DIFFERENCES IN SITUATIONAL EFFICIENCY PARAMETERS BETWEEN SUCCESSFUL AND UNSUCCESSFUL FEMALE BASKETBALL TEAMS ON THE OLYMPIC GAMES IN LONDON 2012

Dragan Milanović, Lovro Štefan and Dario Škegro

Faculty of Kinesiology, University of Zagreb, Croatia

Abstract

The purpose of this study was to determine differences in situational efficiency parameters among successful and unsuccessful female basketball team on the Olympic Games in London 2012. Sample of entities was comprised of 38 games as following: 15 games played in group A, 15 games played in group B, 4 games in the quarter-finals, 2 games in semi-finals, 1 game in finals and 1 game for third place. Situational efficiency variables were consisted of 13 parameters measured and analyzed in the study. Differences between winning and defeated teams were calculated using Student t-test and multivariate analysis of variance (MANOVA). To determine which parameters differentiated groups the most, discriminate analysis with standardized canonical coefficients was used. Statistical significance was set up at p≤0.05. Obtained results showed overall differences in situational parameters between winning and defeated teams (p≤0.01). Also, parameters that discriminated winning from defeated teams the most were 2 points-fail (F-value=9.79; SCC=0.829; p<0.01), 3 points-fail (F-value=14.03; SCC=0.676; p<0.01), defensive rebounds (F-value=11.63; SCC=-0.623; p<0.01), offensive rebounds (F-value=5.20; SCC=-0.508; p<0.05) and turnovers (F-value=4.77; SCC=0.418; p<0.05). In conclusion, score efficiency with rebounds represent most important game variables to achieve advantage and win the game. Based on that, coaches need to pay more attention in preserving technical-tactical and cognitive functions of the players on higher level, especially at the end of the game.

Key words: collective sport, final outcome, situational parameters

Introduction

Notational analysis represents key point of preparing coaches and their teams for training process (Thomson et al. 2009). Today, coaches from all kind of sports have tried to identify team's and player's efficiency performance in different game-contexts (Hughes, Franks, 2004). According to Hughes and Bartlett (2002), performance indicators are defined as as the selection and combination of variables that define some aspect of performance and help to achieve athletic success. The activity of individual player in basketball game started to get measureable through situational efficiency with standardised and non-standardised indicators in basketball game (Trninić et al., 1997). Federation International Basketball Association (FIBA) standardizes thirteen indicators of situational efficiency that are followed during each game (Sindik, Vidak, 2010).

That is why situational parameters contribute the most in sport games. For example, Ohnjec et al. (2008) researched the contribution of the performance indicators of play in attack to the final competition success in female handball, defined by the goal-difference during the preliminary part of the 2003 World Championship. Also, Đurković et al. (2009) wanted to explore differences between the group of semi-finalists (1st-4th place) and other teams (5th-8th place) in volleyball matches on the basis of 6 situational parameters. Zadražnik et al. (2009) examined differences in the phase of a volleyball game between the successful and unsuccessful youth female teams for each of the six volleyball rotations separately. Ortega et al. (2009) analyzed the differences in rugby game statistics between winning and losing teams from the Six Nations tournament from the 2003-2006. This evidence have shown that situational efficiency parameters are crucial in every sport. Studies conducted on female basketball players showed that *defensive rebounds* also discriminated successful from unsuccessful teams (Sampaio et al., 1998; Graber, 1998), together with *3 points-made*, *fouls* and *assists*. Sampaio et al. (2004) provided evidence that male and female basketball players had different playing tactics and strategies during the game.

According to those authors, different factors, like playing position, gender etc. influenced on picking appropriate players in the team. Nakić (2004) showed that successful teams performed better in 2 points-made, defensive rebounds and assists, led by free throws-made, steals, blocks, offensive rebounds, 3 points-made and free throws-fail.

Unsuccessful teams were defined with greater level of personal fouls, turnovers, 3 points-fail and 2 points-fail. It could be seen that there was lacking of studies that have researched situational efficiency parameters between female basketball teams according to outcome of the game. Based on that, the aim of present study was to determine which of analyzed 13 parameters differentiate winning and defeated female basketball teams playing on the Olympic Games in London 2012.

Material and methods

Participants and procedure

The research has been conducted on the sample of 12 basketball teams (38 games, 76 opponents) playing on the Olympic Games in London 2012. Teams were devided into A group (15 games), B group (15 games), teams which got into the quater-finals (4 games), teams which got into the semi-finals (2 games), finals (1 game) and 1 game for the third place.

Measures

Sample of variables was comprised of 13 standard situational efficiency parameters prescribed by FIBA. Table 1. represented each parameter abbreviation and description. Variables for *2 points* represent primary situational indicators for overall efficiency in the game. Those efficiencies ranged from 55% to 60% from total of scored points in basketball game. One of the most important principle of organized (transitional and set) attack represents *selective shot*. Due to that, organisation of the game must contain ball control and movement line, which allow the releasement of a large number of players for "opened" shot on a different playing positions (Trninić, 1996). Variables for *3 points* represent great strategic importance, because they make around 25% of total scored points on basketball games and around 36% from total of thrown balls. Because of that, requirements increase in the phase of defense for pressure in front line of defense, but defense spreads. It means that opponent players have much more space for attack. Knight and Newell (1986) considered that total shot percentage mustn't be lower than 52%. *Free throws* are defined as indefensible ball throw in the basket made as the result of punishing the opponent's team for personal foul made. Between 15% to 30% of total scored points during the game can be attributed to free throws. *Defensive rebounds* represent the number of caught rejected balls in the phase of transitional or set defense. Trninić et al. (1994) showed that defensive rebounds were more significant indicator of situational efficiency than *offensive rebounds* (RO=0,57). According to Trninić (1996), defensive rebounds account for about 66% of total rebounds. Based on that, that the transition from the phase of defense to the phase of attack start when player comes in possession of the ball, it is necessary to point out that defensive rebounds important component for overall efficiency in the game. *Offensive rebounds* represent the number of caught rejected balls in the phase of transitional or set offense. According to Knight and Newellu (1986), the number of caught balls in the phase of defense and attack must be over 58% from the overall rebounds. Well-prepared and organized attack will cover offensive rebounds and keep defensive balance. It decreases psychological pressure on the shooter and simultaneously increases realization in attack. *Assists*, according to Trninić (1996), are factors that produce "easy shots". Also, assists, % of free throws, offensive and defensive rebounds make very important components that discriminate successful from unsuccessful teams. Greater number of assists and got balls generate with greater shoot efficiency, producing greater number of successful throws for 2 points and lower unsuccessful throws for 2 points. *Personal fouls* represent illicit and irregular physical touch with the opponent, no matter if the ball is in the game or out. *Turnovers* represent lost ball during the basketball game. In basics, minimal number of lost balls (around 6) points high level of individual and team game, along with high level of sports form of individuals and teams. Losing the ball in the phase of transitional and set attack was caused with aggressive defense and level of ball control of the team who is in the phase of attack. *Steals* represent successful and unsuccessful throws the ball into the basket, cause higher number of stolen balls creates assumptions for higher number of shots. Obtained balls occur when defensive players intersecting passed balls, outbreaking the ball and dead ball rebounds.

Most of the college coaches think that winning 10-12 balls during first half is one of the important defensive goals (Trninić, 1996). *Blocks* are events, where team shows individual or collective aggression in the phase of defense. It represents indicator for evaluation central player in the phase of defense.

Table 1. *Abbreviation and description of each situational efficiency parameter*

Abbreviation	Description
2P-M	2 points-made
2P-F	2 points-fail
3P-M	3 points-made
3P-F	3 points-fail
FT-M	Free throws-made
FT-F	Free throws-fail
RB-O	Offensive rebounds
RB-D	Defensive rebounds
AS	Assists
PF	Personal fouls
TO	Turnovers
ST	Steals
BS	Block Shots

Criteria variable was determined categorically, according to final result 39of the game. The outcome was set up like win/lose result (win=1, lose=0).

Statistical analysis:
For all analyzed parameters, arithmetic mean and standard deviation were calculated.
Kolmogorov-Smirnov test was used to determine whether the variables were normally distributed (maxD and p-value). Separate differences between successful and unsuccessful teams were obtained with Student t-test and overall group differences by using multivariate analysis of variance (MANOVA). For determining variables, which differentiate teams according to outcome, discriminant analysis was used. The statistical analysis was performed using SPSS software (SPSS Inc., ver. 16). Statistical significance was set up at p≤0.05.

Results

Statistical data of situational efficiency parameters of successful and unsuccessful female basketball teams
Table 2. showed basic parameters of arithmetic means, standard deviations, Kolmogorov-Smirnov maxD for each of the parameter and p-value. Also, statistical differences between winning and defeated female basketball teams were marked

using asterisk (*) next to each parameter. Presenting shooting results from the angle of percentages, successful teams scored 57,22% of *2 points-made*, in contrast to unsuccessful teams (42,78%). Opposed to successful *2 points-made*, unsuccessful teams made more *2 points-fail* (52,50% vs. 47,50%). Successful teams scored 52,76% of successful *3 points-made*, opposed to 47,24% scored by unsuccessful teams, while winners had lower percentage of *3 points-fail* (45,69%) than losers (54,31%). Results from *free throws-made* showed higher percentage of realization by successful teams (55,87%) in contrare to unsuccessful (44,13%), while similar percentages were obtained in *free throws-fail* among successful (49,84%) opposed to unsuccessful (50,16%) teams. Successful teams did more *offensive* (51,36% vs. 48,64%) and *defensive rebounds* (55,70% vs. 44,30%). Also, winning teams performed better in *assists* (59,77%), *steals* (59,42%) and *blocks* (66,54%), but lower in *personal fouls* (47,78%) and *turnovers* (46,48%).

Table 2. *Basic descriptive parameters of successful and unsuccessful female basketball teams*

Variables/Descriptive parameters	N	Mean±SD		maxD		p-value	
		Winning	Defeated	Winning	Defeated	Winning	Defeated
2P-M	38	23,87±6,28*	17,84±3,94	0,12	0,13	p>,20	p>,20
2P-F	38	26,03±6,39*	28,76±5,42	0,11	0,11	p>,20	p>,20
3P-M	38	5,03±2,47	4,50±1,90	0,14	0,13	p>,20	p>,20
3P-F	38	10,05±3,61*	11,95±3,00	0,14	0,09	p>,20	p>,20
FT-M	38	14,03±5,22*	11,08±4,78	0,09	0,16	p>,20	p>,20
FT-F	38	4,26±2,51	4,29±2,61	0,20	0,21	p<,10	p<,10
RB-O	38	13,37±4,33	12,66±4,41	0,10	0,09	p>,20	p>,20
RB-D	38	29,71±4,70*	23,63±4,30	0,07	0,10	p>,20	p>,20
AS	38	18,92±5,38*	12,74±3,80	0,12	0,12	p>,20	p>,20
PF	38	17,00±3,46	18,58±4,75	0,15	0,09	p>,20	p>,20
TO	38	14,76±4,10*	17,00±4,11	0,15	0,13	p>,20	p>,20
ST	38	8,05±3,08*	5,50±2,73	0,11	0,18	p>,20	p<,20
BS	38	4,55±2,68*	2,29±1,56	0,09	0,15	p>,20	p>,20

*p<0,05

Multivariate analysis of variance between successful and unsuccessful female basketball teams in situational efficiency parameters
Table 3. showed multivariate analysis of variance across successful and unsuccessful teams. In basics, results presented that general differences

occured between successful and unsuccessful female basketball teams.

Table 3. *Multivariate analysis of variance between successful and unsuccessful female basketball players*

Effect	Test	Value	F-value	p-value
Win/lose	Wilks lambda	0,33	9,63	**0,00**

p<0,0

Discriminant analysis between successful and unsuccessful female basketball teams in situational efficiency parameters

Results in table 4. showed statistically significant coefficients and each parameter correlation with significant root. Also, significant variables which differentiated groups the most were highlighted and marked with asterisk (*= p<0,05; **= p<0,01).

Table 4. *Discriminant differences between successful and unsuccessful female basketball players*

Variables	F-value	Standardized canonical coefficients	Factor structure-root 1
2P-M	0,33	,161	-,623
2P-F	9,79	**,829****	-,481
3P-M	0,87	-,203	-,474
3P-F	14,03	**,676****	-,410
FT-M	0,91	-,197	-,368
FT-F	0,86	,169	-,313
RB-O	5,20	**-,508***	-,210
RB-D	11,63	**-,623****	,204
AS	1,06	-,234	,194
PF	0,67	,135	,165
TO	4,77	**,418***	,135
ST	2,40	-,338	-,085
BS	1,79	-,236	-,058

**p<0,01
*p<0,05

Discussion

The aim of present study was to determine differences in situational efficiency parameters among successful and unsuccessful female basketball team on the Olympic Games in London 2012. Results in table 2. showed partial numerical statistical significant differences in most of the situational efficiency parameters. Also, looking on situational indicators like set of variables, results in table 3. showed global differences between successful and unsuccessful female basketball teams playing on the Olympic tournament (F-value= 9,63; p= 0,00). Main findings were presented in table 4. Variables that mostly differed female basketball teams, according to outcome, were *2 points-fail* (F-value= 9,79; SCC= 0,829; p<0,01), *3 points-fail* (F-value= 14,03; SCC= 0,676; p<0,01), *defensive rebounds* (F-value= 11,63; SCC= -0,623; p<0,01), *offensive rebounds* (F-value= 5,20; SCC= -0,508; p<0,05) and *turnovers* (F-value= 4,77; SCC= 0,418; p<0,05). Variable *2 points-fail* (0,829) showed the biggest difference between successful and unsuccessful teams. Successful teams scored less unsuccessful shots for 2 (47,50%) opposed to unsuccessful teams (52,50%). Successful teams sent more shots from favorable positions, they had better shot selection and greater number of shots from the zone of high percentage of shots. It was also assumed that defense of successful teams was successfully prevented regular entrance and line movement of the unsuccessful players in transitional and set attack. Along with 2 points-fail, *3 points-fail* represented significant contributor of discriminating successful from unsuccessful teams (0,676). Successful teams performed lower percentage of 3 points-fail (45,69%) than unsuccessful teams (54,31%). Quality defense of successful teams forced unsuccessful teams on higher number of unsuccessful shots for 2 points (successful teams 26,03 vs. unsuccessful teams 28,76). *Turnovers*, with smaller, but significant contribution on the final score, represented lost balls during the game. Unsuccessful teams had greater number of lost lost balls than successful teams (17,00 vs. 14,76). In percentages, from total turnovers, successful teams performed 46,48%, opposed to 53,52% among unsuccessful teams. As mentioned before, quality defense with agressive play, making pressure and inaccurate passing, led to stealing the ball and made the fast transition from the phase of defense to the phase of attack. According to presented results, negative contribution on the efficiency in the game had *offensive rebounds* (-0,508). This result came from the fact that successful teams had greater percentage (51,38%) than unsuccessful teams (48,62%). Nevertheless, aggresive offensive rebounds in the phase of attack represented significant indicator for successfulness. According to Trninić et al. (1997), offensive rebounds were defined as extension of agresion of attack that opened the option of greater shoot percentage. This meant that the team had to close the way towards the basket. In that way, team who got in possesion of the ball had bigger percentage of shots and more succesfull transition from the phase of attack to defense and vice versa. Along with offensive rebounds, *defensive rebounds* contributed the most on the efficiency in the game (-0,623). Trninić et al. (1997) explained that by maintaining the pressure on the ball in the phase of defense, stopping the opponents to achieve regular entrance in transitional and set offence along with stopping the attack with more than one shot. Successful teams forced unsuccessful teams for higher number of unsuccessful shots from the game and created greater chance for defensive rebounds (successful teams 55,70% vs. unsuccessful teams 45,30%). Gomez et al. (2006) reported that winning teams

had greater success in *free throws*, *3 points-made*, *defensive rebounds* and *assists* in balanced games (final score differences equal or below 12 points). Opposed to that, *2 points-made*, *defensive rebounds* and *steals* represented parameters that differentiated teams in unbalanced games (final score higher than 12 points). Authors explained those results by better individual and group stability. Also, successful offenses depend on player's decision making and coordination (Brown, 1995). Brandenburg (1994) reported that defensive rebounding teams had more opportunities to shoot, score points and win the game. Koh et al. (2012) reported that field goal percentage, including *2 point shots*, represented one of the key factors in determining team's success among Youth Olympic Female Basketball Teams. Those results were similar with present study, where *2 points-made* made the biggest difference between teams according to outcome, but study was conducted on young female basketball players opposed to senior players. When we compared present study with studies conducted on male basketball players, results showed similar parameters that differentiated successful and unsuccessful groups. More precisely, Pojskić et al. (2009) showed that *assists, % 2 points scored, 2 points-made, defensive rebounds* and *bench points* statistically differed mentioned groups. Also, Trninić et al. (2002) and Gomez et al. (2008) presented results, where *defensive rebounds* and *assists* were on higher level among winning basketball teams. Based on obtained results in the study, model game of the successful teams was based on strict selection of a 2 and 3 point shots from the external positions, as many offensive rebounds (to start new attack in the game) along with defensive rebounds (try to win the ball in defense with fast transitions in the phase of attack). Also, assists with stolen balls speed the game up and player's creativity came to higher level of performance. All these indicators comprised technical and tactical actions in the phase of attack and defense, where players had to be well-prepaired for the upcoming competition during the specific cycle period. In conclusion, similar results were obtained across several analyzed studies, where *rebounds* and *unsuccessful shots for 2* and *3 points* showed the greatest differences among groups. In the game, phase of attack starts after defensive rebounds or continuing the attack after offensive rebounds. Also, successful shots, as the main component of the game, at the end represent winners. Based on that, combining those situational parameters team achieves quality advantage opposed to the opponent. Effective transition from the phase of defense to the phase of offense and vice versa represented better conditioning ability levels, along with technical-tactical components. Overall situational efficiency parameters are associated with game rhythm, player's anthropological characteristics, pvoting and blocking, along with muscular fitness connected with offensive and defensive rebounds connected with gaining the advance and winning the game.

References

Brandenburg J. Defensive Rebounding. In Coaching Basketball. National Association of basketball Coaches. (Edited by J. Krause) Master Press: NewYork, 65-80; 1994.

Brown H. Basketball's box offense. Master Press, Indianapolis; 1995.

Đurković T, Marelić N, Rešetar T. Rotation analysis of team's performances at European volleyball championship 2003. Kinesiology, 2009; 41(1): 60-66.

Gómez MA, Lorenzo A, Sampaio J, Ibáñez SJ. Differences in game-related statistics between winning and losing teams in women's basketball. Journal of Human Movement Studies, 2006; 551: 357-369.

Gómez MA, Lorenzo A, Sampaio J, Ibáñez SJ, Ortega E. Game-related statistics that discriminated winning and losing teams from the Spanish men's professional basketball teams. Collegium Antropol, 2008; 32(2): 315–319.

Graber LM. The Relationship between rebounding and winning percentage N. C. A. A. Division I Big Sky Conference women´s basketball. Microform Publications Bulletin. Exercise and Sport Sciences, 1998; 12(1): 2.

Hughes M, Franks IM. Notational Analysis of Sport. Systems for better coaching and performance in sport. London: Ed. Routledge; 2004.

Hughes MD, Bartlett RM. The use of performance indicators in performance analysis. Journal of Sports Sciences, 2002; 20(10): 739-754.

Knight B, Newell P. Basketball. Vol 1. Seamoor: Graessle Mercer Co.; 1986.

Koh KT, Wang CKJ, Mallett CJ. Discriminating factors between successful and unsuccessful elite youth Olympic Female basketball teams. International Journal of Performance Analysis in Sport, 2012; 12(1); 119-131.

Nakić J. Differences in standard and derived situation efficacy parameters between men's and women's basketball teams in senior European basketball championships in 2003. Unpublished master thesis. Zagreb: Faculty of Kinesiology, 2004.

Ohnjec K, Vuleta D, Milanovic D, Gruic I. Performance indicators of teams at the 2003 World Handball Championship for woman in Croatia. Kinesiology, 2008; 40(1): 69-79.

Ortega E, Villarejo D, Palao JM. Differences in game statistics between winning and losing rugby teams in the six nations tournament. J Sport Sci Med, 2009; 8(4), 523–527.

Pojskić H, Šeparović V, Užičanin E. Differences between successful and unsuccessful basketball teams on the final Olympic tournament. Acta Kinesiologica, 2009; 3(2): 110-114.

Sampaio J, Cachulo C, Janeira M. Quantitative analysis in Women'sBasketball: identifying variables and game periods related to final outcome. Paper presented at the Proceedings of the 4th World Congress of Notationa; 1998.

Sampaio J, Ibáñez S, Feu S. Discriminative power of basketball game statistics by level of competition and sex. Perceptual and Motor Skills, 2004; 99: 1231-1238.

Sindik J, Vidak N. The difference between top senior basketball players from differently ranked team sin terms of situation efficacy parameters. Facta Universitas. Series: physical education and sport, 2010; 8(2): 163-171.

Trninić S, Dizdar D, Lukšić E. Differences between winning and defeated top quality basketball teams in final tournaments of European club championship. Coll. Antropol, 2002; 26(2): 521-531.

Trninić S, Milanović D, Dizdar D. Discriminative analysis of successful and unsuccessful teams in space of standard indicators of situational efficiency in basketball game. Leistungs sport, 1997; 2: 29-34.

Trninić S. The analysis and learning of basketball game. Pula: VIKTA d.o.o; 1996

Trninić S, Perica A, Pavičić L. The analysis of conditions in basketball game. Kinesiology, 1994; 26(1-2): 27-32.

Zadražnik M, Marelić N, Rešetar T. Differences in rotations between the winning and losing teams at the youth European volleyball championships for girls. Acta Universitatis Palackianae Olomucensis, Gymnastic, 2009; 39(4): 33-40.

RAZLIKE U PARAMETRIMA SITUACIJSKE EFIKASNOSTI IZMEĐU USPJEŠNIH I NEUSPJEŠNIH ŽENSKIH KOŠARKAŠKIH TIMOVA NA OLIMPIJSKIM IGRAMA U LONDONU 2012.

Sažetak

Svrha ovog istraživanja je bila odrediti razlike u parametrima situacijske efikasnosti među uspješnim i neuspješnim ženskim košarkaškim timovima na Olimpijskim igrama u Londonu 2012. Uzorak entiteta se sastojao od 38 igara, kako slijedi: 15 igara odigranih u skupini A, 15 igara odigranih u skupini B, 4 igre u četvrtfinalu, 2 igre u polufinalu, 1 igra u finalu i 1 igra za treće mjesto. Varijable situacijske učinkovitosti su se sastojale od 13 parametara izmjerenih i analiziranih u istraživanju. Razlike između pobjedničkih i poraženih timova su izračunate koristeći studentski t-test i multivarijantne analize varijacija (MANOVA). U svrhu određivanja koji parametri su najviše razlikovali grupe korištena je diskriminacijska analiza sa standardiziranim kanonskim koeficijentima. Statistička značajnost je određena na p≤0.05. Prikupljeni rezultati su pokazali sveukupnu razliku u situacijskim parametrima između pobjedničkih i poraženih timova (p≤0.01). Također, paramteri koji su najviše razlikovali pobjedničke od poraženih timova bili su promašaj šuta za 2 (F-value=9.79; SCC=0.829; p<0.01), promašaj šuta za 3 (F-value=14.03; SCC=0.676; p<0.01), skok u obrani (Fvalue=11.63; SCC=-0.623; p<0.01), skok u napadu (F-value=5.20; SCC=-0.508; p<0.05) i izgubljena lopta (F-value=4.77; SCC=0.418; p<0.05). U zaključku, efikasnost uspjeha s odskokom predstavlja najvažnije varijable igre za postizanje prednosti i pobjeđivanja u igri. Zasnovano na tome, treneri trebaju obratiti više pozornosti na održavanje tehničko-taktičkih i kognitivnih funkcija igrača na višoj razini, osobito na kraju igre.

Ključne riječi: *kolektivni sport, konačni ishod, situacijski parametri*