick outcome: offensive	<p><b>Goal:</b> The ball went over the goal line and into the net. The referee awarded a goal.</p> <p><b>Attempt on target, excluding goals:</b> The ball would have entered the net, but for being prevented by a goalkeeper or defender save.</p> <p><b>Attempt off target:</b> Any attempt by the attacking team that was not directed within the dimensions of the goal. An attempt that made contact with the crossbar or either of the posts was classified as an attempt off target.</p> <p><b>Attempt miss hit:</b> Any attempt by the attacking team that was not directed within the dimensions of the goal.</p> <p><b>Ball exited the ball no contact:</b> Any player did not touch the ball and the ball exited the 18-yard box.</p> <p><b>Attacking free kick/pen:</b> The referee awarded a free kick/penalty to the attacking team.</p> <p><b>Flick on or pass:</b> An attacking player touch the ball onto another attacking player.</p> <p><b>Defensive Clearance:</b> The goalkeeper or defensive player from the opposition either regained possession or cleared the ball from the 18 yard box</p>
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Number of intervening attackers	Number of players on the team being observed moving towards the direction of the ball or situated in position where they could visibly touch the ball on delivery (0, 1, 2, 3-4).
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Match status	<p><b>Winning:</b> Goal tally higher for the observed team.</p> <p><b>Drawing:</b> Goal tally for observed team equal with opponent.</p> <p><b>Losing:</b> Golly tally lower for the observed team.</p>
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537 Table 3. Intra-observer and Inter-observer reliability values for the notional analysis  
 538 data quantified through the calculation of Cohen's Kappa.

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Categories	Intra-rater	Inter-rater
	Observer <sub>1</sub> - Observer <sub>1</sub>	Observer <sub>1</sub> - Observer <sub>2</sub>
Time	1.00	1.00
Position of corner	1.00	1.00
Laterality of corner	1.00	1.00
Delivery type	0.96	0.92
Delivery Zone	0.75	0.70
Number of attackers	0.95	0.94
Attack organisation	0.82	0.78
Number of defenders	0.94	0.94
Type of marking	0.81	0.75
Number of defenders on the post	0.94	0.94
Interaction context	0.83	0.80
Corner kick outcome: offensive	0.83	0.88
Number of intervening attackers	0.98	0.95
Match status	1.00	1.00
<b>K<sub>total</sub></b>	<b>0.92</b>	<b>0.90</b>

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542 \*When:  $k = (p_o - p_c) / (1 - p_c)$

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549 Table 4. Relative frequencies for variables related to the execution of corners for the  
 550 top six and bottom six teams (N = 2303).

Variables	Position in the league			$\chi^2$	Sig.	
	Overall	Top six	Bottom six			
Time	0-15	15.5%	16.4%	14.4%	14.74	0.01
	16-30	13.6%	14.6%	12.2%		
	31-45+	16.6%	17.5%	15.6%		
	46-60	18.2%	17.8%	18.8%		
	61-75	17.6%	17.7%	17.5%		
	76-90+	18.5%	16.0%	21.4%		
Laterality of corner	Right Side-Right Foot	24.8%	24.2%	25.5%	77.85	<0.001
	Right Side-Left Foot	25.1%	24.9%	25.3%		
	Left Side-Right Foot	28.3%	22.9%	34.8%		
	Left Side-Left Foot	21.8%	28.0%	14.3%		
Delivery type	Direct: Inswing	43.0%	38.5%	48.5%	145.40	<0.001
	Direct: Outswing	38.0%	45.9%	28.5%		
	Direct: Driven	3.0%	2.3%	3.8%		
	D-Clipped	5.2%	1.4%	9.9%		
	Indirect	10.7%	11.9%	9.3%		
Delivery zone	GA1	15.9%	16.2%	15.5%	48.00	<0.001
	GA2	13.1%	13.4%	12.8%		
	GA3	4.4%	3.9%	5.1%		
	CA1	10.2%	11.2%	9.0%		
	CA2	18.2%	16.5%	20.3%		
	CA3	5.6%	5.4%	5.9%		
	CA4	2.3%	2.4%	2.2%		
	CA5	5.2%	6.0%	4.3%		
	CA6	2.1%	1.6%	2.6%		
	Front Zone	10.4%	12.9%	7.3%		
	Inside Middle	7.1%	7.0%	7.2%		

	Back Zone	4.4%	2.9%	6.2%		
	Outside Middle	1.0%	0.6%	1.4%		
Attacking organisation	Static	40.4%	32.3%	50.0%	73.58	<0.001
	Dynamic	59.6%	67.7%	50.0%		
Number of defenders	4-5	5.3%	6.7%	3.6%	11.20	0.01
	6+	94.7%	93.3%	96.4%		
Type of marking	Man-to-man	37.5%	44.8%	28.7%	69.00	<0.001
	Zonal	5.8%	6.3%	5.3%		
	Combined	56.7%	48.9%	66.0%		
Number of defenders on the post	0	46.8%	44.1%	50.1%	7.12	0.03
	1	40.1%	42.2%	37.7%		
	2	13.0%	13.7%	12.2%		
Match status	Winning	20.0%	28.1%	10.3%	188.52	<0.001
	Drawing	50.7%	52.7%	48.3%		
	Losing	29.3%	19.2%	41.4%		
Corner kick outcome	Goal	3.1%	3.3%	2.9%	5.148	0.642
	Attempt on target	4.4%	4.5%	4.2%		
	Attempt off target	9.1%	9.0%	9.2%		
	Attempt miss hit	0.6%	0.6%	0.5%		
	Attempt free kick or penalty	0.3%	0.2%	0.4%		
	Ball exited the box with no contact	5.0%	5.2%	4.8%		
	Fick on or pass	0.3%	0.5%	0.1%		
	Defensive clearance	77.3%	76.7%	77.9%		

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555 Table 5. Corner kick success analysed by attempt on target (excluding goals) (N =  
 556 99/395)

Variables		Criterion 2: ATTEMPT ON TARGET (EXCLUDING GOALS)				
		Yes	No	$\chi^2$	Sig.	Contingency Coefficient
Position of corner	Right	29.5%	70.5%	4.25	0.04	0.103
	Left	20.5%	79.5%			
Delivery zone	GA1	43.8%	56.2%	48.18	<0.001	0.33
	GA2	14.3%	85.7%			
	GA3	4.1%	95.9%			
	CA1	47.1%	52.9%			
	CA2	56.0%	44.0%			
	CA3	26.7%	73.3%			
	CA4	16.7%	83.3%			
	CA5	30.7%	69.2%			
	CA6	14.0%	86.0%			
	Front Zone	20.8%	79.3%			
	Inside Middle	43.5%	56.5%			
	Back Zone	16.7%	83.3%			
Outside Middle	18.2%	81.8%				
Attacking organisation	Static	20.0%	80.0%	7.92	0.05	0.14

	Dynamic	32.5%	67.5%			
	0	18.7%	81.3%			
Number of defenders on the post	1	26.7%	73.3%	43.36	<0.001	0.315
	2	85.0%	15.0%			
	Numerical inferiority	65.3%	34.7%			
Interaction context	Numerical equality	0.0%	100.0%	209.06	<0.001	0.588
	Numerical superiority	5.0%	95.0%			

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570 Table 6. Relative frequencies of the top six and bottom six teams related to execution of  
 571 corners resulting for an attempt on target (excluding goals) (N = 99).

Variables		League Position			$\chi^2$	Sig.
		Overall	Top six	Bottom six		
Position	Left	40.2%	36.5%	44.7%	0.68	0.41
	Right	59.3%	63.5%	55.3%		
Delivery zone	GA1	5.4%	7.8%	2.4%	21.37	0.045
	GA2	5.4%	7.8%	2.4%		
	GA3	2.2%	0.0%	4.8%		
	CA1	17.2%	13.7%	21.4%		
	CA2	18.3%	15.7%	21.4%		
	CA3	8.6%	3.9%	14.3%		
	CA4	1.1%	0.0%	2.4%		
	CA5	10.8%	13.7%	7.1%		
	CA6	5.4%	5.9%	4.8%		
	Front Zone	9.7%	17.6%	0.0%		
	Inside	10.8%	9.8%	11.9%		
	Middle					
	Back Zone	3.2%	3.9%	2.4%		
	Outside	2.2%	0.0%	4.8%		
Middle						
Attacking organisation	Dynamic	52.5%	63.5%	40.4%	5.25	0.022
	Static	47.5%	36.5%	59.6%		
Number of defenders on the post					0.37	0.83
	0	42.4%	42.3%	42.6%		
	1	40.4%	38.5%	42.6%		
	2	17.2%	19.2%	14.9%		
Interaction context	Numerical inferiority	99.0%	100.0%	97.9%	1.118	0.29
	Numerical equality	0.0%	0.0%	0.0%		
	Numerical superiority	1.0%	0.0%	2.1%		

572 Table 7. Corner kicks success analysed by goal (N=70/395)

Variables		Criterion 3: GOALS				
		Yes	No	$\chi^2$	Sig.	Contingency Coefficient
Attacking organisation	Static	12.3%	87.7%	5.22	0.02	0.114
	Dynamic	21.3%	78.8%			
Number of defenders on the post	0	19.1%	80.9%	18.79	<0.001	0.213
	1	11.3%	88.7%			
	2	50.0%	50.0%			
Interaction context	Numerical inferiority	46.7%	53.3%	138.96	<0.001	0.510
	Numerical equality	0.0%	100.0%			
	Numerical superiority	0.0%	100.0%			
Match status	Winning	20.7%	79.3%	34.26	<0.001	0.283
	Drawing	33.3%	66.7%			
	Losing	7.2%	92.8%			

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584 Table 8. Relative frequencies of the top six and bottom six teams related to execution of  
 585 corners resulting in a goal (N = 70).

Variables		League Position			$\chi^2$	Sig.
		Overall	Top six	Bottom six		
Attack Organisation	Static	27.1	27.78	26.47	0.015	0.902
	Dynamic	72.9	72.22	73.53		
Defenders on Post	0	61.8	50	73.5	4.368	0.113
	1	24.0	33.33	14.7		
	2	14.2	16.67	11.7		
Match Status	Win	25.8	33.33	18.18	2.372	0.305
	Draw	55.4	47.22	63.6		
	Lost	18.8	19.44	18.18		

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