

## Examination of goals scored in the 2022 World Cup football tournament in Qatar.

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### Abstract:

**Purpose:** This research project aimed to provide valuable insights to World Cup teams analysing all goals scored in the 2022 World Cup. The goal was to equip managers with information that could be utilised in preparing for future tournaments. This data would assist in designing training, programmes, selecting appropriate tactics and implementing them effectively in matches. **Methodology:** The analysis focused on key metrics such as goal timings (in 15-min intervals), impact of scoring first on the final score and possession time before goals were scored. The hypothesis was centred around the expectation that a majority of goals would occur in the second half, aligning with trends observed in previous tournaments. The study employed a quantitative methodology analysing all 172 goals using the selected goal metrics in SPSS. Chi-square tests were used, and they showed that all goal metrics were statistically significant. **Results:** Most goals were scored in the second half (58.72%), most goals were scored in the 31-45 and 61-75 intervals of the game, the average possession a team had directly before scoring was 26 seconds and out of all 57 games where a team scored first, 75.44% of them went on to win. **Conclusions:** More goals in the second half were linked to the introduction of attackers by substitution, the impact of scoring first was linked to positive and negative psychological moments and the goal timing intervals were linked to the newly introduced stoppage time calculation methods. World Cup managers should be prepared to make strategic substitutions and be aware of the new stoppage time calculation methods at future World Cups.

**Key words:** possession, scoring, time, teams

### Introduction

Football coaches control factors that can affect their club by having the ability to make effective decisions (Aarons *et al*, 2023) based on their observation of incidents in a sport performance, which focuses mainly on evaluating the strengths and weaknesses followed by an effective intervention (Sarmiento *et al*, 2014). The barriers of implementing these strengths and weaknesses into effective interventions e.g., training sessions, is that research shows that football coaches can only recall 59.2% of the critical events in a football match (Laird and Waters, 2008) therefore if the intervention is based on inaccurate observations, then it may be invalid and subjective (Jones, James and Mellalieu, 2004). Various factors effect different coaches' observation recall such as the type of way they coach (Crisfield, 1998), the ability levels of the players (Pyke, 2002; Martens, 2004) and the coaching qualifications they have attained (Laird and Waters 2008). A more accurate and reliable solution is for coaches to use technology to provide both the players and coaches with sophisticated, objective information about performance (Liebermann *et al*, 2002).

This objective data can then be communicated to the players within video feedback sessions which typically involve the coach presenting video clips to one or more athletes while simultaneously providing verbal feedback and questioning athletes (Groom, Cushion and Nelson, 2011). These video feedback sessions with players can have various purposes such as to describe past performances (descriptive) and prescribe future performances (prescriptive) (Mason, Farrow and Hattie, 2021), as well as using Hattie and Timperley's (2007) four level model to direct feedback either at the learner themselves, at the task, at the processes underlying the task, or at the self-regulation level. These feedback sessions held by football teams may include specific key performance indicators (KPI's) that have been researched across numerous tournaments such as corner kicks (Zlieli and Soyler, 2022; Kubayi and Larkin, 2019) and KPI's associated with successful World Cup teams such as short and medium passes compared to long passes (Clemente, 2012). This research study intends to serve a similar purpose, to inform World Cup teams with analysis of all the goals scored at the 2022 FIFA World Cup so they can prepare for the next tournament.

Football tactics are always evolving (Wilson, 2010), so the usefulness of this 2022 World Cup research is justified as there is a need for constant record and evaluation of tactics (Leite, 2015) so coaches can use this information about recent trends to design training, choose appropriate tactics and apply it correctly in games (Yiannakos and Armatas, 2006). This application of analysis enhancing the coaching process is displayed in Wright, Atkins and Jones's (2012) study which saw 93% of coaches using match analysis within their short-term planning which clearly shows its importance of helping set goals for training (Palao and Lopez-Martinez, 2012).

FIFA recorded nearly 130,000 professional footballers, over 4,400 professional clubs (FIFA, 2021) and 5 billion football fans around the world in 2021 (FIFA, 2021). According to the leading data firm Nielsen (2018), these statistics show that football is uncontested as the world's biggest sport amongst fans with basketball and rugby union in second and third place. The biggest competition in football is the FIFA World Cup which attracts millions of people to attend the games in the host country and millions of people to watch on television; the 2018 final game alone drew more than 900 million viewers from across the globe (Whitfield, 2019). Not only is this competition hugely popular amongst fans, but world leaders also recognise how important the World Cup is as it is used by host countries to furnish international recognition as well as symbolic power (Almedia, Junior and Pike, 2014). The tournament is powerful enough to act as a tourism resource with the power to enhance the destinations image as well as helping countries, such as Qatar in 2022, seek greater engagement with the international community (Henderson, 2014). The World Cup comes around every four years and it involves athletes representing a wide variety of countries and cultures who compete on a global level (Conchas, 2014). It began in 1930, after the Olympic Games were designated to be restricted to athletes who were amateurs and not professionals, with the first games being held in Uruguay where the host country beat Argentina 4-2 in the final (Conchas, 2014). Ever since, it has been the ultimate test for the great players; arguably the greatest ever player Pele once said 'The World Cup is a very important way to measure the good players, and the great ones. It is a test of a great player' (Wernicke, 2022).

Generally, every association affiliated to FIFA may participate in the FIFA World Cup with its representative team and must progress through the preliminary competition before reaching the final competition, apart from the host country who automatically qualify for the final competition (FIFA, 2020). If an association wants to take part in the preliminary competition, they must progress through a league/knockout tournament consisting of other teams based on sports and geographic factors as well as team performance based on the FIFA world ranking (FIFA, 2020). The 2022 World Cup had thirty-two countries competing in the final competition (FIFA, 2022).

The football World Cup tournament represents the pinnacle of the game globally (Njororai, 2014) so it is only natural that the lessons derived from the countries chosen tactics are applied to the lower echelons of the game including club and institutional levels (Castellano, Casamichana and Lago, 2012; Hughes, 1995; Hughes and Franks, 2005; Jankovic *et al*, 2010; Jinshan *et al*, 1993; Njororai, 2004). Although, teams in the lower echelons of the game must consider the demands of the tactics applied by elite teams at the World Cup as for example, teams at the 2014 World Cup displayed high pressing which requires an appropriate level of endurance from the players (Chmura *et al*, 2014). If a lower echelon team applies the tactics deployed by world class teams and their players have poor endurance, it leads to a greater number of committed errors, losing one-on-one plays and a main consequence of a loss of goals (Mohr, Krustup and Bangsbo, 2005; Bangsbo, Iaia and Krustup, 2007). This displays the different motives of coaches and fans when watching the World Cup, as fans attend the games to support their national team (Kim and Chalip, 2004) whereas coaches watch to learn from teams' performances and identify successful trends to apply in their environments (Wang and Qin, 2020).

Not only is it the coaches who watch football to learn, it is also the researchers who provide projects as recommendations for people involved in football in popular areas such as successful traits in football (Lepschy, Wasche and Woll, 2018). An example of a project identifying successful traits in football was Winter and Pfeiffer's (2016) study at the 2012 UEFA European Championship which identified the importance of transition play after losing possession of the ball. Transitions were also analysed at the 2016 UEFA European Championship, and it was discovered that offensive transitions increased by 6.32% since the 2008 European Championship (Maneiro *et al*, 2019) showing an upward trend of coaches wanting their players to actively regain possession being applied in this competition. The identification of the importance of transitioning when losing possession (Winter and Pfeiffer, 2016), as attacks are more efficient against disorganised defences (Tenga *et al*, 2010), at the 2012 European Championship could have led to coaches using this information and applying it within their environment as offensive transitions increased at the 2016 European Championship.

One of football's characteristics is the low frequency of scoring (Yiannakos and Armatas, 2006) but despite this, successful teams have been found to score more goals than less successful teams (Armatas *et al*, 2009; Lago-Ballesteros and Lago-Penas, 2010; Bekris *et al*, 2013) making it an important KPI if teams have desires to be successful. As well as goals being an important KPI, it is also one of the most exciting moments for football fans (Wang and Griffin, 1997) as nothing brings people to their feet like a goal (Kortemeier, 2016). Due to the low frequency and importance of goals, they are researched and studied to see what contributes to them such as shot placement (Durlik and Bieniek, 2014), the number of passes leading to goals (Hughes and Franks, 2005), playing tactics of goalscoring teams (Tenga *et al*, 2010) and many others to identify successful trends. Another research area within goal analysis is the timings of goals, which has been explored at the previous three World Cups and it concluded that at all three 2010, 2014 and 2018 tournaments they saw more goals being scored in the second half (Njororai, 2013; Michailidis, 2014; Kubayi, 2020). Armatas, Yiannakos and Sileloglou (2007) contributes increased scoring in the second half to fatigue and physical deterioration, the increasing tempo of football matches, tactical roles of the players, dehydration, hyperthermia and diminished cognitive function. Njororai's (2013) study on the 2010 South Africa World Cup saw more goals scored specifically in the

76–90-minute period and attributed it to pronounced physiological deterioration of defenders as compared to forwards (Reilly, 1994; Njororai, 1996, 2004, 2007). Nepfer (1992, 1998) also attributed the scoring of more goals towards the end of a match to good or poor physical condition, lack of concentration in defence due to mental and physical fatigue and all or nothing efforts to decisively influence match outcome.

The most recent World Cup in 2018 also saw more goals scored in the second half but specifically in the 45-60-minute period (Kubayi, 2020), which is earlier in the match compared to the 2010 World Cup (Njororai, 2013). Despite this, the reasonings given for goals scored in the 45-60-minute period were similar to the 2010 World Cup (Njororai, 2013) that player performances deteriorate because of fatigue (Kubayi, 2020), but should the players performances be deteriorating this early in the second half after they have had a break. If fatigue was the reasoning for more goals scored in the 45-60-minute period, then why is there not more goals scored after the 60-minute mark as fatigue would increase. Fatigue could have played a factor in goals being scored after the second half, but research should be conducted whether to see if substitutions limited goals being conceded after the 60-minute mark by coping with the physical deterioration of starting players (Njororai, 2007). Substitutions are one of the most important ways coaches can actively influence a match in progress (Wittkugel, Memmert and Wunderlich, 2022). For example, coaches can substitute in offensive players, who have been shown to participate the most in substitutions, with an intention to change the score line (Wittkugel, Memmert and Wunderlich, 2022).

Another research area within goal analysis is the impact of scoring first in a game, which is considered important (Castellano, 2009) as only 2.66 goals are scored per match in main European leagues (Anderson and Sally, 2013). Scoring first has a direct impact on teams' behaviour because they vary the way they play based on the result (Caballero, Garcia-Rubio and Ibanez, 2017), adopting more conservative approaches to try to reduce the chances of the opponent scoring (Lago-Penas, 2009). Not only is it a tactical shift but also a psychological shift, as scoring before your opponent can cause a positive psychological moment that increases the probabilities of victory (Jones, 2009) whereas the opposition can go through a negative psychological moment (Courmeya, 1990) which provokes a crisis in the team, reducing players confidence, increasing the demoralisation and decreasing group cohesion (Bar-Eli, Tenenbaum and Geister, 2006). This trend has continued in the World Cup as 77.77% of teams who scored first in World Cup qualifiers or finals between 1930-2018 went on to win the match (Martinez and Gonzalez-Garcia, 2019). As well as this, another research area within goal analysis is the amount of time a team has possession of the ball before they score a goal.

There is not a lot of research about a team's possession time directly before scoring a goal at World Cups, but there has been research conducted around a team's possession time five minutes before they scored a goal. Ridgewell (2011) discovered that at the 2010 World Cup, teams had an average possession of the ball for 57.77% of the five-minute period before scoring a goal compared to 48.17% possession of the ball within the five minutes period after scoring a goal which supports Redwood-Brown's (2008) statement that once a team has scored, they do not look to score again immediately. Of course, Redwood-Brown's (2008) statement synthesised with Ridgewell's (2011) results is only true if you support that more ball possession leads to success (Bate, 1998; Hook and Hughes, 2001; Stanhope, 2001) but currently support for this statement is divided (Jones, James and Mellalieu, 2004). Overall, goal analysis provides useful information to teams (Armatas, Yiannakos and Sileloglou, 2007), which is important as goals are the most valid KPI to determine team success (Pratas, Volossovitch and Carita, 2018), to help both score goals and increase effective defending (Cobanoglu, 2019).

The rationale of this study is to provide teams looking to qualify for the 2026 World Cup with goal analysis from all goals scored at the 2022 World Cup so coaches can use this information about recent trends to design training, choose appropriate tactics and apply it correctly in games (Yiannakos and Armatas, 2006). The aims of this study is to analyse all the goals using the metrics goal timings (15-min intervals), impact of scoring first on the final score and possession time before goals were scored. As most goals were scored in the second half at the previous three World Cups before 2022 Qatar (Njororai, 2013; Michailidis, 2014; Kubayi, 2020), the hypothesis will be that most goals were scored in the second half which follows the previous tournaments trend and will help build upon the previous work around goal timings. As well as this, this study will also help to fill in the gaps in literature around team's possession time directly before scoring a goal at the World Cup, as currently there is only research conducted around World Cup team's possession time five minutes before they scored a goal (Ridgewell, 2011). Also, analysing all the KPI's in this study will naturally fill gaps in literature about the goals at the 2022 World Cup as the tournament finished last year meaning not as much research has been conducted due to the short time frame.

## Material & methods

This study employed a quantitative methodology and involved analysing all the goals scored at the 2022 World Cup. The tournament was hosted in Qatar between 20<sup>th</sup> November 2022 to 18<sup>th</sup> December 2022 (FIFA, 2023). There were 32 teams competing, 64 games played and 172 goals scored which meant an average of 2.69 goals scored per game.

Video footage of the matches were obtained from the website Footballia.eu (2023), who provide a large database of football matches for their users to watch. Once all the matches were obtained, they were analysed

using the Hudl Sportscode software. Sportscode is widely applied in football clubs (Seidenschwarz *et al.*, 2020) and offers a performance analysis software with the mission of helping teams and athletes win (Castner and McChesney, 2019) as well as being suited to this project because of its user-friendly analysis software. The direct possession time before scoring a goal was the only metric analysed in Sportscode and a coding template was not necessary as it was analysed by slowing down the footage to find the exact moment possession starts and then finding out the exact moment when the goal is scored.

If the opposition won the ball back and the team that was in-possession had to transition into out-of-possession, this meant that the possession was over. If the opposition touched the ball but it was not under control and they were not in possession, this is still considered in-possession for the team who were just on the ball. When there were set pieces and penalties, the time was paused when the whistle was blown and restarted when the set piece or penalty was taken.

The data for goal timings and the impact of scoring first on the final result were instead collected from the scores and fixtures page on the FIFA 2022 World Cup website (2023). Goal timings were collected and categorised into their correct time periods: 0-15, 16-30, 31-45, 1<sup>st</sup> extra time, 45-60, 61-75, 76-90, 2<sup>nd</sup> extra time, 91-105 and 106-120. The data for the impact of scoring first on the full-time result was collected by analysing and reviewing if a team won, drawn or lost after they scored first in a match. Extra time goals scored after 90 minutes were excluded when collecting data for the impact of scoring first on the full-time result. The only games that were excluded from being analysed and having data collected for all the metrics were the games that were goalless. The software's used were SPSS, Hudl Sportscode and Tableau.

Data for goal timings and the impact of scoring first on the final results were collected from FIFA (2023), who use the FIFA Football Data Ecosystem to collect their information. To ensure data quality and reliability, they gather data live by having experienced analysts communicate information to writers who enter the information on the system which is then checked by up to two live observers (FIFA, 2022).

The Football Data Ecosystem has been developed over recent years and tested at several FIFA tournaments (FIFA, 2022). As direct possession before scoring was the only KPI collecting information not from an external source, it underwent Cohen's kappa test to establish reliability. The test was an intra-observer test which saw 17 random goals, selected on a random number generator, analysed once by the principal investigator and then again three weeks later to reduce learning effects (O'Donoghue, 2015). The measure of agreement was 0.94 which is almost perfect agreement (McHugh, 2012). The Cohen's Kappa test and the analysis of all data was completed using SPSS and displayed in tables and figures to clearly see the results. A chi-square goodness-of-fit test was applied to examine whether any significant differences existed regarding the direct possession time before scoring, timing of goals and the impact of scoring first (table I) on the result. The probability level was set at  $p \leq 0.05$  to indicate significance.

## Results

Table I shows the chi-square results for each of the KPI's used in this study to identify if there were significant differences.

**Table I: Chi-square results for the direct possession before scoring a goal, goal timings and first goal impact on final result.**

|             | Direct possession before scoring  |
|-------------|-----------------------------------|
| Chi-Square  | 120.291 <sup>a</sup>              |
| df          | 62                                |
| Asymp. Sig. | <.001                             |
|             | Goal timings                      |
| Chi-Square  | 70.791 <sup>a</sup>               |
| df          | 9                                 |
| Asymp. Sig. | <.001                             |
|             | First goal impact on final result |
| Chi-Square  | 45.579 <sup>a</sup>               |
| df          | 2                                 |
| Asymp. Sig. | <.001                             |

All three chi-square tests showed that they were all statistically significant as their probability levels were less than  $p \leq 0.05$  (direct possession before scoring  $X^2=120.291$ ,  $p<.001$ , goal timings  $X^2=70.791$ ,  $p<.001$  and first goal impact on result  $X^2=45.579$ ,  $p<.001$ ).

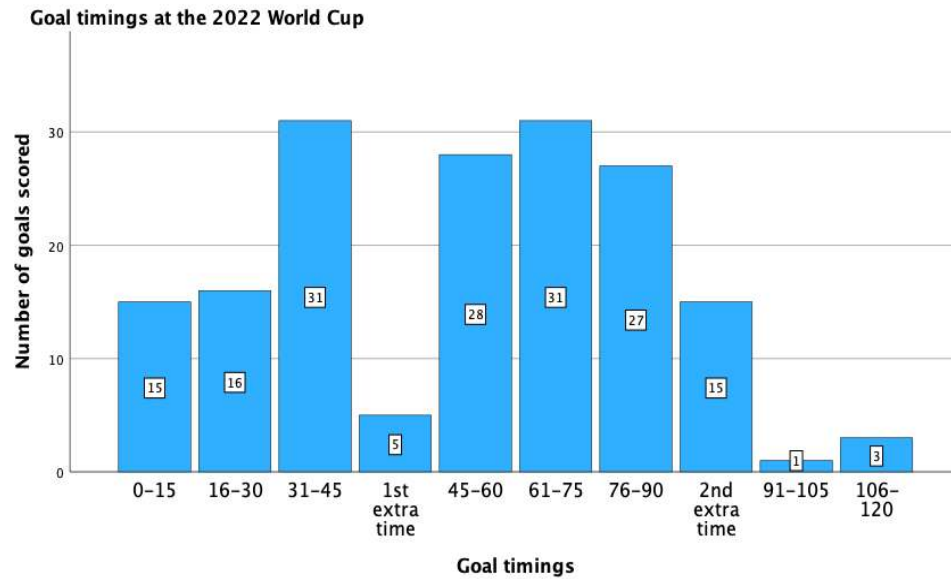


**Figure I: Goal timings of all 172 goals scored at the 2022 World Cup**

Most goals were scored in the second half with 101 goals (58.72%) compared to the first half which had 67 goals (38.95%) and extra time with 4 goals (2.33%), with the highest number of goals recorded in the 31-45 (18.02%) and 61-75 (18.02%) minutes of the game (see figure I).

The average possession a team had directly before scoring was 26 seconds and the data had a standard variation of 23.09, as well as a coefficient of variation of 88% which shows a high variation within the data set. The lowest possession time was goal 68 at 1.87 seconds and the highest possession time was goal 94 at 165.07 seconds (see figure II).

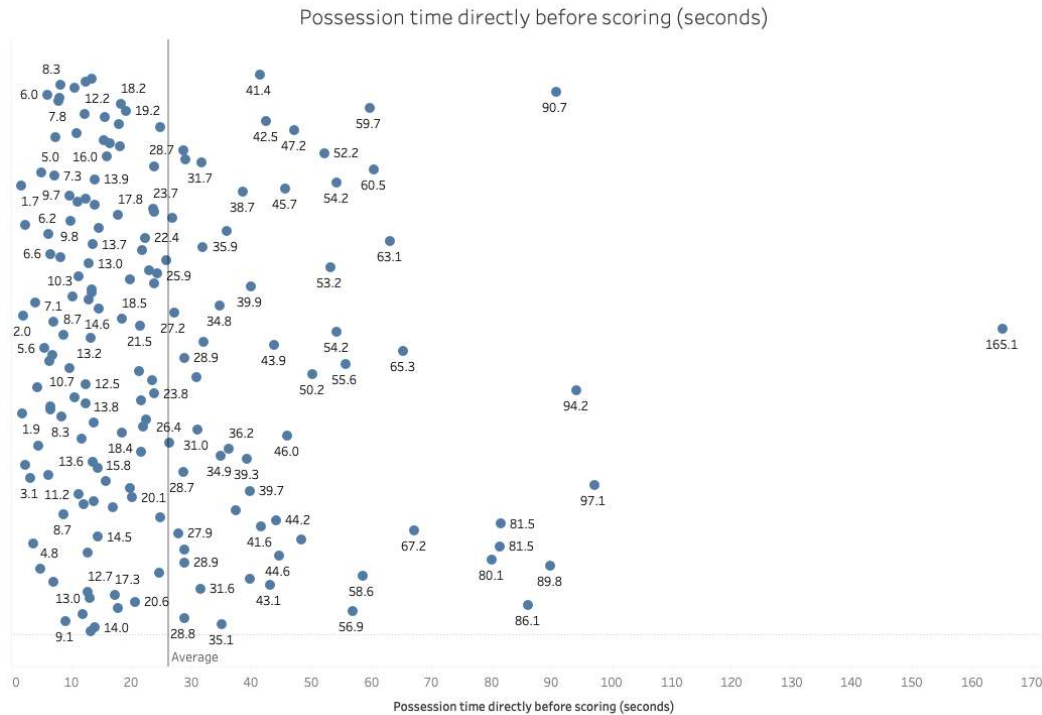


**Figure II: The possession time directly before scoring in seconds of all 172 World Cup 2022 goals.**

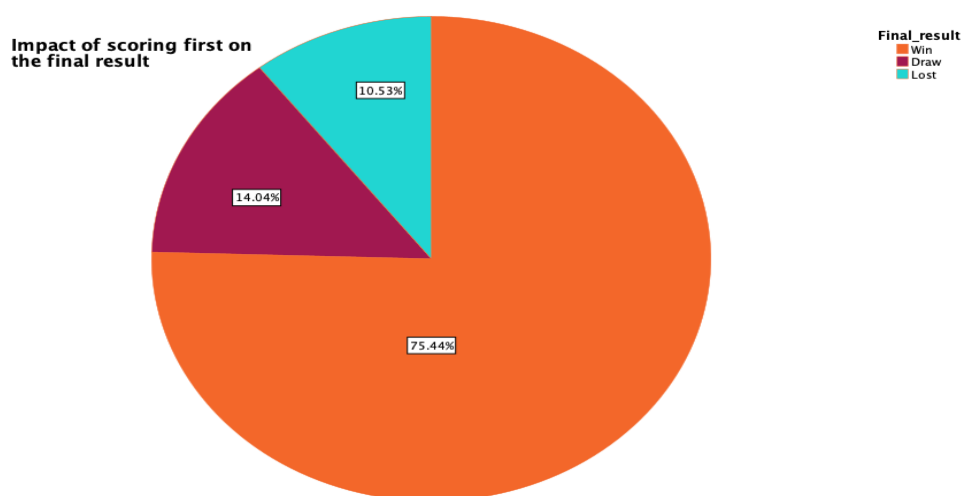


**Figure III:** Impact of scoring first on the final result of 56 games at the 2022 World Cup.

Out of all 57 games where a team scored first, 43 (75.44%) of them went on to win, 8 went on to draw (14.29%) and 6 lost (10.71%) (see figure III).

### Discussion

Most goals were scored in the second half with 101 goals (58.72%), compared to the first half which had 67 goals (38.95%) and extra time with 4 goals (2.33%) (see figure I). This followed the same trend as the last three World Cups as more goals were scored in the second half in 2018 at 63% (Kubayi, 2020), 2014 at 57% (Yiannis, 2014) and 2010 at 58% (Njororai, 2013). These results support the study's hypothesis that more goals are scored in the second half at the 2022 World Cup. A potential reason for this trend at the last four World Cups, and has been suggested as a reason at the 2010 (Njororai, 2013) and 2018 (Kubayi, 2020) World Cups, is physiological deterioration of defenders compared to forwards (Reilly, 1994; Njororai, 1996, 2004, 2007), which leads to increased scoring towards the end of a match due to a lack of concentration in defence due to physical fatigue (Nepfer, 1992, 1995). Despite previous World Cup studies suggesting this, it is important to consider that these pieces of literature by Nepfer (1992, 1995), Reilly (1994) and Njororai (1996) are outdated and a more recent study by Rago, Pizzuto and Raiola (2017) found that professional defenders were able to perform endurance exercise to a greater capacity than any other position and Paskalis, Wati and Rubiyatno (2022) found that defenders have higher levels of endurance than attackers. An argument could be made that both these studies samples were on youth players so it is unreliable, but Altmann's *et al* (2020) study was based on professional players in the top two German leagues and they also found that defenders didn't physiological deteriorate compared to forwards and instead they found no significant differences involving endurance among all outfield playing positions. This change of defenders not becoming physiologically deteriorated before attackers can be linked to speed and stamina becoming a positional requirement for all defenders (Hughes *et al*, 2012) and the modern game requiring above-average performances on a variety of physical components from all positions for successful football performances (Clark, 2007).

Instead of suggesting that the increased number of goals in the second half is linked to the defenders' performances decreasing due to physiological deterioration, it could instead be linked to the introduction of attackers in the second half by substitutions. The introduction of fresh players is linked to the increased scoring towards the end of matches as substituting a player at the right time can help sustain a team's tempo or provide a lift (Njororai, 2007). At the 2006 and 2010 World Cup, substitutes scored 23 and 15 goals respectively hence there is an important goal scoring contribution that substitutes bring into the game (Njororai, 2013). Not only can substitutions increase the chances of the team scoring, but they can also restore imbalances in work rate as they have been shown to cover significantly more ground at high intensity during the final 15 minutes than the other players already on the pitch (Carling *et al*, 2008). Synthesising the data supporting the impact substitutions have on goals being scored and the data showing more goals in the second half at the last four World Cups, it could be suggested that substitutions play a major part in this trend and coaches should monitor players conditions in the second half and be prepared to make strategic substitutions if their conditions are effected (Njororai, 2007, 2012).

The highest number of goals were recorded in the 31-45 (18.02%) and 61-75 (18.02%) minutes of the game (see figure I). These results are different to the last World Cup in 2018 which saw most goals scored between 45-60-minute interval (Kubayi, 2020) and the 2014 (Yiannis, 2014) and 2010 World Cup (Njororai, 2013) which saw most goals scored in the 76-90-minute interval. Over the last twelve years and four tournaments, this is the first World Cup which saw the most goals scored in a 15-minute-interval in the first half. It is normally unusual to see goals scored in the 31-45-minute-interval as teams normally play 'safe' until half

time as teams who score before half-time gain a boost for the rest of the game (Ayton and Braennberg, 2009) and teams who score later in the first half are more likely to beat their opposition in the second half (Gauriot and Page, 2018). Teams also want to go into the break without conceding as the coach would have prepared key points to get across during the break as this is one of two moments in the game where teams can choose their strategies efficiently (Santos, 2013), any late goals will impact the coaches plans. Despite this, a lot of the tournament's goals were scored in the 31-45-minute interval and a potential reason for this could be because the 2022 World Cup used new stoppage time calculation methods (Wei *et al*, 2023). Rule changes have been known to lead to an upward surge in goals such as the amendment to the offside rule and back pass rules in 1993 and implemented at the 1994 World Cup where an average scoring went up to 2.71 goals per match (Njororai, 2013). This competition was no different as the 2022 World Cup was the highest scoring World Cup ever (FIFA, 2022). Pierluigi Collina, chairman of the FIFA referees' committee, aimed to compensate for time that wasn't played during matches by adding it on into additional time to avoid games like Aston Villa vs Brentford which only saw 43 minutes of football being played (ESPN, 2023). This led to the first half between England vs Iran having the longest additional time in a single World Cup match at 14:08 minutes (Opta, 2022). With this in mind, teams may not have played 'safe' in the 31-45-minute interval as they may have been aware that there would be another long interval in the first half stoppage time for them to use this tactic which would result in more goals in the 31-45-minute interval. This may occur especially if the coaches and players were aware that there was a big stoppage during the first half like during the England vs Iran game where play stopped for a while due to an injury which resulted in the 14:08 minutes of additional time (Wyscout, 2023).

The average possession a team had directly before scoring was 26 seconds and the data had a standard variation of 23.09, as well as a coefficient of variation of 88% which shows a high variation within the data set. The lowest possession time was goal 68 at 1.87 seconds and the highest possession time was goal 94 at 165.07 seconds (see figure II). Tenga and Sigmundstad (2011) said that possessions with a duration of over 12 seconds are associated with scoring situations, which when looking at the average possession time before scoring at the 2022 World Cup (26 seconds) is supported. Of course, Tenga and Sigmundstad's (2011) study looked at goal scoring situations and not actual goals, so future research should focus on possession times associated with scoring to support/argue this 2022 World Cup projects results. Despite 128 goals (74.42%) at the 2022 World Cup being 12 seconds or over, there were still 46 goals (26.74%) scored under 12 seconds suggesting other key factors in scoring, as well as the direct possession time, such as the location where the scoring team wins possession.

As the results show high variation within the data set with goals scored at various times, it agrees with Jones (2004) that larger periods of possession predicting goal scoring is a statement divided in support. Despite the varying direct possession times and the arguments around more possession resulting in goal scoring, a constant throughout is that teams must win the ball back and transition into attack. Studies in a top European league have showed that recovering ball possession as quickly as possible after losing possession was an important determinant of successful performances (Vogelbein, Nopp and Hokelmann, 2014) and these goal patterns are not related to a particular season or country-related style of play (Alberti *et al*, 2013). It is also important where on the pitch the transition happened as this would affect how quickly a goal scoring opportunity would arise and therefore effect the direct possession time before scoring. An example would be in Turner and Sayers (2010) study which discovered that players were likely to shoot from a central area and not from the wing, so if the ball is won out wide then the direct possession time is affected as this team would have to move the ball into central areas. This shows that regaining possession is important, but where the ball is won could be an important factor when figuring out why the direct possession times at the 2022 World Cup had high variation. Further research should be conducted on where possession was regained at the 2022 World Cup and it should be synthesised with the data around direct possession time before scoring in this study to see if there are any connections between the two.

Out of all 57 games where a team scored first, 43 (75.44%) of them went on to win, 8 went on to draw (14.29%) and 6 lost (10.71%) (see figure III). Based on these results, scoring first clearly has a huge impact on the result and this data supports Jones (2009) that a potential psychological shift occurs when scoring first as it can cause a positive psychological moment that increases the probabilities of victory. Another potential reason why so many teams who scored first went on to win can be linked to the opposition going through a negative psychological moment (Courneya, 1990) which provokes a crisis in the team, reducing players confidence, increasing the demoralisation and decreasing group cohesion (Bar-Eli, Tenenbaum and Geister, 2006). Although the data suggests it is important to score first at the World Cup, Garcia-Rubio *et al* (2015) and Lago-Penas *et al* (2016) also suggest that this all depends on the minute in which the first goal went in as Nevo and Ritov (2013) indicate that scoring first can lead to having to withstand constant attacks from the opposition. Lago-Penas *et al* (2016) supports this as their study on the top European leagues showed that the towards the end of the game it is more important to score the first goal, whereas the first goal at the beginning of the match is less important given that the conceding team has more time to recover. This research was conducted in league competitions where teams play home and away which research shows effects whether the team who scores first goes on to win or not (Lago-Penas *et al*, 2016), so further research should be conducted on when the first goal was scored at the 2022 World Cup and the impact it had on the final result as these countries play all their games in a host country.

From 1930 to 2010, the effect of scoring first and winning the game in the qualifiers and the finals of the World Cup is 79.16% (Martinez and Gonzalez-Garcia, 2019), this is a 3.72% increase than the effect it had in the 2022 World Cup (75.44%). Of course, Martinez and Gonzalez-Garcia's (2019) results are expected to be higher as their data collection included the qualifier games before the World Cup which included lower ability teams who didn't manage to qualify, compared to the World Cup where all teams had to win a certain number of games to qualify, except the host country (FIFA, 2020). Not only this, during the qualifier's teams play home and away which as mentioned influences whether the team who scores first goes on to win or not, as it has been researched that when the home team scores first they obtain 84.85% of points won compared to the away team who obtain 76.25% (Lago-Penas *et al*, 2016). Further research should look at previous/future World Cup competitions to see the impact of scoring first on the result at the finals so it can be compared with the data from this study.

### Recommendations and conclusion

The video footage for all 64 games at the 2022 World Cup was obtained from Footballia.eu (2023). All games on their website are recordings from a broadcaster and as the footage is from a tv broadcaster, sometimes during an 'uninteresting' part of the game they will show a replay of a goal/shot/miss/tackle to the viewers. This is a limitation to the study as while they are showing this replay, it is unknown who is in possession and this effects collecting data for the direct possession before scoring metric. A solution to this problem in future studies would be to obtain a license to an analysis service like Wyscout and use a camera angle like the tactical camera which captures the whole pitch in one shot to always see who is in possession.

During the World Cup, video assistant referee (VAR) was also in use which could have provided limitations to this study. Teams could be in or out of possession and a sudden VAR check may occur for a previous incident which could result in a penalty. This effects collecting data on the direct possession before scoring, as a team may be out-of-possession and then suddenly be awarded a penalty, resulting in their direct possession time to be very minimal. Thankfully, this did not happen at the 2022 World Cup but future studies should be aware of this and should decide whether these goals should be in the inclusion or exclusion list.

Future research on World Cups should focus on possession times associated with scoring to support/argue this projects results. Future research on the 2022 World Cup should focus on where possession was regained to see its connections with the direct possession time before scoring, and when the first goal was scored and its impact it had on the final result. World Cup managers should monitor players conditions in the second half and be prepared to make strategic substitutions, as well as being aware of the new stoppage time calculation methods which will mean they should not look to play 'safe' in the 31-45-minute interval if they are aware play was stopped for a while.

In conclusion, most goals were scored in the second half of games at the 2022 World Cup, which followed the same trend as the previous three World Cups, and proved the hypothesis that more goals are scored in the second half to be true. The suggestion that defenders physiologically deteriorate before attackers was discussed as being outdated and was ruled out as a reason for increased second half goals, and instead the introduction of attackers by substitutions was discussed as a valid reason. Most goals were scored in the 31-45 and 61-75 minutes of the game which was unusual as the over the last twelve years this was the first World Cup which saw the most goals scored in a 15-minute-interval in the first half. The new stoppage time calculation methods introduced at this World Cup was listed as a reason for this as it meant teams would not play 'safe' football before half time as they were aware a lot of time may be added on. The average possession teams had directly before scoring was 26 seconds and the data set showed high variation which suggests that having possession doesn't affect goalscoring, instead looking at where the ball is won could show a better goal scoring trend. When teams scored first, 75.44% went on to win, 14.29% went on to draw and 10.71% lost showing that scoring first has a huge impact on the result and the data was linked to a positive psychological moment for teams who score first and a negative psychological moment for teams who conceded. Future World Cup research should focus on possession times associated with scoring, where possession was regained, and when the first goal was scored and its impact on the result. World Cup managers should be prepared to make strategic substitutions and be aware of the new stoppage time calculation methods at future World Cups.

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