GAME EFFICIENCY INDICATORS OF OLYMPIC BASKETBALL PERFORMANCE

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Abstract

The analysis of players' and teams' situational efficiency indicators is an important factor for planning and programming a training process, as well as the tactical preparation of top basketball teams. The purpose of this paper is to determine game related efficiency indicators i.e. parameters of competition performance in offence and defense phase of the basketball games for the outcome in 2016 Olympic male basketball. The sample used to conduct this research consisted of 30 opposing teams in 15 matches. Results showed that, on a global level, situational efficiency indicators influence final outcome of the basketball game by 97.5%. The most significant predictors of the final result of the match are the 2 points shot-unsuccessful, 3 points shot-unsuccessful, offensive and defensive rebounds, steals, and turnovers. These results can help coaches in preparing and controlling the training variables for high-level competitions.

Key words*: competition, match statistics, final score*

Introduction

The Olympic Games are the most significant sporting competition characterized by the participants' highest level of performance. Basketball is complex team sports dominated by fast actions and transformations, and coaches and experts devote great time to analysis of different aspect of team efficiency. Indicators of situational efficiency in the basketball game reflect individual and collective duties of each player considering his position and functional role in the team (Trninić at all 2001). Following the progress of the basketball match we can register and analyze large number of standard and derived parameters of situational efficiency that can help us to understand final match result (Milanović, 2013).

For the purpose of objective data acquisition FIBA standardized 13 indicators of situational efficiency: number of shots for two and three points scored, number of shot attempts for two and three points, number of free throws scored and free throw attempts, number of defensive and offensive rebounds, assists, personal fouls, turnovers, steals and blocked shots (Trninić, S., Milanović, D., Dizdar, D. 2001).

Research of game related statistics in different sports has been related to: game efficiency, dependence of gender, age, sport performance (national leagues, Euroleague, NCAA, World Championships, Olympic Games), comparison of winning and losing teams in different parts of the season as well as player's role in the games (Mikołajec, Maszczyk & Zając, 2013). Some researchers (Sampaio & Janeira, 2003) also relate game statistics with difference in the final score (close, balanced and unbalanced games).

Problem and aim

Previous research on basketball situation efficiency showed that the final score of the match specifically depends on the level of efficiency indicators (Milanović, 1979; Trninić & Dizdar, 2001; Pleslić, 1994; Milanović, Štefan, Sporiš & Vuleta, 2016; Milanović, Štefan, Sporiš, Vuleta & Selmanović, 2016).

Several authors proposed the goals of offence play in situation efficiency values (Knight & Newell, 1986): shot percentage of team should be over 52%, successful free throw percentage over 75%, team must not lose more than ten balls and should have score better than the opponent in both half times. The same authors propose the goal of playing defense as well: allowed number of received shots should be less than 65 points achieved without easy points (open shoots, lay-ups, offense jumps), allowed percentage of opponents' shots must be kept under 42%, team should have more throws than the opponent (not less than 12), individual players from the opposing team shouldn't score more than 20 points, the opponent should lose at least 24 balls, the number of fouls must be kept below 16.

This kind of recommendation are practically important to coaches and athletes striving to Olympic and high level competition medals. Since the basketball game is in constant progress, further research on relation of measurable indicators of efficiency can offer new, up-to-date recommendations for greatest performance.

The aim of this paper is to determine the relation between the indicators of situational efficiency i.e. parameters of competition performance in offence

and defense phase of the basketball games and the final outcome of male basketball matches at the 2016 Rio de Janeiro Olympics and specifically to determine the efficiency differences between winning and losing teams.

Methods

The sample consisted of 15 matches, more precise thirty opposing teams that played those 15 matches. Analyzed data refers to six male basketball teams which were part of the A group (USA, Australia, France, Serbia, Venezuela and China) at the 2016 Rio de Janeiro Olympics. Data were obtained from official FIBA resources. Variables were 13 standard indicators of situational efficiency standardized by FIBA, which are: 2-point shot scored, 2-point shots missed, 3-point shot scored, 3-point shot missed, free throws scored, free throws missed, defensive rebounds, offensive rebounds, assists, personal fouls, turnovers, steals and blocked shots.

Basic statistics, arithmetic means and standard deviations were calculated for all variables. Tests for evaluating normality of distribution and reliability for predicting variables were used. Further, multivariate and univariate regression analysis was used to determine the correlation between independent (final score) and the dependent (indicators of efficiency) variables. Level of significance was set to $p<0.05$.

Results

Main results of this research show that final outcome of Olympic basketball matches is 97,5% predetermined by thirteen indicators of game efficiency. Multiple regression analysis shows significant correlation of efficiency indicators on the final score of male basketball matches during the 2016 Rio de Janeiro Olympic games ($R=0.978$, $R2=0.975$, $p<0.001$). Significant partial regression coefficients for winning e.g. 2-point shoot–missed, 3-point shoot-missed, offensive rebounds, defensive rebounds, turnovers and steals ($p<0.01$) and 3-point shoot-scored ($p<0.05$) are presented in Table 1.

Table 1. Multiple regression coefficients: A and partial regression coefficients: B (Beta-β) of indicators of situational efficiency and the final match score and mean and standard deviation of winning and losing teams

A: Multiple regression coefficients	**R**	**R^2**	**p**
	0.978	**0.975**	**<0.001**
B: Partial regression coefficients **VARIABLES**	**Beta - β**	**WINNING TEAMS** **AS±SD**	**LOSING TEAMS** **AS±SD**
2-point shoot - scored	.039	24.00 ± 5.27	20.33 ± 5.05
2-point shoot - missed	-.542**	17.26 ± 4.66	20.46 ± 4.27
3-point shoot - scored	.205*	8.40 ± 3.04*	5.13 ± 2.09
3-point shoot - missed	-.300**	13.20 ± 3.83	14.00 ± 3.20
Free throws - scored	.094	19.60 ± 8.33*	14.46 ± 5.12
Free throws - missed	-.123	5.80 ± 2.36	4.73 ± 2.28
Offensive rebounds	.434**	12.33 ± 4.11*	8.86 ± 2.53
Defensive rebounds	.290**	26.26 ± 5.09*	20.33 ± 5.30
Assists	-.110	24.80 ± 5.05	17.73 ± 5.10
Personal fouls	.031	21.33 ± 3.45*	24.86 ± 4.79
Turnovers	-.433**	12.33 ± 4.33	15.20 ± 4.12
Steals	.181**	7.93 ± 3.19	6.93 ± 2.91
Blocked shoots	.064	2.40 ± 1.95	2.20 ± 1.42

* $p<0.05$, **$p<0.001$

Discussion and Conclusions

Relation of game efficiency indicators and the final score of the game

Main results of this research show strong predictive power of indicators of situational efficiency to the final match score in male basketball matches at the 2016 Rio de Janeiro Olympic games. Indicators of

game efficiency which determine the winning outcome are: less unsuccessful 2-point shots, less unsuccessful 3-point shots, more offensive and defensive rebounds, fewer turnovers, more steals and more successful 3-point shots.
Final score was determined by smaller number of unsuccessful 2-point shots. We can assume that winning teams had better shoot selection and a greater number of shots from within the high percentage score zone. The results of our research suggest that selective shots is the first principle of an organized offense. Therefore, the organization of the game in the offense phase must comprise of control of the game and the flow of movement which enable more players to attempt an "open" shot. Key factors of selective shooting in the offense are: player's distance from the hoop, horizontal distance between the defensive player and the offensive player holding the ball (the level of defense pressure) and the shooting rank. As the game goes on, conditions for performing the shot also change, especially in the 2-point zone. Hence, for a successful shot inside the 2-point zone it is important to successfully block the offense, "read" the defense position, pass accurately and at the right time, and to have high level of familiarity with shooting techniques while moving and the rhythm and speed of throw-out (Trninić, 1996).
Significantly predictive for winning in Olympic male basketball games were also the smaller number of unsuccessful, and a greater number of successful 3-point shots. Shots outside of 6.75m zone enable wider movement radius and vertical play, not just for the center, but also for the players on other positions.

Furthermore, greater number of offensive and defensive rebounds are significant predictors of victory. Defensive rebound is a culmination of a successful defensive play and it is a crucial factor for developing a transition phase. The teams who dominate this segment change the opponent team's tactics and force them to less shot attempts. In relation with the theory of basketball games (Knight and Newell, 1986. and Trninić, 1996) as well as our research results show that important factors for a successful defensive rebound are: accurate evaluation of trajectory of the ball, the speed of jump, catching the ball with both hands above and in front of the head in the highest access point and wide leg and elbows stance during flight and landing.
Successfully organized offense will constantly cover the offensive rebound and keep the balance of the defense, but it has to be automatized for all players. The greatest possibilities for attempting the offensive rebound come from the inside game and defense/offense transition where the defense hasn't had the time to set up accordingly. Winning the center position is a prerequisite for a successful offensive rebound and it can be performed directly before the shoot or at the moment when the ball leaves player's hands (Trninić, 1996).

Victories were predicted by fewer turnovers during games, which indicates high-level performance of individual and collective game, but also the fitness levels of certain players. If we describe basketball as a game of mistakes (fouls) and movement angles, win is determined by fewer mistakes and the organization of the game with optimal movement angles and fast circulation of game from stressed onto the less stressed side of the offense (Trninić, 2006).
Final result is also determined by more steals, which enable more shots and create opportunities for primary counter-offense. They are the result of a quality and aggressive defense and they create possibilities for a transition offense whose results in high percentage of scores (Mikołajec, Maszczyk, and Zając, 2013 and Trninić, 2006). Practically that means that steals can be the result of an individual or group effort (double team) during defense play on certain parts of basketball court (angles). College coaches in the USA suggest that one of the most important defense goals is stealing 10-12 balls during one halftime (Trninić, 2006).
Greater number of successful 3-point shots was also the predictor of winning the game, but less than the rest of the indicators of situational efficiency. In our research the winning teams made more 3-point shots and had more successful shoots from behind the 6.75m line than the losing teams. This indicate better offense organization and the achievement of optimal position for successful 3-point shots could result in winning a game.
In female and male basketball matches during 2012 London Olympics (Milanović, Štefan, Sporiš & Vuleta, 2016; Milanović, Štefan, Sporiš, Vuleta & Selmanović, 2016) similar indicators were found to be related to final outcome of the game. The win was affected by a smaller number of unsuccessful three and two point shots and turnovers, and a greater number of defensive and offensive rebounds. In research of Pleslić (1994) shots from under the hoop, from midrange and free line throws were best related to final score.

Differences between winning and losing male basketball teams in indicators of situational efficiency

Greatest difference between winning and losing team of a match were found in several indicators of game efficiency: successful 3-point and free-throw shots, offensive and defensive rebounds and number of personal fouls. Greater number of 3-point shots by winning teams indicates the importance of quality shoot selection and locating the player in the optimal position for its realization. Furthermore, winning teams achieved a greater number of free throws which indicates quality of organization of successful teams' offence play. In research of Kozar et al. (1994) of 490 NCAA Division I men's basketball games free-throws comprised a significantly higher percentage of total points scored during the last 5 minutes than the first 35 minutes of the game for both winning and losing teams. Also, winners scored a significantly higher percentage of points from free-throws than did losing teams. Similar was found in Milanović and associates (2016) who compared teams from the

2012 London Olympics to determine the differences between winning and losing teams and they were: 2-point shot - successful, free throws - successful, defensive rebounds, assists, turnovers, steals and blocks.
In different system of competitions, for example in Portugal national league, regular season profile was best discriminated by successful free - throws, whereas play-offs profile was best discriminated by offensive rebounding (Sampaio & Janeira, 2003). On the other hand, home wins were best discriminated by committed fouls whereas successful free-throws discriminated away wins (Sampaio & Janeira, 2003). Some researchers went further with analysis of result difference in a match and factors of game performance that influence outcome. Lorenzo et al. (2010) found that in close games (final score differences below 9 points) the discriminant variables were the turnovers and the assists. In balanced games (final score differences between 10 and 29 points) the variables that discriminated between the groups were the successful 2-point field-goals and defensive rebounds; and in unbalanced games (final score differences above 30 points) the variables that best discriminated winners and losing teams were the successful 2-point shots.
From this comparison and similar research, we can follow basketball game changes in the Olympic games and other competitions and during time.

Practical application of this research is related to top-level teams and elite players and can help coaches in training design. Coaches and players should be aware of different factors that influence outcome of the basketball match in order to increase specificity of game planning and control at various competition levels and systems of training processes.
Main limitation of this research is that only one group of national basketball teams on the Olympic competition was analyzed. Further research should be expanded to performance analysis with more situation variables of all teams competing on large competitions.

References

Knight, B., Newell, P. (1986). Basketball. Vol 1. Seamoor: Graessle Mercer Co.
Kozar, B., Vaughn, R.E., Lord, R.H., Whitfield, K.E. (1994). Importance of free- throws AT various stages of basketball games. Perceptual and Motor Skills, 1994; 78: 243-48.
Lorenzo, A., Gomez, M.A., Ortega, E., Ibanez, S.J., Sampaio, J. (2010). Game related statistics which discriminate between losing under-16 male basketball games. Journal of Sport Science and Medicine, 9: 664-668.
Mikołajec, K., Maszczyk, A., Zając, T. (2013). Game Indicators Determining Sports Performance in the NBA. Journal of Human Kinetics, 37, 145-151.
Milanović, D. (2013). Training theory – Kinesiology of sport. Zagreb: Faculty of Kinesiology University of Zagreb. (In Croatian).
Milanović, D. (1979). Influence of different ball throws on final result of a basketball match. Kinesiology, 9(1-2), 135-149. (In Croatian).
Milanović, D., Štefan, L., Sporiš, G., & Vuleta, D. (2016). Effects of game-related statistics parameters on final outcome in female basketball teams on Olympic Games in London 2012. International Journal of Current Advanced Research, 5(8):1186-1189.
Milanović, D., Štefan, L., Sporiš, G., Vuleta, D., & Selmanović, A. (2016). Effects of situational efficiency indicators on final outcome among male basketball teams on the Olympic Games in London. Acta Kinesiologica, 10(1), 78-84.
Pleslić, D. (1994). Influence of some basketball elements on final match outcome. (Master thesis). Zagreb: Faculty of Kinesiology University of Zagreb. (In Croatian).
Sampaio, J., Janeira, M. (2003). Statistical analyses of basketball team performance: understanding teams' wins and losses according to a different index of ball possessions. International Journal of Performance Analysis in Sport 3(1):40-49.
Trninić, S. (1996). Analysis and learning of basketball play. Pula: Vikta d.o.o. (In Croatian).
Trninić, S., Milanović, D., Dizdar, D. Discriminant analysis of the winning and losing teams in space of standard parameters of situational efficiency in basketball games In: Trninić, S., Dizdar, D. (2001). Scientific research of basketball play 1 (1994.-2000.). Zagreb: Vikta d.o.o. pp 57-68 (In Croatian).
Trninić, S. (2006). Selection, preparation and leadership of basketball players and teams. Zagreb: Vikta- Marko (In Croatian).
Trninić, S., Viskić Štalec, N., Štalec, J., Dizdar, D. and Birkić, Ž. Latent structure of standard indicators of situational efficiency in basketball game. In: Trninić, S., Dizdar, D. (2001). Scientific research of basketball play 1 (1994.-2000.). Zagreb: Vikta d.o.o. pp 19-34 (In Croatian).

SITUACIJSKA USPJEŠNOST KOŠARKAŠA NA OLIMPIJSKIM IGRAMA

Sažetak

Analiza pokazatelja situacijske učinkovitosti igrača u sportskim igrama važan je faktor za planiranje i programiranje trenažnog procesa, kao i taktičke pripreme vrhunskih košarkaških ekipa. Cilj ovog rada jest utvrditi pokazatelje situacijske učinkovitosti košarkaških ekipa koji su povezani s konačnim ishodom utakmice na olimpijskim igrama 2016 u Rio de Janeiru. Analizirano je 30 košarkaških ekipa u 15 utakmica. Rezultati pokazuju da se konačan rezultat košarkaške utakmice 97,5% može objasniti pokazateljima situacijske učinkovitosti. Najznačajniji prediktori konačnog ishoda utakmice bili su šut za dva poena neuspješno, šut za tri poena neuspješno, skokovi u obrani i napadu, osvojene i izgubljene lopte. Ovi rezultati mogu pomoći trenerima u pripremi i kontroli trenažnih varijabli tijekom pripreme za važna natjecanja.

Ključne riječi: *košarka, natjecanje, statistika igre, konačan rezultat*

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