

DIFFERENCES IN THE QUANTITY AND INTENSITY OF PLAYING IN ELITE SOCCER PLAYERS OF DIFFERENT POSITION IN THE GAME

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Abstract

The aim of this study was to determine differences in the amount and intensity of movement of top players in terms of the position in the team, on a sample of 167 players who played all 90 minutes of the eighth finals of the World Cup 2010 in South African Republic. By comparing the players' position it was found that the midfield players, on average, most ran, ($10952 \pm 2123\text{m}$), which is the case and the amount of movement when the team in possession ($4279 \pm 1099\text{m}$) and when the team is not in possession of the ball ($4485 \pm 1010\text{m}$). In relation to the intensity of the defensive players during a game on average the most time spent in the low intensity ($83.86 \pm 2.92\%$), the activities of medium and high intensity most spent midfielders ($10.44 \pm 1.47\%$ of total distance traveled). The highest maximum average speed achieved attackers ($24.24 \pm 3.07 \text{ km / h}$). Canonical discriminant analysis obtained three discriminant functions of which two have statistically significant value (Canonical Cor. = 893, $p = .00$) and Canonical Cor. = 488; $p = .00$). The highest correlation with the first isolated discriminant function, which maximally different positions in the team (Wilks Lambda = 143; $p = .00$), have all three variables that determine the intensities of movement, variables that determine the total length of the distance traveled, distance covered in possession and the amount of players, a dominant position is midfield players. The second isolated discriminant function that also statistically significantly different position in the game (Wilks Lambda = 709; $p = .00$) variable determines the amount of distance traveled without the ball, but the most dominant group are defenders, then midfielders.

Key words: **football, speed, intensity of movement, distance covered**

Introduction

Top footballers from year to year progress in the quantity and intensity of movement, which necessitates the need for experts to determine what it characterizes profile players who are in the finals of major competitions. Modern football is characterized by the fact that all players participate in defense and in the attack phase which requires a lot of effort and energy requirements. Matches at the elite level is characterized by activities that are dominated by fast movement of players and a growing volume of motion activities in the basis of which are anaerobic-aerobic fitness. Thus developed skills players lead to the creation of "shallow" formations in the IGI, where a large part of the game all the players are in one part of the field in the summary area of about forty meters. The tendency in modern football is a multifunctional football player, usable at multiple positions that can do the tasks and in defense and in the attack phase, which again carries a certain positional specificity: goalkeeper, midfielder, defender, side player and the like. Research indicates that top football players on average are aged between 25 and 27 years (Ekblom, 1994). The average height of the top players according to exploring Bloomfield et al (2005) shows that the players

of the Bundesliga are the biggest $183 \pm 6\text{cm}$, four European top league, the players of the Spanish La Liga are the smallest $180 \pm 6 \text{ cm}$. The average height, all players of the participants of the World Football Championship 2002 is $180.90 \pm 6.13 \text{ cm}$ and the average body weight of $75.91 \pm 6.38 \text{ kg}$. The greatest heights are goalkeepers ($186.42 \pm 5,27\text{cm}$), then they Defenders ($181.87 \pm 5,57\text{cm}$), attacks ($180.27 \pm 5.76 \text{ cm}$) and at least average height ($178.38 \pm 5, 55 \text{ cm}$) and body mass ($73.87 \pm 5.55 \text{ kg}$) were footballers midfielder. As for players under the age of positions, the oldest Goalkeepers ($29.50 \pm 4.34 \text{ years}$), and the youngest attackers ($26.71 \pm 3.82 \text{ years}$) (Đurašković and Associates, 2004). Average values of age and height for all 368 participants at the European Football Championship 2008 years was $27.58 \pm 3.98 \text{ years}$ and $182.97 \pm 6,59\text{cm}$. The highest average was at goalkeeper (age $29.42 \pm 4.76 \text{ years}$, height $189.06 \pm 4.54 \text{ cm}$), and then the defense (age 27.79 ± 3.56 ; height $184.69 \pm 5,43\text{cm}$) and the offensive player (age 27.06 ± 3.98 ; height $182.60 \pm 6.42 \text{ cm}$), and the lowest value of height ($179.02 \pm 5.95 \text{ cm}$) and age (26.97 ± 3.83) was recorded with midfielders (Joksimovic et al, 2009). As for

the amount of movement, research has shown that the top players on average cover a distance of 9 km -14km during matches (Rienzi et al., 2000; Bloomfield et al., 2005; Barros et al., 2007; Di Salvo et al., 2007; Mohr, Krustup and Bangsbo, 2005; Rampinini et al., 2007; Lago et al., 2010). If the football players moving at a constant rate, then the average speed of top players was between 6.5 km / h - 8 km / h corresponding legwork. Since it is constantly changing speed in the game, it is necessary to the overall distance covered to match dismember the categories in relation to the speed (intensity) movement. So far defined categories of activities vary from author to author, therefore it is very difficult to compare with each other. The latest results obtained in the analysis of Champions League matches, clearly suggest as a top footballer, on average, about 58% of the time in the game carry standing (15%) and walking (43%), about 30% of the time running around (7-14 km / h) , about 8% of the time running at a moderate speed (15-19 km / h), about 3% of the time running at high speed (20-25 km / h), and only about 1% of the time sprinting at maximum speed. If these time percentages are converted into distance traveled, then a professional player walk about 4 km, prancing about 4.5 km, running moderately fast about 1.8 km, runs fast about 0.7 km and 0.3 km sprint around. To analyze their profile activity, so far the football players on the field usually shared on defense, midfielders and attackers. It is a known fact that midfielders due role and requirements of their positions, on average cross the longer distance of defenders and attackers. Profile of competition in this divided world-class players shows that the total distance by top defenders behind (about 1 km) for players with other players' positions, where the difference is most visible in the distance traveled moderate and high intensity running (speed greater than 14 km / h). Given that the speed of about 14 km / h of running in which players reach the so-called. anaerobic threshold, the central defenders have less anaerobic demands of players at other positions in the game. Comparing other positions it was observed that midfielders and defenders outer yarn about the same distance, while the distance by attackers are between midfielders and central defenders. In addition to the distance covered at a different pace, players in different positions are different to other specific activities in the game. Most of the information available on this section refers to the classical division of players on the defenders, midfielders and attackers. Although there are significant variations in the data, it was observed that midfielders perform significantly higher number of activities for the ball in relation to players at other positions. During a game, top football players on average quarterbacks 1200-1400 different activities changes (mainly short-term), changing them every 4-6 seconds (Bangsbo, 1994; Mohr et al., 2005). Bangsbo, Mohr and Krustup (2005) determined that the midfield players cover the total distance traveled and distance high-intensity similar to the defenders and attackers, but Sprint less. Earlier indicated studies have shown that players of midfield cover greater distances during matches of defenders and attackers. These differences are explained by

the development of the physical demands defenders and attackers. It was noted that players at all positions on the team have a significant decrease in acts of high intensity towards the end of the match, which proves that almost all the players in the elite football exploit the maximum of their physical abilities in the game (Bangsbo, 1994; Mohr et al., 2003). Research Mohr & Bangsbo (2005) has shown that footballers achieve a maximum speed in the game of 32 km / h. Activities that player performs during the soccer game can be divided into two categories: things with the ball and without the ball activities. Considering the total number of players, as well as the dimensions of the court, it is not surprising that the activities of individual players without the ball waste on average over 95% of the effective time of the game. Although the total physical work done players includes a variety of activities, most of this work is spent in walking and running at a different tempo and different directions. Taking into account the above, as a global indicator of the physical demands of football and the total volume of work players used the total distance traveled during the match and the intensity of labor. The aim is to determine the amount and intensity of movement of top players by position in the team for the World Cup in South Africa 2010.

Methodology

Samples

Respondents in the survey consisted of 167 elite soccer players who participated in the finals of the World Cup football in South Africa 2010. The sample represents players who played all 90 minutes of the eighth finals championship and come from national teams: Uruguay, South Korea, USA, Ghana, Germany, England, Argentina, Mexico, Netherlands, Slovakia, Brazil, Chile, Paraguay, Japan, Spain and Portugal.

Sample of variables

Data were taken from the official website of world football federation (www.fifa.com) presenting all the parameters of situational efficiency of all players of the participants of the World Cup in 2010. To determine the amount and intensity of movement of players are used the following variables: age (years), body height (cm), the length of the distance traveled (m), the length of the distance traveled in possession of the ball (m), the length of the distance traveled without the ball (m), the maximum recorded speed (km / h), a low-intensity (%) - represents the time the player spent in activities where speed is less than 10 km / h, medium intensity activity (%) - represents the time the player has been in activities where the speed is equal to or greater than 10 km / h and less than 15 km / h, the activities of high intensity (%) - represents the time the player spent in activities where speed is equal to or greater than 15 km / h.

Data processing methods

For each applied variable was calculated by the arithmetic mean and standard deviation, while the differences between the different positions in the team were established by canonical discriminant analysis. The criterion for discriminating the strength of applied variables is Wilks' lambda. In this way were found discriminant functions and variables on which are the most different positions in the team.

Results

Based on the results (Table 1), we can conclude that modern goalkeepers average age 28.25 ± 4.05 years, average height 187.12 ± 5.96 cm and an average run across 4437 ± 877 m in the game. When the team is in possession of the ball goalkeepers are ran, $1,621 \pm 328$ m, when a team is not in possession of the ball $1,601 \pm 343$ m, while the average maximum speed achieved was 17.18 ± 2.46 km / h. Due to the intensity of activity can be seen that the goalkeepers during matches on average most of their time spent in activities of low intensity and $97.75 \pm 683\%$, in the activities of medium intensity ± 1.25 , 447% or a minimum of ± 1 , 632% are spent in activities of high intensity. The average age of the corner points to the fact that the top football goalkeeper station until late twenties. At the age of thirty years, many top athletes finishing his successful career, but in general terms today's soccer goalkeepers, they only then enjoyed their best. A large number of appearances and experience probably contributes a certain psychological stability football goalkeeper, which in turn affects their performance. Defensive players ($n = 66$) who played all 90 minutes in the eighth finals of World Cup 2010 are an average age 27.71 ± 3.64 years, the aver-

age height of $180.57 \pm 5,87$ cm and on average they ran, 10273.42 ± 1780 m. When the team in possession of the ball defensive players ran, 3833 ± 843 m, and when the team is not in possession of the ball 4276 ± 826 m, while the average maximum speed was 22.88 ± 2.14 km / h. It was noted that the defensive players during a game on average most of their time spent in the low intensity and $83.86 \pm 2.92\%$, in the activities of medium intensity $7.83 \pm 1.31\%$ in activities of high intensity $8.33 \pm 2, 04\%$ of the total duration of the match. The study included 52 midfielders and based on the results we can say that modern midfielders average age 25.76 ± 3.78 years, average height 178.59 ± 5.84 cm, and an average of $10,952 \pm 2123$ run across him during a game . When the team in possession of the ball midfield players run across 4279 ± 1099 m, and when the team is not in possession of the ball 4485 ± 1010 m. The average top speed achieved was 23.54 ± 2.62 km / h. Due to the intensity of activity can be seen that the midfield players during a game on average at least their time in the low intensity and $80.07 \pm 3.04\%$, in the activities of medium intensity $9.82 \pm 1.79\%$ in the high-intensity activities implemented most time from all positions on the team or $10.44 \pm 1.47\%$ of the total duration of the match. Modern top strikers ($n = 33$) were, on average, the youngest (25.42 ± 2.89 years), the average height of 179.12 ± 6.38 cm and an average run across 9093 ± 1749 m for 90 minutes. When the team in possession attackers run across 3744 ± 748 m, and when the team is not in possession of the ball 3425 ± 808 m. The maximum average speed you reach attackers was 24.24 ± 3.07 km / h. Due to the intensity of activity, attackers during a game on average most of their time in the low intensity and $83.15 \pm 3.07\%$, in the activities of medium intensity $7.84 \pm 1.43\%$ in activities of high intensity 9 ± 1.80 % of the total duration of the match.

Table 1. The values of arithmetic means and standard deviations of variables according to groups

Variable	Goalkeepers (n=16)		Defenders (n= 66)		Midfield (n=52)		Forward (n=33)	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Age	28,25	4,05	27,71	3,644	25,76	3,78	25,42	2,89
Height (cm)	187,12	5,96	180,57	5,875	178,59	5,84	179,12	6,38
Distance covered (m)	4437,50	877,03	10273,42	1780,99	10952,00	2123,75	9093,03	1749,60
Distance covered in possession of ball (m)	1621,87	328,35	3833,00	843,63	4279,32	1099,38	3744,42	748,31
Distance covered without ball (m)	1601,50	343,02	4276,48	826,47	4485,55	1010,02	3425,39	808,79
Maximum speed (km/h)	17,188	2,46	22,88	2,14	23,54	2,62	24,24	3,07
Low-intensity (%)	97,75	,68	83,86	2,92	80,07	3,04	83,15	3,07
Medium intensity activity (%)	1,25	,44	7,83	1,31	9,82	1,79	7,84	1,43
Activities of high intensity (%)	1,00	,63	8,33	2,04	10,44	1,47	9,00	1,80

In tables 2-6 were analyzed differences between groups divided according to the players positions on the team, as well as variables that are most different positions. The criterion for discriminating the strength of applied variables was *tz*. Wilks' Lambda (Table 5), which is statistically significant at the 99% (Sig = .00). Determination of statistical significance of each discriminant variable was done on the basis of Bartlett's chi-square test. Table 2 and Table 3 (boxes M-test) was tested similarity matrix covariance between the four groups, ie. positions on the team. We see that the difference is statistically significant covariance matrix (Sig = .000) at the level of 99%, which is a condition that can access the further procedure of canonical discriminant analysis. The results of discriminant analysis (Table 4) shows that the obtained three discriminant functions of which two have statistically significant high value (Can. Correlation = ,893 and Can. Correlation = 488), which indicates to us that where the correlation data set based on which we conducted discriminant analysis and the results of the discriminant function. Based on Table 6 it can be seen that the highest correlation with the first isolated discriminant function, which maximally different positions in the team, with all three variables that determine the intensities of move-

ment: a low-intensity (-, 852); medium intensity activities (809); activities of high intensity (750), then the variables that determine the total length of the distance traveled (493); distance covered in possession of the ball (416) and the amount of players (-, 198). These variables are most different groups of players which proves the value of Wilks' lambda (,143; $p = .00$). The predominant group of players in this discriminative Function (Table 7) are midfielders (1,449), followed by the players attacks (168), Defenders (125) and the outskirts of the goalkeepers who are on the negative side of the tool (-5.731). The second isolated discriminant function that also significant differences between groups of players (Wilks Lambda = 709; $p = ,000$) define a variable amount of distance traveled without the ball (661) and the most dominant group are defenders (466), followed by midfielders (,064), goalkeepers (,033) and at the end of the attackers (-1.049) which are located on the negative pole of this function. Third diskriminativnu function that no statistically significant (Wilks Lambda, 931; $p = ,121$) determine the variables that determine the age of the players and the average maximum speed, and the most dominant group are midfielders and goalkeepers, followed by attackers and defenders by the negative pole this function.

Table 2. Testing equality of arithmetic means positions on the team

Variable	Wilks' Lambda	F	df1	df2	Sig.
Age	,912	5,274	3	163	,002
Height (cm)	,860	8,833	3	163	,000
Distance covered (m)	,494	55,604	3	163	,000
Distance covered in possession of ball (m)	,593	37,296	3	163	,000
Distance covered without ball (m)	,500	54,322	3	163	,000
Maximum speed (km/h)	,634	31,360	3	163	,000
Low-intensity (%)	,258	156,162	3	163	,000
Medium intensity activity (%)	,278	141,408	3	163	,000
Activities of high intensity (%)	,309	121,678	3	163	,000

Table 3. Box's M test

Box's M	240,962
Approx.	4,906
df1	45
df2	39419,173
Sig.	,000

Table 4. Isolated canonical function

Function	Eigenvalue	% of Variance	Cumulative %	Canonical Correlation
1	3,952	91,1	91,1	,893
2	,312	7,2	98,3	,488
3	,074	1,7	100,0	,263

Table 5. Wilks'ova Lambda

Test of Function(s)	Wilks' Lambda	Chi-square	df	Sig.
1 through 3	,143	309,919	27	,000
2 through 3	,709	54,754	16	,000
3	,931	11,434	7	,121

Table 6. The matrix structure of isolated functions

Variable	Function		
	1	2	3
Low-intensity (%)	-,852(*)	,133	-,167
Medium intensity activity (%)	,809(*)	,036	,464
Activities of high intensity (%)	,750(*)	-,225	,156
Distance covered (m)	,493(*)	,430	-,229
Distance covered in possession of ball (m)	,416(*)	,075	-,063
Age	-,198(*)	,155	,006
Distance covered without ball (m)	,466	,661(*)	-,223
Maximum speed (km/h)	,357	-,371	-,649(*)
Height (cm)	-,092	,399	-,432(*)

Table 7. Function group centroid

GRUPS	Function		
	1	2	3
GOALKEEPERS	-5,731	,033	,258
DEFENDERS	,125	,466	-,243
MIDFIELD	1,499	,064	,342
FORWARD	,168	-1,049	-,179

Discussion

The differences between players at different positions in the game suggest that on average the oldest are goalkeepers and the youngest are players attack. The greatest heights are goalkeepers, then that footballers defense, attack and at least average height are midfielders. These results are similar to previous results (Blomfilda et al., 2005; Đurašković et al., 2004; Joksimovic et al., 2009). By comparing certain types of players in the average run so meters during a match has been found that most run across are midfield players ($10952 \pm 2123\text{m}$), then they are footballers defense, attack and at least average values at run on distances are goalkeepers. When the team in possession of the ball during a game, the most run across are midfield players ($4279 \pm 1099\text{ m}$), then they are footballers defense, attack and minimum average values are goalkeepers. By comparing certain types of players in the values of the distance run so far when the team is not in possession of the ball during a game most run across are midfield players ($4485 \pm 1010\text{m}$), then they are footballers defense, attack and minimum average values are goalkeepers. The values achieved the maximum speed during a game, shows that the highest average speed of the attackers were ($24.24 \pm 3.07\text{ km / h}$), then they midfield players, defensive players, and that the lowest average realized rate had goalkeepers as safe conditioned the specifics and requirements of the position in the team. Given the intensity of the activity, it is possible to observe that most goalies time ($97.75 \pm 683\%$) implemented in the activities of low

intensity, then the players attack, defensive players and a minimum of time spent in activities of low intensity have midfield players. By comparing certain types of players due to the intensity of the activity, it is possible to observe that midfielders average ($9.82 \pm 1.79\%$) spend engaged in activities of moderate intensity, then the players attack ($7.84 \pm 1.43\%$) and defensive players ($7.83 \pm 1.31\%$), which have approximately the same percentage of time they spend engaged in the activities of at least moderate intensity and time spent in activities of moderate intensity have goalkeepers. Given the intensity of the activity has been observed that midfielders average of $10.44 \pm 1.47\%$ distance traveled spend engaged in activities of high intensity, then the players attack and defenders and the lowest percentage in the high-intensity activities are goalkeepers.

Conclusion

Compared to similar previous studies, with the exception of the position of goalkeeper, it is evident convergence of positions on the team in relation to the amount of distance traveled, the intensities of movement and a maximum speed of movement which supports the thesis that in modern football more profiled polyvalent footballers usable at multiple positions team. Discriminant analysis confirmed statistically significant differences in the amount and intensity of movement between players' position in the

team that are vital to the activities of medium and high intensity movements and the total distance traveled during the match. Top soccer players in certain positions are not statistically significant different in age and achieved maximum speed of movement. Based on the analysis of the game, it is clear that training players at all positions should focus on improving their ability to perform high-intensity exercise and to recover quickly from periods of high-intensity exercises. In relation to these results, the selection of the football schools and training technology of younger age groups should go in the direction of a multi-faceted motor development, with the growing increase in the amount and intensity of running in young players. Training technology at earlier ages should not be much different to the positions on the team and sub-specialization to the positions on the team should begin as late as possible. Normally you should pay attention to the observed individual differences and energy requirements among the players kind of work and selection, gets the type of player who can make use of the several positions and with better performance and conditioning.

References

- Bangsbo, J. (1994). The physiology of soccer: With special reference to intense intermittent exercise. *Acta Physiologica Scandinavica*, 619, 151.
- Barros, R. M. L., Misuta, M. S., Menezes, R. P., Figueroa, P. J., Moura, F. A., Cunha, S. A., et al. (2007). Analysis of the distances covered by first division Brazilian soccer players obtained with an automatic tracking method. *Journal of Science and Medicine in Sport*, 6, 233-242.
- Bloomfield, J. R., Polman, R. C. J., & O'Donoghue, P. G. (2005). Effects of score-line on team strategies in FA Premier League soccer. *Journal of Sports Sciences*, 23, 192-193.
- Di Salvo, V., Benito, P. J., Calderon Montero, F. J., Di Salvo, M., & Pigozzi, F. (2007). Activity profile of elite goalkeepers during football match-play. *Journal of Sports Medicine and Physical Fitness*, 48, 443-446.
- Eklblom, B. (1994). *Football (Soccer)*. Oxford. Blackwell Scientific Publications.
- Đurašković, R., Joksimović, A., & Joksimović, S. (2004). Težinsko visinski pokazatelji fudbalera učesnika svetskog prvenstva 2002 godine. *Physical Education and Sport*, 2, (1): 13 – 24. University of Niš, Faculty of Physical Education, Serbia.
- Joksimović, A., Smajić, M., Molnar, S. & Stanković, D. (2009). An analysis of anthropomorphological characteristics of participants in the 2008 european football championship. *Beograd: Serb J Sports Sci* 3 (2): 71-79.
- Lago-Peñas, C., Rey, E., Lago-Ballesteros, J., Casais, L., & Domínguez, E. (2009). Analysis of work-rate in soccer according to playing positions. *International Journal of Performance Analysis in Sport*, 9, (2): 218-227.
- Lago, C., Casais, L., Dominguez, E., & Sampaio, J. (2010). The effects of situational variables on distance covered at various speeds in elite soccer, *European Journal of Sport Science*, 10 (2): 103-109.
- Mohr, M., Krstrup, P., & Bangsbo, J. (2003). Match performance of high-standard soccer players with special reference to development of fatigue. *Journal of Sports Sciences*, 21, 519-528.
- Mohr, M., Krstrup, P., & Bangsbo, J. (2005). Fatigue in soccer: A brief review. *Journal of Sports Sciences*, 23, 593-599.
- Rampinini, E., Coutts, A. J., Castagna, C., Sassi, R., & Impellizzeri, F. M. (2007). Variation in top level soccer match performance. *International Journal of Sports Medicine*, 28, 1018 - 1024.
- Rienzi, E., Drust, B., Reilly, T., Carter, J., Martin, A. (2000). Investigation of anthropometric and work-rate profiles of elite South America international soccer players. *Journal of Sports Medicine and Physical Fitness*, 40, (2): 162 – 169.

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