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Analysis of Attacking Corner Kick Strategies in the FA Women's Super League 2017/2018

This study describes how corner kicks were taken across the 2017/2018 FA Women's Super League season and assesses the effectiveness of these attacking corner kick strategies. A total of 824 corner kicks were analysed examining delivery type, delivery area and attack organisation on corner kick outcomes. A total of 38 goals were scored (4.6% of corners taken resulted in a goal) from the corner kicks, accounting for 13.5% of the total 282 goals scored during the 2017/2018 season. Corner delivery type did not affect the outcome of the corner ($p > 0.05$). However, delivery zone effected both the likelihood of an attempt on target ($p = 0.018$) and goal being scored ($p < 0.001$). Attempts on target were increased when the ball was delivered into the central area of the 18-yard box (zone CA2) with 14.7% of corners delivered to CA2 resulting in an attempt on target. Goals were most likely to be scored when the ball was delivered into the central zone but closer to the goal line (zone GA2) with 13.0% of corner kicks delivered to this zone resulting in a goal. These results can aid coaches to enhance the attacking effectiveness of corner kicks within Women's soccer.

Key words: Performance analysis; Set pieces; Football; Soccer

Introduction

Performance analysis is now an integral part of the coaching process in soccer (Carling, Williams, & Reilly, 2005; Groom, Cushion, & Nelson, 2011; Hodges & Franks, 2002). There has been a continued growth of performance analysis research focusing of set plays within men's soccer (e.g., Kubayi & Larkin, 2019; Strafford, Smith, North, & Stone, In Press). Performance analysis research within women's soccer has also increased in recent years, for example, examining attacking strategies leading to goal scoring opportunities (Bergier, Soroka, & Buraczewski, 2009; Mara, Wheeler, & Lyons, 2012), comparing women's soccer performances in international and domestic league games (Andersson, Randers, Heiner-Møller, Krustrup, & Mohr, 2010; Krustrup et al., 2009) and the effects of scoring first on match outcome (Ibáñez, Pérez-Goye, Courel-Ibáñez, & Garcìa-Rubio, 2018). Despite this increase there is still significantly less research, specially examining set plays within women's soccer compared to the men's game.

During soccer matches, when the ball runs out of the playing area or play is stopped due to fouls, the game is restarted through set plays (e.g., penalty kicks, free kicks, corner kicks, and throw-ins). Set plays account for 30% to 40% of goals scored in elite men's soccer (Armatas, Yiannakos, & Sileloglou, 2007; Yinnakos & Armatas, 2006) and provide a 1.8% chance of scoring a goal compared to a 1.1% chance in open play (Power, Hobbs, Ruiz, Wei, & Lucey, 2018). Hence, set plays are critical game events for successful offensive performance (Janković, Leontijević, & Mićović, 2011). Corner kicks are one form of set play and are awarded when the whole of the ball passes over the goal line, on the ground or in the air, having last touched a player of the defending team, and a goal is not scored (Law 17, International Football Association Board, 2019). With an average of 10 corners per game in men's soccer (Casal, Maneiro, Ardá, Losada, & Rial, 2015; Siegle & Lames, 2012; Taylor, James, & Mellalieu, 2005),

corner kicks are considered an important form of set play as they provide more goal scoring opportunities than free kicks (Mara et al., 2012; Page & Robins, 2012; Taylor et al., 2005) with a 2.1% chance of scoring from a corner compared to 1.1% chance from a free kick (Power et al., 2018).

Research examining attacking corner kicks in men's soccer have mainly focussed on delivery type (Casal et al., 2015), delivery area (Pulling, 2015) and overall effectiveness in the men's game (Strafford et al., In Press). Although corner kicks produce frequent opportunities to score, they are not very effective at producing goals with 2.1% to 2.9% of corners taken resulting in a goal being scored in men's soccer (Casal et al., 2015; De Baranda & Lopez-Riquelme, 2010; Power et al., 2018; Pulling & Newton, 2017; Taylor et al., 2005). Despite this, the goals scored from corner kicks are decisive on game outcome, in the 2015/2016 English Premier League, 67% of goals scored from corners contributed towards the team winning or drawing the game (Strafford et al., In Press). Taylor et al. (2005) analysed corner kick delivery area in men's soccer and highlighted the importance of a 'critical area' for deliveries to be made in to, defined as the area 6-12 yards from the goal line, within the width of the goal area. Pulling (2015) found a significant association between attempts at goal and delivery area, yet no significant association between delivery type and attempts at goal; suggesting that delivery area is more important than delivery type in regard to creating attempts at goal. This important finding needs further assessment within a professional women's league.

Set plays, specifically corners, seem to be important match events within men's soccer. However, the importance of corner kicks in the professional women's game has yet to be investigated. Therefore, a season long analysis exploring the attacking corner kick strategies in the 2017/2018 FA Women's Super League may identify those

variables that are considered the most important for creating goal scoring opportunities from corner kicks in the women's game. Therefore, the aims of this research were to first, describe how corner kicks were taken across the 2017/2018 season, and second, determine the effectiveness of these different types of corner kicks and identify key variables associated with attempts on target and goal scoring.

Methods

Match Sample

A total of 824 corner kicks were analysed from 89 games in the 2017/2018 FA Women's Super League with all teams in the league being included in the study. Corner kicks could not be sampled from one game (Manchester City Women v Everton Ladies FC - 20/05/18) due to footage being unavailable. Each corner was cropped from full game footage sourced from Wyscout (Wyscout 2017, Chiavari, Italy), being defined when the whole of the ball passed over the goal line, on the ground or in the air, having last touched a player of the defending team, and a goal was not scored (International Football Association Board, 2019). Corner kicks were considered complete when the ball exited the 18-yard box and did not immediately re-enter (Pulling, Robins, & Rixon, 2013). The Local University ethics committee granted approval for the study.

Procedures and Measures

Corner kicks were analysed using a custom notational instrument using SportsCode performance analysis software (Agile Sports Technologies 2018, Lincoln, NE). The coding system was developed using the operational definitions selected from empirical research on corner kicks in the men's games (Casal et al., 2015; Pulling et al., 2013; Pulling, 2015; Pulling & Netwon, 2017) and are outlined in table 1 and figure 1.

Table 1 near here

Figure 1 near here

Prior to data collection, the two analysts participated in a training session on how to conduct the analysis and agreed the operational definitions of the corner kick outcomes, attack organisation, delivery type and delivery area. Pilot testing was then conducted on 10 corner kicks to test the functioning of the coding system and to ensure stability of the operational definitions used. For each corner, the type of ball delivery, attack organisation, delivery area and corner outcome were recorded. Coding was completed in two hour sessions with at least an hour break between sessions to reduce the risk of error. The lead researcher had 2 years' experience working as a performance analyst within a professional soccer club. The second independent observer used for checking reliability of the analysis had six years' experience coding soccer matches during applied field research.

Reliability

Intra-observer and inter-observer reliability tests were conducted to assess the reliability of the data collection methods and subsequent data collected. Intra-observer analysis was verified through the reassessment of the same 94 corners (11.4% of corners) on two separate occasions, two-weeks apart by the primary researcher (Altman, 1991). A second analyst separately assessed the same 94 corners for comparison to the primary researcher's first observation for inter-observer reliability. Intra- and inter-observer reliability of the data was quantified through the calculation of Cohen's Kappa (Cohen, 1960). Reliability of each variable are presented in table 2, with a mean kappa

157 statistic of $k = 0.90$ and $k = 0.88$, corresponding to '*excellent'* intra- and inter-observer
158 agreement respectively (Fleiss, Levin, & Paik, 2003).
159
160 **Table 2 near here**
161
162 ***Data Analysis***
163 Data was exported from SportsCode and descriptive analyses were completed in
164 Microsoft Excel (Version 14.7.1, Microsoft Cooperation, United States) to calculate
165 relative frequencies for each variable. The data were analysed further in SPSS (Version
166 24.00 SPSS Inc., USA). An important assumption of the chi-squared test is that the
167 expected values should not be less than 5 (Field, 2009). To prevent this assumption
168 being violated, the delivery area was collapsed by combining CA1 and GA1 to create an
169 area at the front of the 6-yard box, (GA&CA1), combining GA3 and CA3 to create an
170 area at the back of the 6-yard box, (GA&CA3), and combing the frontzone, backzone
171 and edge to create a combined outer zone.
172 Bivariate analyses (χ^2) were employed to analyse *attempts on target* and *goals*
173 scored. The following associations were tested via chi squared: (1) attempts on target in
174 relation to delivery area, (2) goals scored in relation to delivery area, (3) attempts on
175 target in relation to the delivery type, (4) goals scored in relation to the delivery type,
176 (5) attempts on target in relation attack organisation, and (6) goals scored in relation to
177 attack organisation. The alpha level was set at .05. Cramer's V (V) effect sizes were
178 calculated and described as small ($V = 0.10$), medium ($V = 0.30$) or large ($V \geq 0.50$)
179 (Gravetter & Wallnau, 2007).
180 **Results**
181 ***Descriptive Analysis***

A total of 824 attacking teams' corner kicks were analysed within the study, an average of 9.3 corners per game (see table 3). There was a total of 276 (33.5% of corners taken) attempts at goal from the corners analysed, of which, 122 (14.8%) were attempts off target, 77 (9.3%) attempts on target excluding goals and 38 resulting in a goal (4.6% of total corners). Goals from these corners accounted for 13.5% of the total 282 goals scored within the 2017/2018 FA Women's Super League season. The most frequent corner outcome was loss of possession (434) which accounted for 52.7% of all corners analysed.

Table 3 near here

Corner Delivery Type

The most frequent delivery type was an inswing delivery (36.7% of total corners) with the least frequently delivery type being short (5.0% of total corners). However, corner kick delivery type was not associated with the creation of attempts on target (χ^2_4 = 4.057, p = 0.398, V = 0.070) or if a goal was scored (χ^2_4 = 0.893, p = 0.926, V = 0.033) (see table 4).

Table 4 near here

Delivery Area

Corner kicks were most frequently delivered into CA2 (156 corners; 18.9% of total corners) whereas the least number of corners were delivered to the back zone (23 corners; 2.8% of total corners). There was a significant association for the likelihood of an attempt on target, χ^2_4 = 11.918, p = 0.018, V = 0.121 with 14.7% of corners delivered to zone CA2 resulting in an attempt on target. Corners delivered to the combined outer zones (backzone, frontzone and edge) resulted in an attempt on target 11.5% of the time in comparison to zones CA1&GA1 which had the lowest percentage of corners

resulting in an attempt on target (4.8%). For the likelihood of goals scored there was also a significant association, $\chi^2_4 = 28.300$, $p < 0.001$, $V = 0.186$ with 13.0% of corners delivered into GA2 resulting in a goal (19 out of 38 goals scored) (see figures 2 and 3). No goals were scored from either the back zone or front zone.

Figure 2 near here

Figure 3 near here

Attack Organisation

There was no significant association for the type of attack organisation on attempts on target ($\chi^2_1 = 2.098$, $p = 0.147$, $V = 0.05$) or goals scored ($\chi^2_1 = 0.523$, $p = 0.470$, $V = 0.25$). However, teams most commonly used a static attack organisation (80% of corners) during corner kicks.

Discussion

The aim of this study was first to describe how corner kicks were taken across the 2017/2018 FA Women's Super League season, and secondly assess the effectiveness of these attacking corner kick strategies. In total, 824 corner kicks were analysed within the study, which equated on average to 9.3 corners per game. This is in line with previous research in men's soccer where an average of 10 corner kicks per game occurred (Siegle & Lames, 2012; Taylor et al., 2005). Of the corners analysed, 4.6% resulted in a goal scored and accounted for 13.5% of the total 282 goals scored in the 2017/2018 FA Women's Super League. Importantly, although corners appear relativity inefficient (4.6%) at producing goals in the women's game, this is approximately double that of efficiency values reported in the men's game (ranging from 2.1% to 2.9%) (Casal et al., 2015; De Baranda & Lopez-Riquelme, 2010; Power et al., 2018; Pulling & Newton, 2017; Taylor et al., 2005). Hence, suggesting that corner

kicks are more effective at producing goals in women's soccer compared to men's soccer and should be an important area for teams to focus on during tactical and technical preparation for matches.

The most frequent delivery type was the inswinger (36.7% of corners) supporting previous research in the men's game that this is the most common type of delivery (De Baranda & Lopez-Riquelme, 2010; Power et al., 2018; Pulling, 2015; Strafford et al., In Press; Taylor et al., 2005). However, corner delivery type was not associated with the creation of attempts on target or if a goal was scored. The inswing delivery resulted in the lowest percentage (7.6%) of corners resulting in an attempt on target. While the percentage of goals scored were similar across driven, inswinger, outswinger and worked corners (4.0%-5.6%), with the lowest delivery type being short (2.4%). This finding supports Pulling (2015) that delivery type might not be important to achieve attempts on target or goals scored.

Examining corner kick delivery areas, there were significantly more attempts on target achieved when the ball was delivered into the CA2, and outer areas. This support research from men's soccer (e.g. Pulling, 2015; Strafford et al., In Press) with corner kicks being most frequently delivered into CA2 and also resulting in the most attempts on target. However, the likelihood of scoring from zones CA2 (3.2%) and outer zones (3.3%) were low, meaning balls delivered centrally, but further away from the goal, enabled attempts on target to be created, however, these were not effectively converted into goals. In comparison, corner kicks were also frequently delivered into GA2 (17.4% of total corners) and importantly, significantly increased the likelihood of scoring a goal from this delivery area (13.0%) with 50.0% of all goals being scored from GA2. This is in contrasts to literature within men's soccer where the majority of goals scored are from corners delivered within the critical area, notably CA1 and CA2 (Casal et al.,

2015; Pulling, 2015). This is an important difference between attacking corner kicks within men's and women's soccer and from the findings of this study could explain the increase in efficiency, in terms of goals scored, in women's soccer compared to men's.

When descriptively examining the 38 goals scored (see figure 3), there was a large proportion of goals resulting from inswing and driven deliveries, within the zone (GA2) closest to the goal. It is proposed, unlike the men's game when often the goalkeeper or defenders may regain possession or clear the ball in this central zone closet to the goal; in the women's game it seems the attacking team can use this zone as an effective method of scoring. Based on these results coaches in the women's game may focus specifically on attacking corner kicks delivered in to GA2, as these were the most effective at producing goals. Similarly, a recommendation for coaching practice for the defensive teams is to work on technical and tactical methods to reduce the effectiveness of this specific corner tactic. One possible way could be using principles of Non-Linear Pedagogy (Chow, Renshaw, Button, Davids, & Tan, 2013), and specifically focussing on representative learning design (Pinder, Davids, Renshaw, & Araújo, 2011), to create training scenarios which recreate these specific corner kick strategies identified here.

With this being one of the first examinations of women's corner kicks, future research should continue to assess attacking corner kick strategies within the FA Women's Super League to assess strategies over recent seasons. Alongside this, research should explore attacking corner kick strategies across other top professional women's leagues around the world and in international competitions; this will allow comparisons and analysis to be made across a wider range of leagues. This will help to develop the understanding of women's soccer and will aid coaching processes in developing women's soccer on both a practical and research level, therefore enhancing

the game to the level of understanding currently available for professional men's soccer. Furthermore, this study has focused on attacking variables, future work should explore more defensive variable's, with a possible focus on the most effective strategies to reduce goals being scored from zone GA2, to give further understanding into both effective offensive and defensive tactical behaviours.

Conclusion

In conclusion this present study assessed the attacking corner kick strategies within professional women's soccer. Findings demonstrate corner kicks occur frequently within the women's game and are more efficient at producing goals in comparison to the men's game. Corner kicks were frequently delivered in to CA2 which resulted in attempts on target, however, goals are most frequently scored from corner kicks delivered in to GA2. Future research should continue to assess attacking corner kick strategies across multiple leagues and at international level of women's soccer to aid the development of the professional women's game at a practical and research level, whilst also allowing for results to be correlated and compared directly between studies.

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412 Table 1. Operational definitions for the corner kick outcomes, delivery type, and attack
413 organisation. Adapted from (Casal et al., 2015; Pulling et al., 2013; Pulling, 2015;
414 Pulling & Netwon 2017).

Variable	Definition
Corner Outcome	**Goal:** The ball went over the goal line inside the dimensions of the goalposts. The referee awarded a goal. **Attempt on target excluding goals:** Any goal attempt that was heading towards the goal which was saved by the goalkeeper or blocked by a defensive player. **Attempt off target:** 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. **Lost possession:** The attacking team lost possession of the ball as a result of the corner kick. This was defined when the ball exited the 18 yard box and was not re-delivered by the attacking team. **Penalty:** The defending team commits a foul during the corner kick phase and the referee awards a penalty kick. **Free Kick:** The referee awarded a free kick to the defensive team. **Defensive block**: Any goal attempt that was heading towards the goal and is immediately blocked by a defensive player. **Goalkeeper catch:** The goalkeeper gained possession of the ball by catching the ball. **Goalkeeper punch:** The goalkeeper made contact with the ball by using a punching action.
Delivery Type	**Inswinger:** The ball was kicked and moved through the air in a curve towards the goal. **Outswinger:** The ball was kicked and moved through the air in a curve away from goal. **Driven:** The ball was kicked with no curve and the ball entered the 18-yard box aerially with pace. **Short Corner:** The ball is kicked to an attacking player who is in short proximity to the initial corner kick taker; the initial ball does not immediately or directly enter the 18-yard box. **Worked Corner:** The corner kick is played where there is a clear corner kick routine in place by the attacking team.
Attack Organisation	**Static:** The players on the team being observed stay in their set positions during the corner kick. **Dynamic:** The players on the team being observed vary from their set positions during the corner kick.

415

Table 2. Intra-observer and Inter-observer reliability values for the notional analysis data quantified through the calculation of Cohen's Kappa.

Categories	**Intra-rater**	**Inter-rater**
	$Observer_1$ -$Observer_1$	**$Observer_1$ - $Observer_2$**
Delivery type	0.88	0.88
Delivery area	0.95	0.90
Attack organisation	0.84	0.80
Corner outcome	0.91	0.92
K_{total}	0.90	0.88

Table 3. Descriptive analysis of corner kicks (n =824) during the 2017-18 season

Variable	Absolute	Percentage
Delivery Type		
Driven	247	30.0%
Inswinger	303	36.8%
Outswinger	126	15.3%
Short	41	5.0%
Worked	107	13.0%
Delivery Area		
CA1	67	8.1%
CA2	156	18.9%
CA3	57	6.9%
GA1	122	14.8%
GA2	143	17.4%
GA3	89	10.8%
Back zone	23	2.8%
Front zone	52	6.3%
Edge	107	13.0%
N/A	8	1.0%
Attack Organisation		
Static	158	19.2%
Dynamic	666	80.8%
Corner Outcome		
Goal	38	4.6%
Attempt on target	77	9.3%
Attempt off target	122	14.8%
Shot blocked	39	4.7%
Foul: Free kick	26	3.2%
Foul: Penalty	3	0.4%
Loss of possession	434	52.7%
Goalkeeper punch	40	4.9%
Goalkeeper catch	42	5.1%
N/A	3	0.4%

467 Table 4. Corner kick success analysed by attempts on target (excluding goals) and
468 goals. Data is presented as absolute frequencies and percentages occurrence (stated in
469 brackets).
470

	Goal: Yes	Goal: No	Attempt on target: Yes	Attempt on target: No
Delivery Type				
Driven	11 (4.5%)	236 (95.5%)	21 (8.5%)	226 (91.5%)
Inswinger	15 (5.0%)	288 (95.0%)	23 (7.6%)	280 (92.4%)
Outswinger	5 (4.0%)	121 (96.0%)	15 (11.9%)	111 (88.1%)
Short	1 (2.4%)	40 (97.6%)	4 (9.8%)	37 (90.2%)
Worked	6 (5.6%)	101 (94.4%)	14 (13.1%)	93 (86.9%)
Delivery Area				
GA&CA1	5 (2.7%)	183 (97.3%)	9 (4.8%)	180 (95.2%)
CA2	5 (3.2%)	151 (96.8%)	23 (14.7%)	133 (85.3%)
GA&CA3	3 (2.1%)	141 (97.9%)	14 (9.6%)	132 (90.4%)
GA2	19 (13.0%)	127 (87.0%)	10 (7.0%)	133 (93.0%)
Outer Area	6 (3.3%)	176 (96.7%)	21 (11.5%)	161 (88.5%)
Organisation				
Dynamic	9 (5.7%)	149 (94.3%)	10 (6.3%)	148 (93.7%)
Static	29 (5.0%)	637 (95.6%)	67 (10.1%)	599 (89.9%)

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