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# Analysis of Attacking Possessions Leading to a Goal Attempt, and Goal Scoring Patterns within Men's Elite Soccer

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**Abstract**

Limited research within sports analysis has been conducted regarding the lower professional divisions within men's elite soccer in England. Therefore, the aims of the study were to investigate patterns within attacking possessions leading to an attempt on goal or goal scored. Ten matches from the Npower League One fixtures (7 from 2011-12 season and 3 from 2012-13 season) were recorded, producing 297 attacking possessions finishing in shot or goal (32 goals). The data was split into 10 variables, with 5 of the variables analysed using a Friedman's test ($\chi^2$), with a Wilcoxon test (Z) to discover significant differences. The remaining 5 variables were analysed using just the Wilcoxon test (Z). Results indicated that significantly more shots and goals coming from ≤ 4 passes (Z = -3.924, p= <0.001) and (Z = -3.094, p = 0.002) respectively, more attacks originated in the middle or final thirds of the pitch ($x^2$ = 26.909, p = < 0.001), and that more goals were scored within the penalty area (Z = -2.346, p = 0.019). Practical implications from this study have been suggested for the teams within the Npower League One division, however further in depth research considering full seasonal averages may be beneficial to understand how to succeed in this league in the future. Teams should aim to utilise quick attacking play through either set pieces or counter attacks and shoot within the penalty area with short passing combinations, however playing styles and philosophies of the teams should be considered.

**Keywords**: *Men's soccer, league one, attacking possessions, shooting patterns, performance analysis*.

## Introduction

Over the last few decades there has been an increase in the quantity of research conducted regarding analysis in soccer (Wright *et al*., 2011; Abt and Lovell, 2009; Carling, Williams and Reilly, 2005), particularly goal scoring opportunities (Mahony, Wheeler and Lyons, 2012; Tenga, Ronglan and Bahr, 2010c; Grehaigne, Richard and Griffin, 2005; Hughes and Franks, 2005; Kirkendall, Dowd and DiCicco,

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2002). The most effective measure of attacking success in soccer is the goals scored and scoring opportunities created (Mahony, Wheeler and Lyons, 2012; Carling, Williams and Reilly, 2005; Jones, James and Mellalieu, 2004). Generally, the more successful teams will create more opportunities and score more goals per match (Hughes *et al*., 2012b; Mahony, Wheeler and Lyons, 2012; Grehaigne, Richard and Griffin, 2005; Reep and Benjamin, 1968). This is essential as the overall objective in soccer is to outscore the opposition (Wright *et al*., 2011; Tenga, Ronglan and Bahr, 2010c; Lago, 2009; Jones, James and Mellalieu, 2004).

Within this literature, performance indicators have been of particular interest (Wright *et al*., 2011; Reilly, 2007; Carling, Williams and Reilly, 2005). Performance indicators are game variables that define some or all the actions that occur during a soccer match, these can be separate actions or a combination of moves (Castellano, Casamichana and Lago, 2012; O'Donoghue *et al*., 2012; Janković *et al*., 2010; Hughes and Bartlett, 2002a). These can help to establish the ideal method of playing soccer and therefore can be used to predict performance in future games (O'Donoghue, 2005). Furthermore these performance indicators can prove to be valuable information for coaches, as it enables the team to understand their strengths and utilise those identified strengths within a game setting, as well as being able to build training sessions to enhance performance in the weaker aspects of their play (Hughes *et al*., 2012a; Lago, 2009; Carling, Williams and Reilly, 2005; Franks, 2004; Jones, James and Mellalieu, 2004).

A significant performance indicator in soccer is goals scored, as generally success is regarded as being able to score more than the opposition (Hughes *et al*., 2012b; Mahony, Wheeler and Lyons, 2012; Lago, 2009; Grehaigne, Richard and Griffin, 2005; Kirkendall, Dowd and DiCicco, 2002). However, just analysing goal scoring doesn't provide succinct analysis of performance within elite level soccer (Ruiz-Ruiz *et al*., 2011), as

goal scoring yields very little data. Tenga, Ronglan and Bahr (2010c) found that goal scoring attributed to 1% of the total possession within elite Norwegian soccer matches, therefore other aspects that demonstrate attacking effectiveness should be considered. Previous studies have highlighted shots on goal, balance between attacking and defending teams and type of attack as other key areas to analyse (Ruiz-Ruiz *et al*., 2011; Tenga *et al*., 2010b; Tenga, Ronglan and Bahr, 2010c; Olsen and Larsen, 1997).

Most of the early studies within soccer were conducted manually (Abt and Lovell, 2009; Mayhew and Wenger, 1985; Reilly and Thomas, 1976) and considered laborious in nature. These studies highlighted simple movements within a game in addition to the location of the pitch and how long each movement occurred (Mayhew and Wenger, 1985; Reilly and Thomas, 1976). By recording these variables the work rate and distance travelled could be obtained, however this method contains major inaccuracies due to a lack of differentiation between game movement categories (James, 2006). These studies also only focused on a single player's actions, rather than viewing how the team interacted during the course of a match (Moussa, Douik, and Messaoud, 2011; Figueroa, Leite and Barros, 2005), even with these significant limitations in the methodology, these studies were still considered to be the building blocks of analysis as it is today.

As technology has developed over the past few decades, more effective ways of recording and analysis can now take place (Abt and Lovell, 2009; O'Donoghue, 2006). Some of the more significant advances include video recording, computerisation and live to air TV footage; these are now readily used within analysis research and have proved to be mainly successful (Wright *et al*., 2011; Worsfold and Macbeth, 2009; Leibermann and Franks, 2004; Scoulding, James and Taylor, 2004). Video technology originated in the 1950s, however, this technology has only regularly been used by analysts

and coaches in soccer for feedback purposes, within the past 15 years (Wright *et al*., 2011; Hodges and Franks, 2004; Liebermann *et al*., 2002). By using video cameras in conjunction with computers, games can be recorded, stored and processed with relative ease (O'Donoghue, 2006). However issues still remain with this method as the quality of the video footage can be poor, when rerecording to a DVD or VHS, and instant replays and crowd shots can affect the viewing of the full sequence of events (Tenga, 2009). Also, computer-based notational analysis methods are increasingly common within elite level sport (Hughes *et al*., 2010). Using this method of analysis, it is easy to adapt to a coaches specific needs and edit and attribute video footage to the system (Hughes, Hughes and Behan, 2007a). Collectively, these methods help to enhance feedback to coaches and players alike (Leibermann and Franks, 2004; Hughes, 1996).

The technological progressions within elite level sport, have lead to the development of systems that use multiple cameras to track every player or official's movement through a full game (Randers *et al*., 2010; Redwood-Brown, 2008; Moura *et al*., 2007; Di Salvo *et al*., 2006). However this method requires significant financial investment and the installation of a number of roof cameras within a stadium, and therefore, it isn't accessible to all teams within elite soccer (Di Salvo *et al*., 2006). While single camera tracking relies heavily on the skills and experiences of the cameraman involved. Without a high degree of competence, the footage collected becomes unusable (Ariki and Takiguchi, 2008). However, even with these significant technological advances little or no operational benchmarks can be found in research (Williams, 2012). Thus making it difficult to compare studies effectively and, as a result, questions the repeatability of the study itself (O'Donoghue, 2007).

Williams, (2009); James, Mellalieu and Jones (2005); Bloomfield, Polman and O'Donoghue (2004) and Hughes (2004a) all state that operational definitions must be

produced in order to obtain valid and reliable data. Williams (2012) conducted research to assess how many journals from the International Journal of Performance Analysis in Sport included definitions in their papers, 61.1% had clear definitions, 16.8% partially defined and 22.1% had no definitions out of the 278 journals assessed. He also concluded that a lack of overall definitions within specific sports created ambiguity and produced little consistency. This point is highlighted by Worsfold and Macbeth (2009); they studied 6 performance indicators, over 15 games, from 4 different broadcasting companies. In this research errors of > 10% and up to 59.51% were found in five out of the six variables analysed. These vastly different results occured due to the lack of standardised definitions and individual interpretation within soccer analysis (Worsfold and Macbeth, 2009). Without these standardised definitions, comparing findings is difficult (Williams, 2012; James, Mellalieu and Jones, 2005; Hughes, 2004a).

O'Donoghue (2007), in contrast, suggests that by having operational definitions the research is not immediately acceptable, instead he implies that an analysts understanding of the behaviours and knowledge of the sport is a much more important aspect instead. However this requires all analysts associated within the study to have the same knowledge of the sport, and even with the same level of knowledge, interpretation of events may still vary which suggests that operational definitions should be adopted (Williams, 2012).

Operational definitions alone do not ensure reliability of the methods used. It is vital that reliability tests of the analysis systems available should be conducted and clearly stated within studies (Hughes, Cooper and Nevill, 2002b), as this will help to ensure repeatability of any tests undertaken (Bruton, Conway and Holgate, 2000). However Hughes, Cooper and Nevill (2002b) found that within 72 published journals, 70% of articles failed to report reliability measures or used ineffective methods to

report it. One such ineffective method is intra-observer reliability, as this test only highlights the operator's ability to use the system, regardless of whether it is correct or not (O'Donoghue, 2007). Boyce, Carter and Neboschick (2000) found that when using intra-observer reliability a high level of agreement was established between trials however when analysing reliability using the more appropriate test, inter-observer reliability, the reliability was very low, which highlights the issue of the intra-observer test. Inter-observer reliability is considered to be a more acceptable method as this aims to establish the extent to which 2 or more observers can produce the same or very similar results on the same subject (O'Donoghue, 2007; James, Mellalieu and Hollely, 2002) and is therefore more accurate at finding inaccuracies in the data.

Reep and Benjamin (1968), who many consider pioneers in soccer notational analysis, studied 3213 soccer games from within the English 1st division, league and FA cups, as well as World Cup competitions and found that 80% of goals came from ≤3 passes. They also suggested that the direct style of soccer is the most effective method of scoring. More recently Hughes and Franks (2005) and Kirkendall, Dowd and DiCicco (2002) suggest that direct play is still the most effective method and both studies found very similar results where 80%, 77% and 80% of attempts on goal came from ≤4 passes from the 1990, 1994 and 1998 World cups respectively. According to research Wright *et al*., (2011) the same trend occurred in the English Premier League where 85% of all goals came from ≤4 passes.

Many studies have looked at when goals occur during match play. They commonly split the full matches up into 15-minute segments and look at whether goals were scored during the 1st and 2nd halves (Armatas and Yiannakos, 2010; Armatas *et al*., 2007b; Kirkendall, Dowd and DiCicco, 2002; Jinshan *et al*., 1993; Jinshan, 1986). Armatas and Yiannakos (2010) and Yiannakos and Armatas (2006) suggest that

more goals are scored in the 2nd half (52.5% to 57.4%) compared to the first half. The most prolific segment within the halves occurred between the 60-75 minute (Jinshan, 1986) and 75-90 minute (Jinshan *et al*., 1993), the latter of the results corresponding to Armatas and Yiannakos (2010), Armatas *et al*., (2007a), and Abt, Dickson and Mummery (2002) who all found that the most goals occurred during the 75-90 minute. This is thought to be due to player fatigue. Fatigue has a direct link to poor decision making as well has being linked to a decrease in sprinting speed, therefore affecting the ability of players to track back and deal with all situations effectively (Catteeuw *et al*., 2010; Krustrup, Mohr and Bangsbo, 2002; Reilly, 1996). Therefore it would appear that the frequency of goals scored is time dependant (Abt, Dickson and Mummery, 2002).

A large amount of research in analysis gathers samples from tournament style competitions (Aramatas and Yiannakos, 2010; Kirkendall, Dowd and DiCicco, 2002; Grant, Williams and Reilly, 1999), as it draws together the world's elite in a competitive context and has the benefit of a large sample size in a short time period (Hughes and Franks, 2005). However in many of these studies they fail to recognise the direct influence other games within the group stages of the competition can have on performance (O'Donoghue *et al*., 2012; McGarry, 2009; Jones, James and Mellalieu, 2004). O'Donoghue *et al*., (2012) stated that by playing games at the same time during cup competitions, performances of teams vary depending on the scores of related games. As a result, by using random games over the course of a full season the influence of important individual games should be nullified. Similarly to this very few studies make reference to the direct influence the opposition have on the actions within games (Tenga *et al*., 2009; Konstadinidou and Tsigilis, 2005; Hughes and Churchill, 2004b). McGarry (2009), Tenga *et al*., (2009) and Taylor *et al*., (2008) all state that the opposition help create unexpected situations within

games and therefore should be regarded when conducting analysis. Tenga *et al.,* (2010a; 2010b and 2009) suggest that it is important to state how the defense is set up, either balanced or imbalanced, as this can help to assess the effectiveness of the attacking play. They state that without this, technical or tactical analysis remains incomplete as the interactions alter the outcome of events (Tenga *et al*., 2010a; O'Donoghue, 2009). However the accuracy of such methods remains an issue and is difficult to quantify, as it is quite subjective (McGarry, 2009). Therefore, more research is required in this area before it can be widely adopted within analysis research methods (O'Donoghue, 2009).

Lucchesi (2001) states that attack types are defined as a tactical situation when one team makes a clear attempt to move towards the attacking goal, in order to produce a shot on goal. Attacking types within soccer have often been studied (Armatas and Yiannakos, 2010; Tenga *et al*., 2010a; Tenga *et al*., 2009; Lucceshi, 2001), however there seems to be mixed reports regarding which attack type is more effective. Tenga *et al*., (2010a) and Tenga *et al*., (2010b) suggest that counter attacks produce more goals than any other forms of attacking play, however Armatas and Yiannakos (2010) found the opposite. They state that 47.1% of goal attempts came from elaborate attacks, 32.6% from set pieces and 20.3% from counter attacking play during the 2006 World Cup. Whereas, in other studies there seems to be more of an emphasis on set pieces. Taylor, James and Mellalieu (2005), Grant, Williams and Reilly (1998) and Jinshan *et al*., (1993) all found between 27 to 32% of goal attempts resulted from set pieces. However, there still remains a large difference between goals scored from set pieces and goals scored from open play. Williams and Reilly (1999) found that 24.6% of goals originated from set pieces and 63.2% of goals were created from open play. But Kirkendall, Dowd and DiCicco (2002) indicated between 50-65% of goals were scored from set pieces.

Tenga *et al*., (2010a) however only highlighted counter attacks and elaborate attacks, and their influence on the defensive set up of goal scoring opportunity. They completely disregarded set pieces altogether. However Bangsbo and Peitersen (2000) suggest that set pieces account for a large percentage of chances per game and stress that they shouldn't be dismissed. Wright *et al*., (2011) also found that 39% of goal attempts came from 'other' attack types (Wright *et al*., 2011, pp. 447), this included rebounds, deflections, and flicks-on from balls that were contested for. This highlights that even within elite level soccer chance still plays a key role on the outcome of the game (McGarry, 2009).

A recent study conducted by O'Donoghue *et al*., (2012), highlighted issues regarding the use of chi-squared a statistical method of analysis in performance sport research. O'Donoghue *et al*., (2012) state that this method assumes that performance actions within a game are treated as separate incidents rather than general performance data, which therefore creates the illusion that a larger sample size has been collected, and as a result appears to show more significant findings. Furthermore, the chi-squared method assumes that all data is individual (O'Donoghue *et al*., 2012). However, this contradicts research by McGarry (2009), Tenga *et al*. (2009), and Taylor *et al*. (2008), who all state that it is the interactions between teams that actually determine what happens during a game. This in turn implies that games cannot be completely independent and highlights a limitation in the analysis method chosen. This is highlighted in the study by Yamanka *et al*., (1997), which found that within 4 games a statistically significant difference occurred. Due to the small sample size researched meaningful conclusions cannot be assumed as the results are inflated due to the method of analysis, in this case the chi-squared test (O' Donoghue *et al*., 2012). Similar results were also found in Costa *et al*., (2011) and Laios and Moustakidis (2011). The Friedman's test, however, doesn't assume independence, as it is

a within measure design test and is considered to be a more appropriate measure (O'Donoghue, 2012).

There is a plethora of research regarding passing sequences, goal attempts and goals scored in the highest levels of football competition; however this can be found predominately in World Cup events or throughout the English Premier League season (Wright *et al*., 2011 Armatas and Yiannakos, 2010; Acar *et al*., 2009; Redwood-Brown, 2008; Armatas, Yiannakos and Sileloglou, 2007c; Jones, James and Mellalieu, 2004). But there has been relatively little research conducted in the Championship, League 1 or League 2 divisions within English men's elite soccer. In addition, as previously stated, most research within analysis uses the chi-squared method of statistical analysis, which has fundamental errors (O'Donoghue *et al*., 2012).

Therefore the aim of this study is to investigate patterns within attacking possessions leading to an attempt on goal or goals scored. In particular predicting four results from the outset; a) that significantly more attempts on goal come from ≤ 4 passes, b) significantly more attempts on goal and goals scored originate within the middle or final thirds, c) that more goals are scored in the second half compared to the first and d) that most attacks come from counter attacking play. However to cover a broader range of attacking variables the following will also be considered; shot location, time of shot within a game, type of shot, location of goal scored, and time of goal.

## Methods

*Subjects*

Footage from ten Npower League 1 games during the 2011-12 and part of 2012-13 seasons were used for the analysis. The league follows a double, round robin league style and involves 24 teams. Out of the 10 games, seven were supplied by a Npower league 1 club; each of these games were recorded using a Sony NDR FX160E camera (Sony, Tokyo, Japan) which was located in the stands and had an elevated view of the whole pitch on a Sony VCT60AV tripod (Sony, Tokyo, Japan). The remaining 3 games were recorded live on Sky+ TV and then recorded onto DVD using a Cello - R100LB DVD recorder (Cello Electronic Ltd, Manchester United Kingdom) and uploaded onto iMovie (Apple, California, USA) to be analysed. Any passages of play that included interruptions by replays, off side/ foul play or poor camera tracking were discarded from the study.

*Study Design*

Once all the games were filmed all footage was uploaded onto iMovie (Apple, California, USA). The analysis took place 3 weeks after the games had been filmed to prevent subjective bias. Each game was played back at normal speed until a shot took place, once this occurred the footage was rewound back to the start of the possession and played at half speed to enable succinct analysis of each attack (Rees *et al*., 2010; Hughes and Reed, 2007b). All actions were recorded using a hand notational system that was developed on a Microsoft Excel spread sheet. This highlighted passing sequences, origin of attack (see Figure 1.), type of attack, shot location (see Figure 2.), time of shot, type of shot, location of goal scored and time of goal. Each of these areas were divided into sub-categories and given definitions to abide by, see Appendix 1. All shots and goals from both teams were analysed.

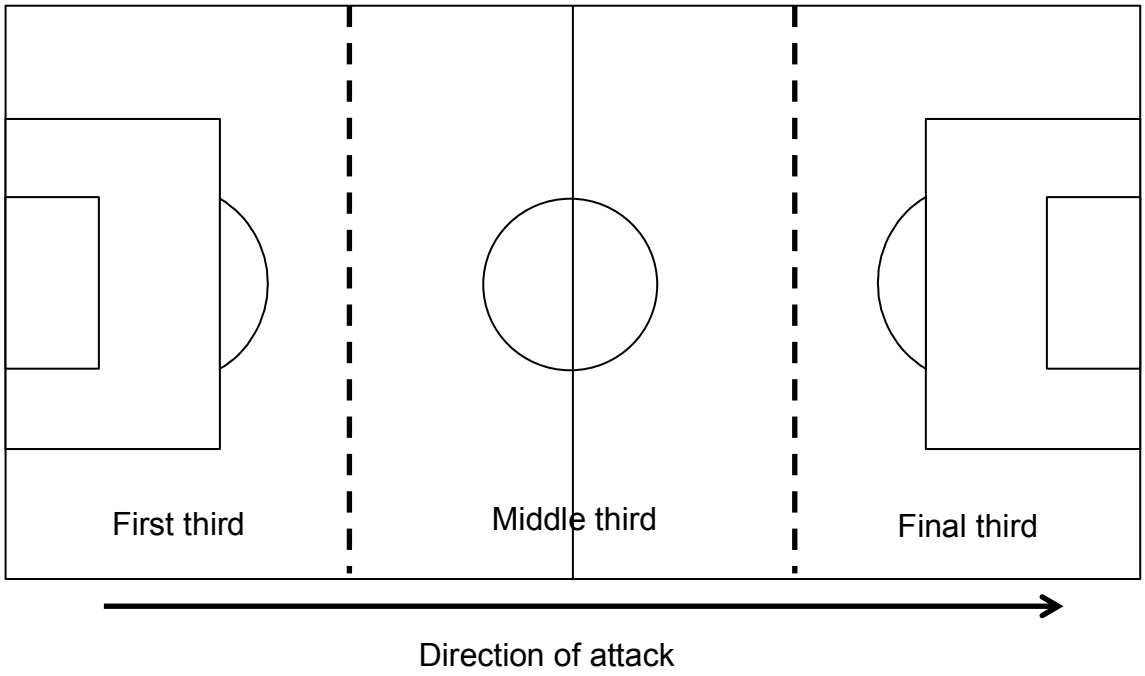



**Figure 1.** The pitch map used to differentiate the origin of attack, adapted from Tenga, Ronglan, L. T. Bahr, R. (2010c).

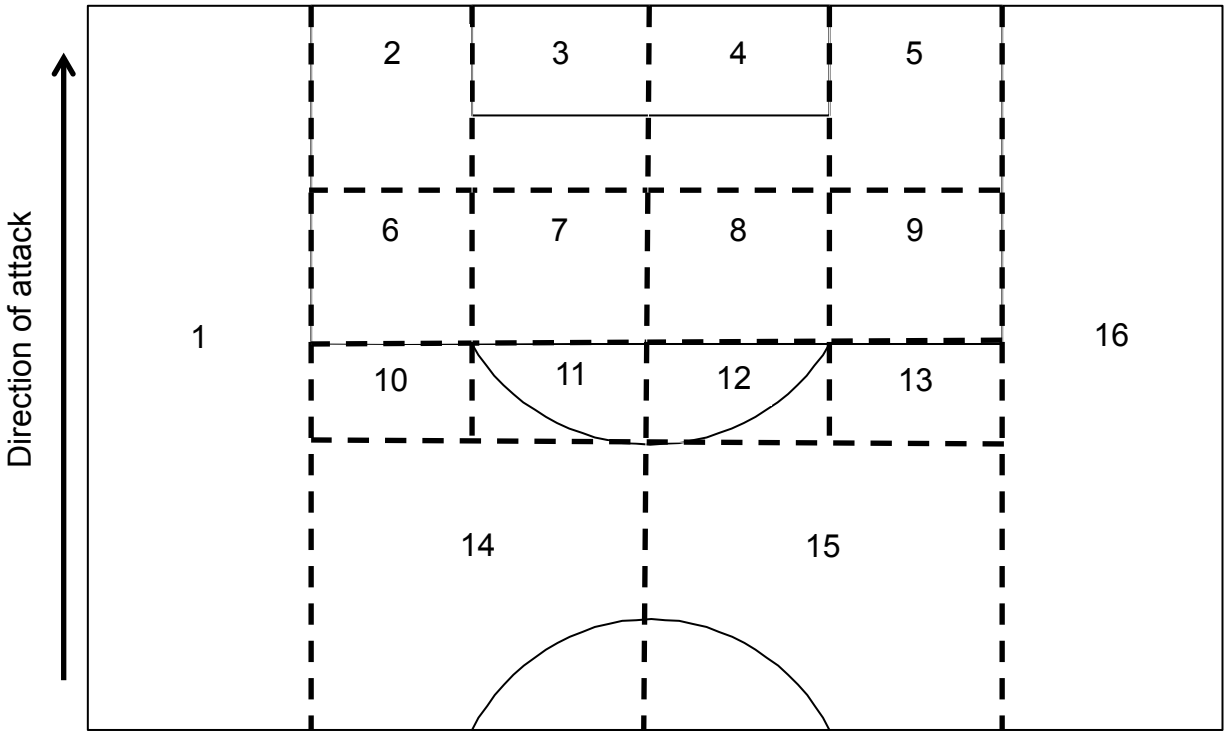



**Figure 2.** The pitch map used to assess the shot and goal locations during games, adapted from Wright *et al*., (2011); Gréhaigne, Mahut and Fernandez (2010) and Carling, Williams and Reilly (2005).

After all games were analysed, 4 weeks were left and 45-minute segments from 4 randomly selected games were recoded by a separate analyst to improve the inter-reliability (Wright *et al*., 2011). Any differences in the data were discussed and altered accordingly. The kappa test was conducted on 5 of the 10 variables within the study and produced ratings between 0.83-0.98. Scores >0.80 were deemed to be the acceptable limit for this study.

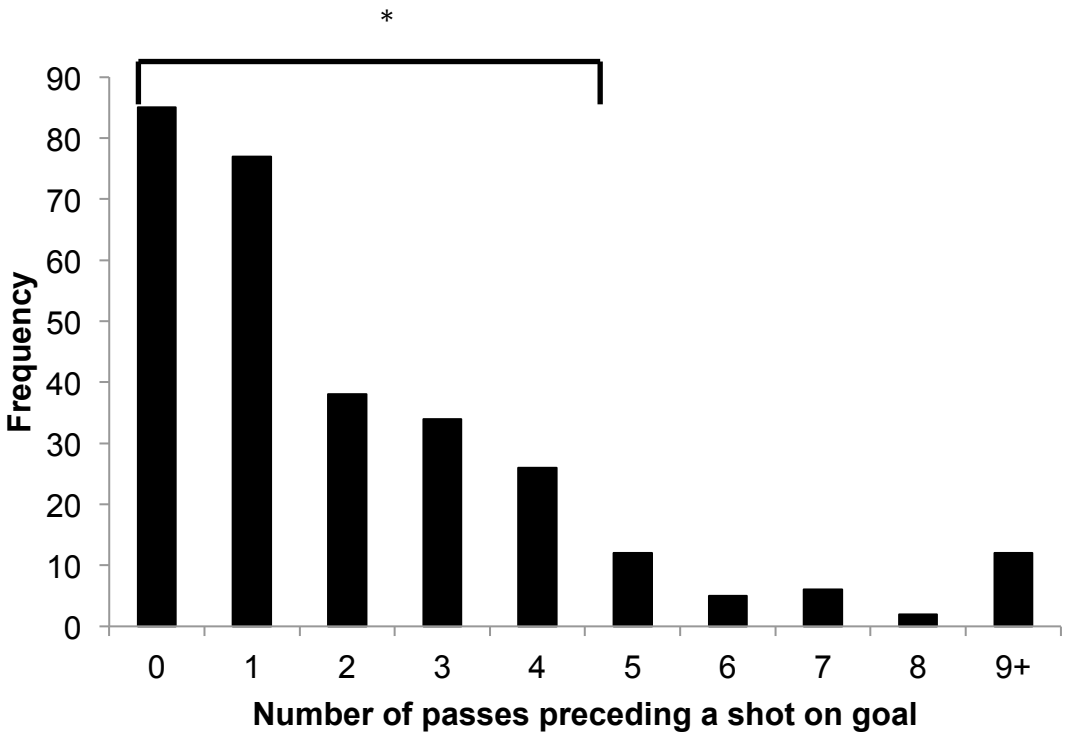
*Data Analysis*

All data was checked for normality using the Kolmogorov-Smirnov test. Once this was established the Friedman's test was deemed to be the most applicable in this study and was used to analyse variables that have 3 or more sub categories. If a significant result was found a Wilcoxon test was used as a post-hoc test to discover where the differences were found. For variables that have less than 3 sub categories either a Wilcoxon test or paired t-test was chosen, dependant on whether the data was parametric or non-parametric.

All analysis was conducted on SPSS v 20.0.0 (SPSS: An IBM Company, Armonk, NY) software with an alpha rating set at $p<0.05$.

**Results**

Figure 3. indicates the frequency of the number of passes used before a shot on goal is created. This highlights that 87.5% of shots came from ≤ 4 passes in the attacking possession, whereas 12.5% came from ≥ 5 passes. There was a significant difference between these two values ($Z = -3.924$, $p = <0.001$).




* Indicates a significant difference between the number of passes preceding an attempt on goal

**Figure 3.** Number of passes completed preceding a shot on goal.

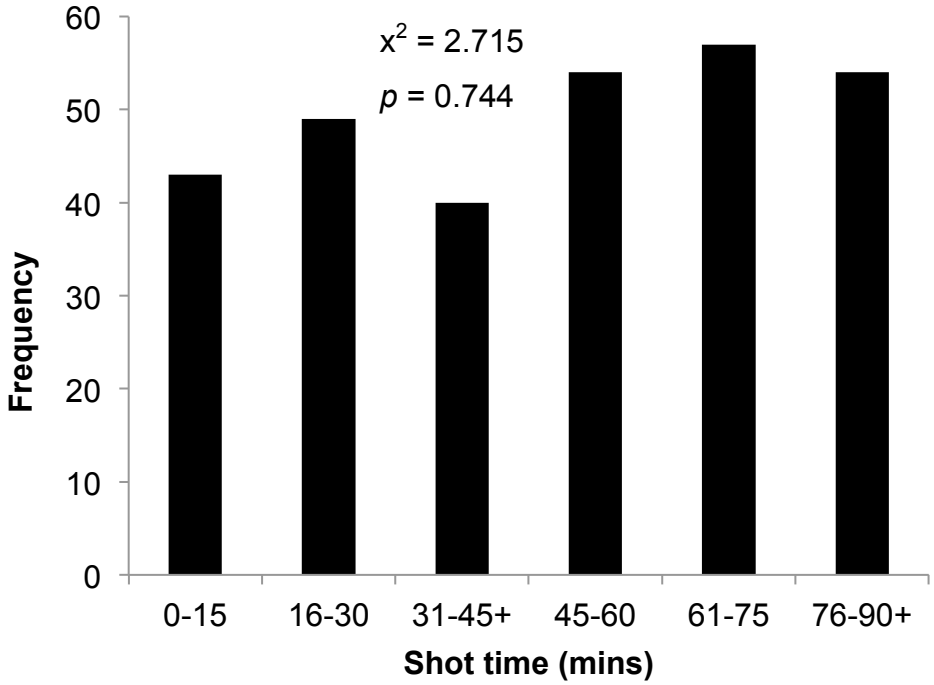



**Figure 4.** The frequency of when shots occurred during matches.

Figure 4. shows the breakdown of when shots on goal occurred most during a game. This yielded no significant difference ($x^2$ = 2.715, $p$ = 0.744) however this figure clearly shows more shots occurred during the second half.

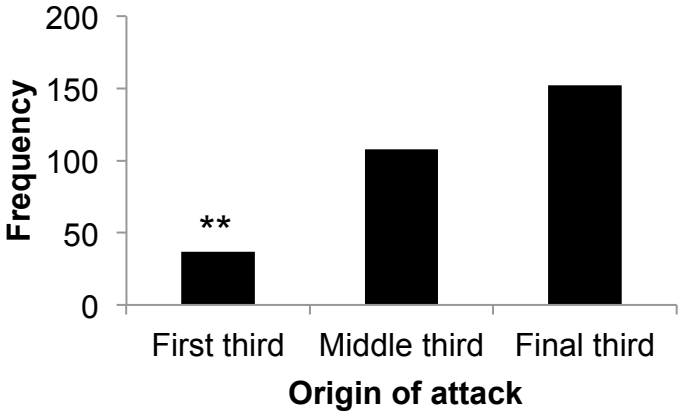
Figure 5. depicts during which half shots most often occurred in a match. This produced no significant difference statistically, however there is a clear difference in the totals, 132 shots in the first half (44.4%) whereas 165 shots were taken in the second half (55.6%).

Figure 6. highlights from which position on the pitch the origin of the attack started. This shows that more attacking possessions resulting in a shot on goal, originated in either the middle (Z = -3.461, $p$= 0.001) or final third (Z = -3.823, $p$ = < 0.001) compared to the first third ($x^2$ = 26.909, $p$ = < 0.001).

Figure 7. reveals the type of attack which was most commonly used in the build-up to a shot on goal, no statistically significant difference was found ($x^2$ = 6.210, $p$ = 0.102).

No statistical analysis was conducted on the shot outcome, the location of shot or type of shot regarding attacking possessions. However, it was found that 55.2% of shots were taken inside the area whilst 44.8% were taken from outside of the penalty area. The most common outcome was that the shots went wide (38.4%), this was followed by a shot being blocked (26%), saved or parried (22.9%) and hitting the woodwork (2%). Goals or own goals made up only 10.4% and 0.3% of attacking possessions respectively. Shots were most often taken with the right foot (54.2%) compared to the left foot (25.9%) or from headed attempts (19.9 %).

Table 1. shows the key variables and their sub categories, highlighting attacking possessions resulting in a goal. Two of the variables yielded significant results, passes
(Z = -3.094, $p$ = 0.002) where ≤ 4 passes produced more goals than ≥ 5 passes and shot location (Z = -2.346, $p$ = 0.019) where more goals were scored inside the penalty area compared to outside.




$x^2 = 26.909$

$p = < 0.001$

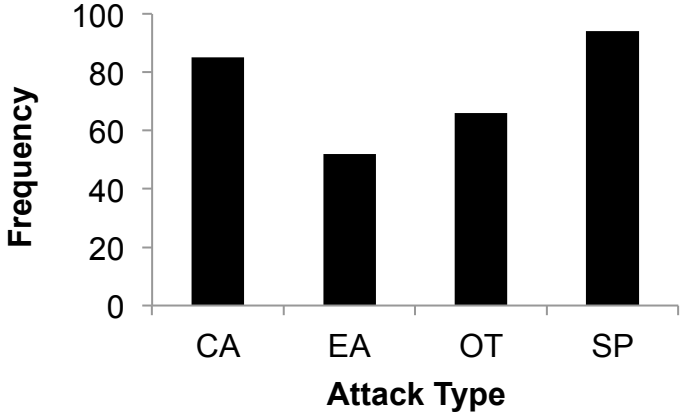
** Indicates the first third was significantly different to the other attacking origins.

**Figure 5.** The frequency of shots per half (45mins).


$Z = -1.424$

$p = 0.154$

**Figure 6.** The origin of attack for attacking possessions resulting in a shot on goal.




$x^2 = 6.210$

$p = 0.102$

**Figure 7.** The frequency and type of attack during possessions that lead to a shot on goal.

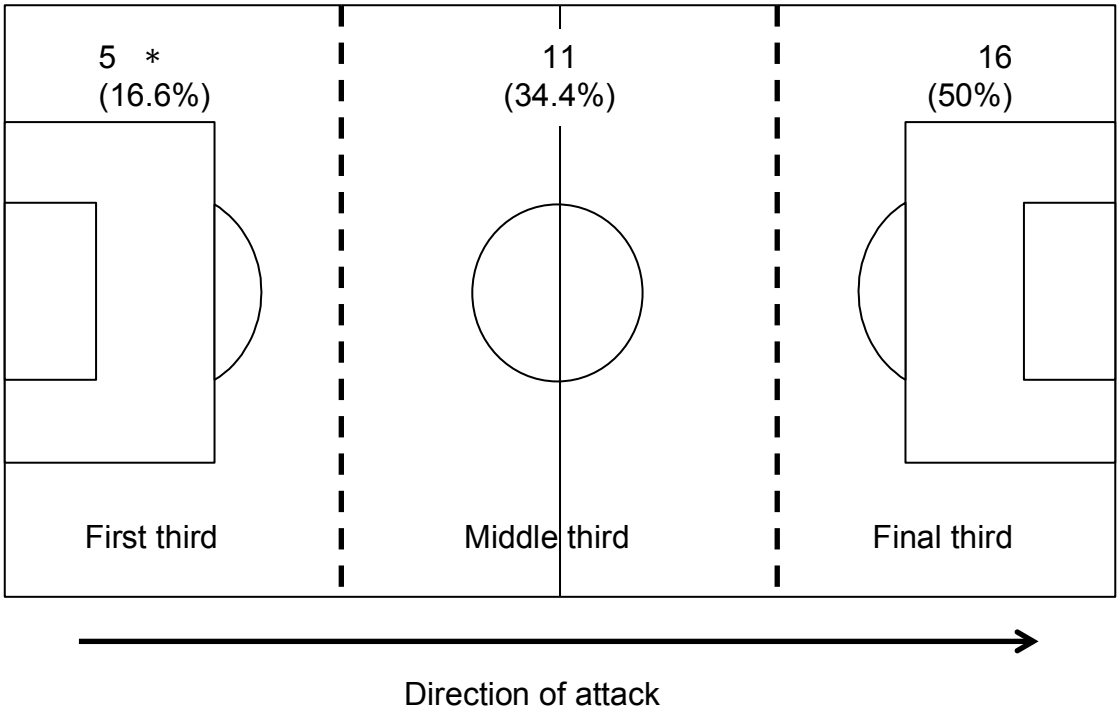
**Table 1.** Key variables and sub categories, highlighting the number of goals scored (N) and the percentages (%) for each action.

| Variable | Number of Goals (N) | Percentage (%) |
|---|---|---|
| **Passes** | | |
| ≤ 4 | 29* | 90.6 |
| ≥ 5 | 3 | 9.4 |
| **Goal Time (per half)** | | |
| 1st Half | 13 | 40.6 |
| 2nd Half | 19 | 59.4 |
| **Goal Time (mins)** | | |
| 0-15 | 3 | 9.4 |
| 16-30 | 5 | 15.6 |
| 31-45+ | 5 | 15.6 |
| 45-60 | 6 | 18.8 |
| 61-75 | 8 | 25 |
| 76-90+ | 5 | 15.6 |
| **Type of Attack** | | |
| Counter attack (CA) | 12 | 37.5 |
| Elaborate attack (EA) | 4 | 12.5 |
| Other attack (OT) | 10 | 31.25 |
| Set piece (SP) | 6 | 18.75 |
| **Shot Location** | | |
| Inside the area | 26** | 81.2 |
| Outside the area | 6 | 18.8 |
| **Shot Type** | | |
| Left foot | 12 | 37.5 |
| Right foot | 15 | 46.9 |
| Head | 5 | 15.6 |

* Significant difference between ≤ 4 passes and ≥ 5 passes ($p$ = 0.002)

** Significant difference regarding shot location ($p$ = 0.019).

Figure 8. Segments used to define where the origin of attack started. Significantly more goals scored originated within the middle (Z = -1.927, p = 0.054) and final (Z =- 2.726, p = 0.006) thirds compared to the first third of the pitch ($x^2$ = 6.255, p = 0.044).




* Significant difference compared to middle and final thirds (*p* = <0.05).

**Figure 8.** The number and percentages regarding origin of attack during possessions that resulted in a goal.

## Discussion

The aim of this study was to identify the patterns within the attacking possessions leading up to an attempt on goal within League 1 men's soccer. Concerning the four predictions made at the outset of the study, three were confirmed to be correct, with significant differences in shots on goal coming from ≤ 4 passes (Z = -3.924, *p* = < 0.001) as well as more attempts on goal ($x^2$ = 26.909, *p* = < 0.001) or goals scored ($x^2$ = 6.255, *p* = < 0.05) originating in the final and

middle thirds of the field compared to the first third. Although more goals were scored in the second half of play (59.4%) no significant difference was found. The final hypothesis turned out differently, as set pieces created the most attempts on goal rather than counter attacking play as previously suggested.

Passing is a key component within soccer and the efficiency of an attack is often due to players successfully passing the ball to each other in order to create space and goal scoring opportunities (Janković *et al*., 2010). Previous studies regarding passing sequences suggest that a greater proportion of attempts on goal occur from ≤ 4 passes (Acar *et al*., 2009; Hughes and Franks, 2005; Kirkendall, Dowd and DiCicco, 2002). These papers found that between 77 to 80% of attempts came from ≤ 4 passes, this is slightly different to this current study as 87.5% of attempts on goal came from passing sequences of ≤ 4 passes. Similar findings were recorded regarding goals scored from ≤ 4 passes. Research found that within the old English 1st Division, FA Cup, League Cup, World Cups (1990 and 1994) and the current English Premier League generally 80-85% of goals (Wright *et al*., 2011; Hughes and Franks, 2005; Reep and Benjamin, 1968). Whereas in this current study the figure was slightly higher, with 90.6% of goals coming from ≤ 4 passes. The difference seen between goals scored and attempts on goal, from ≤ 4 passes, within this study compared to other literature could be partially due to the standard of competition, tactics or playing style (Wright *et al*., 2011; Kannekens, Elferink-Gemser and Visscher, 2009). By having adopting a direct style of play, more shots would result from shorter passing sequences (Hughes and Franks, 2005). Teams that take part within competition at International or top National level, generally have longer passages of play as they adopt a more possession based style of play (Hughes and Franks, 2005) and this would explain the slight difference within the values.

Tenga *et al*., (2010b), Hughes and Snook (2006) and Hughes and Franks (2005) suggest that the longer styles of passing (> 5 passes) were more effective in terms of scoring goals compared to smaller passages of play, ≤ 2 passes. However this is dependent on the team's ability and is limited in its capacity to work for every team (Tenga and Sigmundstad, 2011; Hughes and Franks, 2005). Therefore further research is still needed within this area, as there seems to still be conflicting research regarding passing sequences within the modern era. A larger sample size would be beneficial, as soccer has changed dramatically over the past 45 years since the initial and largest study conducted by Reep and Benjamin (1968) (Kuhn, 2005).

Wright *et al*., (2011) and Millar (1994) state that teams should apply pressure within the defensive third of the opposition territory, to force turnovers of possession, as this creates more goal scoring opportunities and indicates the importance of utilising possession in the final third when attacking. Research by Tenga *et al*., (2010a) supports this, as more attacks originated within the final third (Tenga *et al*., 2010a). Similar findings were recorded in Acar *et al*., (2009) and Kirkendall, Dowd and DiCicco (2002) where 88% and 83% of goals scored originated within the final third of the pitch respectively. This current study correlates to literature as 87% ($p < 0.001$), and goals scored, 84.4% ($p < 0.05$) originated in the middle or final thirds compared to the first third and also matches the hypothesis. Although research states that yielding a high number of attacks from the more advanced positions is dependant on a number of factors (Wright *et al*., 2011; Lago, 2009; Pollard, 2006). Fitness levels of players is required to be high, as attackers pressing high up the pitch expend a greater amount of energy (Wright *et al*., 2011). In addition location of the game and tactics also reflect how many attacks start in advanced positions, as teams that play away from home generally defend in a deep position and counter attack when possession is regained (Lago, 2009; Pollard, 2006). This

current study supports literature in that longer attacking possessions are more difficult to score from, and that counter attacking play along with short passing sequences create imbalances within the opposition defence and yield more attempts on goal (Tenga and Sigmundstad, 2011; Bergier, Soroka and Buraczewski, 2008).

Research suggests that goal scoring seems to be a time dependant element within soccer (Abreu, 2011; Armatas, Yiannakos and Sileloglou, 2007b; Abt, Dickson, Mummery, 2002). This could be due to defenders covering as much as 20% less ground in the last 15 minutes of the game compared to the first 15 minutes of the game, whereas attackers aren't affected to the same extent (Bradley *et al*., 2009). In addition, during the progression of the game, fatigue builds up exponentially and causes a decrease in performance and ability to make effective decisions (Catteeuw *et al*., 2010; Krustrup, Mohr and Bangsbo, 2002), this therefore benefits the attacking players as more space is created for them to utlise and create more goal scoring opportunities (Ensum, Pollard and Taylor, 2005). These reasons listed above may therefore indicate why, in general, more goals are scored in the second half of a game compared to the first (Armatas, Yiannakos and Sileloglou, 2007c; Yiannakos and Armatas, 2006; Kirkendall, Dowd and DiCicco, 2002).

To illustrate this further, Armatas *et al*., (2009), Yiannakos and Armatas (2006) and Kirkendall, Dowd and DiCicco (2002) found that 58.9%, 57.4% and 77% of goals occurred in the second half of a game within the European 2004 championships and 1998 World Cup respectively. Armatas, Yiannakos and Sileloglou (2007c), also found similar results, however, it appears that the number of goals scored in the second half decreases with each tournament, as 60.8%, 59% and 52.5% of goals came in the second halves within the 1998, 2002 and 2006 World Cup competitions. The current study correlates to the research already stated, as 59% of all goals were scored in the second half of play. No significant statistical

difference was obtained when comparing goals scored in the 1st and 2nd halves of play. Similar findings were recorded regarding attempts on goal, see Figure 5., as 55% of shots came from the second period of play. Again, this result wasn't statistically significant.

Most research indicates that the final 15 minutes of the game is the most prolific time for creating an attempt on goal or scoring (Armatas and Yiannakos, 2010; Armatas *et al*., 2009; Armatas *et al*., 2007b; Jinshan *et al*., 1993). However this current study contradicts research as the most attempts and goals came between minutes 61-75. This matches findings from Abt, Dickson and Mummery (2002) and Jinshan (1986). Both suggest that the final 30 minutes of the game produce the highest frequency of attempts and goals. The reasoning for this is, as previously stated, thought to be due to fatigue and poor decision making as a result of the fatigue (Catteeuw *et al*., 2010; Krustrup, Mohr and Bangsbo, 2002).

Studies have regularly analysed the method by which goals were scored (Wright *et al*., 2011; Armatas and Yiannakos, 2010; Tenga,*et al*., 2010a; Tenga, 2009; Lucceshi, 2001). However within these studies only a few variables were highlighted. Tenga and Sigmundstad (2011), Tenga *et al.*,(2010a) only analysed elaborate attack vs counter attack. Armatas and Yiannakos (2010) highlighted these areas and included set pieces as another variable and Wright *et al*., (2011) also looked at the areas stated previously and included a category for any events that didn't fall into the previous variables. Therefore cross comparisons of studies regarding attacking types is often difficult to gauge, due the types of study design, variables and definitions used (Tenga and Sigmundstad, 2011).

The variables used within this study were based around Wright *et al*., (2011), as they were viewed to be more detailed and relevant, as not all attempts on goal can be categorised into the three variables often used (Wright *et al*., 2011).

Most attacks resulted from a set piece (31%), which matched research by Armatas and Yiannakos (2010), Taylor, James and Mellalieu (2005), Williams and Reilly (1999), Grant, Williams and Reilly (1998) and Jinshan *et al*., (1993), who all found between 27 to 32.6% of attacks came from this variable. This however yielded no significant difference ($p$ = > 0.05) and didn't relate to the hypothesis, counter attacking play wasn't the most common method of attack.

Significantly more goals were created within the penalty area ($p$ = 0.019), as 81.2% came from this position. Wright *et al*., (2011), Acar *et al*., (2009) and Yiannakos and Armatas (2006) found that 77%, 79% and 79.6% of goals were scored inside the penalty area in the English Premier League, World Cup and European Championships respectively. The increased amount of shots in the penalty area were found to be more effective. Not surprising perhaps, as skilled players can place shots nearer the posts and out of the goalkeepers' reach, therefore becoming more efficient than shots outside the area (Michailidis *et al*., 2004). However a much lower figure was recorded for attempts on goal, 55.2%, and yielded no significant difference.

This current study has some practical implications on performance within the Npower League 1 competition, however individual team tactics and playing styles may vary, and should be considered when applying the results from this study. In addition, the small sample size should also be considered. The primary factor for coaches to implement should be increasing the players' fitness in order to limit the decline in performance towards the end of the game. This should be coupled with utilising short attacking play combinations of ≤ 4 passes, in the form of either set pieces or counter attacking play to create an imbalance within the oppositions' defence so that players can use the space created by these forms of attack. Finally teams should aim to deliver the ball into the penalty area to create more goal scoring opportunities, and increase the likelihood of scoring. Further investigation within League 1 men's

soccer should be conducted over the course of a season, so that seasonal averages can be obtained. Effective attacking possessions, must combine the key factors explored within this study.

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**Appendix 1.**

The definitions and sub categories selected for the hand notational system.

| Variable | Definition | Sub-category |
|---|---|---|
| Passing sequences | A deliberate attempt to get the ball to player on same team, which is received (successful) or is intercepted/ out of play (unsuccessful) (Redwood-Brown, 2008). | 0,1,2,3,4,5,6,7,8,9+ (Reep and Benjamin, 1968) |
| Origin of attack | Where the possession begins that results in an attempt. (Tenga, Ronglan, Bahr, 2010c). | First, middle and final third, see Figure 1. (Tenga, Ronglan, Bahr, 2010c) |
| Type of attack | *CA* - The creation or utilisation of imbalance within an opposition defensive line, just after they had been attacking, this is a quick process (Tenga, Ronglan, Bahr, 2010c).<br>*EA* - Indirect style of play and involves lots of short passes (Armatas, Yiannakos, 2010).<br>*SP* - Corner, throw-in, free-kick or penalty (Armatas, Yiannakos, 2010).<br>OT - Any type of play where the ball changes possession quickly from the following: interception and quick shot occurs, a rebound, when the ball comes back into play off the post, from the goalkeepers save, hitting the | Counter (CA), elaborate (EA), set pieces (SP) and other (OT) (Tenga, Ronglan, Bahr, 2010c; Lucchesi, 2001). |

| | | |
|---|---|---|
| | woodwork, or a blocked attempt with an immediate shot after (Wright *et al*., 2011). | |
| Location of shot | The area of the pitch where the attempt on goal took place. (Kirkendall, Dowd and DiCicco, 2002). | See Figure 2. |
| Shot inside/ outside of area | Inside the area - The shot took place within the penalty area, excluding the D (Bergier, Soroka, Buraczewski, 2008).<br>Outside the area - The shot took place anywhere outside the penalty area (Bergier, Soroka, Buraczewski, 2008). | In or Outside the penalty area (Bergier, Soroka, Buraczewski, 2008). |
| Shot / Shot type | An obvious attempt on goal using either right/left foot or head (Kirkendall, Dowd and DiCicco, 2002; Carey, 2001). | Left/ right foot, headed shot (Kirkendall, Dowd and DiCicco, 2002). |
| Shot time (mins) | The frequency of when the shots took place in the game (Armatas *et al*., 2009). | 1st 45mins and 2nd 45mins.<br>0-15 16-30 31-45+ 45-60 61-75 76-90+ (Armatas, Yiannakos, 2010; Armatas *et al*., 2009). |
| Shot Outcome | B - The action of the goalkeeper stopping a shots without the keeper | Blocked (B), saved (S), parried (P), wide (W), hit |

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| | using their hands or the defender stopping a shot legally where there are other players behind the person blocking (adapted from: FIFA, 2012; Venatrack, 2012; Opta, 2011).<br>S - When the goalkeeper uses their hands and either catches or tips the ball around the posts and the ball goes out of play (adapted from: Venatrack, 2012).<br>P - When the goalkeeper uses an open hands to stop the ball and pushes the ball away from the goal, however the ball stays in play (Venatrack, 2012)<br>W - When a shot is taken and goes wide of the goal and out of play or misses the goal altogether (Opta, 2011)<br>HW - When a shot taken hits the goalposts or bar and either rebounds back into or out of play (Venatrack, 2012).<br>G - When the whole of the ball crosses the line between both posts and under the bar from the attacking team (FIFA, 2012).<br>OG - The act of the ball crossing the line between both posts and under the bar, eg scoring a goal that increases the opponent's score tally (FIFA, 2012; Venatrack, 2012). | woodwork (HW), goal (G) and own goal (OG) (FIFA, 2012; Venatrack, 2012; Opta, 2011). |

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| Location of goal scored | The area of the pitch where the shot resulting in a goal took place. (Kirkendall, Dowd and DiCicco, 2002). | See Figure 2. |
| Shot to goal ratio | The number of shots taken before a goal goes into the net (Reep and Benjamin, 1968). | For example shot: goal. (Reep and Benjamin, 1968). |
| Time of goal scored (mins) | Time period that the goal goes into the net (Armatas, Yiannakos, 2010). | 1st 45mins and 2nd 45mins.<br>0-15 16-30 31-45+ 45-60,61-75,76-90+ (Armatas, Yiannakos, 2010; Armatas *et al*., 2009). |
| Defence type | Distance between the player with possession of the ball and pressing opponent and moment of winning, receiving or shooting the ball (Tenga, Holme, Ronglan and Bahr, 2010a).<br>Balanced - when 1 defender is closer than 1.5m from the player with possession (adapted from O'Donoghue *et al*., 2012; Tenga, Holme, Ronglan and Bahr, 2010a).<br>Imbalanced- when the defender is further away than 1.5m from the player with possession (adapted from O'Donoghue *et al*., 2012; Tenga, Holme, Ronglan and Bahr, 2010a). | Balanced and Imbalanced (Tenga, Ronglan and Bahr, 2010c). |