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Shot Analysis of Basketball Matches in 2004-2008-2012-2016 Olympic Games

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Abstract

The objective of this study is to carry out the shot analysis of men's basketball matches in the 2004, 2008, 2012 and 2016 Olympic Games. For this purpose, the variables of points per match, total points, 2-points and 3-points shot analyses were included. Kruskal Wallis test was used to determine the differences between the four Olympic Games. The highest points per match were observed in the 2016 Olympic Games. There was a statistically significant difference between the 2004 and 2016 Olympic Games in regards to time played per match. Although there are minimal differences in shots success percentages, none of them were statistically important. There was no statistically significant difference as regards total points, points made, points attempt, success rate, 2-points made, 2-point attempts, 2-points success rate, 3-points made, 3-points attempt and 3-points success rate in four different Olympic Games (except the time per game). In conclusion although some minimal differences exist, there was found no significant difference in total points, 2- and 3-points attempts in Olympic Games basketball matches. That is why other factors such as assists, rebounds, steals, turnovers and blocks and the tactical components which play a prominent role in the outcome of the game should be investigated in detail.

Keywords: *Basketball, Olympics, Score, Shot, Match analysis*

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2004-2008-2012-2016 Olimpiyat Oyunlarında Basketbol Müsabakalarının Şut Analizi

Öz

Bu çalışmanın amacı, 2004, 2008, 2012 ve 2016 Olimpiyat Oyunlarında erkekler basketbol müsabakalarının şut analizini yapmaktır. Bu amaçla maç başına sayı, toplam sayı, 2 sayı ve 3 sayı şut analizleri değişkenleri dahil edilmiştir. Dört Olimpiyat Oyunları arasındaki farklılıkları belirlemek için Kruskal Wallis testi kullanılmıştır. Maç başına en yüksek sayı 2016 Olimpiyat Oyunları'nda gözlemiştir. Maç başına oynanan süre açısından 2004 ve 2016 Olimpiyat Oyunları arasında istatistiksel olarak anlamlı farklılık vardır. Şutların başarı yüzdelerinde minimal farklar olmasına rağmen, hiçbiri istatistiksel olarak anlamlı farklı değildir. Dört farklı Olimpiyat Oyunu'nda toplam sayı, alınan sayı, denenen sayı, başarı oranı, 2 sayı, 2 sayı denemesi, 2 sayı başarı oranı, 3 sayı, 3 sayı denemesi ve 3 sayı başarı oranı açısından istatistiksel olarak anlamlı bir fark yoktur (maç başına süre hariç). Sonuç olarak, Olimpiyat Oyunları basketbol müsabakalarında bazı minimal farklılıklar olmasına rağmen; toplam sayı, 2 ve 3 sayı denemesi anlamlı farklı bulunmamıştır. Bu nedenle asist, ribaund, top çalma, top kaybı ve blok gibi diğer faktörler ve maçın sonucuna etki eden taktik bileşenler detaylı olarak araştırılmalıdır.

Anahtar sözcükler: *Basketbol, Olimpiyatlar, Skor, Şut, Müsabaka analizi*

Introduction

Basketball is a highly popular sports field that appeals to an audience of millions on national and international platforms and hosts giant organizations (FIBA, 2022). It is a competitive team sport with specific rules and tactics taking the time, location and participation limits of the players into account (Ferreira & De Rose, 2003). The main parameters used to define the team performance in basketball are: Field throws, missing field throws, points, points per attempt, 3-point attempts on target, 2-point attempts on target and match winning (Berri & Schmidt, 2002).

Shooting is of critical importance to winning the match (Mülazımlıoğlu, Vedat & Mülazımlıoğlu, 2009; Savucu, Polat, Ramazanoğlu, Karahüseyinoğlu & Bicer, 2004) and it is the most important and the most difficult one to develop, among technical skills used in the game (Hay, 1993). Shooting is the most important factor in dominating and winning the game (Malone, Gervais & Steadward, 2002). The knowledge about the 2- and 3- point success percentages of the opponents is of paramount importance for the coaches to define their tactics.

In order to have an increased probability of success and chose the best tactical system, there needed reliable information about the strengths and weaknesses of the players (Cengizel, Cengizel & Öz, 2020) and the different defensive and offensive strategies of the opponents (Alvurdu, 2013; Csataljay, Donoghue, Hughes & Dancs, 2009). The statistical action profile and match analyses are frequently employed for the quantitative clarity of the game structure (Madarame, 2017). A complete and comprehensive analysis of the opponents will help the trainers to prepare the game in the best possible way (Seifried, 2004).

In an era where diversity is seen as a cultural heritage, the concept of Olympism and the Olympic Games are the mutual product of all the nations in the world (Parry, 2006). The essence of the Olympic Ga mes is the idea of being the platform where elite athletes compete to be the best rather than the arena of the competition of the countries on the contrary of the other international tournaments (International Olympic Committee, 2004).

The performance and statistical analyses, in team sports especially in basketball, are the best sources for the trainers to have valid and reliable information about their team and opponents (Sampaio, Janeira, Ibáñez & Lorenzo, 2006). In recent years, match analyses have got increasingly important. There are numerous studies in the literature dealing with game analyses, score analyses, action profile analysis of the Olympic Games (Sampaio, Lago & Drinkwater, 2010), continent and world championships (Dežman, Erčulj & Vučković, 2002; Molik et al., 2009; Xiao-ping, 2012) and in top class leagues such as NBA (Gomez, Gasperi & Lupo, 2016).

There are also researches investigating the dominance of a single country in the Olympic games (Jing, 2005; Sampaio et al., 2010; Yong-dong, 2005) and the comparison of men's and women's basketball competitions in Olympic Games and other tournaments (Higgs Weiller & Martin, 2003; Refoyo, Romarís & Sampedro, 2009). However, to the best of our knowledge there is no study dealing with the basketball games in four different Olympics which constitutes the topic of the present article. Therefore, the objective of this study is to carry out the shot analysis of men's basketball matches in the 2004, 2008, 2012 and 2016 Olympic Games.

Methods

Study design

This study was a retrospective analysis of publically available data from the FIBA internet site (archive.fiba.com). The study concerns the detailed analyses of the basketball matches of 12 countries in the 2004, 2008, 2012 and 2016 Olympic Games. All teams participating in the Olympics (12 countries in total) were included in the research. Only shot analysis was evaluated from official statistical data. In this context the parameters of points per game, total points and 2 and 3 points shots data were used in the analyses.

Statistical analysis

The descriptive statistical analyses (arithmetic mean, minimum and maximum values and standard deviation) were carried out by the use of Sigma Plot 11.0 (Systat Software, Inc) program. Shapiro-Wilk test was used for normality distribution. The difference between Olympic Games was determined using one-way analysis of variance. Since the data did not show statistically normal distribution, significant differences were determined by Kruskal Wallis statistics. The significance level was determined to be <0.05.

Ethical approval is not required as the data is obtained as open access from the International Basketball Federation (FIBA) website.

Results

In this study the shot analyses of the mens' basketball matches in four Olympic Games were carried out. The teams played a minimum of five and maximum of eight matches. The teams which came to the semi-final or final played eight matches. The average points per game were 79.3±8.5 points in the 2004 Olympic Games, 79.6±12.2 points in the 2008 Olympic Games, 78.7±13.7 points in 2012 Olympic Games and 80.6±10.2 points in the 2016 Olympic Games. The highest points per game was scored in the 2016 Olympic Games. However, there was no statistically significant difference between the Olympic Games in terms of game played, points per game and total points (Table 1).

Table 1. The points per game analysis of the mens' basketball in Olympic Games

		2004 (n=12)	2008 (n=12)	2012 (n=12)	2016 (n=12)
GP	Mean ± SD	6.8±0.9	6.3±1.3	6.3±1.3	6.3±1.3
	Max.	8.0	8.0	8.0	8.0
	Min.	6.0	5.0	5.0	5.0
PPG	Mean ± SD	79.3±8.5	79.6±12.2	78.7±13.7	80.6±10.2
	Max.	93.8	106.2	115.5	100.9
	Min.	63.8	64.2	62.6	63.0
TP	Mean ± SD	545.1±115.8	514.9±173.3	509.5±182.2	519.0±158.4
	Max.	750.0	850.0	924.0	807.0
	Min.	383.0	321.0	313.0	315.0

Mean±(SD) : Mean value±Standard deviation, Max.: Maximum value, Min.: Minimum value, GP: Games played, PPG: Points per game ; TP : Total points.

The highest playing minute per game has been observed in the 2016 Olympic Games. There is a statistically significant difference 2004 and 2016 Olympic Games regarding the playing minute per game ($p=0.020$, $p<0.05$). The highest total points were reached in the 2004 Olympic Games with 545.1±115.8 points, followed by the 2016 Olympic Games with 519.0±158 points, 2008 Olympic Games with 514.9±173.3 points and 2012 Olympic Games with 509.5±182.2.

There are minimal differences in shots success rate. The lowest and highest percentages were observed in the 2012 Olympic Games with 49.0±6.2% and in the 2016 Olympic Games with 51.6±4.0%. There were no statistically significant differences in total points, points made, attempts and success rate according to Olympic Games (Table 2).

Table 2. The total point analysis in the basketball matches in Olympic Games

		2004 (n=12)	2008 (n=12)	2012 (n=12)	2016 (n=12)
GP	Mean ± SD	6.8±0.9	6.3±1.3	6.3±1.3	6.3±1.3
	Max.	8.0	8.0	8.0	8.0
	Min.	6.0	5.0	5.0	5.0
MPG	Mean ± SD	39.9±0.1[b]	40.1±0.3	40.0±0.03	40.3±0.7[a]
	Max.	40.0	41.0	40.0	42.0
	Min.	39.5	39.8	39.9	39.8
TP	Mean ± SD	545.1±115.8	514.9±173.3	509.5±182.2	519.0±158.4
	Max.	750.0	850.0	924.0	807.0
	Min.	383.0	321.0	313.0	315.0
PM	Mean ± SD	134.0±39.6	130.5±50.1	135.8±39.8	134.8±40.8
	Max.	215.0	235.0	200.0	196.0
	Min.	71.0	72.0	84.0	87.0
PA	Mean ± SD	263.7±63.8	247.9±67.6	272.5±51.2	258.5±63.8
	Max.	425.0	363.0	343.0	365.0
	Min.	196.0	172.0	204.0	177.0
SR%	Mean ± SD	50.4±6.4	51.3±6.7	49.0±6.2	51.6±4.0
	Max.	57.7	64.7	59.5	58.0
	Min.	36.2	41.7	39.5	43.8

$p<0.05$, [a]: Significant difference with 2004 Olympic Games, [b]: Significant difference with 2016 Olympic Games , Mean ± SD: Mean value± Standard deviation , Max.: Maximum value, Min.: Minimum value, GP : Games played , MPG: Minutes per game, TP: Total points, PM: Points made, PA: Points attempts , SR%: Success rate.

Although the 2-point success rate shows variation according to the years, this difference is minimal and is not of statistical significance. 2-point average success rate according to Olympic Games is 50.4±6.4% in 2004, 51.3±6.7% in 2008, in 2012 and 51.6±6.4% in the 2016 Olympic Games. Although the lowest and the highest success rates were observed in the 2012 and 2016 Olympic Games with 49.0±6.1% and 51.6±6.4%, they are not of statistical significance (Table 3).

Table 3. 2-points shot analysis of the basketball matches in Olympic Games

		2004 (n=12)	2008 (n=12)	2012 (n=12)	2016 (n=12)
GP	Mean ± SD	6.8±0.9	6.3±1.3	6.3±1.3	6.3±1.3
	Max.	8.0	8.0	8.0	8.0
	Min.	6.0	5.0	5.0	5.0
PPG	Mean ± SD	79.3±8.5	79.6±12.2	78.7±13.7	80.6±10.2
	Max.	93.8	106.2	115.5	100.9
	Min.	63.8	64.2	62.6	63.0
2PM	Mean ± SD	134.0±39.6	130.5±50.1	135.8±39.8	134.8±40.8
	Max.	215.0	235.0	200.0	196.0
	Min.	71.0	72.0	84.0	87.0
2PA	Mean ± SD	263.7±63.8	247.9±67.6	272.5±51.2	258.5±63.8
	Max.	425.0	363.0	343.0	365.0
	Min.	196.0	172.0	204.0	177.0
2SR%	Mean ± SD	50.4±6.4	51.3±6.7	49.0±6.1	51.6±6.4
	Max.	57.7	64.7	59.5	58.0
	Min.	36.2	41.7	39.5	43.8

Mean ± SD: Mean ± Standard deviation, Max.: Maximum value, Min.: Minimum value, GP: Games played, PPG: Points per game, 2PM: 2-points made, 2PA: 2-points attempts, 2SR%: 2-points success rate %.

3-points made and the success rate showed a decreasing trend by the years. The average 3-points success rate according to the years was found to be 36.0±5.4% in 2004, 36.8±4.3% in 2008, 34.4±4.6% in 2012 and 32.9±4.6% in the 2016 Olympic Games. In all Olympic Games the 3-points success rate was lower than the 2-points success rate. There are no differences of statistical significance between 3-points attempts, 3-points made and 3-points success rates in all Olympic Games investigated (Table 4).

Table 4. 3-points shot analysis of the basketball matches in Olympic Games.

		2004 (n=12)	2008 (n=12)	2012 (n=12)	2016 (n=12)
GP	Mean ± SD	6.8±0.9	6.3±1.3	6.3±1.3	6.3±1.3
	Max.	8.0	8.0	8.0	8.0
	Min.	6.0	5.0	5.0	5.0
PPG	Mean ± SD	79.3±8.5	79.6±12.2	78.7±13.7	80.6±10.2
	Max.	93.8	106.2	115.5	100.9
	Min.	63.8	64.2	62.6	63.0
3PM	Mean ± SD	57.3±19.7	52.8±15.3	49.9±28.1	50.1±20.5
	Max.	105.0	77.0	129.0	83.0
	Min.	36.0	37.0	27.0	19.0
3PA	Mean ± SD	156.7±34.2	143.4±37.2	141.2±58.5	148.4±48.8
	Max.	221.0	204.0	293.0	225.0
	Min.	112.0	99.0	69.0	77.0
3SR%	Mean ± SD	36.0±5.4	36.8±4.3	34.4±4.6	32.9±4.6
	Max.	47.5	43.4	44.0	36.9
	Min.	29.9	30.4	27.3	23.5

Mean ± SD: Mean ± Standard deviation, Max.: Maximum value, Min.: Minimum value, GP: Games played, PPG: Points per game, 3PM: 3-points made, 3PA: 3-points attempts, 3SR%: 3-points success rate %.

Discussion

This study, was carried out to derive a shot analysis of the basketball competitions in 2004, 2008, 2012 and 2016 Olympic Games the change of variables points per game, total points, 2-points attempts and 3-points attempts means and percentages of the participating countries were examined.

The points per game were 79.3±8.5 points in 2004, 79.6±12.2 points in 2008, 78.7±13.7 points in 2012 and 80.6±10.2 points in the 2016 Olympic Games. The corresponding order for success rate in 2-points was 50.4±6.4%, 51.3±6.7%, 49.0±6.1% and 51.6±6.4%. The order of 3-points success rate was 36.0±5.4%, 36.8±4.3%, 34.4±4.6% and 32.9±4.6% in the 2004, 2008, 2012 and 2016 Olympic Games respectively.

Şentuna, Şentuna, Özdemir & Serter (2018) reported that the average points scored, 2- and 3- points success rates of the winning teams were 81.62, 55.28% and 38.87% respectively. These values were found to be 71.67, 49.21% and 31.87% for the losing team. When we compare the percentages of the winning teams with the percentages of the Olympic Games in our research we see lower percentages, albeit minimal, than the research

percentages in the literature. The reason for this is thought to be a more resistant defense in the Olympic Games.

In another study that examines the seasonal and playoff statistic, the authors reported that the average values for 2- and 3- points made 35.86 and 15.08. The corresponding values for the playoff matches were found to be 38.60 and 14.66 (García Ibáñez, De Santos, Leite & Sampaio, 2013).

The total points for the 2004, 2008, 2012 and 2016 Olympic Games were 545.1±115.8, 514.9±173.3, 509.5±182.2 and 519.0±158.4 points. The decreasing trend observed in the Olympic Games can be explained by the domination of defensive tactics in basketball.

Pojskić, Šeparović & Užičanin (2009) found that the 2- points success rate of winning and losing teams in the Olympic Games as 57.84% and 46.43%. The corresponding values have a 3-points success rate of 41.14% and 32.92%.

Gómez, Alarcón & Ortega (2015) analyzed 510 shots randomly chosen from 10 matches in the 2010 FIBA basketball world championship. They reported that they have high level performance simulation from the data obtained which can be used by the trainers to improve and develop the performance of their respective teams.

Ibáñez, Sampaio, Feu, Lorenzo, Gomez & Ortega (2008) investigated the discriminant game analysis after the analyses of 780 matches in the Spanish Men's basketball league in the 2000-2001 and 2005-2006 seasons. The researchers reported that the losing and winning teams are separated from each other by defensive rebounds and successful shooting parameters. They also reported that the teams cannot be distinguished by their passing skills and defensive preparations during the season-long performance. They reiterated that shooting is of paramount importance in affecting the final score.

Sampaio et al. (2010), investigated the dominance of the USA basketball team in the 2008 Olympic Games and reported that the reasons for the big score differences in their matches are their superiority in steals and attempts at target. They reached the conclusion that the USA team makes more steals and converts them into points much better than their opponents especially when the pace of the game is high. Oliver (2004) determined four factors as shooting efficiency, turnovers, offensive rebounds and successful free throws which affect the ultimate result of the game. He stated that the winning team is at least successful in three of them these four factors. On the other hand, the thorough examination of the NBA between 2003 to 2011 seasons revealed so many factors which determine the ultimate result. A limited number of mostly offensive factors were found to determine the final results of NBA games. Among the critical factors is the variable "points per game at the third quarters" (Mikoljec, Maszczyk & Zajac, 2013).

In the current paper detailed shot analysis of the teams in four Olympic Games and their frequencies per game & tournament were determined. The fact that Ibáñez et al. (2008) reported that one of the two parameters which affect the final score is successful shooting, shows the relevant parameters chosen in our study.

In addition Sampaio et al. (2010) emphasized the majör factor is attempts to target the USA's domination of the basketball branch in the Olympic Games for so many years.

Conclusion

In conclusion although some minimal differences exist, there found no significant difference in total points, 2- and 3-points attempts in Olympic Games basketball matches (except for the minutes played per game). That is why it is recommended that the studies of other parameters such as assists, rebounds, steals, turnovers and tactics should be subjected to a detailed analysis. These types of studies are important in terms of movement frequency (e.g. game and tournament frequency). Also the knowledge of the shooting techniques, the frequency of their usage and the effect of the repeated movement on joint mechanics in tournaments such as an Olympic game provide important information for the trainers to establish a relevant training program and physiotherapists to predetermine and obviate the injuries**.**

Conflict of Interest

There is no conflict of interest between the authors regarding the publication of this article.

Author Contributions

Research Idea: SS, ÇÖC; Research Design: ÇÖC, SS, ÖŞ; Analysis of Data: ÇÖC, ÖŞ; Writing: ÇÖC, SS; Critical Review: ÖŞ

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