

# JUSTIFICATION FOR INTRODUCING NONSTANDARD INDICATORS FOR MONITORING OF SITUATIONAL EFFECTIVENESS IN BASKETBALL

Vlatko Šeparović, Haris Pojskić, Edin Užičanin

Faculty of physical education and sport, Tuzla University, Bosnia and Herzegovina

Original scientific paper

## Abstract

The aim of this paper is to determine if winning teams can be discriminated from losing teams in basketball on the basis of 6 nonstandard indicators of situational effectiveness in 3 competitions (Regional League; League 6 - final round of Bosnian basketball championship; and Under-16 European basketball championship), two systems of competition (tournament and league), in two categories (senior and under 16). T-test determined the significance of differences in arithmetic means between winning and losing sides in used nonstandard indicators, and discriminative analysis determined the difference as a whole as well as the contribution of each situational indicator to discriminative function. Research results confirm that discriminating winning from losing teams based on newly introduced 6 indicators is possible and justified, and that based on variables which discriminate and make the strongest contribution to discrimination between winning and losing teams one can make a quality analysis of an opponent's game style. On the basis of this information it is possible for a team to correct and improve its own game plan.

**Key words:** Transition offense, indicators of situational effectiveness, discriminative analysis, T-test.

## INTRODUCTION

Every scientific discipline is a work which helps us acquire new perceptions (Mejovšek, M 2008). This scientific research includes theory and practice with the purpose to use scientific perceptions to control practical actions which lead towards certain goal, specifically in this case to win a basketball game. Practice is the only support which can evaluate theoretical perceptions. By connecting theory and practice we create preconditions for establishing awareness of different, alternative solutions, and therefore we make room for sound analysis of successfulness in the game of basketball. Within the process of tactical preparation it is also necessary to solve the number of tasks:

- economical use of technical elements and their application in tactics depending on specific situations,
- scouting opponents, their capabilities as well as the conditions for a game or a tournament, and
- acquiring tactical elements, combinations and variants until players develop habits.

For a quality process of tactical preparation, standard indicators for evaluating situational effectiveness do not give quality data for structural analysis of the game (Trninić, S., Milanović D., Dizdar, D., 1997), therefore the introduction of new nonstandard indicators is inevitable. Suggested model with 6 nonstandard indicators for evaluating situational effectiveness is the way to recognize elements for a quality tactical analysis and preparation.

Nonstandard indicators of situational effectiveness related to transition and set offense which discriminate between winning and losing teams point to the offense of basketball teams as well as to the balance of quality of the competition itself.

## WORK METHODS

### Entity sample

Entity sample for this research includes teams that reached the final round of basketball championship in Bosnia and Herzegovina – League 6 (total number of games played is 30), games of Regional basketball league (entity sample which included 20 games) and games of Under-16 European basketball championship - Division B, held in Sarajevo.

### Variable sample

Data registering was done by official statisticians qualified and trained for this job.

Nonstandard indicators based on the type of offense (Šeparović, V., 2007) used in this research are: transition offense – successful (T\_U), transition defense – unsuccessful (T\_B), transition offense – neutral (T\_N), set offense – successful (P\_U), set offense – unsuccessful (P\_B) and set offense – neutral (P\_N).

Transition offense – successful, includes the following situational indicators: three point field goal - successful, two point field goal - successful, forced personal foul – free throws. Transition offense – unsuccessful, includes the following situational indicators: three point field

goal – unsuccessful, two point field goal – unsuccessful, and turnover - lost possession.

Transition offense – neutral, covers the following situational indicators: forced personal foul – non-shooting foul (throw-in), and offensive rebound - new possession.

Set offense – successful, includes the following situational indicators: three point field goal – successful, two point field goal – successful, and forced personal foul – shooting foul (free throws).

Set offense – unsuccessful, covers the following situational indicators: three point field goal – unsuccessful, two point field goal – unsuccessful, and turnover – lost possession.

Set offense – neutral, covers the following situational indicators: forced personal foul, non-shooting foul (throw-in), and offensive rebound - new possession.

### **Methods of data processing**

Data processing in this research was done by using software package for multivariate analysis. Statistical significance of differences between two or more groups in one or more variables is often determined in kinetic researches (Dizdar, D., 2006). T-test was used to determine the differences and test the significance of those differences in arithmetic means between winning and losing teams based on 6 nonstandard indicators of situational

effectiveness in basketball. Discriminative analysis was used in order to determine differences in general, so based on the obtained results we determined the hierarchy of variables which contribute to the difference between successful (winning) and unsuccessful (losing) teams.

## **RESULTS AND DISCUSSION**

### **Determining partial differences in nonstandard indicators of situational effectiveness**

Winning and losing teams in Regional league are discriminated (statistically very significant – on the level over 99%) by variables successful (P\_U) and unsuccessful set offense (P\_B). Regional league teams are prepared for defending transition offense which if not well defended can produce many easy points. For such defense it is necessary to have strong conditioning (physical preparation) and organized, tactically well-prepared and set transition defense. After a successful transition defense, possession is continued with set offense against set defense. The difference in variables of set offense shows that Regional league is a competition with balanced quality of basketball teams.

Regional league					Bosnian League 6					European U-16 championship				
	Mean Lose	Mean Win	t-value	p		Mean Lose	Mean Win	t-value	p		Mean Win	Mean Lose	t-value	p
T_U	12.70	12.95	-0.272	0.787138	T_U	9.57	13.27	-4.599	0.000024	T_U	15,676	12,556	3,434	0,0008
T_B	6.65	6.25	0.516	0.608804	T_B	5.17	3.83	1.986	0.051823	T_B	12,647	16,833	-3,406	0,0009
T_N	3.30	3.35	-0.096	0.923903	T_N	2.27	1.53	2.289	0.025769	T_N	4,456	4,528	-0,143	0,8863
P_U	25.20	30.05	-4.996	0.000013	P_U	26.53	29.40	-2.517	0.014629	P_U	28,176	22,014	4,962	0,0000
P_B	31.20	24.25	6.041	0.000001	P_B	29.07	25.10	3.474	0.000978	P_B	34,088	36,931	-1,628	0,1058
P_N	11.25	11.00	0.233	0.816657	P_N	12.90	10.73	2.384	0.020415	P_N	12,015	10,528	1,748	0,0826

Table 1. T – test

It is obvious that winning and losing teams in Bosnian League 6, in the field of introduced variables, are discriminated by all variables, only variable T\_B (0.051823) above statistical significance. The largest difference is registered in successful transition offense and unsuccessful set offense (variables T\_U and P\_B).

By analyzing 198 entities or 99 games of U-16 European basketball championship, it has been determined that successful teams (winners) are discriminated from unsuccessful teams (losing sides) on statistically significant level in three following variables: transition offense successful (T\_U), transition offense unsuccessful (T\_B), and set offense successful (P\_U), on the level of significance  $p \leq 0.01$  (99 %). Therefore

successfulness, a win or a loss, strongly depends on successful transition game performance.

### **Results of Discriminative analysis**

Discriminative analysis determined statistical significance of more entity groups measured in more variables, during which we determined the extent of difference among the groups and how much certain variables contribute to that difference. Analysis determined the difference among the groups (position of group centroids in the area of discriminative function) and how much certain groups of variables contribute to that difference (correlation matrix of variables with discriminative function).

Function 1	Eigenvalue	% of Variance	Cumulative %	Canonical Correlation
Regionalna liga	2.102142089	100	100	0.823
Liga 6 BH	1.057130612	100	100	0.716
Evropsko kadetsko	.513 <sup>a</sup>	100	100	0.582

Table 2. Distinctive values of discriminant function

Very large distinctive value has been obtained from the data for Regional basketball league with extremely large correlation value of 0.823. Bosnian League 6 has correlation value of 0.716, while European U-16 championship has correlation value of 0.582, which shows that 6

adopted indicators of situational effectiveness provide a very good discrimination between winning and losing teams. Obtained value is larger from the values published in some researches.

Competition	Test of Function(s)	Wilks' Lambda	Chi-square	df	Sig.
Regional league	1	0.322	39.623	6	.000
Bosnian League 6	1	0.486	39.672	6	.000
U-16 European	1	0.661	55.932	6	.000

Table 3. Significance test of discriminative function by Wilks' lambda and  $\chi^2$  test.

Table (3) proves statistical significance of discriminative function by Wilks' lambda and Bartlett's  $\chi^2$  - test for the results obtained in all three competitions (Regional league, Bosnian League 6 and U-16 European championship – division B). Values obtained by Wilks' lambda were low, while  $\chi^2$  - test shows significance of 0.0000, which is considerably less than  $p=0.01$ . Coefficients obtained from Table 4 describe the influence of certain variables and their discriminative power in comparison to the final

score of games. In Regional league, variables transition offense have the strongest contribution to discriminative function, while in Bosnian League 6 variable transition successful offense is dominant. In U-16 European basketball championship, besides variable successful set offense there are also variables which determine transition offense (successful and unsuccessful).

Regional league		Bosnian League 6		U-16 European	
Var	Function 1	Var	Function 1	Var	Function 1
P_B	0.675914	T_U	-0.587271	P_U	.590
P_U	-0.558957	P_B	0.443600	T_U	.408
T_B	0.057740	P_U	-0.321422	T_B	-.405
T_U	-0.030427	P_N	0.304467	P_B	.208
P_N	0.026121	T_N	0.292264	P_N	-.193
T_N	-0.010758	T_B	0.253567	T_N	-.017
POB	Centroids	POB	Centroids	POB	Centroids
Lose	1.413165	Lose	1.010887	Lose	-.691
Win	-1.413165	Win	-1.010887	Win	.732

Table 4. Correlation between certain variables and discriminative function and position of group centroids for winning and losing teams

In Bosnian League 6 for basketball champion of Bosnia and Herzegovina it is easy to notice realization of transition offense with the largest but also with the lowest correlation coefficient. However, League 6 is a competition with few quality teams (in most cases those are the teams which participate in Regional league) which stand out with their quality and manifest their domination by quality defense that leads to fast breaks which produce successful offense. Variables, nonstandard indicators of situational effectiveness, which make the strongest contribution to the difference between winning and losing teams in U 16 European basketball

championship Division B are: set offense successful (P\_U), transition offense successful (T\_U), and transition offense unsuccessful (T\_B).

### CONCLUSION

Standard pattern for evaluating situational effectiveness does not provide enough information to make more accurate evaluation of a basketball team's successfulness, therefore our orientation is to have a detailed analysis using newly-created pattern for monitoring offensive effectiveness in basketball which

would help us obtain more information for analyzing successfulness in basketball.

Practical application of such pattern is tested in monitoring the final round of Bosnian championship League 6, in Regional league, and on the sample of games played in U-16 European championship Division B. This type of monitoring basketball games gives us more precise insight into the game philosophy, tactical concept and game strategy of opponents, (Ibáñez, S., García, J., Feu, S., Lorenzo, A., Sampaio, J., 2009) but also the possibility to do self-evaluation and correct some of our opinions about the game, with the overall goal to make the game more effective and enjoyable for fans. This type of approach to research in basketball can have a negative influence on players and

coaches if too much information and too many assignments limit their freedom for creativity and imagination, creating restricted areas for basketball plays. This can definitely happen if we direct the information which we obtain into creating controlled basketball, but at the same time it is dangerous to give players too much freedom for improvisation. Results of this research confirm that based on the suggested pattern for monitoring nonstandard indicators of situational effectiveness in basketball it is possible to make quality discrimination between winning and losing teams as well as to determine which variable contributes to that discrimination the most.

## REFERENCES

1. Dizdar, D. (2006). Kvantitativne metode. Sveučilišni udžbenik. Kineziološki fakultet Sveučilišta u Zagrebu. Grafički zavod Hrvatske d.o.o.
2. Ibáñez, S., García, J., Feu, S., Lorenzo, A., Sampaio, J., (2009). Effects of consecutive basketball games on the game related statistic that discriminate winner and losing teams. *Journal of Sports Science and Medicine*, 8, 458 – 462.
3. Gómez, M.A., Lorenzo, A., Sampaio, J., Ibáñez, S.J., & Ortega E. (2008) Game-related statistics that discriminated winning and losing teams from the Spanish men's professional basketball teams. *Coll. Antropologicum*, 32(2): 451-456.
4. Mejovšek, M. (2008). Metode znanstvenog istraživanja u društvenim i humanističkim znanostima. Naklada Slap, Jastrebarsko.
5. Pojskić, H., Šeparović, V., Užičanin, E. (2009). Razlike između uspješnih i neuspješnih košarkaških momčadi na završnom olimpijskom turniru. *Acta Kinesiologica* 3 (2009) 2: 110-114.
6. Šeparović, V. (2007). Uspješnost košarkaških ekipa u prostoru situacionih pokazatelja primarnog tranzicijskog i pozicionog napad. Doktorska disertacija, Tuzla: Fakultet za tjeleni odgoj i sport Univerziteta u Tuzli.
7. Trninić, S. (2006). Selekcija priprema i vođenje košarkaša i momčadi. Sveučilišni udžbenik, Sveučilište u Splitu. Vikta - Marko d.o.o.

## Sažetak

*Cilj ovog rada je da se utvrdi da li je moguće na osnovu 6 nestandardnih pokazatelja situacijske efikasnosti u košarci razlikovati pobjednike od poraženih ekipa i to u tri natjecanja (Regionalna liga, Liga 6 završnica nacionalnog prvenstva Bosne i Hercegovine i Evropsko prvenstvo za kadete), dva sistema natjecanja (turnirski i ligaški) te u dvije natjecateljske kategorije košarkaša (seniori i kadeti).*

*T – testom je utvrđena značajnost razlika između aritmetičkih sredina između pobjedničkih i poraženih ekipa u primjenjenim nestandardnim pokazateljima, a diskriminativnom analizom je utvrđena razlika na globalnom nivou kao i doprinos svakog situacijskog pokazatelja diskriminativnoj funkciji.*

*Rezultati istraživanja potvrđuju da je razlikovanje pobjednika od poraženih na osnovu novouvedenih 6 pokazatelja moguće i opravdano, a da se na osnovu varijabli koje razlikuju i najviše doprinose diskriminaciji između pobjednika i poraženih može kvalitetno analizirati struktura igre protivnika, a temeljem tih informacija i korigiranje plana igre vlastite momčadi.*

**Cljučne riječi:** Tranzicijski napad, pokazatelji situacijske efikasnosti, diskriminativna analiza, T – test.

Correspondence to:

Vlatko Šeparović, PhD  
Faculty of physical education and sport,  
Tuzla University  
2. oktobra 1,  
75000 Tuzla,  
Phone: 00387 35 278 536  
E-mail: vlatko.separovic@untz.ba