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An investigation into the creation of goal scoring opportunities in Women's International Football; And a comparison to Men's International Football

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An investigation into the creation of goal scoring opportunities in Women's International Football; And a comparison to Men's International Football

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ABSTRACT

Football is the most popular sport in the world, played in over two hundred countries and it is governed by the *Fédération Internationale de Football Association* (FIFA), who host a World Cup every four year for both men and women. Women's football is growing in terms of popularity, with this growth in popularity, research into the women's game has begun to emerge. However, to date there is very little published research in women's football that describes effective attacking strategies and the creation of goal scoring opportunities (GSO). Video of each match (52) from the Women's World Cup (Canada 2015) was analysed to assess the factors related to the creation of GSO that lead to success at the World Cup. The results revealed that the middle third of the pitch was the most effective area for gaining possession and creating GSO at Canada 2015 and that the time taken to create a GSO at Canada 2015 was just under twelve seconds. Furthermore, analysis was undertaken of the (24) matches of the Top 4 performing teams at the Men's World Cup (Brazil 2014) so that the GSO of the Top 4 Men's teams could be compared to the Top 4 Women's teams. The results reveal a number of similarities and differences between men and women when it comes to the creation of GSO at international football tournaments. The findings of the study can be used to influence players and coaches to design training sessions and interventions to successfully create GSO in women's football. The data from the research may influence the tactical and technical set up of women's international football teams and help to evolve the game in the same way that research into the men's game has.

DECLARATION

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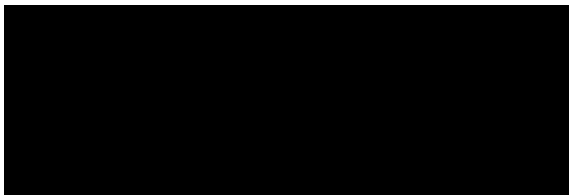
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Finally, I need to thank my family.

The last few years have not been without their challenges, without your unwavering support this would not have been possible at all. I hope that the sacrifices you made to help me along the way pay dividends in the future. I'll forever be grateful.

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CHAPTER 1: INTRODUCTION

The following chapter introduces the background to the study, the purpose, intent and significance of the research to cater for the lack of research into women's football and goal scoring. It also outlines the research questions, limitations and delimitations of the study.

1.1 BACKGROUND TO THE STUDY

Football is the most popular sport in the world, played in over two hundred countries with two hundred and fifty million players. The sport is governed by the *Fédération Internationale de Football Association* (FIFA) who host a World Cup every four year. There are two separate tournaments held, one for the men and one for the women. To achieve success in football is impossible without the ability to score goals, as the team who scores the most goals wins.

Women's football is growing in terms of popularity and is becoming an internationally competitive sport. With this growth in popularity, research into the women's game has begun to emerge [1-4]. To date there is very little published research in women's football that describes effective attacking strategies and the creation of Goal Scoring Opportunities (GSO) in women's football. In contrast, there has been extensive research in the men's game into the creation of GSO as the creation of GSO is related to greater success [5-12].

Using Notational Analysis (NA), investigations into how GSO are created have been undertaken in the literature in men's football. NA is the study of patterns, strategy and tactics in team sports and allows for the collection of successful patterns of play to be identified and utilised in training to improve performance. NA has been extensively used in previous research in Performance Analysis (PA) in football due to the simplicity and reliability of NA

methodologies. However, as there are multiple differences in the tactical, technical and physical attributes of men's and women's footballers, it could be hypothesised that there are also differences between the two sexes in the creation of GSO [3]. The attacking strategies leading to GSO that have been shown to be effective in men's international football may not be appropriate or effective when applied to the women's game. For example, research suggests that a large proportion of goals scored in men's football were the result of set plays (free kicks and corner kicks) [13-17]. PA in women's football needs to be undertaken to explore whether GSO in women's international football are similar to their male counterparts.

A previous study by Alcock [1] in PA in women's football has described set plays that contribute to goal scoring. An analysis of direct free kicks in the 2007 Women's World Cup reported on the outcome of each free kick taken at that tournament. Information on shot placement, ball flight time and position were recorded with the study finding that only 7 free kicks out of the 71 directed at goal for the tournament were scored. Another study from Alhoff, Kroiher & Hennig [18] compared the playing behaviour difference between men and women in international football using NA. The study looked at 26,000 player actions from the final stages of the 2002 men's World Cup and the 2003 women's World Cup. This was done by using video analysis to localise the position of the action on the pitch. The study found gender differences in kicking technique, movement characteristics and ball actions (dribbling, short pass, long pass etc.). Positively, the data collection and presentation of the results for the study are an example of the kind of NA research that is abundant in the previous literature in men's international PA research. [2, 13-15, 19-24]. However, the information regarding free kicks is not applicable to the creation of GSO from open play and it's not known if these gender differences in kicking technique, movement characteristics and ball actions influence different strategies in creating GSO.

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Previous research in men's football has used NA to investigate GSO in men's football in club and international tournaments [13, 17, 21, 25-27]. It may be easy to draw conclusions about the GSO created in international football and apply the findings to both men's and women's football [13, 17, 26-30]. However, research has demonstrated differences in the men's and women's game and this would likely indicate differences may also occur in how women create GSO.

In a recent review Mackenzie & Cushion [31] highlighted the lack of specific contextual information and variables assessed in NA studies (i.e. where on the pitch actions were performed). A lack of contextual information can affect the applicability of the results of these studies because they don't provide the player or coach with the specific game related insight that they need to make a change to their individual or team performance. The situational and interactional contexts, in which performances occur, are the kind of information that coaches, and players are most interested in [24, 31]. It is important therefore to investigate how opportunities to score are created and how goals are scored. Providing contextual information about 'where', 'when' & 'why' GSO are created and then displaying that information in a clear, concise and accessible way, may help players and coaches and cater for different learning styles and alleviate any issues associated with players speaking a different language to their coach [32, 33].

Research by Mujika, Santisteban, Impellizzeri & Castagna (2009) showed that female football players possess less physical capability than their male counterparts and that coaches should adapt their match strategy according to the physical capabilities of the players available [34]. This indicates that if coaches are adapting their match strategy according to

differences in physical capabilities, this may also affect the way GSO are created between the sexes. Abundant research has been undertaken to compare the two sexes, common areas of research comparing men and women involve the biomechanics of football [35-39], the kinematic differences between males and females [40-45], psychological differences between male and female athletes [46, 47], differences in nutritional demands [48, 49] and physical fitness differences between men and women [34, 50, 51]. With all these aforementioned differences between men and women researched and published, it is possible to hypothesize that there are also differences between how men and women create GSO in international football.

Research into women's international football and specifically in the creation of GSO is an area of the literature that needs further exploration. It is suggested that differences exist between men's and women's international football teams, so this should be examined, as international football is perceived as being the pinnacle of the game and draws the largest audience in terms of fans globally and is emulated by players at lower levels of competition. Therefore, the aim of this research was to investigate GSO for women's international football, by comparing the successful and unsuccessful teams and then comparing the successful women's teams to the men's teams. These results may provide insight for players and coaches of women so that they can design specific training to focus on the creation of GSO and scoring the goal.

1.2 PURPOSE OF THE RESEARCH

The aim of this research is to undertake analysis of GSO in international women's football that occurred at the Women's World Cup in 2015. The study will investigate GSO to assess the factors related to the creation of GSO as well as possible patterns that lead to ultimate success at the tournament. The study will provide thorough analysis of the zones of

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possession gain, the time in possession of the ball in the build-up to a GSO, the method of recovery of possession and the type of GSO. It will also determine the differences between successful and unsuccessful teams in the 2015 tournament. Additionally, the Top 4 Men's and Women's teams from World Cup 2014 & Women's World Cup 2015 will be used as a case study to investigate the differences in GSO in Men's and Women's teams.

1.3 SIGNIFICANCE OF THE RESEARCH

This study will be the first of its kind to provide comprehensive findings into goal scoring in international Women's football. The research will investigate whether there is a difference between successful and unsuccessful teams in Women's international football. This research will add to the lack of research into Women's football and in particular, PA in Women's football. The research will investigate whether there are zones on the pitch that GSO arise from, the time taken to create a GSO, how possession is gained in the build-up to the GSO and what type of GSO are created in Women's international football. Finally, a comparison will be made between the Top 4 Men's international teams and their female counterparts. To date, no research in football in GSO has compared the two sexes.

1.4 RESEARCH QUESTIONS

1. From which Zones on the pitch do GSO/goals originate from at the Canada 2015 tournament?

2. How long does it take to create a GSO in Women's international football?

3. What are the types of Possession Gain to create GSO in Women's International Football?

4. What are the types of GSO created in Women's International Football?

5. What are the differences between successful/unsuccessful teams regarding Zone of Possession Gain at the tournament?

6. What is/are the difference/s in terms of the creation of GSO between the top 4 Men's teams from the 2014 World Cup & Women's teams from the 2015 World Cup?

1.5 HYPOTHESES

Based on the previous research in men's football it was expected that:

1. GSO originate in the attacking third of the pitch, close to the opponent's goal [52].

2. GSO are created in <15 seconds in open match play [53] .

3. A tackle or high pressure (THP) is the most common method to gain possession to create a GSO [52].

4. Crossing the ball is the most common method to create GSO in Women's International Football [54].

5. Successful teams win more possession in the attacking third of the pitch than unsuccessful teams to create GSO [52].

6. Men's Top 4 teams would regain possession in the attacking 1/3 more than the Women's Top 4 teams and take less time to create a GSO.

1.6 LIMITATIONS & DELIMITATIONS

Limitations

All match videos were obtained from the official match broadcast on free-to-air television which was telecast here in Australia. The aim of the broadcast is to make the match an enjoyable experience for the viewer which made notation difficult on occasion due to camera angles and replays that hindered analysis. Video that was not obtained from the SBS broadcast was downloaded from the Wyscout platform, which used the same match video that was available to on free-to-air television, only with different commentators.

Delimitations

There were several delimitations to the research that deserve consideration. The focus of the research was women's football and the games are from the World Cup, which is considered the peak of international football were chosen for analysis. This means that the findings may not be applicable to league or grassroots football competitions due to the differences in the standard of competition. In the analysis the top 4 teams were classified as successful and the remaining women's teams were classified as unsuccessful. The number of matches played at the tournament by the successful and unsuccessful teams also needs to be taken into consideration. Teams that failed to qualify from the group stage of the tournament played in less games than the Top 4 teams at Canada 2015.

The comparison of the Men's and Women's teams were delimited to the Top 4 teams at the World Cups. Penalty shoot-outs were not analysed for the study due to the fact they occur in isolation from match play and are used to determine a winner when matches are drawn after

extra time. It is also important to consider the effect that a team's tactics from match to match may affect the results of the study. Match context (whether a team is winning, drawing or losing) may affect the way a team creates GSO. Situational variables such as players sent off, goal difference in the group stage etc. may also affect the applicability of the results.

CHAPTER 2: REVIEW OF THE LITERATURE

2.0 INTRODUCTION

This chapter provides a thorough examination of the previous literature that influenced the study design for this thesis. The chapter reviews the origin of PA & NA in football, research that has made a comparison of teams from different tournaments in Men's football and GSO, areas of previous research into Women's football and GSO as well as highlighting the appropriateness of a contextual approach to research design in PA. It also highlights some of the other areas of research in which male and female footballers and athletes have been compared.

2.1 THE ORIGIN OF PA & NA IN FOOTBALL

PA and NA and the integration of video feedback has become very common in football and is utilised to measure performance [55]. PA is the study of strategy, tactics and patterns of play. NA in football is the science of observing and recording events during match play and training. Combined, both PA and NA are utilised in football to provide accurate and precise feedback and have become central to the improvement of an individual and teams performance, as well as being used to analyse future opposition in preparation for upcoming matches [55, 56].

PA in football can be traced back to the pioneering work of Charles Reep, who began to develop his notational analysis (NA) system as a spectator at a match between Swindon Town and Bristol Rovers on March 18, 1950. Reep started to take notes with a pencil of passing movements in his notebook at the matches he attended and, in the years that followed, began to see how the information he was collecting could be used to plan tactics and analyse performance [57]. Reep's work of taking notes on movement of players, attacking strategies, passing movements and tactics was one of the earliest recorded forms of NA. Reep's system

broke the game down into a series of passing movements, with each discrete action allocated its own shorthand code. From his NA of games, Reep was able to analyse the performance of teams and provide insight and feedback to players and coaches, providing some of the first recorded examples of PA in professional sport. Reep analysed over 2500 games, with the system being utilised for over 50 years. Reep contacted the coach of Wolverhampton Wanderers, Stan Cullis in August 1951 to offer his services of weekly performance feedback. Coincidentally this coincided with the most successful period in the history of Wolverhampton Wanderers, who were first division champions 3 times in the 1950s. After retiring from the RAF in 1955, Reep became the first performance analyst in football, taking up a position with Sheffield Wednesday. He was also the first person to publish a football paper in a statistical journal [58]. Reep's work predated any other published attempts to analyse and notate performance in football by at least two decades [57].

This original work has led to significant increase in the amount of PA research in recent years [59-63] mainly because of the continued development of digital video and computers in addition to complex design but user-friendly software, e.g. SportsCode (Hudl, Lincoln, NE, USA). Most of the research has focused on GSO in football and has expanded to other sports such as hockey and rugby in an attempt to analyse successful attacking strategies and the creation of GSO at various levels [13, 64-76]. The reason for the main focus on GSO is that goal scoring is very important for team success and therefore previous studies have attempted to determine the most effective way of scoring goals [77, 78]. All this significant research was conducted in Men's football only.

2.2 THE INVESTIGATION OF GOAL SCORING IN PA IN TEAM SPORTS

The investigation of the variables in sport that contribute to success is a common area of research in PA, particularly, the investigation of how teams score goals and/or points. This research is popular in a sporting context as the findings of this type of research may be utilised to improve team performance by athletes and coaches. Research from other sports into goal or point scoring has either tried to look at the creation of opportunities to score in a dynamic system or has concentrated on the isolated technique of kicking/shooting required to do so.

Goal kicking in rugby union has been investigated by numerous authors hoping to understand the complexity of goal kicking from penalty kicks and try conversions [79, 80]. Researchers have sought to break down the action of goal kicking in rugby union to investigate the effect of; the distance and angle from which the attempt is made to kick a goal, the time the kicker takes in their routine to attempt the kick and situational (match context) pressure that the kicker is under when attempting the kick. This is because the success of a team is often dependent on the effectiveness of their goal kicker, with research from the International Rugby Board (IRB) indicating that up to 60% of points scored in international rugby matches are from goal kickers [79].

Analysis into the abridged format of rugby union, known as rugby sevens has started to emerge, owing to the increase of the profile of the game internationally and the debut of the sport at the 2016 Olympic Games. Researchers have sought to examine the movement patterns of players to better understand the successful strategies employed in the new format of the sport [81, 82]. Due to the tournament format and expansive nature of the sport, the researchers sought to investigate the tactical approaches and performance indicators

associated with success, finding that there were several indicators that discriminated between successful and unsuccessful teams which when applied to monitor and compare performance, could assist coaches in developing strategies to increase a team's performance and score points [81, 82].

The relationship between success and team performance indicators has also been investigated in other sports. One example is a study into the match outcome of teams in the Australian Football League (AFL) using performance indicators, utilising the commonly measured and reported performance indicators in the sport (inside 50's, clearances, possession, kicks, goal conversion etc.) and then compared them to the match outcome (win/loss) [83]. This was to ascertain whether there were significant differences between successful and unsuccessful teams in the aforementioned performance indicators. The research found a significant difference in the percentage of kicks and goal conversions between the successful and unsuccessful teams, as well as other winning performance indicator profiles that may feasibly provide a comparative use in the field for coaches and analysts when it comes to scoring in AFL [83].

Hockey is another sport utilising PA to investigate goal scoring, with NA being utilised to investigate tactical and technical indicators leading to the creation of an opportunity to score. Researchers have sought to identify the key performance indicators that lead to ultimate success in hockey, with previous researchers investigating the patterns of play that resulted in goals from open play in women's international hockey [84]. Phases of play leading to the goal being scored, the passing patterns and zones involved in the build-up were all investigated to ascertain the indicators of team success. It was found that repossession of the ball in the attacking half, from outside the D (penalty area) and from a free hit or from

interceptions was the most successful way to score goals in international women's hockey. Time in possession was also found to be an influencing indicator of success as the closer to goal possession was gained resulted in less time for the opposition to organise a defensive effort [84]. This research implied that coaches should practice and encourage styles of play that lead to quick repossession of the ball high in the opposition's half, the offensive play area of the field.

2.3 PA IN FOOTBALL

Owing to its popularity, football is one of the most commonly researched sports in PA with researchers seeking to identify variables in football that positively or negatively affect match outcome. Researchers have recognised the importance of goal scoring and have sought to understand the attacking strategies leading to the creation of opportunities to score goals. Researchers have investigated the relationship of variables such as time, zone and possession with ultimate success in league, cup and tournament football across the globe.

2.3.1 GSO IN FOOTBALL

A critical review of PA in Football was undertaken in 2013 and a number of reasons were given when proposing an alternative research perspective to some of the previously established research methodologies used since the inception of PA in football [55]. The primary reason for providing feedback with PA is to provide information to individuals to improve understanding and modify behaviour in a sporting context. If that individual can retain information effectively, their future behaviours and performance levels should be improved. However, this is where a disconnect between theory and practice has been found, as previous research suggests that feedback may only be advantageous if the individual understands what has been presented to them and can interpret the new information correctly. The review raises concerns with research driven to predict successful future performance, citing that there are inherent problems with investigating the multifaceted and often uncontrollable phenomenon that is football [55].

It has been suggested that researchers should be able to provide clear rationales for undertaking their research to illustrate its value and potential to further understand performance and influence professional practice [55, 56]. Whilst there has been research

undertaken on GSO in football many of the studies were limited in their analysis and variables recorded, which limits the context and therefore the meaningfulness and practical application to coaches. A critical review of PA in football highlighted the lack of context in previous research, indicating little attention given to the applicability of the performance variables investigated. It could be argued that in previous research, some variables have been measured because of availability rather than to develop a deeper understanding of the subject matter, and with little real world application [55].

A study from 2014 sought to address the lack of context in some of the scientific literature by investigating the effect of match location, match status and the quality of opposition in the 2011-2012 Champions League [52]. With a majority of previous research concentrating on the offensive phase of the game, a lot of studies disregarded the possibility that elite teams tend to base their competitive success and strategy on a match by match, opponent and contextual specific approach [52, 55]. The findings from this study supported the critical review of Mackenzie & Cushion [55], who highlighted that "regaining possession in the own final third" as being one of the few aspects from previous literature that may translate to "success" in football. The results highlighted the influence of situational variables and context in elite football matches that had previously been lacking and had the practical application of providing coaches with the information that: promoting the intention to win the ball back as quickly as possible and as high up the pitch as possible in football seems to be the most effective strategy for success [52].

A strategic analysis of goals scored in open play from four consecutive World Cup tournaments was undertaken by Smith & Lyons in 2017 of the 2002-2014 tournaments. The research reinforced the findings from previous research that 'regaining possession in the own

final third' lead to success in football [5]. This study analysed the build-up leading to goals and categorised them into three types: (a) from passing behind the opposing defence or to a player level with the last defender in a position to shoot or pass to a teammate, (b) from in front of the opposing defence of from dribbling past the last line of defence and (c) from crosses. The authors divided the field of play into seven zones to determine where possession was gained in the build-up to the goal. The results of this analysis showed that the most successful strategy for scoring goals at the 4 World Cup tournaments between 2002 and 2014 was category (a), which was to pass the ball behind opponents or to a player level with the last defender. The analysis showed that the most successful area to regain possession of the ball was in the attacking teams' own half, with the middle third of the pitch consistently providing the highest number of possession regains than the front (final) and back third. The research showed that the percentage of goals from regained possessions was similar for each third of the pitch across the four tournaments, however the research only investigated GSO that resulted in a goal being scored and omitted GSO from open play that did not result in a goal.

A study by Wright et al. (2011) investigated 1788 GSO and 167 goals from an English Premier League season [53]. The aim of the study was to explore the factors associated with goals and GSO, with the design of the study based on previous literature. The authors hypothesised that; most goals would be scored in the penalty area (> 70%), approximately 30% of goals would be scored from set plays and that goals would be scored in a relatively short time, with a short passing interchange (<4). The study identified a number of similarities between attempts and goals scored in their data to previous research, much of which was from tournament football [6, 8, 10, 12, 78, 85]. The key similarities were those surrounding positions of attempt of the GSO, set – play GSO and analysis of possession.

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There were a number of variables however that exhibited some influence on the creation of GSO that the authors recommended might require further investigation. The authors found that 63% of attacks from transition resulted in goals being scored, indicating that time in possession may be a factor related to GSO. They also found that the zone where a team regains possession was important as 34% of goals scored resulted from possession gained in the same zone. The authors stated that these factors uncover the importance of tracking GSO back to their point of origin as the information may help provide a better understanding of the factors affecting GSO [53].

From the previous research in the men's game it was found that attacking strategies investigating the number of passes, the type of passes, the zone of possession and time was important for the creation of GSO, but it is not known whether this is the case for the women's game.

2.3.2 THE TIMING OF GOAL SCORING IN MEN'S FOOTBALL

The relationship between time and goal scoring was investigated across three world cup tournaments in 2010 [86]. The researchers analysed the timing of goal scoring at the 1998, 2002 and 2006 Men's World Cup tournaments, by categorising the goals scored into 15-minute intervals. It was found that in 1998 and 2002 significantly more goals were scored in the second half of games and that more goals were scored as time progressed. Statistical analysis showed that there was no uniform distribution of goals or any differences between tournaments and that the results might display that goal scoring could be dependent on elapsed time in match play. This could be explained by deterioration of physical condition and substitutions altering style of play and match context [86]. It could also be reasoned that

lapses in concentration due to fatigue may be a contributing factor to the number of late goals scored in the three World Cup tournaments.

Armatas and colleagues earlier research was undertaken on the European Championships in Portugal in 2004, aimed to present the goal scoring characteristics of international football teams [78]. The study consisted of the 32 games at the tournament with chi-square analysis utilised for data analysis. One of the metrics utilised in the study was the timing of goal scoring, with the frequency of goal scoring examined by which half of the game that the goal was scored in. The results found a statistical significance between the first and second half when it came to the time of goals scored with 57.4% of goals scored in the second half of the games at the tournament compared to 42.8% scored in the first half. This mirrors the researchers later work [86], highlighting that a majority of goals in international football occur in the second half of the game [78, 86].

Researchers have also sought to investigate the effect of performance indicators on the time a goal is scored in football matches, as opposed to time being a performance indicator in itself. Previous NA research has paid relatively little attention to the performance indicators affecting the timing of the first goal scored in football and the match outcome that followed [87]. An analysis of performance indicators influencing the timing of the first goal scored in high level matches was undertaken in 2016 by Pratas et. al. during the Portuguese Premier League 2009/2010 season. Indicators such as time, goal difference (goals scored and conceded), ball possession, shots on goal, set pieces, player bookings and substitutions were investigated for the study, which consisted of 240 matches in total. The results indicated that home teams had a greater chance of scoring more goals and conceding less goals than their opponents but that there was no significant effect of the total time in ball possession on the

time the first goal was scored. Evidence was found from the data that there was a negative effect on the time of the first goal scored from substitutions and player bookings, meaning that making substitutions and receiving disciplinary sanctions may negatively affect how quickly a team may score the first goal of the match. This may be because of the way these two variables affect the fluidity of match play, allowing an opponent to re-organise their defence during the stoppage that they would not have time to do during a transition or quick counter attack that has been found to have been effective for creating GSO in previous literature [53, 56, 87]

2.3.3 ANALSYIS AND COMPARISON OF SUCCESSFUL AND UNSUCCESSFUL TEAMS

A number of studies to compare two or more separate tournaments in men's GSO have been conducted, with comparisons made between teams competing at the European Championships [12] and World Cup tournaments [86]. There have been studies which have investigated several variables in relation to the creation of GSO between successful teams from both within the same tournament and from different international tournaments in men's international football. These studies have objectively attempted to analyse whether two or more teams from different tournaments have created GSO in the same or similar ways and investigated whether there has been any evolution in the way teams from the same country have created GSO and changed their playing style between tournaments.

A comparative tournament analysis of the European Championship held in 1996 and 2000 was undertaken to study selected offensive and defensive variables by utilising NA. These offensive and defensive variables were quantitative (number of successful executions) and quantitative categorical data (passes, runs with the ball, interceptions, tackles etc.). The

authors then compared the variables in relation to tournament success, with rank correlation analysis indicating different relationships describing that success. It revealed that the team who was most successful at the defensive variables had ultimate tournament success at Euro '96 (Germany). Surprisingly, the successful team at Euro 2000 (France) was not the best team defensively, but topped the analysis when it came to the attacking variables measured in the study [12]. The authors concluded that a speculative comparison of tournaments could be undertaken, but that an absolute comparison could not be made. This is because of the change of teams competing at the tournaments as well as the individual changes to players selected for the teams between tournaments. The change to coaches and the style of play that the coaches implement on their teams also make absolute comparisons difficult as well as tactics implemented for individual matches to exploit possible weaknesses of opponents, or to compensate for injury or suspension of players from previous tournament matches. It was found however that The Netherlands had regularly been one of the best offensive teams across tournaments, with greater spells of possession on average and creating larger numbers of GSO comparatively despite not winning either tournament [12].

Selected offensive and defensive variables were measured utilising NA in the successful and unsuccessful teams that participated in the 2010 World Cup in South Africa [11]. The researchers used game related statistics such as total shots, offensive and defensive variables (shots/total shots/goals) and the influence of the first goal on match outcome to compare teams that made the knockout stage (successful) to the teams that only participated in the group stage (unsuccessful). The authors found that successful teams had better offensive variables (shots/goals) than the unsuccessful teams during the group stages of the tournament, which of course saw them advance from their groups. They also found that despite facing theoretically stronger opponents in the knockout stages of the tournament, the final 4 teams

were able to maintain the same offensive performance throughout the tournament. Thus, offensive variables related to shots and the creation of GSO appeared to be good indicators of tournament success at the 2010 World Cup [11].

Clemente also completed analysis of successful teams at the 2010 World Cup in 2012 by utilising NA to analyse performance indicators so as to characterise the successful teams at the tournament [85]. A successful team was considered one that played 7 matches at the tournament (top 4) and unsuccessful teams were those that failed to advance beyond the group stage after playing 3 games. The study sought to identify through the use of 3 performance indicators that discriminated between successful and unsuccessful teams at the tournament, areas of attacks of the teams (zones), shots of the teams and number and type of passes of the teams' leading to GSO. The results indicated to the researcher that successful teams were better at utilising the wide areas or zones of the pitch in build-up to GSO and that successful teams were able to get the ball into their opponents' penalty area more frequently, which lead to a greater number of shots and GSO than the unsuccessful teams. Successful teams also recorded more short and medium passes than long passes, showing more efficacy when it came to possession in the build-up to GSO compared to unsuccessful teams who reported more long passes in the build up by comparison [85].

2.3.4 ANALYSIS OF POSSESSION IN FOOTBALL

Many researchers have investigated the importance of ball possession in football. Possession is thought of as being central to success in modern football, but previous studies of possession have tended to focus singularly on individual leagues or tournaments which can have limited implications when talking about the findings of such studies in a broader, global sense when talking about football [7, 63, 88, 89].

Research by Collet (2012) sought to address this limitation by comparing ball retention and team success in 5 European football leagues and international football between 2007-2010 [90]. The data set of the study consisted of 6078 games from club football leagues (English, Spanish, German, French and Italian) as well as the UEFA club competitions, the Champions League and Europe League. A separate data set was compiled from international football of 299 matches from the African Cup of Nations, AFC Asian Cup, the European Championships, FIFA Confederations Cup and the FIFA World Cup. The study operationalised possession as the percentage of time in which a given team had possession of the ball. Both datasets included other variables such as date and time of match, shots on/off target, home/away team and home/away goals for the cup competitions. A passing accuracy variable was also measured (completed passes/total passes) as a further measure of possession [90].

It was found that having more ball possession was a direct predictor of positive outcomes in the domestic competitions analysed as well as in the domestic knockout tournaments [90]. Teams who held the ball longer were found to advance higher in their respective leagues and progress further in the knockout tournaments than teams who enjoyed less possession of the ball in match play. Furthermore, teams who possessed the ball more than their opponents

enjoyed more shots, scored more goals, with frequent and accurate passing strongly linked to shots, goals and points won in league and competition football. However, when elite teams played each other, where there was a balance in team quality (e.g. Manchester United v Chelsea), the effect of possession was marginal. In this case it was found that efficiency of shooting and to a lesser extent passing was more important than the total time spent in possession. How clinical they were with their GSO often predicted match outcome for elite teams, with the quality of possession and efficiency with possession more important than total possession as an indicator of success [90].

Greater possession of the ball in the domestic league football competitions was concluded to be an indicator of success, but that this was ultimately driven by the elite teams in said competitions [90]. In the national team competitions, the strongest direct effects of possession were found in the continents Europe and South America, the regions with the highest quality teams, or elite teams (according to FIFA rankings). When elite teams played each other, the benefits of greater possession were negligible, as efficiency of shots and passes took greater importance over total possession. Efficiency measures such as passing accuracy, shooting accuracy and passes to shots-on-goal ratios were stronger predictors of match outcome than time in possession. The findings from Collet's study suggest that tactical inferences and assumptions about football drawn from possession data should be critically examined, as inferences should consider the variations in quality of teams and competition that can directly influence teams' total time in possession [90].

Other researchers have used social network analysis (SNA) in football to analyse possession by analysing the passing between teammates which highlights the importance of co-operation between players to overcome an opponent [91-95]. SNA involves analysing the relationships

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and interactions between groups). Researchers have found that decentralised co-operation with high levels of interactions are beneficial to performance. Adversely it was found that centralised interaction, the over-reliance on key players, was associated with decreased team performance [91-95].

Possession and strategy of play were investigated through the link/passes between players through SNA in a study of the Switzerland football team at the 2014 FIFA World Cup [95]. The 4 matches that Switzerland played at the tournament were analysed for the study with 334 units of attack generated, comprising of 1129 passes in total. It was revealed that defenders and midfielders were the origin of most passing sequences in attacking play, with the Swiss midfielders the most prominent at being available for a pass. This suggested that the style of Switzerland was that of patient, possession based build up as opposed to a counter-attacking or long ball style. The evidence of a patient, possession-based style of play is further reinforced by the fact that to the two outfield positions with the lowest levels of connectivity were that of the forward players and the goalkeeper. This study highlights the attacking strategy of the Switzerland national team in possession, giving a real world, practical insight for opposition coaches, players and researchers and provides useful information that shows the importance of gaining contextual information for GSO [95].

A similar study investigated all the teams at the World Cup in Brazil in 2014 [91]. A dataset of 37,864 passes from 64 matches was utilised for the study. Similar metrics to [95] were utilised for this study and were applied to all 32 teams participating at the tournament. It was found that the successful teams had the highest levels of network density, which is a measure of connectivity between teammates when in possession of the ball and total links (passes). This finding indicated that the ability to increase the connection between all the players on

the pitch may result in excellent overall team performance. High levels of network density and total links may also lead to increased team performance in matches (goals scored, overall shots and shots on target). That is, the further or less connected teammates become, a decrease in the possibility of scoring and shooting is found [91]. With the intention of exploring whether patterns of play vary between teams and whether they emerge because of self-organisation by players and opponents, the authors were able to demonstrate that successful teams can create links (passes) regardless of the opposition. Successful teams with decentralised co-operation in ball possession were more likely to be successful at the World Cup 2014 [91].

Recent research from Bialkowski et. al. has developed further investigation into playing patterns and team structure in possession of the ball in football [96]. The study involved ProZone software to track the players in 374 professional matches. This type of data analysis can be challenging due to the fluidity of players changing positions in the game, but the approach was able to provide important contextual information and facilitated large scale analysis by yielding the structure or 'formation' of teams in open match play. This identified a team's 'style of play' and has the real world, practical application of providing information that can be used by opposition coaches and players to select players and tactics to counteract their opponents 'style of play' when in possession of the ball [96].

Researchers have also started investigating team sports as dynamical systems to understand how players interact in the context of match play. Interactions between teammates are likely to form a 'game style' or 'style of play' [96, 97]. Hewitt and colleagues implemented a framework of variables to be used to measure and describe a team's game style. Identifying a team's playing style or patterns of play allows for the quantification of 'game style' and will

allow for more detailed analysis into the correct training methodologies and allow for the evaluation of training. These real-world applications and the contextual information provided is an example of the evolution of the research since the critical review in 2013 that highlighted the lack of context in previous research [55, 97]. Overall the research has demonstrated that greater possession is associated with greater success, however it is not known if the origin of possession or the zone of possession is attributed to greater success. Studies that provide contextual game style and patterns of play leading to GSO would be useful information that could have real world, practical applications.

2.4 AREAS OF PREVIOUS RESEARCH IN GSO IN WOMEN'S FOOTBALL

To better understand the constraints in which teams are successful in football, PA has assumed a very important role in the professional sporting, and scientific community. In football, a team's performance can be defined as the interaction of technical, tactical, mental, physiological and contextual factors [55, 98].These factors have been studied extensively since the beginning of the technological revolution of the 1990's, which saw the development of computerised analysis systems and the creation of PA specific societies and journals (e.g., International Society of Performance Analysis in Sport & *International Journal of Performance Analysis in Sport*) [55, 56, 98]. Because of this evolution and approach to analysis, PA in football has gained a more prominent role in the scientific literature. There has been an overwhelming majority of research on analysis in men's football, enabling the general description of technical, tactical and physical variables in single match, league and tournament football. Comparatively, there has been little research into women's football, with very few studies having been undertaken and published in the last two decades [1, 36, 99, 100]. With the increasing popularity, professionalism and participation rate of women in football, this would be an area of research that requires further investigation.

There have been very few papers in PA in women's football overall and in GSO specifically. One of the first examples of research into PA in women's international football was the exploration of variables that constructed offensive playing profiles of the teams competing at the 1999 Women's World Cup in the USA [99]. The study investigated the 20 games played by the tournament's top 4 teams in the 1999 tournament, analysing 749 offensive phases of possession. Analysis consisted of coded phases of play across 7 zones to explore the scoring attempts. Scoring attempts consisted of 5 subcategories: combination play, individual attempt, cross, set plays and opponents mistakes. The researchers recorded the type of possession (low, medium and high) as well as the type of passes (short, intermediate and long) for the top 4 teams. The researchers created attacking profiles of each team. These profiles were created using correspondence analysis, which is a statistical method for analysing contingency tables and categorical data with multiple variables. They conducted a chi-square analysis and found that all 4 teams had different offensive profiles; Norway created goal scoring opportunities from crosses and defensive errors, USA created their chance predominantly from set pieces, China from passing and combination play and Brazil from individual actions and skill. Norway's offensive style was the most different to the other 3 teams, using long passes and crosses to create goal scoring opportunities. The other 3 teams had similar results when the source of scoring attempt was explored, with attacks originating in the central area [99]. This shows that there were different strategies used by the women's teams.

Further research in GSO in women's football investigated the direct free kicks at the 2007 Women's World Cup. This research was undertaken to identify areas of goal scoring potential to assist tactical decisions and training design [1]. Video of all free kicks taken at

goal from 32 games were analysed, with the location of the ball on the pitch ascertained from pitch markings and image pixel co-ordinates. The outcome of each kick was examined, with the kicks that resulted in a save by the goalkeeper or a goal, having its ball flight time and placement in relation to the goal recorded. Seventy-one free kicks were on target, with seven scored for the whole tournament. Chi-square analysis revealed that the location on the pitch from which the free kick was taken affected the outcome, with all seven free kicks that resulted in goals taken from a central zone within seven metres of the penalty area. No direct free kicks taken from this area were saved by the goalkeeper, meaning that if the free kick avoided the defensive wall and was on target, a goal was scored. The author also found that placement in the goal was important, with all free kicks scored and/or resulting in a difficult save being placed within 1m of the goal posts or crossbar [1].

A study in PA in Women's football focused primarily on the movement patterns of players and used video analysis to compare the playing behaviour of elite female and male soccer players across two World Cups the final, semi-finals and quarter finals of the 2002 men's World Cup in Japan/South Korea and the Women's World Cup 2003 in USA were analysed using broadcast footage. More than 26,000 actions were recorded with the following variables analysed for the study; actions with the ball, movement categories, kicking techniques, shots on goal and location on the field. The study found many differences in the movement patterns, individual ball actions and game strategies between the genders. It found that in 2003, Women were using a greater number of long and high passes in comparison to the men, who in the final stages of the World Cup 2002, played a greater number of short passes. During analysis of kicking techniques, it was recorded that differences in muscle strength between the genders influenced passing and shooting accuracy and distances. The men's game was also reported as being more aggressive than the women's game with more

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sliding tackles and dribbling recorded in the final stages of each tournament. The research also indicated that women were more likely to use the instep of their foot to complete passes or shots on goal in instances where the men were more likely or able to, strike the ball with their laces. It is not known if these differences observed in women's football influence the strategies adopted by women in their attempt to score goals. The study analysed the movement patterns between both genders in international football to influence the design of gender specific football boots. This was highlighted in the conclusion which stated, a women's soccer shoe design should consider the more frequent use of the instep and full instep kicking techniques [18].

A study in GSO in women's football of the attacking strategies leading to the creation of a GSO was investigated in the 2010/2011 W-League season [54]. All 34 in-season games were analysed and coded using variables that described the attacking strategies employed by teams. The W-League is the national women's football competition in Australia. The researchers measured the attacking strategies (e.g. conventional passes, crosses, free kicks and corner kicks) associated with various field positions (intermediate, close distant, defensive half). Chi-square analysis showed that 24% of goal attempts were from the result of a cross, 26% from a corner kick and 14% from free kicks and the other 36% were from conventional passes. Despite this there was a strong association between crossing and a loss of possession (60%), indicating that there was a risk associated with a style of play focused on crossing to create goal-scoring opportunities [54]. The study also revealed that teams who employed short passing were more likely to retain possession than teams who employed more long passes, and that teams who enjoyed more possession of the ball were more likely to acquire more corner kicks. Corner kicks were found to be an effective strategy at creating GSO, with the top 2 teams acquiring a greater numbers of corner kicks than the other, lower

ranked teams. Effectively, possession based football afforded the top 2 teams a greater number of corner kicks than their opponents and that corner kicks were an effective way at creating goal-scoring opportunities in the 2010/2011 W-League season [54]. On the basis of these findings, the authors recommended that the effective use of attacks through the wide area of the field combined with accurate crossing, may significantly increase a team's ability to create goal-scoring opportunities. This provides insight into the creation of GSO in a single league season of football in Australian Women's football.

An investigation utilising PA in women's football examined the influence of ball position on playing space in match-play in elite women's Spanish football in 2013 [100]. The study explored the playing area relative to the position of the ball on the pitch by investigating the space between the two offside lines when the players were distributed across the pitch in open match play (length), the width, the distance from the least advanced defender to the goal line in defensive activity, the distance from the least advanced attacker to her goal line in attacking activity and the distance between the goalkeeper and her nearest attacking and nearest defending teammate. Four Spanish league football matches were analysed with the pitch divided into a 6-zone grid system to aid analysis and categorisation of data for analysis [100]. The results obtained from the analysis of the play areas showed the distribution of players was wider and shallower when the ball was in the central areas of the pitch. When the ball was close to a goal, the block of defensive players became narrower, with the width of the distribution of defensive players decreasing. These can be attributed to the effect of the offside rule on match play as well as the tactical organisation of the defensive team making the central area of the pitch compact, forcing the attacking team to either use the wide areas to create a GSO or; forcing a turnover in the compact and crowded central area. The results highlighted the fluidity of elite Spanish women's football in open match play due to the ever

changing distribution of players relative to the position of the ball, the effect of the offside

rule on the distribution of players and that the behaviour of teams varied in relation to the

play space available and the position of the ball on the pitch which all influence the attacking

strategies leading to the creation of a GSO [100].

The final study in PA in women's football compared males and females in international

football teams from the same country [101]. A study from Sweden in 2011, analysed almost

10,000 player actions from the 14 games of the Swedish national teams in the Women's

World Cups of 2003 & 2007, and the Men's World Cups of 2002 & 2006. A player action

was referred to as passes, ball interceptions, dribbles, final shots and fixed situations (set

pieces). Analysis of the games were broken down into actions (a pass or a shot at goal) and

then rated them as positive or negative (for example, was the shot on target or off target).

Overall, it was found that there were far more similarities between the genders in technical

and tactical terms in Swedish international football than was previously believed. However,

the analysis only analysed player actions as a positive or negative, isolated outcome and

recorded it as categorical data. It lacked the match specific context such as zone of possession

gain, types of passes and time utilised by previous research and as a result provides little

insight into the creation of GSO in women's international football [101].

2.6 SUMMARY

In the aforementioned review of PA research in women's football, it is evident that there is a

paucity of research compared to men's football. Furthermore, few studies in PA in women's

football have examined GSO. Most of previous research has focused on other areas of

interest. This includes direct free-kicks, movement patterns of players, analysis of scoring

patterns in league football and player distribution. However, this body of work is extremely limited in its volume in comparison to the abundance of research into the men's game. Chapter 2 provided an insight into the established research of PA and highlighted the lack of research into GSO in women's football. This was to establish that an investigation into women's international football and GSO was warranted and would add to the body of work in PA in football. The following chapter will outline the research methodology utilised to answer the research questions posed in this thesis.

CHAPTER 3: METHODOLOGY

3.1 INTRODUCTION

The aim of this chapter is to describe research methodology to answer the research questions posed with regards to data collection, including the processes used to ensure the accuracy of the data entry, the validity and reliability of the data collected. This chapter will explain how the coding system was established, how the data was categorised and analysed using specific software and the use of Yule's Q test for intra-operator and inter-operator reliability. Special attention is given to explain the operational definitions of this research in light of previous discussion in the literature review.

3.2 SAMPLE

Video of each match (52) from the Women's World Cup (Canada 2015) was accessed, captured and analysed to assess the factors related to the creation of GSO and the patterns that lead to the ultimate success at the tournament. Attention was given to the Top 4 teams in the Women's World Cup to allow further analysis and comparison. Video of the matches (24) of the Top 4 performing teams at the Men's World Cup (Brazil 2014) was also captured and analyedwith the GSO in each match assessed and then compared to the Top 4 Women's teams. Ethical declaration was obtained from the ECU Human Research Ethics Committee.

3.3 EQUIPMENT

The matches analysed were the broadcast, live on free-to-air television footage (Copyright Act 1957) and were recorded using Elgato Video Capture (Elgato Systems) for the purpose of the study. The video of the matches was converted to .mp4 or .mov file format. Matches that couldn't be recorded from free-to-air television were sourced from the Wyscout platform, SportsCode Pro/Elite (Sportstec. Limited) software was used to analyse each match. The

analysis of the match was conducted on a Macintosh Pro Laptop (version 10.10.2, Apple Inc. Cupertino, CA, USA). Microsoft Excel 2010 (Microsoft, Redmond, Washington, USA) was used to create a spreadsheet to record the information gathered from the analysis. The data and video collected for the study was stored in external hard drives and backed up to an iCloud (Apple Inc. Cupertino, CA, USA) account as a precaution against any data loss.

3.4 PROCEDURES

Data for the study was gathered from the video of the Women's World Cup tournament and Men's World Cup tournament, held in Canada in 2015 and Brazil in 2014. A code window was created in SportsCode that allowed the creation of video clips of each team's GSO in every game of the 2015 tournament and the top 4 men's teams games from 2014. This software allows a database to be created to enable a football coach or performance analyst to click on any element of the performance to view the associated video clips. The code window for the data collection included a 9 Zone system (Figure 3.1). The code window was used to analyse the video of each game, with the analyst viewing the video as many times as considered necessary. The analyst noted the required information into a Microsoft Excel 2010 (Microsoft, Redmond, Washington, USA) Spreadsheet.

The following process was used for recording the data. The analyst reviewed each GSO as many times as necessary to record the location of the first possession of the ball in the phase of play in the 9 Zone grid system. The type of Possession Gain (Pos. Gain) was noted as one of the 3 types (Restart, Interception/Misplaced Pass & Tackle/High Pressure) to the GSO. The type of GSO from (Smith, Lyons 2017) was allocated upon review to the GSO (BBS, BBPS, C, and O). The video duration was recorded from the start of the GSO to the attempt

on goal so that a total time for the GSO could be recorded. Finally, it was noted if a goal was scored from the GSO. For the purpose of the study a GSO was classified as being a shot that was determined to have been on target with the potential to score if not for the intervention of the goalkeeper or an opposing defender. Therefore, shots that rebounded back into play after striking the woodwork of the goal, were omitted from the study as technically they weren't goal bound and never had the potential to be a goal. Every GSO was assessed in the study, but not penalty shoot-outs. Penalty shoot-outs are used to determine a winner when matches have been drawn after normal and extra time. Time data was recorded as part of the analysis of every GSO for the study, with each time recorded and logged so that the effect of time on the creation of a GSO; and whether that GSO was successful could be investigated. Time was also recorded so that a comparison between the successful and unsuccessful teams at Canada 2015 could be made, as well as a comparison between the Top 4 Men's and Women's teams. Total time in possession leading to the creation of GSO was recorded, with Means calculated and expressed with Standard Deviation (SD) (±). Total time in possession leading to the creation of an unsuccessful GSO (a goal not being scored due to the keeper making a save for example) and a successful GSO (a goal being scored) was also recorded, calculated and expressed with ±. This was to see if there was any discernible difference between those successful and unsuccessful attempts to score and to explore whether time may have been a factor in ultimate GSO success. Analysis of the types of Possession Gain and the type of GSO was also recorded from the sampled matches. This was to see if there were any differences between how the successful teams create GSO compared to unsuccessful teams in terms of how they gained possession of the ball at the start of the GSO and the method utilised to create the GSO at the end of the phase of play.

(Figure 3.1) was designed so that the area or origin of possession on the pitch could be recorded. The video clips began at the gaining of possession (the moment a player touched the ball) for the attacking team and finished at the creation of the GSO (the goal was scored or keeper made a save). Nine zones of possession gain were recorded for analysis in the creation of GSO in Women's International Football. AR, AC, AL, MR, MC, ML, DR, DC, DL.

AR: Attacking Right **AC:** Attacking Centre **AL:** Attacking Left

MR: Midfield Right **MC:** Midfield Centre **ML:** Midfield Left

DR: Defensive Right **DC:** Defensive Central **DL:** Defensive Left
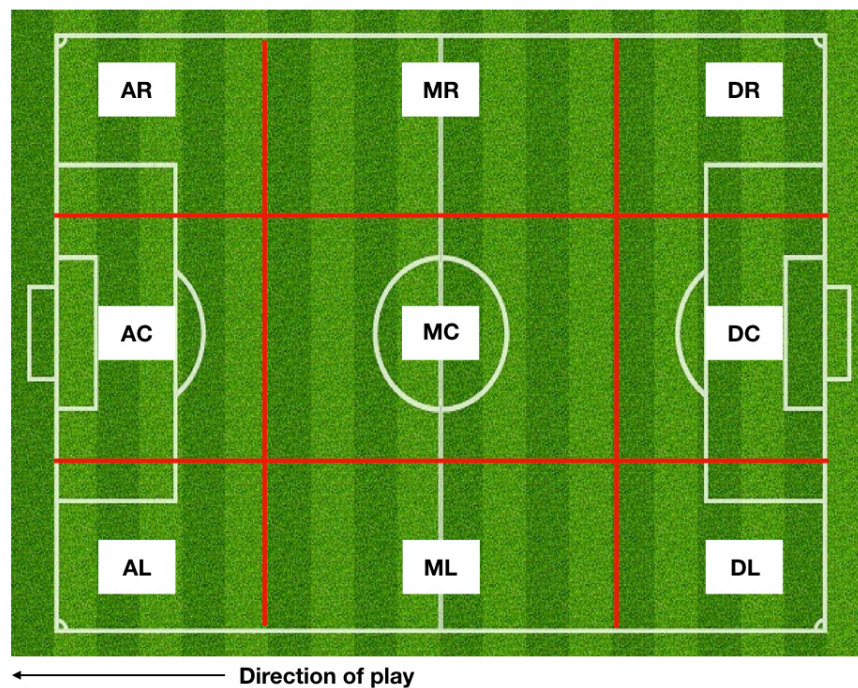
Figure 0.1 The 9-zone grid system employed to record origin of possession.

Three categories for Type of Possession Gain were created so that further insight into how the phase of possession leading to a GSO could be analysed. The following definitions were created to best explain the 3 categories for Type of Possession Gain.

Interception/Misplaced Pass (IMP): When a player in possession of the ball deliberately attempts a pass to a teammate and the pass is intercepted or when a pass is played into open space with intent for a teammate and the opposition gain possession.

Tackle/High Pressure (THP): When possession is gained through a tackle or when an opponent forces a skill error (heavy touch) through physical contact or close proximity.

Restart (R): Unopposed and controlled possession (goal kick, throw in, free kick or goalkeeper in possession after a save).

The GSO was categorised on review as being one of the following types of GSO, the types of GSO definitions were taken from the study by Smith & Lyons (2017) [5] and incorporated due to the similarity of the study type and sampled tournament matches. The definitions for type of GSO were:

BBS: Ball Behind & Strike

BBPS: Ball Behind, Pass & Strike

BBSPS: from passing the ball behind opponents or to a player level with the last defender who could either shoot or take the ball forwards (BBS) or pass to a team mate to score (BBPS)

Other: Other methods, anything that doesn't fit BBS/BBPS or C (for example, shots from distance)

Crosses: A pass into the penalty area from either side of the penalty area and from within 20 yards of the goal line.

3.5 OBSERVER RELIABILITY

Reliability is the overall consistency of a measure, with a measure returning a high reliability if it produces similar results under consistent conditions. There have been a number of papers that have discussed the reliability assessment techniques in PA [102, 103]. These techniques require methods appropriate to the collection of categorical data on the nominal scale i.e. where events are recorded within defined categories. Therefore, a reliability measure should reflect the way in which the notational data is analysed. This is so that assessments can be made with regard to the extent to which each variable presented in the results was coded accurately intra-operator and inter-operator reliability is a very common method used to assess the reliability of methodological procedures in PA research.

Intra-operator reliability examines the individual operator of consistency, while the inter-operator reliability is used to assess the ability to defect faulty operational definitions. Categorical data can be pervasive in performance analysis but not entirely or mutually exclusive. Reliability in performance analysis pertains to the extent to which the event codes (notated or coded by the analyst) reflect what happened in the game, which gives us an estimate of the accuracy, or validity. [102]

For intra or inter-operator reliability using the Yule's Q statistic was recommended, based on the odds ratio. It is recommended as the reliability statistic of choice for categorical data due to its intuitiveness in measuring, the ease in which it calculates and because of applicability to the decision-making process of performance analysts. A value of 0.95 or above was be deemed acceptable with regards to the analyst's ability to place an event into a category reliably [103].

Intra-reliability

To ensure the reliability of the coding process a test-retest reliability protocol was performed using a 20-day interval for re-analysis to avoid task familiarity. From the available video, the matches of the Top 4 Women's teams were re-reviewed by the analyst, returning a Yules Q Statistic of 1.0. A Yule's Q score of 1.0 for intra-reliability is indicative that the analyst had a 100% probability of analysing the Zone of Possession Gain repeatedly.

Inter-reliability

A Yules Q Statistic of 0.98 was returned for inter-reliability after a second analyst reviewed the Top 4 Women's Games from the Canada 2015 tournament and their results compared against the first analyst's results. (Appendix 1). The Yule's Q score of 0.98 for inter-reliability indicates there is a probability of 99% that the analyst(s) agreed in their coding. To calculate the reliability of coding of the categorical data the two categories that registered the only difference (ATT, MID) in sum total of all the categories analysed was used for the Yule's Q.

3.6 STATISTICAL ANALYSIS

Statistical analysis was conducted to investigate GSO and characteristics in the build-up to the goal and investigated whether there are differences between successful and unsuccessful teams and between men and women. A comparison was made between *Successful/Unsuccessful teams* at the tournament. Successful teams were classified as those who reach the semi-finals (top 4) of the tournament. Unsuccessful teams were classified as those who did not qualify for the semi-finals. Further notational analysis was undertaken to compare between the top 4 women's teams in 2015 and the top 4 teams at the men's World Cup 2014. This was undertaken to investigate if there are any differences in the variables

measured between the sexes. Analysis was conducted by using SPSS version 26 (SPSS Inc., Chicago, IL, USA). A Chi Squared test of independence was used for the categorical data to investigate differences between: zone of Possession Gain, 3rd of Possession Gain, Type of Possession Gain and Type of GSO. Chi Square was also used to compare the top 4 Men's and Women's teams.   Descriptive statistics were displayed as Means ± (SD) unless otherwise stated. Analysis of the time data was undertaken using an independent – samples T-test, which was also conducted in SPSS version 26.

3.7 SUMMARY

This chapter has provided the methodology and the main categories for GSO procedures. A detailed explanation was provided on the data collection, process and procedures highlighting the software, how the data was collected and the systematic approach to creating the code window to allow the accuracy of coding. A thorough explanation was provided of the operational definitions of the coding of the GSO in addition the intra-operator and inter-operator reliability was provided to guarantee the validity and reliability of the data collected. In the next chapter the results of the data analysis will be presented to answer the research questions with discussion to explain the outcomes of the research.

CHAPTER 4: RESULTS

4.1 INTRODUCTION

This chapter presents the data collected as a result of the methodology outlined in Chapter 3. Of the 390 GSO from the Canada 2015 tournament, 295 of these attempts on target were deemed unsuccessful and 95 resulted in a goal being scored. The presentation of the results is in order of the research questions; the data pertaining to the Zone of Possession Gain leading to a GSO and Goals, the time taken to create a GSO and Goals, the Type of Possession Gain leading to GSO and Goals and the Type of GSO for GSO and Goals. The 9 Zones of Possession Gain for each of the 24 teams is presented, as well as data combining; all teams into 9 Zones, 3 Zones vertically and 3 Zones horizontally. The time taken to create a GSO for all teams is presented as a total, successful GSO (Goals) and unsuccessful phases of play. The data for Type of Possession Gain is presented for all 24 teams leading to GSO and Goals and the Type of GSO for all 24 teams for GSO and Goals is presented for comparison and discussion. Finally, a comparison of the aforementioned variables between the Top 4 teams (successful) and the rest of the competing teams (unsuccessful) is made.

4.2 RESEARCH QUESTION 1: From which Zones on the pitch did GSO/goals

originate from at the Canada 2015 tournament?

The 390 attacking phases of play that lead to the creation of a GSO at the 2015 Women's World Cup in Canada and recorded the origin of possession across the 9 Zones; 95 of these attacking phases led to a Goal being scored.
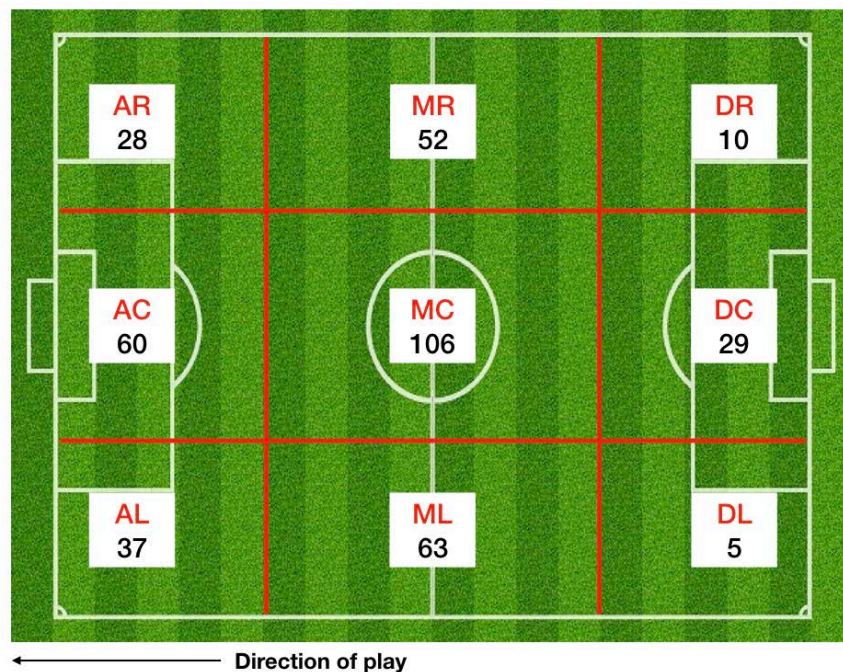
Figure 0.1 The 9 Zones of Possession Gain for all teams leading to a GSO

A Chi Square analysis was utilised to analyse the recorded data to examine if there was difference between the zone of possession gain leading to the creation of a GSO. The test was found to be statistically significant: (χ^2) (8) 178.338, $p \leq 0.05$ as it was shown that there was a difference between the 9 Zones in terms of possession gain in the creation of GSO in open play across the tournament was observed.

It was found that winning the ball in the Midfield Central (MC) zone (106) of the pitch was the most common zone to gain possession in the build-up to create a goal scoring opportunity. The second most effective zone for possession gain was the Midfield Left (ML) zone (63) which accounted for 11 more goal scoring opportunities than the other side of the pitch; Midfield Right MR (52). Winning the ball in the Attacking Central AC (60) zone was an effective strategy at the tournament, given the proximity of the zone to the goal. The Attacking Left AL (37) and Attacking Right AR (28) zones were also shown to be effective areas of the pitch to win the ball and start a phase of play to create a GSO. Comparatively, the defensives zones Defensive Left (DL) (5), Defensive Right (DR) (10) & Defensive Central DC (29) accounted for less than a 3rd of the GSO created across the 52 games at the tournament. Central areas (DC, MC, AC) accounted for 195 GSO or 50% in total, with the left side of the pitch (DL, ML, AL) producing 105 GSO (27%) and the right (DR, MR, AR) producing 90 (23%) opportunities to score.

Nine zones of possession gain were also utilised to record the phases of play that lead to a goal being scored, with 95 goals scored from Open Play. These were analysed using Chi square to see if there was any difference between the zone where possession was gained and the scoring of a goal. The test was found to be statistically significant: (χ^2) (7) 60.537, $p \leq 0.05$ as it was shown that there was a difference between the 9 Zones in terms of possession

gain in the creation of a goal. The results show that 26 of the 95 goals scored originated from possession that started in the Midfield Central MC zone of the pitch. The zone Defensive Left DL was omitted from the analysis as 0 goals originated from possession starting in this zone. The central areas (DC, MC, AC) accounted for 57% of all recorded phases of play that lead to the scoring of a goal, with the left zones (ML, AL) accounting for 23% and the right zones (DR, MR, AR) accounting for 20%
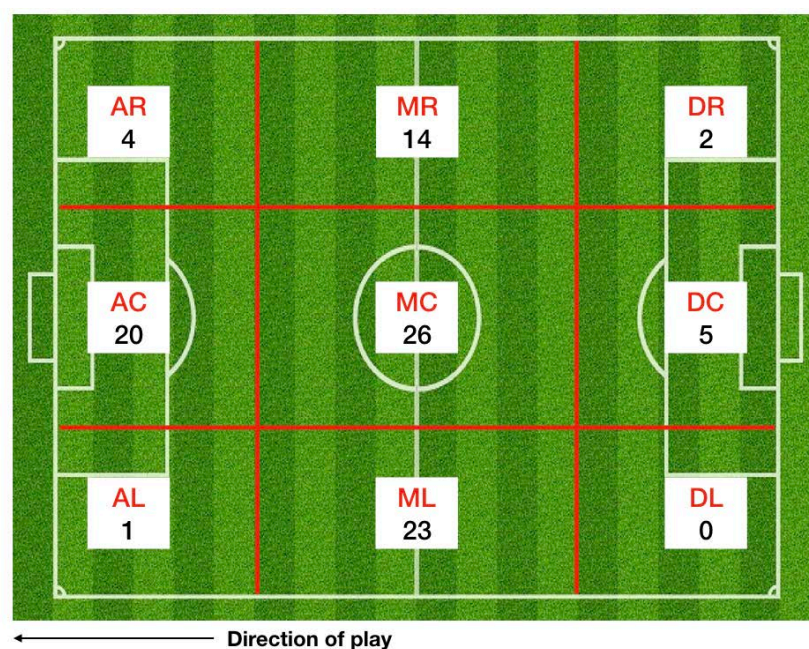
Figure 0.2 9 Zones of Possession Gain for all teams leading to a Goal

Chi Square analysis was also undertaken with the pitch divided into 3rd's, the zones were combined to create 3rd's of the pitch (DEF, MID, ATT) and chi square analysis was utilised to analyse the recorded data to see if there was a difference in 3rd of Pos. Gain in the creation of GSO. The test was found to be statistically significant (χ^2) (2) 120.785, p≤ 0.05 as it showed that there was a difference between the 3rd's. The DEF 3rd (44) was the least prominent zone when it came to the creation of GSO. The ATT 3rd contributed 125

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opportunities to score with the MID 3rd recording the greatest number of Pos. Gain with 221. The DEF 3rd accounted for only 11.3% of all recorded phases of play, MID 3rd 56.7% and ATT 3rd 32%.
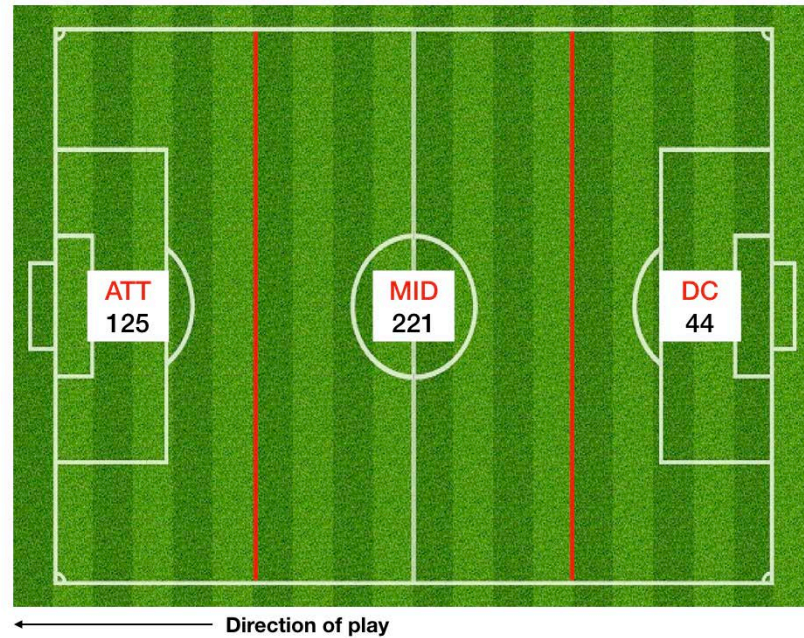
Figure 0.3 Vertical 3 Zones of Possession Gain for all teams leading to a GSO
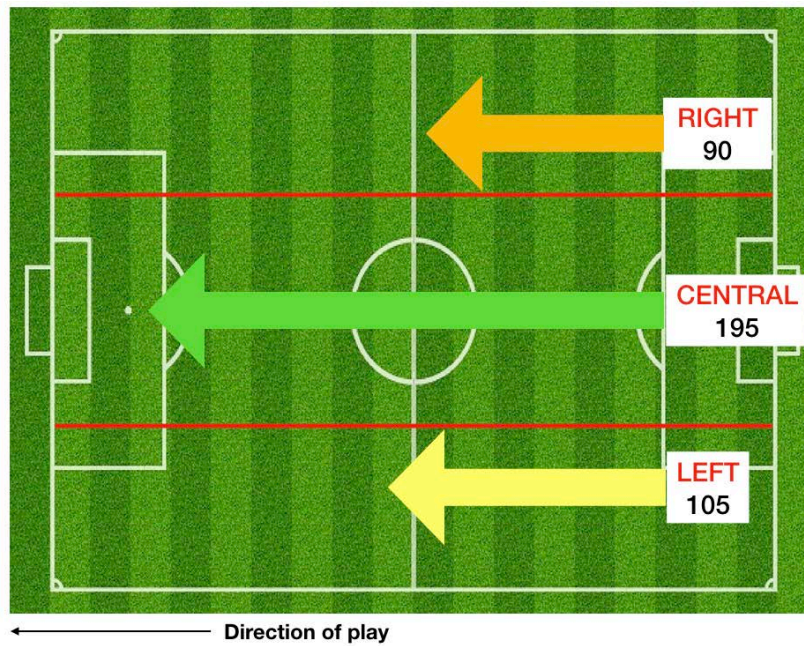
Figure 0.4 Horizontal 3 Zones of Possession Gain for all teams leafing to a GSO

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The zones were combined to create 3rd's of the pitch (DEF, MID, ATT) for Chi Square analysis. This was to investigate whether there was any difference in possession gain leading to the scoring of a goal between the 3rd's. The Chi Square analysis was found to be statistically significant (χ^2) (2) 60.637, p≤ 0.05 as it showed a difference between the 3rd's. The analysis revealed that the MID 3rd was overwhelmingly responsible for the origin of possession leading to goals being scored at the tournament. The MID 3rd was responsible for 66.4% compared to 7.3% and 26.3% for the DEF and ATT 3rd's.
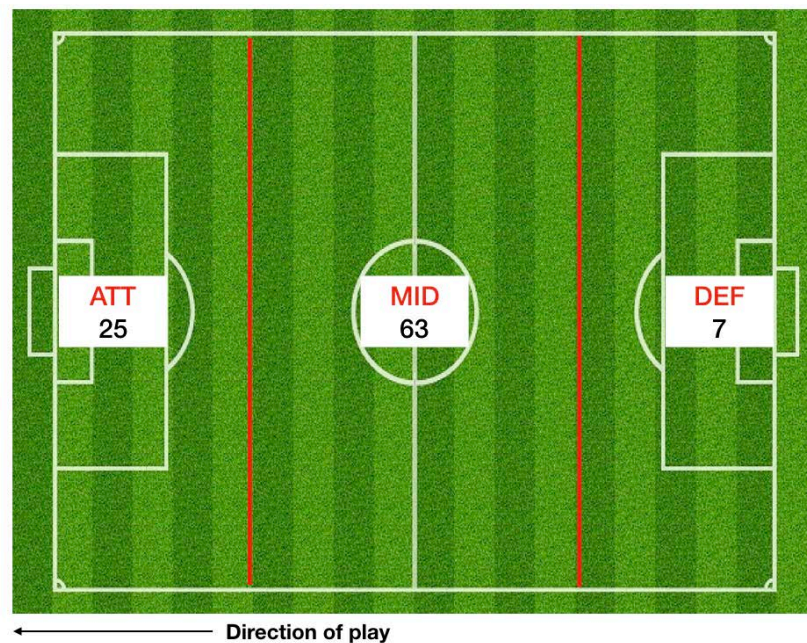
Figure 0.5 Vertical 3 Zones of Possession Gain for all teams from the thirds leading to a Goal
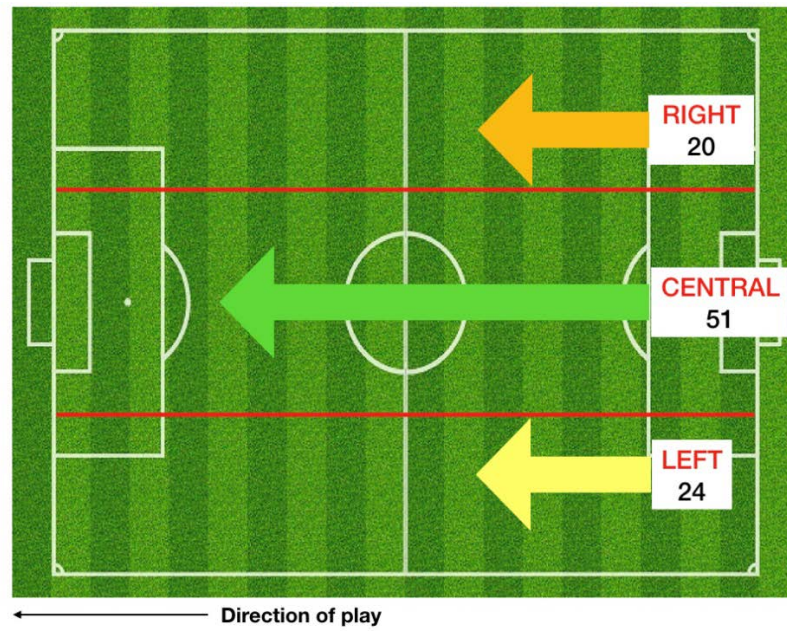
Figure 0.6 Horizontal 3 Zones of Possession Gain for all teams leading to a Goal

4.3 RESEARCH QUESTION 2: How long does it take to create a GSO in Women's international football?

Time data was recorded for the GSO created by each of the 24 teams at the 2015 Women's World Cup tournament and labelled as either being successful or unsuccessful. (Appendix 4.) An independent – samples t-test was conducted to compare the time taken to create a GSO for all 24 teams and the time taken to score a goal. There was no significant statistical difference in the scores for unsuccessful GSO (M=11.40, SD=2.47) and Goals (M=10.96, SD=6.04) conditions; t (46) =0.33, p=0.743. These results suggest that the time taken to score a goal at the Canada 2015 tournament was less than the time taken to create an unsuccessful GSO. However, a statistically significant difference was not found between the time taken to create an unsuccessful GSO and to score a goal. Further analysis of the time data was undertaken to compare the successful teams at the tournament (Top 4) against the unsuccessful 20 teams (The Rest). This explored whether there was any significant difference between the teams who reached the semi-final stage of the tournament against the others. An independent – samples t-test was conducted to compare the time taken for the successful teams (Top 4) to create an unsuccessful GSO and to score a goal. There was no significant statistical difference in the scores for unsuccessful GSO (M=13.46, SD=4.02) and Goals (M=11.81, SD=0.64) conditions; t (6) =0.809, p=0.475. (Appendix 5.)

An independent – samples t-test was then conducted to compare for the unsuccessful (The Rest) to create an unsuccessful GSO and to score a goal. This revealed that there was no statistically significant difference either, in the scores for unsuccessful GSO (M=10.97, SD=2.61) and Goals (M=10.79, SD=6.62) conditions; t (38) =0.111, p=0.912 (Appendix 6.)

4.4 RESEARCH QUESTION 3: What are the types of Possession Gain in Women's International Football?

In total 390 instances were labelled as being one of the types of Possession Gain from the origin of the attacking phase leading to a GSO. A Chi Square analysis was undertaken to investigate the differences between the types of Possession Gain. The analysis revealed statistical significance: (χ^2) (2) 24.969, p$\leq$ 0.05, Interception/Misplaced Pass (IMP) as the type of Possession Gain accounted for 176/390 or 45% of the instances in comparison to Tackle/High Pressure (THP) 113/390 or 29% and Restart (R) 101/390 or 26%. The same analysis was undertaken for the GSO that resulted in a Goal being scored, with 95 goals from open play analysed and labelled for the study. Chi Square analysis was undertaken: (χ^2) (2) 10.505, p $<$ 0.05 and statistical significance was found, Interception/Misplaced Pass (IMP) leading to a goal accounted for 46/95 or 48.5% of all goals scored. Tackle/High Pressure (THP) 28 or 29.5% and Restart (R) 21or 22%. These figures are very similar when compared to the figures for GSO in total and shows a similar ratio of Goals to GSO in terms of type of Possession Gain.

Types of Pos. Gain	IMP	THP	R
GSO	176	113	101
Goals	46	28	21

Figure 0.7 Types of Pos. Gain leading to GSO & Goals

4.5 RESEARCH QUESTION 4: What are the types of GSO created in Women's International Football?

The types of GSO measure was utilised for the 390 GSO from open play, these were also recorded and analysed using Chi Square: (χ^2) (3) 101.282, $p < 0.05$ where a statistical significance was found. There was a notable difference in the ratio of types of GSO at Canada 2015. Ball Behind & Strike (BBS) 84/390 & Ball Behind Pass & Strike (BBPS) 26/390 accounted for 21.5% and 6.6% of the GSO with Other Methods (O) accounting for 162/390 or 41.6% and Crosses (C) 118/390 or 30.3%. BBS & BBPS combined into Ball Behind Pass & Strike (BBSPS) accounted for 28.1% of all GSO, which is the method used by Smith & Lyons [5] in their study and is where the type of GSO analysis is adapted from. The results show that Other Methods was the most common method of creating a GSO at the Women's World Cup, having a shot from distance or a player attempting to dribble then shoot from in front of the oppositions defensive line was the most common attempt to score at the tournament. However, this did not translate into success as the analysis of the GSO that resulted in a goal being scored revealed. Chi Square was also undertaken on the Types of GSO that lead to a Goal (95), where statistical significance was not found: (χ^2) (3) 6.927, $p > 0.05$ (p= 0.74).

The distribution of Types of GSO resulting in Goals returned a Chi Square value that could not find a significant difference between the 4 categories. BBS accounted for 25/95 or 26.3% of goals, BBPS 14/95 or 14.7%, Other Methods (O) with24/95 or 25.3% and Crosses (C) 32/95 or 33.7%. The combined BBSPS accounted for 39/95 or 41% of all Goals. Unlike the type of Possession Gain, the ratio of GSO and Goal data is not similar in its distribution.

'Other methods' was the most prevalent way of creating a GSO (41.6%) but was a less

successful method to actually score goals (25.3%) when compared to BBSPS and Crosses.

Types of GSO	BBS	BBPS	O	C
GSO	84	26	162	118
Goals	25	14	24	32

Figure 0.8 Types of GSO categories of GSO & Goals

4.6 RESEARCH QUESTION 5: What are the differences between successful/unsuccessful teams' Zone of Possession Gain at the tournament?

Analysis between the Top 4 teams at the Women's World Cup tournament (USA, Japan, England & Germany) and the other 20 teams was performed. Zones of possession gain were recorded using the aforementioned 3rd's of the pitch (DEF, MID & ATT) and Chi Square analysis was performed on the data collected. For the Top 4 teams at the tournament in the creation of GSO, the Chi Square analysis was found to be statistically significant (X^2) (2) 28.938, $p \leq 0.05$. The same analysis was performed for the rest of the teams at the tournament and also revealed statistical significance (χ^2) (2) 92.163, $p \leq 0.05$. Both analyses showed that there was a difference between the zone of possession gain when it came to the creation of GSO. For the Top 4 teams the MID (55%) 3rd was the most prevalent zone for the origin of an opportunity to score. For the rest of the tournament the MID 3rd was similar, responsible for 57% of origin of possession leading to GSO. For the rest of the teams at the tournament the ATT (31%) 3rd was just as effective an area of the pitch to win the ball to create a GSO as the Top 4 teams with 34%.

Analysis of the Top 4 teams v the rest of the teams at Canada 2015 was also undertaken with regards to possession gain leading to the scoring of a goal. Statistical significance was found for both groups; Top 4: (χ^2) (2) 17.862, $p \leq 0.05$, The rest: (χ^2) (2) 33.909, $p \leq 0.05$. For the Top 4, gaining possession in the MID 3rd accounted for 69% of goals scored compared to 65% for the rest of the teams. However, the ATT 3rd only accounted for 24% of goals for the Top 4 compared to 27% for the rest of the teams.

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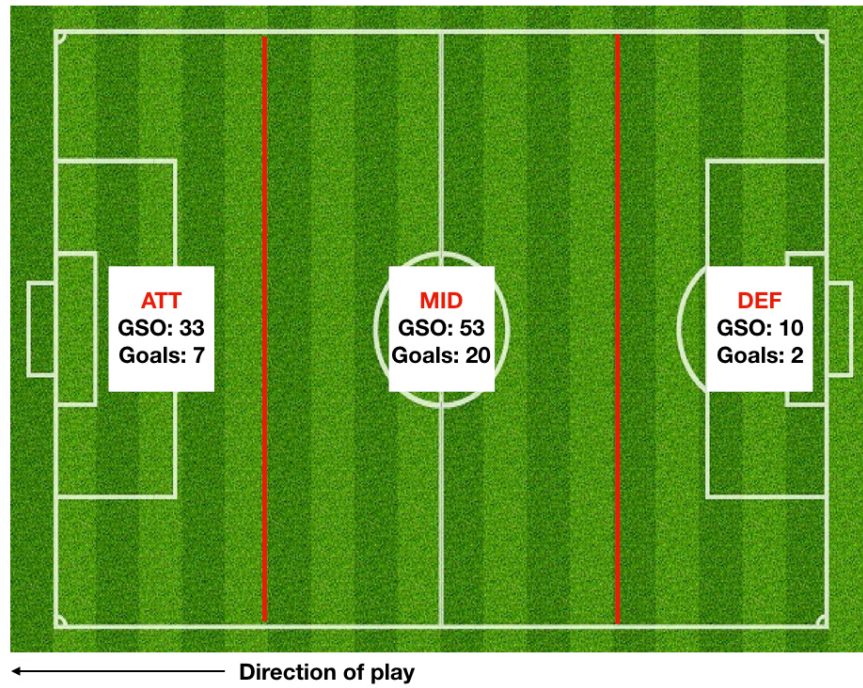
Figure 0.9 Vertical 3 Zones of Possession Gain for the Top 4 team's leading to a GSO and Goal.
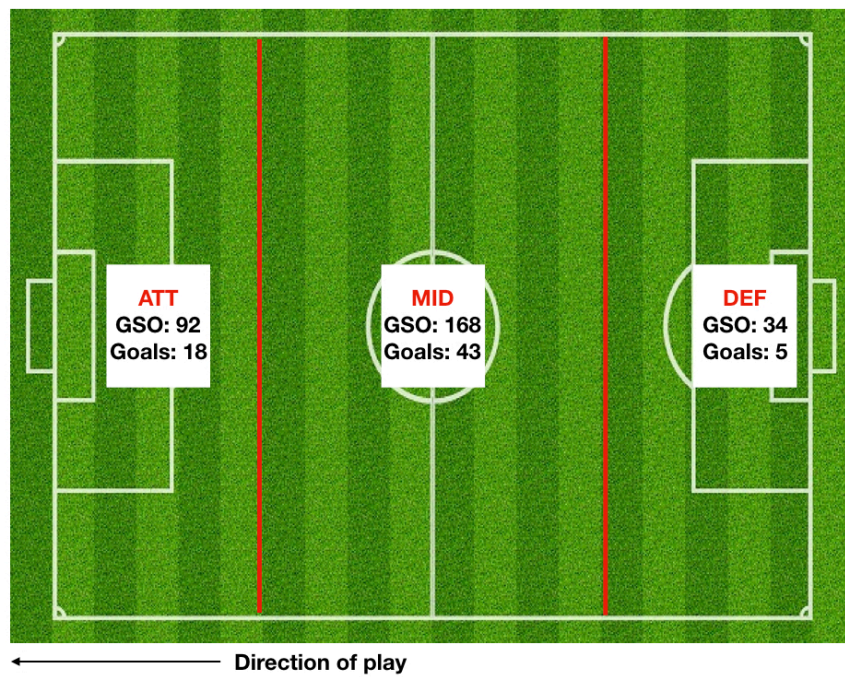
Figure 0.10 Vertical 3 Zones of Possession Gain for The Rest of the team's leading to a GSO and Goal.

4.7 RESEARCH QUESTION 6: What is/are the difference/s in terms of the creation of GSO between the top 4 Men's teams from the 2014 World Cup & Women's teams from the 2015 Women's World Cup?

Analysis of the Top 4 teams from the Men's Brazil 2014 World Cup was undertaken in the same way that the Women's Canada 2015 tournament was analysed. This was to see if there were any differences or similarities between world class men's and women's teams in the way that they create chances to score goals and the way they score goals. Chi Square analysis (χ^2) (2) 92.947, p≤ 0.05 revealed statistical significance. The Women's Top 4 GSO was also statistically significant (χ^2) (2) 28.938, p≤ 0.05, in the way that the women's teams created GSO compared to the way they scored goals.

The MID 3rd of the pitch in the Men's Top 4 accounted for 57.66% of GSO Pos. Gain. Comparatively, the Women's Top 4 accounted for 55.2% in the MID 3rd of the pitch. Regaining the ball and starting an offensive phase in the ATT 3rd of the pitch was 21.49% for the Top 4 Men and 34.39% in the Top 4 Women. Finally, the defensive 3rd of the pitch accounted for 20.85% of all GSO Pos. Gain's in the Top 4 Men's teams compared to just 10.41% for the Top 4 Women's teams.

The same analysis was repeated for the 3rd of Pos. Gain leading to a goal being scored by the Top 4 teams at their respective World Cup's. Statistical significance was found for the Top 4 Men's teams (χ^2) (2) 14.800, p≤ 0.05 and the Top 4 Women's teams: Top 4: (χ^2) (2) 17.862, p≤ 0.05. The 3rd's of Pos. Gain were different with the defensive 3rd for men accounting for 11.43% and the women 6.89%. The MID 3rd for men was 62.85% and women 68.96%

accordingly, with the ATT 3rd accounting for 25% in Men and 24.13% for the Women's Top 4 teams.

The time taken to create a GSO was also recorded to see if there were any differences between successful and unsuccessful women's football teams. It was also recorded so that a comparison between the successful men's and women's teams could be made to investigate if there is a significant difference in the time taken to create a GSO between the sexes in international football. This revealed the time taken to create a GSO, unsuccessful GSO and goals. Time taken to create a GSO for the Top 4 Men's was 14.16 ± 1.88 compared to 13.13 ± 2.94 for the Women. Time taken to create unsuccessful GSO took the Men on average 14.89 ± 1.34 seconds, with the Women averaging 13.46 ± 3.72. Finally, the average time taken to create a goal for the Top 4 Men's teams was revealed to be 11.49 ± 3.74 compared to 11.81 ± 0.60 for the Top 4 Women's teams.

TIME TAKEN TO CREATE A GSO/ GOAL (secs)	Unsuccessful GSO	SD (±)	GOALS	SD (±)
MEN	14.89	1.34	11.49	3.74
WOMEN	13.46	3.72	11.81	0.60

Figure 4.11 Time taken to create a Unsuccessful GSO & Goal for the Top 4 Men's & Women's Teams

A comparison of the Top 4 Men's and Women's teams from the Brazil 2014 World Cup and the Canada 2015 Women's World Cup was undertaken, to explore whether there was any difference between the two sexes elite international football teams. The type of Possession Gain and Type of GSO was recorded and analysed for both sexes to investigate if there was any significant difference. Phases of play leading to GSO and Goals were analysed with 163 GSO for the Men and 127 for the Women. Chi Square was used to explore types of Possession Gain for the Men's Top 4 and the Women's Top 4. The analysis of both the Men: (χ^2) (2) 22.245, $p < 0.05$ & Women: (χ^2) (2) 10.692, $p < 0.05$ revealed statistical significance for both sexes in relation to types of Possession Gain. IMP accounted for more than half of the types of Possession Gain 50.3% in the Men's and 45.6% in the Women's. THP was similar for both the Men and Women, with 21.5% and 22.04% respectively. Finally, restarts (R) for the Men accounted for 28.22% of Possession Gain and 32.28% in the Women.

The same analysis was undertaken to explore the phases of play that lead to a Goal being scored. Chi Square was utilised to analyse if there was any statistically significant difference in the types of Possession Gain leading to a Goal being scored by the Top 4 teams. The Chi Square analysis did not reveal any statistical significance for either the Men or Women, Men: (χ^2) (2) 0.765, $p > 0.05$ (p=0.682) Women: (χ^2) (2) 1.310, $p > 0.05$ (p=0.519). The results reveal similarities between the two sexes in ball recovery leading to a Goal being scored in international football.

The Types of GSO leading to a GSO and Goal from the Top 4 Men's and Women's international teams was investigated using the same analysis used for every team at Canada 2015. The Top 4 teams were analysed and compared to explore whether there was a statistically significant difference in the type of GSO they create and Goals they score. Chi

Square analysis of the results revealed statistical significance in the way the Top 4 Men's teams' Types of GSO, Men: (χ^2) (3) 58.080, p < 0.05. The same analysis also revealed statistical significance for the Top 4 Women's teams' Types of GSO, Women: (χ^2) (3) 41.157, p < 0.05. For both the Men and Women, Other Methods (O) was the preferred methods of trying to create a GSO, 50.3% for the Men and 41.7% for the Women. Crossing the ball accounted for 18.4% of the Men's GSO with almost double for the Women with 35.43% of all their GSO coming from crosses into the box. For the Men, BBS was 19.63% and BBPS was 11.65% compared to the Women who recorded 16.53% for BBS and 6.29% for BBPS. Combined into BBSPS, the results reveal that Men 31.28% create far more GSO as a percentage than Women 22.82% by getting the ball behind the opposition's defensive line.

The same analysis was undertaken into the Types of GSO that resulted in a Goal being scored for both the Top 4 Men's and Women's teams. Chi Square analysis of both the Men and Women failed to reveal statistical significance when it came to Goals; Men: (χ^2) (3) 1.059, p > 0.05 (p=0.787) Women: (χ^2) (3) 8.931, p > 0.05 (p=0.3). Comparing the data from the GSO to Goals reveals the ratio at which Types of GSO resulted in Goals being scored. Other Methods has a significantly high number of GSO with a relatively smaller conversion rate compared to the other Types of GSO, with 11/82 for Men & 9/53 for Women. This is in stark contrast, for instance, to BBPS in both which had 7/19 for Men and 4/8 for Women. It highlights that getting the ball into a position behind the oppositions defensive line with support from a teammate may allow the opportunity to create an effective GSO that can lead to a Goal being scored.

4.8 SUMMARY

The Zone of Possession Gain leading to the creation of a GSO was investigated for every team at the Canada 2015 Women's World Cup. This was to discover if there was an area on a football pitch where successful ball recovery could lead to the creation of a chance to score a goal. The time taken to create a GSO was also explored, to see if there was a significant time frame in which a team should try to create a GSO. The type of Possession Origin was explored to identify the most successful strategy for the recovery of possession and the type of GSO was recorded so as to identify the best method or strategy to create an opportunity to score a goal.

<center>**CHAPTER 5: DISCUSSIONS AND CONCLUSIONS**</center>

<center>**5.0 INTRODUCTION**</center>

The focus of the final chapter of this thesis will seek to answer the research questions posed from the outset by discussing the results of the data collection and analysis in depth.

The purpose of this study was to perform the first complete investigation into GSO at a Women's international football tournament by analysing the ability of every single team to create GSO at the Canada 2015 Women's World Cup. The research analysed the Zone of Possession Gain, the Type of Possession Gain, the Time taken to create the GSO and the Type of GSO for every team that participated at the tournament. After the aforementioned variables were measured a comparison between the successful, Top 4 (semi-finalist) Women's teams: Germany, England, Japan and the USA and the other unsuccessful 20 teams was made to explore if there was a significant difference in the way the best Women's teams create GSO. Finally, a comparison of the Top 4 Women's teams against the Top 4 Men's teams from the Brazil 2014 World Cup was made. Analysis was undertaken of the Top 4 Men's teams: Brazil, The Netherlands, Argentina and Germany so that a comparison could be made in the way they create GSO compared to their female counterparts.

<center>**5.1 FROM WHICH ZONES ON THE PITCH DID GSO/GOALS ORIGINATE FROM AT THE CANADA 2015 TOURNAMENT?**</center>

Based on the 9-zone grid system that was implemented in the present study of all GSO opportunities at the Canada 2015 Women's World Cup revealed that, compared to other zones, the central midfield zone (MC) was the most prominent zone when it came to the origin of possession leading to a GSO. This result shows that the central zone in midfield is

<center>60</center>

the most common zone for ball recovery as a majority of the gameplay occurs here during normal match play [100], It also allows a team to regain possession and attempt to either carry possession further forward through patient build up into the attacking zones or attempt a ball in behind the oppositions defence (BBSPS) to create GSO [5]. The zone ML recorded more possession gains in total compared to the zone MR, the zone ML recording a higher figure than MR could be explained by the tactic of teams at the tournament fielding right footed players in left 'midfield' positions, which allows for the midfielder to open their body and play passes inside or behind defences on their stronger and preferred foot. Combined, the middle third of the pitch accounted for more than half of all possession gains and highlights the effectiveness of regaining possession of the ball in midfield. The AC zone also accounted for a high number of possession gains leading to the creation of a GSO. This is because of the proximity of the AC zone to the goal that the team who has just won possession is attacking, often catching the opposition in transition without an organised defensive structure and within shooting distance to goal. The three defensive zones DL, DC & DR combined only accounted for 44/390 GSO when it came to Zone of Possession Gain. Effectively, winning, gaining or restarting possession in the defensive 3rd of the pitch only accounted for just over ten percent of all of the GSO at the Canada 2015 tournament and shows that trying to build opportunities to score from the back was not an effective strategy at the Women's World Cup.

When the analysis of Zone of Possession Gain was undertaken on those GSO that lead to the scoring of a goal, similar trends to GSO began to emerge. Recovering the ball in the middle 3rd accounted for two-thirds of all Goals scored from Open Play at the tournament. AC was again shown to be an effective zone to win the ball again with a high number of Goals scored from possession originating from here. Less than ten percent of goals at the tournament were

scored from possession originating from the defensive 3rd of the pitch. This mirrors the GSO results, highlighting that trying to build an attack from the defensive 3rd to score goals is an ineffective strategy in women's international football. The results also contradict our hypothesis that the attacking zones of the pitch would be the most prominent zone for recovery of possession leading to a GSO [52] as it was revealed by our findings that the middle zones were the most prominent areas in which possession was won leading to GSO.

5.2 THE TIME TAKEN TO CREATE A GSO IN WOMEN'S INTERNATIONAL FOOTBALL

The time taken to create a GSO from open play at the Canada 2015 tournament was recorded for each of the 24 competing teams. From open play and across the competing 24 teams at the tournament, the average time to create a GSO from the 390 analysed at the tournament reinforced previous literature that opportunities to score often occur from counter attack situations or inside short periods of time that don't allow for an opponent to organise their defence properly [53, 56, 87]. The opportunities that lead to the scoring of a goal from the 95 analysed in open play returned similar results to the unsuccessful GSO, with no statistical significance found after Chi-square analysis and a mean time difference of less than a second. It could be argued that the difference between successfully scoring a goal or not from a GSO comes down to a difference of less than a second and may be as a result of poor execution and decision making from one player in the build-up making the difference between a goal being scored or not. This was further reinforced after the time data was analysed using an independent - samples t-test, which revealed no statistically significant difference in the time taken to create an unsuccessful GSO and the time taken to score a goal.

The data was then split into the Top 4 teams and the other 20 at the tournament. The Top 4 teams total time to create a GSO from open play revealed that the Top 4 teams took over 2 seconds on average longer than the rest of the competing teams. This could indicate that the Top 4 teams were more patient in their build up and perhaps enjoyed more possession in the creation of their GSO at Canada 2015 [90] . The results of the time data show that the Top 4 took slightly longer in possession to create a GSO. This could be as a result of playing against opposition who played a negative and defensive style of play in response to playing against one of the tournament favourites. However, the independent – samples t-test of the time data revealed no statistical difference between the Top 4 teams time taken to create a GSO and Goals compared to the Rest of the teams at the tournament. This small margin of difference highlights that at Canada 2015, successful teams had possession for a fraction longer than their opposition when it came to creating an opportunity to score. This could be because the Top 4 teams' players took a slightly longer to evaluate the situation in front of them and were patient with possession so as to create a better opportunity to score [90]. The results of our time data supports our hypothesis that it would take <15 seconds to create a GSO at Canada 2015 [53].

5.3 WHAT ARE THE TYPES OF POSSESSION GAIN IN WOMEN'S INTERNATIONAL FOOTBALL?

The Type of Possession Gain was labelled as one of three definitions; an interception or misplaced pass (IMP), as a result of a tackle or high pressure (THP) or as a result of a Restart (R) e.g. a throw in or short, quickly taken free kick. Type of Possession Gain leading to GSO for all the Women's teams revealed that IMP was the most successful ball recovery strategy with almost half occurring from this method. THP accounted for roughly a third of all methods of recovery and R accounted for just over twenty five percent. The results reveal

that intercepting a wayward pass, setting a trap to intercept a good pass or waiting for a pass from the opposition that was under hit or misplaced was the most effective way to gain possession and create a GSO. This could be the result of a direct tactic by teams to organise and wait for a specific trigger to intercept certain passes, to invite risky passes from the opposition in certain zones of the pitch or to create a compact defensive structure that encourages the opponent to play risky passes that have a high likelihood of being intercepted. Thus, the tactic of forcing a turnover in possession through an interception or misplaced pass (IMP) at Canada 2015, lead to a goal scoring opportunity far more often than as a result of a tackle or high pressure (THP) or from a restart (R) such as a throw in or short free kick.

The same analysis was applied to the GSO that resulted in a Goal being scored. Again, it was IMP that was found to be the most effective ball recovery strategy with roughly half of all goals beginning with this recovery method. THP again accounted for roughly a third and R accounted for almost twenty-five percent of all goals. The results of which are not too dissimilar to the attempts resulting in a GSO, indicating that making an interception or waiting for a poorly executed pass was the most effective way to start a phase of play that resulted in the opportunity to score a Goal at the 2015 Women's World Cup. This goes against our hypothesis that a tackle or high pressure would be the most prominent ball recovery strategy at the Canada 2015 World Cup [52].

5.4 WHAT ARE THE TYPES OF GSO CREATED IN WOMEN'S INTERNATIONAL FOOTBALL?

The final phase of the GSO was labelled as one of 4 definitions as per the methodology adapted from the study by Smith & Lyons (2017) [5]. These definitions were Ball Behind & Strike (BBS) which meant the final pass before the GSO was played in behind the

opposition's defensive set-up. Ball Behind Pass & Strike (BBPS) which meant that the ball had been played behind the oppositions defence to a player who then passed to a team mate.

Combining the aforementioned definitions gave us (BBSPS) which resulted from passing the ball behind opponents or to a player level with the last defender who could either shoot or take the ball forwards (BBS) or pass to a team mate to score (BBPS). Crosses (C) were considered a pass into the penalty area from either side of the penalty area and from within 20 yards of the goal line. Any GSO that didn't fit the definition BBS/BBPS/C was labelled as being Other Methods (O) e.g. a shot from distance from in front of the opposition's last line of defence/defensive set-up.

The Type of GSO for all 24 teams was also noted from the 390 instances of GSO in open play. When combined into BBSPS, or Ball Behind Strike or Ball Behind Pass & Strike it was revealed that getting the ball behind the oppositions defence accounted for almost a third of all chances at the Canada 2015 tournament. GSO from crosses (C) numbered similarly to BBSPS, accounting for about a third of all opportunities to score. Other Methods (O) reported the highest number of instances with just over forty-percent of chances created this way.

The same analysis for Goals revealed BBSPS to be the most effective way to score goals at the tournament. Comparing the figures for GSO and Goals reveals that for the Type of GSO getting the ball in behind the opposition was the most effective way to score a goal, accounting for about forty percent, despite being the least prevalent way to create the opportunity. Contrary to this, Other Methods (O) e.g. taking a shot from distance in front of the oppositions defence, was the least effective way of actually scoring a Goal out of all the GSO created that way. Crossing the ball into the box to create a GSO and scoring a Goal

produced similar figures and would seem to be an effective strategy to score in Women's international football. The results show that getting the ball behind the defensive line of the opposition such as in BBSPS or by putting Crosses into the box was a successful way of scoring goals from open play at Canada 2015. A further look at the results of BBSPS shows that almost a third of BBS GSO created resulted in a goal being scored and that BBPS GSO had more than half of them converted into Goals. This reveals the effectiveness of being able to get in a position behind the oppositions defence with the option to pass to a teammate to score goals. These findings contrast our hypothesis that Crossing the ball would be the most prominent way of creating a GSO and scoring goals at Canada 2015 [54].

5.5 COMPARING THE SUCCESSFUL AND UNSUCCESSFUL TEAMS' ZONE OF POSSESSION GAIN AT CANADA 2015

After the analysis of all 24 competing teams at the Canada 2015 Women's World Cup was completed, the resulting data was split into the sub-groups: *successful* and *unsuccessful*. In all, 390 GSO from open play were analysed for the study, when split into *successful* (Top 4) and *unsuccessful* (The Rest) teams the figures were 96 GSO and 294 GSO respectively. For the Top 4 (successful), more than half of their opportunities originated in the middle 3rd of the pitch, The Rest (unsuccessful) produced a similar ratio in comparison. Similar results were found when the DEF 3rd was analysed, the Top 4 were able to create about ten percent of their GSO from the DEF 3rd of the pitch, with the rest producing slightly more of their opportunities originating from phases of play from the back third of the pitch. When analysed, the attacking 3rd of the pitch also produced similar findings, with the Top 4 creating more than a third of their chances in the attacking third and The Rest producing about a third from that area of the pitch as well. The results show similarities in the way that all teams created GSO from open play at Canada 2015. This was a surprising finding as it was

hypothesised that successful teams would gain possession of the ball to create GSO higher up the pitch in the attacking third more frequently than the rest of the teams at the tournament. This finding shows similar ball recovery strategies in terms of Zone of Possession Gain across all teams at the tournament when it came to creating a GSO.

The GSO were then organised between the Top 4 group and The Rest group to look at the opportunities from open play that resulted in a Goal being scored. The Top 4 Women's teams scored almost a third of the goals from open play compared to the other 20 teams competing at the tournament. When split into 3rd's to explore Zone of Possession Gain similar patterns between the two groups emerged from the results, DEF 3rd results for the Top 4: showed that less than ten percent of goals originated from possession in the defensive 3rd. About two thirds originated from possession in the middle 3rd and possession gained in the attacking 3rd accounted for about a quarter of all goals at the tournament. The results show no discernible difference between the teams in the area in which they won, regained or restarted possession leading to the scoring of a Goal at the tournament with similar results returned for each 3rd of the pitch when it came to zone of Possession Gain. This contradicts our hypothesis that the successful teams were able to win the ball higher up the pitch than the unsuccessful teams [52].

5.6 WHAT ARE THE DIFFERENCES BETWEEN THE TOP 4 MEN's AND WOMEN's INTERNATIONAL FOOTBALL TEAMS FROM THE LAST WORLD CUP TOURNAMENTS?

The differences between the best Men's and Women's teams from the last two FIFA World Cups were also investigated. The variables Zone of Possession Gain, Time, Type of Possession Gain and Type of GSO were all used to make a comparison between the Top 4 Men's and Women's teams. Zones of Possession Gain for both sexes returned similar results in the middle 3rd Zones. The middle 3rd of the pitch in the men's Top 4 returned similar statistics of GSO Pos. Gain. with the women's Top 4. Regaining the ball and starting an offensive phase in the attacking 3rd of the pitch was less successful for the Top 4 Men when compared to the Top 4 Women. Finally, the DEF 3rd of the pitch accounted for more than double of all GSO Pos. Gain's in the Top 4 men's teams compared to the Top 4 women's teams. This displayed that the Men were more capable than their female counterparts are building attacking phases of play from the 'back' or defensive third of the pitch.

It was found that it took the Men's teams almost a second longer to create a GSO in open play, however the time taken to score a Goal however returned similar times. When it came to Types of Possession Gain between Men & Women, IMP accounted for more than half of the types of Possession Gain in the Men's and Women Top 4 teams. THP was similar for both the Men and Women and restarts (R) returned similar ratios of Possession Gain from both groups. This analysis revealed no major difference in the aforementioned analysis between the two genders when it came to Types of Possession Gain, highlighting that international football teams deploy similar tactics and strategies when it came to methods to recover the ball, regardless of whether it was the men's or women's team.

For both the Men and Women, Other Methods (O) was the preferred methods of trying to create a GSO. Crossing the ball accounted for less than twenty percent of the Men's GSO with almost double for the Women. For the Men, BBSPS accounted for roughly a third of all GSO compared to the Women who recorded just over twenty-percent. Combined into BBSPS, the results reveal that Men create far more GSO as a percentage than Women by getting the ball behind the opposition's defensive line. This could be because of differences in playing style, formations or indicate the best Men's international teams are more effective at penetrative passing through an organised defence than the equivalent Women's teams.

5.7 GENERAL DISCUSSION

This research conducted the first complete tournament analysis of Women's international football. Furthermore, the research compared the Top 4 Women's and Men's teams in international football in relation to the creation of GSO. The comparison was undertaken to investigate if there were any significant differences in creating GSO in women's and men's international football.

In general, the following conclusions can be made from the results of the study; for women's football at the elite level, the Zone MC was the most effective area for gaining possession of the ball and creating an opportunity to score a goal at Canada 2015. The significance of this cannot be understated, as the current trend in football is to build possession from the defensive third. This 'playing out from the back' approach is taught in coach education globally. It is a philosophy that has evolved from the days of the Dutch *total voetbal* or 'total football' that was popular in the 1970's with the club side Ajax and The Netherlands national team. This philosophy has further influenced the football culture of successful clubs like Barcelona and more recently Manchester City, who try to build possession from their

defensive third to create opportunities to score. The results highlight that this approach in women's international football may not be the best approach as it was found that the middle third was a better area of the pitch to build an attack from.

The time taken to create a GSO at Canada 2015 was just under twelve seconds, which highlights the speed in which a GSO is created. This again goes against the current trend or philosophy in coach education of patient build up from the defensive third that is so prominent in the football landscape. It appears that moving the ball quickly and trying to play forward passes into attacking zones is the best way to create GSO in international football. Making an interception or recovering a misplaced pass from the opposition (IMP) was the most effective ball recovery strategy at Canada 2015 when it came to creating a GSO and scoring a Goal. This indicates that teams with a disciplined defensive structure, who were patient and organised, were able to then recover possession of the ball and counter-attack the opposition by forcing their opponent to play a risky pass or make a skill error attempting a pass. For types of GSO, getting the ball behind the oppositions defence (BBSPS) was the most effective way to score a goal, however Other Methods (O), such as a shot from distance was the most prominent way to create a GSO at the tournament. This could suggest that teams were aware of the dangers of being exposed by methods that got the ball behind their defensive structure, which meant that the opposition was forced to use Other Methods in an attempt to score goals. It also highlights how effective teams were when they were able to break down a team's defensive structure and get the ball behind the oppositions defence.

When comparing Men v Women, the Top 4 Women's teams attempted to score more from Crosses than their male counterparts, who were more successful at creating opportunities to score behind their oppositions defence (BBSPS). The Men's teams took almost a second

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longer to create a GSO but recorded a similar time in possession to the Women when it came to score a Goal. The findings suggest very similar approaches to the creation of GSO in international football, regardless of gender. There were far more similarities found between the best Men's and Women's teams at the last World Cup tournaments than differences when it came to the creation of GSO.

5.8 CONCLUSIONS

This research conducted the first complete tournament analysis of Women's international football. The research also compared the Top 4 Men's and Women's teams in international football when it came to the creation of GSO. The following conclusions from the results can be made: The Zone MC was the most effective area for gaining possession of the ball and creating an opportunity to score a goal at Canada 2015. The time taken to create a GSO at Canada 2015 was just under twelve seconds, highlighting the speed in which a GSO is created. Making an interception or recovering a misplaced pass from the opposition (IMP) was the most effective ball recovery strategy at Canada 2015 when it came to creating a GSO and scoring a Goal. For types of GSO, getting the ball behind the oppositions defence (BBSPS) was the most effective way to score a goal, however Other Methods (O), such as a shot from distance was the most prominent way to create a GSO at the tournament. The Top 4 Women's teams attempted to score more from Crosses than their male counterparts, who were more successful at creating opportunities to score behind their oppositions defence (BBSPS). The Men's teams took almost a second longer to create a GSO but recorded a similar time in possession to the Women when it came to score a Goal.

5.8 RECOMMENDATIONS FOR FUTURE RESEARCH

Due to the lack of research into women's football and in particular women's international football, further research into whole tournament and/or league football should be undertaken. This further research into women's football will allow comparisons to be made to these particular studies in the same way that comparisons between tournament/league football has been made in men's football. Further research should also be undertaken because trends, philosophies and systems of play change over time and can be vastly different, depending on level of competition or league. Future research could be undertaken to not only investigate GSO where the shot was on target, but also those opportunities that due to skill error, or from a defender's intervention for example, are off target. Ultimately, any research that can add to the paucity of previous research into the field would be a welcome addition the scientific literature and continue to grow the profile and professionalism of women's international football.

5.9 PRACTICAL APPLICATIONS

The findings of the present study can be used to influence players and coaches to design training sessions and interventions to successfully create GSO in women's football. The data from the research may influence the tactical and technical set up of women's international football teams and help to evolve the game in the same way that research into the men's game has.

The findings also have implications for coach education, by way of highlighting methods of success that can then be transferred into coaching courses and workshops. Current coach education could be updated or modified to incorporate some of the findings of this study to improve the current coach education literature.

Some specific training/coaching applications could include:

- The development of training that reflects gaining possession of the ball in the midfield zones.

- The development of training where time is a factor in the creation of goal scoring opportunities and teams have to move quickly to create a chance to score.

- Training of a tactical nature that focuses on intercepting passes or forces opponents into turning over possession with misplaced passing.

- Training with the emphasis or focus on getting the ball behind the opposition's defensive set up, as it has been shown to be an effective way at creating opportunities to score in international football.

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APPENDICES

APPENDIX 1 OBSERVER RELIABILITY

Yule's Q Statistic for Intra-reliability and Inter-reliability

YULES Q STATISTIC

	MID	ATT	
ANALYST 1	a	b	a+b
ANALYST 2	c	d	c+d
	a+c	b+d	a+b+c+d

$$\text{YULES Q} = \frac{bc - ad}{bc + ad}$$

TABLE 1 INTRA-RELIABILITY

3RD OF POSS ORIGIN	MID	ATT	TOTAL
ANALYST 1	53	33	86
ANALYST 2	52	34	86
TOTAL	105	67	172

CORRELATION CALCULATIONS

YULES Q FORMULA RESULT	-0.02
YULES Q VALUE	**0.98**

TABLE 2 INTER-RELIABILITY

3RD OF POSS ORIGIN	MID	ATT	TOTAL
ANALYST 1	53	33	86
ANALYST 1 RETEST	53	33	86
TOTAL	106	66	172

CORRELATION CALCULATIONS

YULES Q FORMULA RESULT	0.00
YULES Q VALUE	**1.00**

APPENDIX 2

Zones of Possession leading to the creation of a GSO at the Canada 2015 Women's

World Cup

	DL	DC	DR	ML	MC	MR	AL	AC	AR	GSO TOTAL
Australia	0	3	1	4	6	3	1	2	1	21
Brazil	2	3	1	2	2	3	0	2	5	20
Cameroon	0	4	2	3	9	0	3	1	0	22
Canada	0	1	0	2	1	2	3	7	1	17
China	0	2	0	3	5	0	1	2	0	13
Colombia	0	0	0	3	3	1	0	0	0	7
Costa Rica	0	0	0	1	1	1	0	0	0	3
Ecuador	0	0	0	0	1	0	0	0	0	1
England	0	2	0	1	6	3	1	6	1	20
France	0	0	0	5	5	1	1	5	2	19
Germany	0	1	2	7	15	8	7	8	2	50
Ivory Coast	0	0	0	2	1	0	4	5	0	12
Japan	0	1	0	1	7	5	3	2	3	22
Korea	1	1	0	0	3	0	6	0	1	12
Mexico	0	2	1	1	1	0	0	3	1	9
Netherlands	0	1	1	2	4	4	0	2	1	15
New Zealand	1	0	0	1	3	4	0	0	0	9
Nigeria	0	0	0	3	6	1	0	1	0	11
Norway	0	1	1	4	4	2	2	2	0	16
Spain	0	0	0	2	3	2	0	1	3	11
Sweden	1	1	0	3	3	0	1	0	1	10
Switzerland	0	2	1	3	6	4	3	5	5	29
Thailand	0	0	0	3	3	3	0	0	0	9
USA	0	4	0	7	8	5	1	6	1	32
	5	29	10	63	106	52	37	60	28	390

Zones of Possession leading to the scoring of a Goal at the Canada 2015 Women's

	DL	DC	DR	ML	MC	MR	AL	AC	AR	GOALS TOTAL
Australia	0	0	1	2	1	0	0	1	0	5
Brazil	0	1	0	0	1	0	0	1	0	3
Cameroon	0	1	0	0	3	0	1	1	0	6
Canada	0	0	0	0	0	0	0	2	1	3
China	0	0	0	2	0	0	0	0	0	2
Colombia	0	0	0	2	1	1	0	0	0	4
Costa Rica	0	0	0	1	1	1	0	0	0	3
Ecuador	0	0	0	0	0	0	0	0	0	0
England	0	0	0	0	2	1	0	1	0	4
France	0	0	0	1	1	1	0	2	0	5
Germany	0	0	1	4	3	3	0	2	0	13
Ivory Coast	0	0	0	1	1	0	0	1	0	3
Japan	0	0	0	1	0	1	0	1	1	4
Korea	0	1	0	0	2	0	0	0	0	3
Mexico	0	0	0	0	0	0	0	1	0	1
Netherlands	0	0	0	0	1	1	0	0	1	3
New Zealand	0	0	0	0	0	1	0	0	0	1
Nigeria	0	0	0	0	2	0	0	1	0	3
Norway	0	0	0	2	1	1	0	1	0	5
Spain	0	0	0	0	0	1	0	0	0	1
Sweden	0	0	0	0	2	0	0	0	0	2
Switzerland	0	1	0	2	2	1	0	3	1	10
Thailand	0	0	0	2	0	1	0	0	0	3
USA	0	1	0	3	2	0	0	2	0	8
	0	5	2	23	26	14	1	20	4	95

World *Cup*

APPENDIX 4

Mean Time (±) for each team to create a GSO: Total time, Unsuccessful GSO & Goals

at the Canada 2015 tournament

CANADA 2015	GSO (secs)	GSO	GSO ALL MEAN	Unsuccessful (secs)	GSO	Unsuccessful MEAN	Goals (secs)	GOALS	GOAL MEAN
Australia	251	21	12.09	212	16	13.25	39	5	7.8
Brazil	246	20	12.3	210	17	12.35	36	3	12
Cameroon	232	22	10.54	166	16	10.37	66	6	11
Canada	128	17	7.52	120	14	8.57	8	3	2.66
China	152	13	11.69	119	11	10.81	33	2	16.5
Colombia	93	7	13.28	40	3	13.33	53	4	13.25
Costa Rica	56	5	11.2	23	2	11.5	33	3	11
Ecuador	8	1	8	8	1	8	0	0	0
England	190	19	10	145	15	9.66	45	4	11.25
France	208	19	10.94	165	14	11.78	43	5	8.6
Germany	600	55	10.9	439	42	10.45	161	13	12.38
Ivory Coast	61	11	5.54	48	8	6	13	3	4.33
Japan	348	21	16.57	303	17	17.82	45	4	11.25
Korea	143	13	11	64	10	6.4	79	3	26.33
Mexico	87	9	9.66	86	8	10.75	1	1	1
Netherlands	183	15	12.2	159	12	13.25	24	3	8
New Zealand	85	9	9.44	69	8	8.625	16	1	16
Nigeria	105	11	9.54	83	8	10.37	22	3	7.33
Norway	220	16	13.75	173	11	15.72	47	5	9.4
Spain	113	8	14.12	104	7	14.85	9	1	9
Sweden	120	9	13.33	75	7	10.71	45	2	22.5
Switzerland	328	28	11.71	173	18	9.61	155	10	15.5
Thailand	120	9	13.33	79	6	13.16	41	3	13.66
USA	481	32	15.03	382	24	15.91	99	8	12.37
MEAN			11.40			11.40			10.96
±			2.45			2.47			6.04

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APPENDIX 5

Mean Time (±) to create a GSO: Total time, Unsuccessful GSO & Goals for the Top 4 teams at the Canada 2015 tournament

Top 4 Women's	GSO (secs)	GSO	GSO ALL MEAN	Unsuccessful (secs)	GSO	Unsuccessful MEAN	Goals (secs)	GOALS	GOAL MEAN
England	190	19	10	145	15	9.66	45	4	11.25
Germany	600	55	10.9	439	42	10.45	161	13	12.38
Japan	348	21	16.57	303	17	17.82	45	4	11.25
USA	481	32	15.03	382	24	15.91	99	8	12.37
MEAN			13.13			13.46			11.81
±			2.94			4.02			0.64

APPENDIX 6

Mean Time (±) to create a GSO: Total time, Unsuccessful GSO & Goals for The Rest of the teams at the Canada 2015 tournament

CANADA 2015 REST	GSO (secs)	GSO	GSO ALL MEAN	Unsuccessful (secs)	GSO	Unsuccessful MEAN	Goals (secs)	GOALS	GOAL MEAN
Australia	251	21	12.09	212	16	13.25	39	5	7.8
Brazil	246	20	12.3	210	17	12.35	36	3	12
Cameroon	232	22	10.54	166	16	10.37	66	6	11
Canada	128	17	7.52	120	14	8.57	8	3	2.66
China	152	13	11.69	119	11	10.81	33	2	16.5
Colombia	93	7	13.28	40	3	13.33	53	4	13.25
Costa Rica	56	5	11.2	23	2	11.5	33	3	11
Ecuador	8	1	8	8	1	8	0	0	0
France	208	19	10.94	165	14	11.78	43	5	8.6
Ivory Coast	61	11	5.54	48	8	6	13	3	4.33
Korea	143	13	11	64	10	6.4	79	3	26.33
Mexico	87	9	9.66	86	8	10.75	1	1	1
Netherlands	183	15	12.2	159	12	13.25	24	3	8
New Zealand	85	9	9.44	69	8	8.625	16	1	16
Nigeria	105	11	9.54	83	8	10.37	22	3	7.33
Norway	220	16	13.75	173	11	15.72	47	5	9.4
Spain	113	8	14.12	104	7	14.85	9	1	9
Sweden	120	9	13.33	75	7	10.71	45	2	22.5
Switzerland	328	28	11.71	173	18	9.61	155	10	15.5
Thailand	120	9	13.33	79	6	13.16	41	3	13.66
MEAN			11.06			10.97			10.79
±			2.22			2.61			6.62

Mean Time (±) to create a GSO: Total time, Unsuccessful GSO & Goals for the Top 4

Men's & Women's Teams at Brazil 2014 & Canada 2015

TOP 4 Men's	GSO (secs)	GSO	GSO ALL MEAN	Unsuccessful (secs)	GSO	Unsuccessful MEAN	Goals (secs)	GOALS	GOAL MEAN
Argentina	688	43	16	615	39	15.76	73	5	14.6
Brazil	482	39	12.35	436	32	13.62	46	7	6.57
Germany	791	50	15.82	626	38	16.47	165	11	15
Netherlands	386	31	12.45	288	21	13.71	98	10	9.8
MEAN			14.16			14.89			11.49
±			1.88			1.34			3.74

Top 4 Women's	GSO (secs)	GSO	GSO ALL MEAN	Unsuccessful (secs)	GSO	Unsuccessful MEAN	Goals (secs)	GOALS	GOAL MEAN
England	190	19	10	145	15	9.66	45	4	11.25
Germany	600	55	10.9	439	42	10.45	161	13	12.38
Japan	348	21	16.57	303	17	17.82	45	4	11.25
USA	481	32	15.03	382	24	15.91	99	8	12.37
MEAN			13.13			13.46			11.81
±			2.94			3.72			0.60

APPENDIX 8

The time taken to create a GSO; total, unsuccessful GSO and successful GSO (GOALS)

for the Top 4 Men's & Women's teams.

TOP 4 Men's	GSO (secs)	GSO	GSO ALL MEAN	Unsuccessful (secs)	GSO	Unsuccessful MEAN	Goals (secs)	GOALS	GOAL MEAN
Argentina	688	43	16	615	39	15.76	73	5	14.6
Brazil	482	39	12.35	436	32	13.62	46	7	6.57
Germany	791	50	15.82	626	38	16.47	165	11	15
Netherlands	386	31	12.45	288	21	13.71	98	10	9.8
MEAN			14.16			14.89			11.49
±			1.88			1.34			3.74

Top 4 Women's	GSO (secs)	GSO	GSO ALL MEAN	Unsuccessful (secs)	GSO	Unsuccessful MEAN	Goals (secs)	GOALS	GOAL MEAN
England	190	19	10	145	15	9.66	45	4	11.25
Germany	600	55	10.9	439	42	10.45	161	13	12.38
Japan	348	21	16.57	303	17	17.82	45	4	11.25
USA	481	32	15.03	382	24	15.91	99	8	12.37
MEAN			13.13			13.46			11.81
±			2.94			3.72			0.60