ANALYSIS OF THE LONGEST DISTANCES RUN BY THE BEST SOCCER PLAYERS AT THE FIFA WORLD CUP IN BRAZIL IN 2014

Łukasz Bojkowski,[1, A, B, C, D] Robert Śliwowski,[2, D, E] Andrzej Wieczorek,[2, D, E] Jerzy Eider[3, D, E]

[1] PhD student, Department of Psychology, University School of Physical Education, Poznań, Poland
[2] Department of Team Games, University School of Physical Education, Poznań, Poland
[3] Faculty of Physical Culture and Health Promotion, University of Szczecin, Poland
[A] Study Design; [B] Data Collection; [C] Statistical Analysis, [D] Manuscript Preparation; [E] Funds Collection

Address for correspondence:
Robert Śliwowski, PhD
University School of Physical Education, Department of Team Games
ul. Królowej Jadwigi 27/39, 61-871 Poznań, Poland
E-mail: robert.sliwowski@wp.pl

Abstract. The aim of the study was, among other things, to characterise the maximum distance run by the four best teams in the FIFA World Cup in Brazil, including individual tactical formations and players who played for at least 90 minutes in the whole tournament. In total, the highest results of 68 players were established. In the analysis data obtained using Castrol Performance Index method were used.

The mean maximum distance run by players of the tournament semi-finalist teams in the 24 analysed games was 11.63 km. The mean by the analysed defenders was 11.75 km, whereas for midfielders it was 12.02 km, for forwards – 11.02 km, and for goalkeepers – 5.65 km. In group of all 68 respondents soccer players a distance of over 15 km in one game was obtained by Bastian Schweinsteiger, Thomas Müller and Lucas Biglia.

Key words: World Cup, distance run, soccer

Introduction

According to the researchers (Wilmore and Costill 1999) motor preparation of soccer players to competitive matches should be based on good adaptation to long-term work and efforts characterised by intensity corresponding to aerobic energy metabolism (according to the studies aerobic work in soccer accounts for 90% of active play time (Bangsbo et al. 1991)). Thus, it can be classified as a sport characterised by large endurance efforts, that is those where the ability to continue long-term work of specific intensity is required (from 60 to approx. 80–90% of maximum performance capacity), irrespective of the external conditions. One of the pillars of motor preparation of a soccer player is aerobic performance, the maximum level of which should not be below 60 ml/kg^{-1} (Reilly et al. 2000; Helgerud et al. 2001).

In the 1960s and 1970s a player in a soccer competition would run on average approx. 4,000 to 5,000 m or less during a match. Nowadays, the mean distance (for outfield players) depending on the sports level of a player and a playing position ranges from 8,000 to 12,000 m (Jastrzębski 2005; Barros et al. 2007; Di Salvo et al. 2007). Moreover, this distance can increase to even 13,500–14,000 m in one match (Stølen et al. 2005; Barros et al. 2007). In a comparison of the results of teams and playing positions it should be noted that Di Salvo et al. (2007) on the basis of the analysis of maximum running distances of players in twenty matches of the Spanish Premier League and ten matches of the UEFA Champions League in 2002/2003 and 2003/2004 seasons established that on average players cover approx. 11,393 m in a match (min. = 5,696; max. = 13,746). The largest distance is covered by central midfielders (approx. 12,027 m), side midfielders (approx. 11,990 m), side defenders (approx. 11,410 m), forwards (approx. 11,254 m) and central defenders (approx. 10,627) (Di Salvo et al. 2007). Bradley et al. (2009) reported results corresponding to a large extent to the above. After the analysis of the activity of 370 players of the English FA Premier League competing in 2005/2006 season they indicated that the "most active" tactical positions in terms of running are side midfielders (covering approx. 11,535), central midfielders (approx. 11,450), side defenders (approx. 10,710 m), forwards (approx. 10,314 m) and central defenders (approx. 9,885). During the 2010 World Cup in South Africa the largest distances in the analysed championship matches were covered by midfielders (from 12.3 to 12.9 km), forwards (from 10.5 to 11.9 km) and defenders (from 10.8 to 12.0 km) (Sang Duk et al. 2011).

In the light of the differences between running distances covered by the players a few decades ago and now, and taking into consideration new analyses of soccer play in championship level events it can be noted what changes have taken place in soccer competition in terms of game specificity and, as a consequence, in terms of demands placed on professional players of 11-a-side soccer. For this reason, the aim of the authors of this study was to characterise mean maximum running distances covered by the top players of the best teams of the 2014 World Cup.

Methodology of Study

The main objective of the study was to analyse maximum running distances covered by the players of the four best teams of the FIFA World Cup in Brazil, i.e. the national teams of Germany, Argentina, the Netherlands and Brazil. An additional objective was to determine the differences in mean maximum results between the four top teams of the tournament, and between the corresponding tactical positions of the teams. The following research questions were posed:

1. What mean maximum running distances were covered by the four top teams of the 2014 World Cup during the tournament?
2. What mean maximum running distances were covered according to playing positions of players of the four best teams at the Brazil World Cup during the tournament?
3. What was the largest running distance covered in one match by a goalkeeper, a defender, a midfielder and a forward playing in the semi-finals of the tournament?
4. Can any significant differences be indicated in terms of mean maximum running distances between the individual teams and between players in the corresponding playing positions of individual teams?

The analysis was carried out on players representing the four best teams of the World Cup in Brazil, that is the finalists of the tournament and the teams playing the third-place play-off. Only players who played for at least 90 minutes in the whole tournament were taken into consideration, that is 68 players in total. During the tournament

which took place from 12 June to 13 July 2014 all analysed teams played seven matches (three in the group stage, round of 16, quarter-finals, semi-finals and the third-place play-off or the final).

The analysis also included statistics obtained during so called "extra time". In the cup games, which last 120 minutes instead of 90, the playing time is extended and therefore the competing players have to perform longer work. In total maximum results obtained during 24 championship games were determined. The selection of the specific games for this analysis is not accidental, as it is the best teams competing in international competitions that give direction to the changes in tactics and technique, setting trends in the game (O'Donoghue 2005).

The study used statistical data prepared on the basis of the Castrol Performance Index, a kinematic game analysis (source: www.fifa.com/castrolindex; access on 14–20.07.2014), assessing motor activity of the players during games, and enabling real-time match analysis. It is an objective system of game analysis, which was first introduced to evaluate the players during the 2008 UEFA European Championship.

Thanks to an available database the largest running distances covered by each analysed player in each game played by him in the Brazilian tournament were determined. In the analysis only the highest result (value of the indicator) of a player from all games played was used. On this basis mean maximum running distances were specified for:

1. Individual teams (the total of the greatest distances covered in the tournament by all players of a given team was divided by the number of players included in the analysis of the given team).
2. Playing positions (the total of the greatest distances covered in the tournament by players in a given playing position in given team was divided by the number of players included in the analysis of the given team).

Descriptive statistics was used for the mathematical analysis of the data and to indicate the significance of differences between the analysed teams and playing positions – one-way analysis of variance (ANOVA) was used. The calculations were performed in STATISTICA 10.0 PL software, StatSoft Polska.

Results

The analysis of the four best teams of the championship indicated that mean maximum running distance of representatives of Germany, Argentina, the Netherlands and Brazil in the analysed 24 games was 11,628 m (11.63 km). The players of the German team had the mean result of 12,418 m (12.42 km), the Dutch – 11,664 m (11.66 km), the Argentines – 11,462 m (11.46 km) and the Brazilians 11,142 m (11.42 km). The results are presented in Table 1.

Table 1. Mean values of the maximum running distances of the best four teams of the 2014 World Cup

No.	Team	Number of players	M distance (metres)	Min. (metres)	Max. (metres)
1.	Germany	14	12,418	6,607	15,338
2.	Netherlands	15	11,664	6,949	13,906
3.	Argentina	17	11,462	5,143	15,012
4.	Brazil	18	11,142	8,481	14,513
Mean for 64 players			11.628		

M – mean; Min. – minimum results; Max. – maximum results.

The ANOVA analysis of variance did not indicate any significant differences in the levels of mean largest running distances of the four best teams of the 2014 World Cup (F = 0.868; df = 3.60; p = 0.463).

The mean of the largest distances covered by the defenders of the best four teams of the tournament was 11,747 m (11.75 km). The analysis of these data showed that the Argentine defenders covered the mean distance of 12,492 m (12.49 km), the Dutch defenders covered 11,851 m (11.85 km), the Germans – 11,630 m (11.63 km) and the Brazilians 11,225 m (11.23 km). The results of the analysis were presented in Table 2.

Table 2. Mean values of maximum running distances during covered by the defence players of the four best teams of the World Cup in Brazil

No.	Team (defence)	Number of players	M distance (metres)	Min. (metres)	Max. (metres)
1.	Argentina	5	12,492	10,576	14,089
2.	Netherlands	5	11,851	10,618	12,991
3.	Germany	5	11,630	6,607	14,115
4.	Brazil	7	11,225	9,527	13,780
Mean for 22 defenders			11,747		

M – mean; Min. – minimum results; Max. – maximum results.

The one-way ANOVA showed that there were no statistically significant differences in terms of mean result between the defence formations of Argentina, Netherlands, Germany and Brazil (F = 2.262; df = 3.21; p = 0.111).

The defenders who covered more than 14 kilometres in one game were German, Benedikt Hoewedes – 14,115 m (14.12 km) and Argentine, Marcos Rojo – 14,089 m (14.09 km).

The midfielders of the top four teams of the tournament had mean maximum running distance of 12,021 m (12.02 km). The players of the German team covered the mean distance of 13,758 m (13.76 km), followed by the Dutch with 12,145 m (12.15 km), Argentine with 11,527 m (11.53 km) and the Brazilians with 11,047 m (11.05 km) (Table 3).

Table 3. Mean values of maximum running distances covered by midfield players of the four best teams of the 2014 World Cup

No.	Team (midfielders)	Number of players	M distance (metres)	Min. (metres)	Max. (metres)
1.	Germany	5	13,758	11,261	16,338
2.	Netherlands	5	12,145	10,949	13,906
3.	Argentina	7	11,527	5,143	15,012
4.	Brazil	6	11,047	8,481	14,513
Mean for 23 midfielders			12,021		

M – mean; Min. – minimum results; Max. – maximum results.

The ANOVA analysis of variance carried out on the midfield players of the four best teams of the 2014 World Cup did not indicate any statistically significant differences in the level of mean maximum running distances (F = 2.487; df = 3.22; p = 0.087).

The midfielders of the four top teams of the World Cup who covered distances above 15 kilometres in one game were German, Bastian Schweinsteiger with 15,338 m (15.33 km) and Argentine, Lucas Biglia with 15,012 m (15.01 km).

The mean maximum running distance in the group of forwards was 11,016 m (11.02 km). Among the players in the most offensive playing position of the teams which qualified to the semi-finals, the mean value for the Germans was 11,728 m (11.73 km), for Brazilians it was 11,142 m (11.14 km), for the Dutch 10,995 m (11.00 km), and for the Argentines 10,342 m (10.34 km). The graphic presentation of the mean maximum distances was shown in Table 4.

Table 4. Mean values of maximum running distances covered during the games of the World Cup in Brazil by players in the forward position of the best four teams of the tournament

No.	Team (forwards)	Number of players	M distance (metres)	Min. (metres)	Max. (metres)
1.	Germany	4	11,728	8,942	15,180
2.	Brazil	5	11,142	9,186	13,581
3.	Netherlands	5	10,995	6,949	13,855
4.	Argentina	5	10,342	6,464	13,519
Mean for 19 forwards			11,016		

M – mean; Min. – minimum results; Max. – maximum results.

The ANOVA analysis of variance did not indicate any statistically significant difference in the level of mean maximum running distances of forwards of the four best teams of the championship ($F = 1.628$; $df = 3.18$; $p = 0.218$).

The only forward of the four top teams of the 2014 World Cup who covered a running distance longer than 15 km during one game was German, Thomas Müller – 15,180 m (15.18 km).

The mean maximum running distance covered by goalkeepers was 5,651 m (5.65 km). Among them German, Manuel Neuer covered 6,985 m (6.99 km) in one game, Dutchman Jasper Cillessen 6,277 m (5.11 km), Brazilian Julio Cesar 4,233 m (4.23 km) and Argentine Sergio Romero – 4,233 m (4.23 m).

Discussion

A soccer match is characterised by a long duration, i.e. 90 minutes or 120 minutes or more in case of knockout cup competitions. Therefore, a player's preparation to sport competition should be based on adaptation to long-term effort (Wilmore and Costill 1999). This is supported by the fact that during a match some players cover in total from approx. 8 to 12 kilometres (Jastrzębski 2005; Barros et al. 2007; Di Salvo et al. 2007) or even more (Stølen et al. 2005; Barros et al. 2007). The running distances of individual players differ depending on the role assigned to the player by the manager or the player's playing position. For example, Di Salvo et al. (2007) established on the basis of analysis of the top league in Spain and the UEFA Champions League that the largest distances are covered in one game by central midfielders, followed by side midfielders, side defenders, forwards and central defenders. According to Bradley et al. (2009) the most active players in the analysed element of competition are side midfielders, central midfielders, side defenders, forwards and central defenders (a study of the English FA Premier League). Sang Duk et al. (2011), analysing the games of the 2010 World Cup, established that the highest demands in terms of distance covered are placed on midfielders, followed by forwards and defenders.

With the above as the theoretical foundation of our analysis, its aims included determining the maximum running distances by teams, playing positions and players of the four best teams of the World Cup in Brazil, i.e. Germany, Argentina, the Netherlands and Brazil. Only players who played at least 90 minutes in the whole tournament were included in the analysis. The results were collected for 68 players in total using the Castrol Performance Index. The analysis included also game statistics characterising the analysed players in games with "extra time", that is matches which lasted 120 minutes and more. Four research questions were specified in the study.

The analysis of available data showed that in the studied 24 games the German team covered a mean maximum running distance of 12.42 kilometres, the Dutch covered 11.66 km, the Argentines 11.46 km and the Brazilians 11.14 km. The total mean of all above teams was 11.63 km, which answers the first research question.

The analysis of maximum distances by playing positions indicates that the defenders of the four semi-finalist teams covered in the whole tournament mean distance of 11.75 km (the Argentines – 12.49 km, the Dutch – 11.85 km, the Germans – 11.63 km, the Brazilians – 11.23 km), whereas the midfielders covered approx. 12.02 km (the German team – 13.76 km, the Dutch team – 12.15 km, the Argentine team – 11.53, the Brazilian team – 11.05 km). The mean maximum result for 19 analysed forwards was approx. 11.02 km (the Germans – 11.73 km, the Brazilians – 11.14 km, the Dutch – 11.00 km and the Argentines – 10.34 km) and the four goalkeepers who presented their skills in at least semi-finals of the Cup – 5.65 km. Determining the above data answers the second research question. These values of mean maximum distances covered by top players largely correspond to the results obtained by Jastrzębski (2005), Barros et al. (2007) and Di Salvo et al. (2007), who estimated the mean running distance covered by a player during a soccer game at approx. 8–12 km.

To answer the third research question it was noted that among goalkeepers Manuel Neuer (Germany) and Jasper Cillessen (Netherlands) covered at least 6 km in one game. Among defenders German, Benedikt Hoewedes and Argentine, Marcos Rojo covered more than 14 km in one game. In the group of midfielders and forwards Bastian Schweinsteiger (Germany), Lucas Biglia (Argentina) and Thomas Müller ran over 15 km in one game. Maximum locomotion results obtained by the latter, that is the most active running players who exceeded the limit of 15 km per game, confirm the findings of such authors as Stølen et al. (2005) and Barros et al. (2007), which referred to very high demands in terms of endurance abilities that have to be met by the world's best players during selected championship games. German Bastian Schweinsteiger who covered relatively the largest locomotive distance among all analysed players, ran 15,180 m (15.19 km) in the final with Argentina, played on 13 July 2014 at the Maracanã Stadium in Rio de Janeiro.

The one-way ANOVA analysis of variance did not show any statistically significant difference between the studied teams or between players in corresponding playing positions of the teams in terms of mean maximum running distances. This means that none of the teams and positions showed significantly higher or lower level of the analysed variable. The results of the study could have been influenced by the selection of the studied teams, where only results achieved by the four semi-finalists of the tournament were considered in the analysis.

Conclusions

On the basis of the analysis of mean maximum running distances by teams, playing positions and players of the four best teams of the Brazil World Cup the following conclusions can be formulated:

1. On average in individual games at championship level players cover a maximum distance of approx. 11.63 km (from approx 11.14 to approx. 12.42).

2. In top level soccer games the defenders cover a maximum distance of approx. 11.75 km, midfielders – approx. 12.02 km, forwards – approx. 11.02 km and goalkeepers – approx. 5.65 km.
3. The World Cup in Brazil showed that in sports competition in individual cases a player has to perform higher than average work determined by the running distance of a minimum of 15 km or more per one game.
4. During a championship level tournament there is no statistically significant difference between the best teams and players in the corresponding playing positions in various teams in terms of maximum running distances covered by them.

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