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Determining the most important game-related statistics in Euroleague basketball competitions: A five-year follow-up

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Abstract

The purpose of this study was to investigate the game-related statistics in the Play-Off and Final Four rounds of the Euroleague basketball competitions held between 2014 and 2018. In the study, the game-related statistics of 60 teams that participated in the Euroleague Play-Off and Final Four rounds between 2014 and 2018 were evaluated. The independent samples t-test was used to compare the game-related statistics of the two groups. The linear discriminant analysis was used to determine the important game-related statistics between the teams that qualified and those that were eliminated. The results of the study showed that there was a statistically significant difference between the game-related statistics of the two groups in the Play-Off competitions. This difference was seen in the free throw percentage, fouls committed, and performance efficiency scores. As a result of the discriminant analysis, it was found that foul, three-point field-goal percentage, performance efficiency score, turnover, free-throw percentage, and two-point field-goal percentage are important game-related statistics in qualifying the Play-Off round. When the game-related statistics of the two groups in the Final Four were compared, it was seen that only three-point field-goal percentage was an effective variable in becoming the champion. According to the results of the discriminant analysis, turnover, defensive rebound, and total rebound are important game-related statistics to being an Euroleague champion. In conclusion, it is thought that being the Euroleague champion in the Euroleague, it is necessary to have a lower number of turnovers and a defensive game.

Keywords: Basketball, Euroleague, Game-related statistics.

Özet

Eurolig basketbol müsabakalarında oyun ilişkili en önemli istatistiklerin belirlenmesi: Beş yıllık bir takip

Bu araştırmanın amacı 2014-2018 yılları arasında gerçekleştirilen Eurolig basketbol müsabakalarının Play-Off ve Final Four turlarındaki oyun ilişkili istatistiklerin belirlenmesidir. Araştırmada 2014-2018 yılları arasındaki 5 sezonda Eurolig müsabakalarında Play-Off ve Final Four turunda yer almış 60 takım incelenmiştir. Araştırma verileri Eurolig'in resmî sitesinden elde edilmiştir. Takımlar başarılı ve başarısız takımlar olmak üzere iki gruba

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ayrılmıştır. Başarılı takımlar ve başarısız takımların oyun içi değişkenlerinin karşılaştırılmasında bağımsız örnekler t testi kullanılmıştır. Takımlar arasındaki önemli oyun içi değişkenlerin belirlenmesinde ise doğrusal discriminant analizi kullanılmıştır. İstatistiksel analizler SPSS 22.0 yazılım programı kullanılarak yapılmış ve anlamlılık düzeyi $p<0.05$ olarak belirlenmiştir. Play-Off müsabakalarında başarılı ve başarısız takımların oyun içi değişkenleri karşılaştırıldığında, serbest atış yüzdesi, rakibe yapılan faul ve performans verimlilik puanları arasında istatistiksel açıdan anlamlı bir fark olduğu tespit edilmiştir ($p<0.05$). Diskriminant analizi sonucunda ise, faul, üç sayılık atış yüzdesi, performans verimlilik puanı, top kaybı, serbest atış yüzdesi ve iki sayılık atış yüzdesinin Play-Off turundan Final Four turuna çıkmada önemli oyun içi değişkenler olduğu tespit edilmiştir. Final Four'da şampiyon olan ve elenen takımların oyun içi değişkenleri karşılaştırıldığında, yalnızca üç sayılık atış yüzdesinin şampiyon olma da etkili değişken olduğu görülmüştür. Diskriminant analizi sonuçlarına göre, top kaybının, savunma ribaundunun ve toplam ribaundun Final Four'da şampiyon olmak için önemli oyun içi değişkenler olduğu tespit edilmiştir. Sonuç olarak, Eurolig'de şampiyon olmak için daha düşük sayıda top kaybı gerçekleştirmek ve daha defansif bir oyun sergilemek gerektiği düşünülmektedir.

Anahtar Kelimeler: Basketbol, Eurolig, Oyun ilişkili istatistikler.

INTRODUCTION

The analysis of basketball competitions is the process of bringing together and making sense of the events and performance elements that occur during a game. This provides a new perspective for both coaches and clubs on issues such as the level of conditioning, mental, technical, and tactical skills of athletes and teams, their shortcomings, the identification of the causes of their failure, and the development of training programs related to these (Smith ve ark., 1997). Since basketball is not an individual sport, evaluating team performance and bringing together and analyzing the factors that affect this performance has been the focus of many studies. The collection and analysis of data related to the performance elements of athletes and teams in basketball is a recent trend (2,4-6,9,10,12-15). The history of competition analysis in basketball dates back to 1946. In this year, the National Basketball Association (NBA) began to track variables related to assists, fouls committed, and points for the first time. In the 1977-1978 season, new variables such as turnovers, steals, and blocks were also included in competition analysis (1). Today, the following important game-related statistics are used in basketball in relation to team performance: assist, block, defensive rebound, offensive rebound, total rebound, free-throw percentage, fouls committed, fouls perceived, turnover, steal, two-point field-goal percentage, three-point field-goal percentage, and performance efficiency score. These statistics provide a new perspective for both coaches and clubs on issues such as the level of conditioning, mental, technical, and tactical skills of athletes and teams, their shortcomings, the identification of the causes of their failure, and the development of training programs related to these.

In recent years, as the world of sports has globalized and has a large economy, basketball has taken its rightful place among the most watched organizations. Euroleague is the second most popular and watched organization in closed sports organizations after the NBA (5). Being successful in the Euroleague, which has such a large economic power and viewing rate, is the dream of every club, every coach, every athlete, and every fan. Therefore, the analysis of game-related statistics related to the Euroleague has been the focus of many studies (2,5,10,12,14).

In this study, it was aimed to determine the impact of game-related statistics related to the Euroleague competitions in the years 2014-2018 on the success of teams and to determine the most effective game-related statistics in the Play-Off /Final Four rounds. In this way, it was aimed to be a guide for clubs, coaches, and athletes in identifying their shortcomings, developing areas that need to be improved, new tactical understandings, and developing training programs.

Turkish Journal of Sport and Exercise /Türk Spor ve Egzersiz Dergisi 2023 25(3):455-461
2023 Faculty of Sport Sciences, Selcuk University

456

Berk YILMAZ Orcid ID: 0000-0002-9813-6787 / Özkan ISIK Orcid ID: 0000-0003-2561-1695 / İlkay DOGAN Orcid ID: 0000-0001-7552-6478

METHOD

Data collection

The game-related statistics for the Euroleague matches in the years 2014-2018 were obtained from the Euroleague's official website (8). The game-related statistics for a total of 60 matches of 40 teams that participated in the Euroleague Play-Off and Final Four rounds in 2014-2018 were examined. Players who played less than 5 minutes in these matches were not included in the research. In the analysis, the data set was divided into two groups: teams that qualified for the Play-Off round and teams that were eliminated, and teams that won the Final Four and teams that lost.

Statistical Analysis

Independent samples t-test was used to compare the game-related statistics of the two groups. In addition, discriminant analysis was used to decide which game-related statistics contributed more to the differences between the two groups. Discriminant analysis is a method that develops discriminant functions between group mean factors to distinguish groups with common features (11). The structure coefficient is used in the interpretation of the discriminant functions obtained. If the structure coefficient obtained for any game-related statistic is greater than |0.30|, it means that it effectively contributes to the distinction between groups (17). Discriminant analysis is divided into two types: linear discriminant analysis, which assumes that the covariance matrices between groups are homogeneous, and quadratic discriminant analysis, which assumes that the covariance matrices between groups are not homogeneous (11). In this study, the Box'M test showed that the covariance matrix of the group was homogeneous (F=1.076, p>0.05). Therefore, linear discriminant analysis was used in the study. Statistical analyses were performed using SPSS 22.0 software program.

Ethical approval and institutional permission

This study was officially approved by the Balikesir University Clinical Research Ethics Committee with the number 2021/74 on 10 March 2021.

FINDINGS

Table 1: Comparison of game-related statistics of teams that passed and eliminated the Play-Off round in the Euroleague between 2014-2018

Variables	Eliminated	Qualified	T	p	Effect size
Two-point field-goal percentage	50,4 ± 17,67	53,86 ± 17,95	-1,935	0,054	0,194
Three-point field-goal percentage	36,81 ± 17,47	39,96 ± 18,09	-1,527	0,128	0,177
Free-throw percentage	73,13 ± 22,52	77,7 ± 20,91	-1,979	**0,049***	**0,210**
Offensive rebound	1,09 ± 0,94	1,13 ± 1,05	-0,439	0,661	0,040
Defensive rebound	2,06 ± 1,31	2,27 ± 1,4	-1,557	0,120	0,155
Total rebound	2,87 ± 1,87	3,08 ± 1,96	-1,068	0,286	0,109
Assist	1,78 ± 1,56	1,87 ± 1,7	-0,520	0,603	0,055
Steal	0,71 ± 0,48	0,79 ± 0,54	-1,377	0,169	0,157
Turnover	1,27 ± 0,88	1,17 ± 0,83	1,122	0,262	0,117
Blocks in favor	0,53 ± 0,45	0,61 ± 0,46	-1,315	0,190	0,176
Blocks against	0,56 ± 0,41	0,55 ± 0,44	0,278	0,781	0,023
Fouls committed	2,17 ± 0,84	2,16 ± 0,93	0,186	0,852	0,011
Fouls received	2,1 ± 1,48	2,43 ± 1,72	-2,067	**0,039***	**0,206**
Performance efficiency score	7,05 ± 5,53	9,11 ± 6	-3,630	**0,001***	**0,357**

*p<0,05

Turkish Journal of Sport and Exercise /Türk Spor ve Egzersiz Dergisi 2023 25(3):455-461
2023 Faculty of Sport Sciences, Selcuk University

457

Berk YILMAZ Orcid ID: 0000-0002-9813-6787 / Özkan ISIK Orcid ID: 0000-0003-2561-1695/ İlkay DOGAN Orcid ID: 0000-0001-7552-6478

A comparison of the game-related statistics of teams that qualified and eliminated the Play-Off round in the Euroleague between 2014-2018 showed that there was a significant difference in the free-throw percentage, fouls received, and performance efficiency score variables (p<0.05), while there was no statistically significant difference in other game-related statistics (p>0.05; Table 1).

Table 2: Discriminant analysis structure coefficients (SC) from game-related statistics and tests of statistical significance for Play-Off

Discriminant Function Coefficients			Structure Coefficients (SC)
Variables	Function 1 (Eliminated)	Function 2 (Qualified)	
Two-point field-goal percentage (X_1)	,608	,621	**0.315**
Three-point field-goal percentage (X_2)	,427	,450	**0.462**
Free-throw percentage (X_3)	,447	,454	**0.331**
Offensive rebound (X_4)	3,754	3,759	0.045
Defensive rebound (X_5)	7,815	7,775	0.083
Assist (X_6)	5,615	5,636	-0.021
Steal (X_7)	1,454	1,909	0.031
Turnover (X_8)	-3,662	-4,413	**-0.347**
Blocks in favor (X_9)	4,308	4,964	0.125
Blocks against (X_{10})	-3,835	-2,661	0.240
Fouls committed (X_{11})	4,014	3,336	**-0.582**
Fouls received (X_{12})	7,434	7,145	0.087
Performance efficiency score (X_{13})	-4,296	-4,203	**0.423**
Total rebound *			0.084
(Constant)	-49,429	-50,404	
Wilks' Lambda	0.786		
Eigenvalue	0.273		
Chi-Square	10.015		
p	0.693		
Canonical Correlation	0.463		
Reclassification (%)	78.0		
* This variable is not used in the analysis.			

The results of the discriminant analysis are represented in Table 2. According to Table 2, the discriminant function for determining (separating) the group based on the data has significant separation (p<0.05). In addition, the correct classification rate of the discriminant function was found to be 78,0%. Considering the discriminant function coefficients, the discriminant function can be written as follows:

Y_1 =-49.429 + 0.608 X_1 + 0.427 X_2 + 0.447 X_3 + 3.754 X_4 + 7.815 X_5 + 5.615X_6 +1.454 X_7 − 3.662 X_8 + 4.308 X_9 − 3.835 X_{10} + 4.014 X_{11} + 7.434 X_{12} − 4.296 X_{13}

Y_2 =-50,404 + 0.621 X_1 + 0.450 X_2 +0.454 X_3 +3.759 X_4 + 7.775 X_5 +5.636X_6 +1.909 X_7 − 4.413 X_8 + 4.964 X_9 − 2,661 X_{10} + 3.336 X_{11} + 7.145 X_{12} − 4.203 X_{13}

The game-related statistics that contributed to qualifying of the Play-off round was found as; fouls committed (SC=-0.582), three-point field-goal percentage (SC= 0.462), performance efficiency score (SC= 0.423), Free-throw percentage (SC= 0.331), turnover (SC=-0.347), two-point field-goal percentage (SC= 0.315).

Turkish Journal of Sport and Exercise /Türk Spor ve Egzersiz Dergisi 2023 25(3):455-461
2023 Faculty of Sport Sciences, Selcuk University

458

Berk YILMAZ Orcid ID: 0000-0002-9813-6787 / Özkan ISIK Orcid ID: 0000-0003-2561-1695/ İlkay DOGAN Orcid ID: 0000-0001-7552-6478

Table 3: Comparison of game-related statistics of losing and winning teams in the Euroleague Final Four between 2014-2018

Variables	Eliminated	Qualified	t	p	Effect size
Two-point field-goal percentage	55,22 ± 20,81	55,3 ± 21,3	-0,021	0,983	0,004
Three-point field-goal percentage	41,58 ± 20,8	52,99 ± 20,57	-2,671	**0,009***	**0,552**
Free-throw percentage	77,46 ± 22,33	74,81 ± 25,18	0,620	0,536	0,111
Offensive rebound	1,33 ± 1,08	1,19 ± 0,91	0,664	0,507	0,140
Defensive rebound	2,23 ± 1,44	2,4 ± 1,36	-0,720	0,472	0,121
Total rebound	3,07 ± 2,08	3,18 ± 2,04	-0,318	0,751	0,053
Assist	2 ± 1,59	2,13 ± 1,63	-0,444	0,658	0,080
Steal	0,99 ± 0,78	0,84 ± 0,56	0,949	0,345	0,220
Turnover	1,44 ± 1,02	1,19 ± 0,79	1,467	0,144	0,274
Blocks in favor	0,89 ± 0,82	1,06 ± 0,89	-0,728	0,469	0,199
Blocks against	0,83 ± 0,83	0,77 ± 0,75	0,306	0,760	0,076
Fouls committed	2,33 ± 0,99	2,63 ± 1,41	-1,597	0,112	0,246
Fouls received	2,55 ± 1,76	3,22 ± 4,36	-1,485	0,139	0,201
Performance efficiency score	8,23 ± 6,74	9,33 ± 7,4	-0,945	0,346	0,155

***p<0,05**

A comparison of the game-related statistics of the teams that won and lost the Euroleague Final Four between 2014-2018 showed that there was only a significant difference in three-point field-goal percentage ($p<0.05$), while there was no statistically significant difference in other game-related statistics ($p>0.05$; Table 3).

Table 4: Discriminant analysis structure coefficients (SC) from game-related statistics and tests of statistical significance for Final Four

Discriminant Function Coefficients			Structure Coefficients (SC)
Variables	**Function 1 (Eliminated)**	**Function 2 (Qualified)**	
Two-point field-goal percentage (X_1)	,049	,099	0,025
Three-point field-goal percentage (X_2)	,179	,134	0,076
Free-throw percentage (X_3)	,078	,047	0,118
Offensive rebound (X_4)	-,320	,596	0,105
Defensive rebound (X_5)	3,952	2,312	**0,456**
Assist (X_6)	-,047	,977	-0,046
Steal (X_7)	3,601	,656	0,129
Turnover (X_8)	6,397	,054	**0,575**
Blocks in favor (X_9)	3,561	,436	0,087
Blocks against (X_{10})	8,599	5,725	0,211
Fouls committed (X_{11})	4,582	3,519	0,087
Fouls received (X_{12})	-1,852	-,160	0,190
Performance efficiency score (X_{13})	-,845	-,603	0,127
Total rebound *			**0,374**
(Constant)	-26,389	-12,871	
Wilks' Lambda	0.441		
Eigenvalue	1.267		
Chi-Square	28.235		
p	0.008		
Canonical Correlation	0.748		
Reclassification (%)	95.3		

* This variable is not used in the analysis.

Turkish Journal of Sport and Exercise /Türk Spor ve Egzersiz Dergisi 2023 25(3):455-461
2023 Faculty of Sport Sciences, Selcuk University

459

Berk YILMAZ Orcid ID: 0000-0002-9813-6787 / Özkan IŞIK Orcid ID: 0000-0003-2561-1695 / İlkay DOGAN Orcid ID: 0000-0001-7552-6478

According to Table 4, the discriminant function for determining (separating) the group based on the data has significant separation (p<0.05). In addition, the correct classification rate of the discriminant function was found to be 95,3%. Considering the discriminant function coefficients, the discriminant function can be written as follows;

$Y1 = -26.389 + 0.049 X1 + 0.179 X2 + 0.078 X3 - 0.320 X4 + 3.952 X5 - 0.047X6 + 3.601 X7 + 6.397 X8 + 3.561 X9 + 8.599 X10 + 4.582 X11 - 1.852 X12 - 0.845 X13$

$Y2 = -12.871 + 0.099 X1 + 0.134 X2 + 0.047 X3 + 0.596 X4 + 2.312 X5 + 0.977 X6 + 0.656 X7 + 0.054 X8 + 0.436 X9 + 5.725 X10 + 3.519 X11 - 0.160 X12 - 0.603 X13$

The game-related statistics that contributed to the passing of the round as a result of the Euroleague Final Four matches held between 2014-2018 were determined as; turnover (SC= 0.575) and defensive rebound (SC= 0.456).

DISCUSSION AND CONCLUSION

The results of the analysis showed that the teams that qualified for the Euroleague Play-Off round in 2014-2018 had a higher free-throw percentage, fouls received, and performance efficiency score than the teams that were eliminated in the Play-Off round (Table 1). However, the number of fouls committed by the teams was the most important game-related statistic in distinguishing between the teams that qualified and were eliminated in the Euroleague Play-Off round in 2014-2018. Other important game-related statistics in distinguishing between the teams that qualified and were eliminated in the Play-Off round were three-point field-goal percentage, performance efficiency score, turnover, free-throw percentage, and two-point field-goal percentage, respectively (Table 2).

Doğan and Ersöz (2019) studied the game-related statistics that contribute to the qualifying of the Play-off round and found that the most important variable is the three-point field-goal percentage. They also found that the variables of assists, blocks in favor, and defensive rebounds are also effective in the distinction (5). In some studies, on national leagues, the three-point field-goal percentage was also determined as the most important variable in distinguishing between winning and losing teams (3,7). In this study, the three-point field-goal percentage was determined as the second most important game-related statistic in qualifying for the Play-off round. In addition, we found that game-related statistics such as two-point field-goal percentage and free-throw percentage are also important in qualifying for the Play-off round. With this result, it can be said that the shooting percentage is very important in qualifying for the Play-off round. In order to keep the field goal percentage high and the number of fouls low, a game style should be preferred in which the whole team is involved in the game, each player contributes to the team, and each player plays for a certain period of time, so that the players are always in good condition (not tired-because as fatigue increases, the percentages decrease and the number of fouls increases).

The three-point field-goal percentage of the Euroleague champions in 2014-2018 is higher than that of the eliminated teams (Table 3). However, the turnover was determined as the most important game-related statistic in distinguishing between the Euroleague champions and the eliminated teams in 2014-2018. Another important game-related statistic in distinguishing between the champions and the eliminated teams in the Final Four is the defensive rebound (Table 4).

Doğan and Ersöz (2019) studied the game-related statistics that contribute to winning the Final Four and found that the most important variable is the three-point field-goal percentage. They also found that the variables of two-point field-goal percentages and offensive rebounds were also effective in the distinction. In this study, the three-point field-goal percentage was also determined as the most important game-related statistic in winning the Final Four round. In addition, defensive rebound was also found to be one of the most important variables. With this result, it is thought that teams can reach the championship by paying attention to defensive rebounds and increasing the three-point field-goal percentage (5).

Turkish Journal of Sport and Exercise /Türk Spor ve Egzersiz Dergisi 2023 25(3):455-461
2023 Faculty of Sport Sciences, Selcuk University

460

Berk YILMAZ Orcid ID: 0000-0002-9813-6787 / Özkan IŞIK Orcid ID: 0000-0003-2561-1695 / İlkay DOĞAN Orcid ID: 0000-0001-7552-6478

The results of the study show that teams that qualify for the Play-Off round have a high field goal percentage, including free throw percentage, three-point field-goal percentage, and two-point field-goal percentage. In addition, it is necessary to reduce the number of fouls, which is the most important game-related statistic in qualifying for the Play-Off round. In the Final Four round, the most important variables for winning are three-point field-goal percentage and defensive rebound. It is thought that the coaches of the teams participating in the Play-Off round and the Final Four will contribute to their promotion to the Final Four or to the championship by preparing the mental, technical, and tactical preparations of the players, pre-match preparations, and team in-game plans in the light of this information.

Acknowledgments

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Turkish Journal of Sport and Exercise /Türk Spor ve Egzersiz Dergisi 2023 25(3):455-461
2023 Faculty of Sport Sciences, Selcuk University

461