

University of Niš
Faculty of Sport and Physical Education



XVII Scientific Conference
„FIS COMMUNICATIONS 2014“
in physical education, sport and recreation
and
II International Scientific Conference

(Niš, Serbia, october 16-18th, 2014)

Book of Proceedings

Niš, 2014.

XVII Scientific Conference

*„FIS COMMUNICATIONS 2014" in physical education, sport and recreation and
II International Scientific Conference*

Book of Proceedings

Publisher:

Faculty of sport and physical education , University of Niš

For the publisher:

Faculty dean, prof. Milovan Bratić, PhD

Editor in chief:

prof. Saša Pantelić, PhD

Printed by:

Medivest, Nis

Computer editor:

Predrag Živanović

Cover design:

Dragan Radojković

Circulation:

200 copies

CIP - Каталогизacija у публикацији
Народна библиотека Србије, Београд

796/799(082)

SCIENTIFIC Conference "FIS Communications
2014" in physical education, sport and
recreation (17 ; 2014 ; Niš)

Book of Proceedings / XVII Scientific
Conference "FIS Communications 2014" in
physical education, sport and recreation and
II International Scientific Conference, (Niš,
Serbia, october 16-18th, 2014) ; [editor in
chief Saša Pantelić]. - Niš : Faculty of
sport and physical education, 2014 (Niš :
Medivest). - 502 str. : ilustr. ; 30 cm

Na vrhu nasl. str.: University of Niš. -
Tiraž 200. - Napomene uz tekst. -
Bibliografija uz svaki rad.

ISBN 978-86-87249-58-5

1. International Scientific Conference (2 ;
2014 ; Niš)

a) Спорт - Зборници b) Физичка култура -
Зборници

COBISS.SR-ID 210520332

COMMITTEES for FIS 2014

HONORARY COMMITTEE		
Chairman	Dobrica Živković, PhD	University of Niš, Faculty of Sport and Physical Education, Serbia
Members	Dejan Madić, PhD	University of Novi Sad, Faculty of Sport and Physical Education, Serbia
	Vladimir Koprivica, PhD	University of Belgrade, Faculty of Sport and Physical Education, Serbia
	Boris Maleš, PhD	University of Split, Faculty of Kinesiology, Croatia
	Damir Knjaz, PhD	University of Zagreb, Faculty of Kinesiology, Croatia
	Danko Pržulj, PhD	University of East Sarajevo, Faculty of Physical Education and Sport, BiH
	Munir Talović, PhD	University of Sarajevo, Faculty of Sport and Physical Education, BiH
	Milan Žvan, PhD	University of Ljubljana, Faculty of Sport, Slovenia
	Duško Bjelica, PhD	University of Montenegro, Faculty for Sport and Physical Education, Nikšić
	Vujica Živković, PhD	Ss. Cyril and Methodius University, Faculty of Physical Education, Macedonia
SCIENTIFIC COMMITTEE		
Chairman	Saša Pantelić, PhD	University of Niš, Faculty of Sport and Physical Education, Serbia
Members	Radmila Kostić, PhD	University of Niš, Faculty of Sport and Physical Education, Serbia
	Slobodan Jarić, PhD	University of Delaware, Department of Health, Nutrition and Exercise Sciences, USA
	Đurđica Miletić, PhD	University of Split, Faculty of Kinesiology, Croatia
	Daniel Daly, PhD	KU Leuven, Faculty of Kinesiology and Rehabilitation Sciences, Belgium
	Saša Milenković, PhD	University of Niš, Faculty of Sport and Physical Education, Serbia
	Dragan Radovanović, PhD	University of Niš, Faculty of Sport and Physical Education, Serbia
	Nicolae Ochiană, PhD	University of Bacău, Faculty of Movement, Sports and Health Sciences, Romania
	Branislav Dragić, PhD	University of Niš, Faculty of Sport and Physical Education, Serbia
	Ratko Stanković, PhD	University of Niš, Faculty of Sport and Physical Education, Serbia
	Milivoj Dopsaj, PhD	University of Belgrade, Faculty of Sport and Physical Education, Serbia
	Zoran Milošević, PhD	University of Novi Sad, Faculty of Sport and Physical Education, Serbia
	Milan Čoh, PhD	University of Ljubljana, Faculty of Sport, Slovenia
	Goran Sporiš, PhD	University of Zagreb, Faculty of Kinesiology, Croatia
	Dragana Berić, PhD	University of Niš, Faculty of Sport and Physical Education, Serbia
	Daniela Dasheva, PhD	National Sports Academy „Vassil Levski“, Bulgaria
	Erika Zemková, PhD	Comenius University, Faculty of Physical Education and Sports, Slovakia
	Dragan Nejić, PhD	University of Niš, Faculty of Sport and Physical Education, Serbia
	Goran Marković, PhD	University of Zagreb, Faculty of Kinesiology, Croatia
	Saša Veličković, PhD	University of Niš, Faculty of Sport and Physical Education, Serbia
	Georgi Georgiev, PhD	Ss. Cyril and Methodius University, Faculty of Physical Education, Macedonia
	Dejan Madić, PhD	University of Niš, Faculty of Sport and Physical Education, Serbia
	Radmila Kostić, PhD	University of Niš, Faculty of Sport and Physical Education, Serbia
ORGANIZING COMMITTEE		
Chairman	Milovan Bratić, PhD	University of Niš, Faculty of Sport and Physical Education, Serbia
Secretary	Marko Aleksandrović, PhD	University of Niš, Faculty of Sport and Physical Education, Serbia
Members	Tomislav Okičić, PhD	University of Niš, Faculty of Sport and Physical Education, Serbia
	Zvezdan Savić, PhD	University of Niš, Faculty of Sport and Physical Education, Serbia
	Saša Bujanj, PhD	University of Niš, Faculty of Sport and Physical Education, Serbia
	Slavoljub Uzunović	University of Niš, Faculty of Sport and Physical Education, Serbia
	Nenad Stojiljković	University of Niš, Faculty of Sport and Physical Education, Serbia
	Bojan Jorgić	University of Niš, Faculty of Sport and Physical Education, Serbia
	Nemanja Stanković	University of Niš, Faculty of Sport and Physical Education, Serbia
	Zoran Milanović	University of Niš, Faculty of Sport and Physical Education, Serbia
	Mladen Živković	University of Niš, Faculty of Sport and Physical Education, Serbia
	Tijana Purenović-Ivanović	University of Niš, Faculty of Sport and Physical Education, Serbia

DIFFERENCES IN EXPLOSIVE POWER IN YOUNG SOCCER PLAYERS OF DIFFERENT RANK	98
Nikola Dinić, Marko Jezdimirović, Aleksandar Joksimović, Miodrag Kocić, Dušan Nikolić, Anđela Đošić	
INTER-POSITIONAL DIFFERENCES IN SOMATOTYPE AMONG YOUNG SOCCER PLAYERS	103
Jure Rak, Mirjana Milić, Marko Erceg, Zoran Grgantov, Hrvoje Sivrić	
DIFFERENCES BETWEEN SUCCESSFUL AND UNSUCCESSFUL TEAMS IN INDICATORS OF SITUATIONAL EFFICIENCY IN BASKETBALL - CASE OF ELITE CLUBS	111
Ante Grgurević, Igor Jelaska, Petra Mandić Jelaska	
SPORTS METAPHORS SHOOTING HIGH OTHER DISCOURSES.....	119
Danica Pirsl, Galina Sazhko, Sandra Milanovic, Tea Pirsl, Nebojsa Randjelovic	
EFFECTS OF GAME-BASED TRAINING ON EXPLOSIVE STRENGTH IN ADOLESCENT VOLLEYBALL PLAYERS	124
Nebojša Trajković, Dragan Nejić, Zoran Milanović, Goran Sporiš	
DIFFERENCES OF GYMNASTIC CONTENTS IN THE TRANSFORMATION BALANCE AND STRENGTH	132
Emilija Petković, Hasim Mekić, Daniel Stanković, Aleksandar Raković	
DIFFERENCES IN EXPLOSIVE MUSCLE STRENGTH WITH HANDBALL PLAYERS AGED 14 TO 16 IN RELATION TO THE PLAYING POSITION	138
Jelena Vukosavljević, Saša Bubanj, Milan Stojić, Ognjen Milić	
DIFFERENCE IN EXPLOSIVE STRENGTH BETWEEN ATHLETES AND NON-ATHLETES WITH FLAT AND NORMAL FOOT	145
Saša Bubanj, Mladen Živković, Nenad Nikolić, Tomislav Gašić, Ivana Ćirić-Mladenović, Hristina Čolović	
BODY HEIGHT AND ARM SPAN AS ONE OF THE ASPECTS OF SELECTION IN HANDBALL	151
Jovica Petkovic, Danilo Bojanic, Ivan Vasiljevic, Aldijana Muratovic	
ADAPTATION RESEARCH OF NEUROMUSCULAR APPARATUS OF ATHLETES SPECIALIZING IN SPEED-STRENGTH SPORTS	154
V.M. Bashkin, A.A. Kabanov	
A COMPARATIVE ANALYSIS OF HANDBALL TACTICS IN SERBIA, GERMANY AND SPAIN.....	157
Ljubomir Pavlović, Ivana Bojić, Dragana Berić	
JUMPING ABILITIES OF VERTICAL AND HORIZONTAL DIRECTION IN BASKETBALL.....	163
Imer Ademović, Dejan Milenković, Dragana Berić, Ivana Bojić, Miodrag Kocić	
THE IMPACT OF MORPHOLOGICAL CHARACTERISTICS ON AGILITY IN BASKETBALL PLAYERS	168
Imer Ademović, Dejan Milenković, Ljubomir Pavlović, Miodrag Kocić	
APPLICATION OF PLYOMETRIC METHOD IN DEVELOPMENT OF SPECIFIC MOTOR EXPLOSIVE ABILITIES	172
Dejan Stojiljković, Ivana Mladenović - Ćirić, Danica Piršl, Milan Maslaković, Branislav Dragić	

DIFFERENCES BETWEEN SUCCESSFUL AND UNSUCCESSFUL TEAMS IN INDICATORS OF SITUATIONAL EFFICIENCY IN BASKETBALL - CASE OF ELITE CLUBS

Ante Grgurević¹, Igor Jelaska², Petra Mandić Jelaska³

¹ Basketball Club „Split“, Split, Croatia

² Faculty of Kinesiology, Split, Croatia

³ Fitness Club „Pink Panther“, Kaštel Stari, Croatia

UDC 796,323

SUMMARY

Introduction: The aim of this study was to analyze differences in the parameters of situational efficiency of two clubs that were by results most successful in the Croatian basketball league at the end of the season 2012/2013. The hypothesis of this research is to identify variables that discriminate winning matches from the defeated ones.

Methods: The sample consisted of 8 matches between basketball clubs „Zadar“ and Cibona“ played in the regional ABA league, the Krešimir Ćosić cup, Croatian championship and playoff. Used variables are 13 standard indicators of situational efficiency in basketball. Parameters of descriptive statistics were calculated for an overall sample, and also for groups of winner teams and hence the defeated teams. By using T-test for independent samples, for each of the 13 parameters of situational efficiency, the existence of significant differences between winning and defeated teams has been examined.

Results: Results indicate that variables *Points made*, *Offensive rebounds*, *Three point shots total*, *Free throws total* and *Fouls made* statistically significant differ winning teams from defeated ones ($p < 0,05$)

Conclusion: Obtained results show that, from the viewpoint of basketball expertise, indicators of situational efficiency are only a partial indicator of efficiency of an individual or a team that emphasizes further importance of an expert basketball experience, knowledge and understanding in their interpretation, with the aim of acquiring relevant information of overall efficiency of all participants of the game. Surely, the research is limited due to a relatively small number of matches. In future researches dealing with similar issues, the sample should certainly be increased, and nonstandard indicators of situational efficiency should be used.

Key words: team efficiency, situational efficiency, basketball expertise

INTRODUCTION

Outstanding achievements in basketball in general are a result of continuous scientific research and mostly thorough professional work those cognitions have been integrated. Therefore, the research of the effect of standard indicators of situational efficiency on a total result in a basketball game no longer belongs only to the scientific area, but to a professional area too, and furthermore, it is a practical link between the two areas (Trninić, 2006). Detailed analysis of obtained data along with the results of conducted researches, surely provide coaches with information that can direct and form

the preparation, as well as the training process. It is important to point out that a large amount of works has been published, based on the analysis of standard indicators of situational efficiency conducted with different statistical methods and with different research goals.

Structure of a basketball game is not easily described with one or more sentences. For direct participants, the game goes beyond the mere kinesiological definition, and seen from their point of view, it takes on a different or, that is to say, more concrete dimension. For a coach, the game consists of a number of tasks that players of different positions must execute in order to create defensive

and offensive advantage (Trninić, 2006). Coach, besides the knowledge how to use skills, qualities and knowledge of a player in a tactical part of the game and how to consolidate them within a team, must also know how to compensate the deficiencies, concerning both the team and an individual. On the other hand, for players, the game is consisted of a number of defensive and offensive situations in which their own set of skills can be demonstrated with the aim of outplaying the opponent with the tendency of a rational energy consumption (Trninić, Dizdar & Dežman, 2002). The above mentioned skills, qualities and knowledge raise the question of the equation of specification in basketball. Equation of specification is an often subject of discussion and it is relative in a complex motorical activity that is realized within the dynamic conditions of the game (Trninić, Jelaska & Papić 2009). Quality game performance is highly related to almost every dimension of an anthropological status. Besides an optimal health state and appropriate morphological features, the game demands a high level of functional and certain motor skills. Some experts emphasized conative traits (strong character, motivation,...) are very desirable, also some cognitive abilities (perception, anticipation,...) make a difference between the players and it is an additional quality for players of similar characteristics and skills. The ratio of importance of mentioned dimensions within the equation specification opens up space for further scientifically based discussions (Bartlett, 2006; Jelaska, 2011). Certainly, the structure of a basketball game with its demands opens up a enough large space for participants of various anthropological statuses, which is probably one of the reasons for the attractiveness of this sport.

Of great significance is also the research, that was conducted on a sample of 870 matches during 6 LEB1 seasons (Spanish basketball league) with the aim of establishing which statistical indicators differ seasonally successful and unsuccessful teams (Ibanez, Sampaio et al., 2008). Using the discriminant analysis, the obtained results indicate on a great number of differences between statistical indicators of the best and the worst teams on the end of the season, with an emphasis on the passings, rebounds and blocks. The mentioned example of the research is a part of a great amount of related works that offer a different view on a basketball game, aswell as open up new spaces for further researches.

Previous studies, along with the future ones, do not prove but rather educate, direct and undertake

the additional step to the improvement of basketball and a basketball game. methods

Sample of examinees

In accordance with the resarch goal, 8 games played between basketball clubs „Zadar“ and „Cibona“ in the season of 2012/13 were used. The games were played according to the sequeunce: two in the regional ABA league, one in the Krešimir Ćosić cup semifinale, two in the Champions League of the Croatian championship and three in the Croatian championship playoff finale. Games were observed from the aspect winner – defeated. Both teams had result oscillations during the season and weren't the best ranked Croatian club in the end of the regional league, but the two have played the most matches among themselves, accomplished the best position for the Champions League and played the finals of the championship. The matches were observed in terms of differentiating the winners from the defeated.

Sample of variables

The variables used in this resarch are 13 standard indicators of situational efficiency in basketball: 2PT SUC – two point shots successful; 2PT TOT – two point shots total; 3PT SUC – three point shots successful; 3PT TOT – three point shots total; FT SUC – free throws made; FT TOT – free throws total; DEF REB – defensive rebounds; OF REB – offensive rebounds; ASSIS – assists; STL – steals; TO – turnovers; BL – shot blocks; and FTS – fouls made. The PM – points made variable was also used. Data was taken from the official ABA league site (www.abaliga.com) and the official Croatian basketball association site (www.hks-cbf.hr). Results presented in the tables, aswell as the discussion we written on behalf of this insight in the indicators of situational efficiency, and without any further visual analysis of the matches.

Data processing methods

For both teams, regardless of the match results, parameters of descriptive statistics were calculated: arithmetic mean, median, minimum score, maximum score, standard deviation, coefficient of skewness, coefficient of kurtosis and significance

while testing the normality using Kolmogorov-Smirnov test. Same parameters of descriptive statistics were calculated for groups of both winners and defeated teams as well. T-test for independent samples, for each of 13 parameters of situational efficiency, existence of statistically significant differences for the winners and defeated teams were examined.

RESULTS

In table 1, results of descriptive statistics for all observed matches are found. Indicators of descriptive statistics were calculated: arithmetic mean, median, minimum score, maximum score, standard deviation, coefficient of skewness, coefficient of kurtosis and significance while testing the normality by using Kolmogorov-Smirnov test

Table 1: Results of descriptive statistic for all matches (AS – arithmetic mean, MED – median, MIN – minimal score, MAX – maximal score, σ – standard deviation, α_3 – coefficient of skewness, α_4 – coefficient of kurtosis, KS-p – and significance while testing the normality by using Kolmogorov-Smirnov test).

	AS	MED	MIN	MAX	σ	α_3	α_4	KS-p
PM	82,9	82,5	67	101	9,75	0,29	-0,16	p > 0,20
2PT SUC	23,1	22,0	18	33	4,02	0,86	1,08	p > 0,20
2PT TOT	44,2	44,0	34	53	6,05	-0,26	-0,82	p > 0,20
3PT SUC	6,8	7,0	4	10	1,87	0,24	-0,60	p > 0,20
3PT TOT	21,3	22,0	16	27	2,89	-0,00	-0,20	p > 0,20
FT SUC	16,4	15,0	10	28	5,14	1,50	1,89	p > 0,20
FT TOT	22,4	21,0	16	35	5,92	0,72	-0,23	p > 0,20
DEF REB	24,6	25,0	20	30	2,99	0,25	-0,12	p > 0,20
OF REB	10,4	9,0	5	20	4,60	1,13	0,15	p > 0,20
ASSIS	13,0	11,0	9	21	3,60	1,11	0,23	p < 0,20
STL	7,5	7,0	4	15	2,66	1,52	3,27	p < 0,20
TO	13,4	13,0	9	22	3,10	1,36	2,99	p > 0,20
BL	1,9	1,5	0	5	1,65	0,72	-0,46	p > 0,20
FTS	23,6	23,5	17	32	3,67	0,50	0,65	p > 0,20

Legend: PM – points made, 2PT SUC – two point shots successful; 2PT TOT – two point shots total; 3PT SUC – three point shots successful; 3PT TOT – three point shots total; FT SUC – free throws made; FT TOT – free throws total; DEF REB – defensive rebounds; OF REB – offensive rebounds; ASSIS – assists; STL – steals; TO – turnovers; BL – shot blocks; FTS – fouls made

From the table of basic statistic indicators (Table 1), it is visible that all of the variables are normally distributed. Although there's a slight range of values in the variable *Points made* (67-101), the arithmetic mean (AS=82,9) indicates a standard value of the final result with a standard deviation of 9,75. The range of results of other variables, for example *Offensive rebounds* (5-20), or *Turnovers* (9-22), is also wide, but the arithmetic mean of the two has a standard value, also with no bigger oscillations

($\sigma=4,60$; $\sigma=3,10$). Arithmetic mean of all variables, with the hypothetical replacement of values between the variables STL (AS=7,5) and TO (AS=13,4), observed from a basketball aspect, is a good final match statistic.

In Table 2, results of descriptive statistics of the winning teams are found. The basic statistic parameters are calculated: arithmetic mean, median, minimum score, maximum score, standard deviation, coefficient of skewness and coefficient of kurtosis.

Table 2: Results of descriptive statistics - winners (AS – arithmetic mean, MED – median, MIN – minimal result, MAX – maximum result, σ – standard deviation, α_3 – coefficient of skewness, α_4 – coefficient of kurtosis).

	AS	MED	MIN	MAX	σ	α_3	α_4
PM	89,25	88,50	78	101	8,22	0,32	-1,00
2PT SUC	24,75	25,50	18	33	4,74	0,29	0,11
2PT TOT	43,88	43,00	34	53	7,68	0,09	-1,85
3PT SUC	7,25	7,00	4	10	2,25	-0,01	-1,39
3PT TOT	19,38	18,50	16	23	2,50	0,60	-0,66
FT SUC	18,00	16,00	10	28	6,63	0,85	-0,49
FT TOT	25,25	24,50	16	35	6,30	0,21	-0,67
DEF REB	26,38	26,00	23	30	2,56	0,47	-0,82
OF REB	9,00	8,50	5	17	3,63	1,68	3,90
ASSIS	14,38	12,50	10	21	4,34	0,55	-1,70
STL	8,00	7,00	4	15	3,42	1,23	1,99
TO	12,63	13,00	9	15	1,77	-1,10	2,42
BL	1,00	1,00	0	2	0,76	0,00	-0,70
FTS	21,00	21,00	17	24	2,14	-0,58	0,94

Legend: PM – points made; 2PT SUC – two point shots successful; 2PT TOT – two point shots total; 3PT SUC – three point shots successful; 3PT TOT – three point shots total; FT SUC – free throws made; FT TOT – free throws total; DEF REB – defensive rebounds; OF REB – offensive rebounds; ASSIS – assists; STL – steals; TO – turnovers; BL – shot blocks; FTS – fouls made

From the table of basic statistic indicators (Table 2), it is visible that the variable *Points made* indicates that the winning team, from a basketball point of view, have accomplished a high value in the parameter arithmetic mean (AS=89,25), extremely high in parameter maximum (MAX=101). Moreover, bearing in mind the minimum number of *Points made* (MIN=78), resonating from an aspect of Croatian league basketball practice, we can notice that a relatively high value of *Points made* had been

accomplished at the match. Furthermore, from the more exceptional results of other statistical parameters, the high values of *Successful two point shots* (AS=24,75) and assist variables (AS=14,38) are worth of emphasizing. It should be mentioned that the winning team had a more significant oscillations in values of minimum (MIN) and maximum (MAX) *Offensive rebounds* (5-17), *Steals* (4-15) and *Free throws made* (10-28).

Table 3: Results of descriptive statistics – defeated (AS – arithmetic mean, MED – median, MIN – minimal result, MAX – maximum result, σ – standard deviation, α_3 – coefficient of skewness, α_4 – coefficient of kurtosis).

	AS	MED	MIN	MAX	σ	α_3	α_4
PM	76,63	76,00	67	86	6,72	-0,23	-0,88
2PT SUC	21,38	22,00	18	25	2,39	-0,34	-0,26
2PT TOT	44,50	45,50	35	48	4,38	-1,66	3,16
3PT SUC	6,38	6,50	4	8	1,41	-0,48	-0,56
3PT TOT	23,13	22,00	22	27	1,89	1,64	1,77
FT SUC	14,75	14,00	12	19	2,55	0,85	-0,65
FT TOT	19,50	18,50	16	26	4,07	0,84	-0,92
DEF REB	22,75	23,00	20	25	2,25	-0,19	-2,19
OF REB	11,88	10,00	7	20	5,25	0,78	-1,12
ASSIS	11,63	11,00	9	15	2,13	0,53	-1,15
STL	7,00	6,50	5	10	1,69	0,95	-0,03
TO	14,25	13,50	10	22	3,99	1,03	0,81
BL	2,88	3,00	0	5	1,81	-0,34	-0,93
FTS	26,25	26,00	23	32	2,92	1,05	1,12

Legend: PM – points made; 2PT SUC – two point shots successful; 2PT TOT – two point shots total; 3PT SUC – three point shots successful; 3PT TOT – three point shots total; FT SUC – free throws made; FT TOT – free throws total; DEF REB – defensive rebounds; OF REB – offensive rebounds; ASSIS – assists; STL – steals; TO – turnovers; BL – shot blocks; FTS – fouls made

In Table 3 are the results of descriptive statistics of defeated teams. The basic statistic parameters are calculated: arithmetic mean, median, minimum score, maximum score, standard deviation, coefficient of skewness and coefficient of kurtosis.

From the table of basic statistic indicators for the defeated teams (Table 3), it is evident that the maximum value (MAX) indicates that the defeated teams have not accomplished an exceptionally high value of *Points made* (MAX=86), but have accomplished a high value in *Turnovers* variable (MAX=22), as well as the *fouls made* variable (MAX=32). On the other hand, in the same statistical indicator of variables of *Offensive rebounds*, the defeated teams mark a high value (MAX=20), but not in the arithmetic mean as well (AS=11,88). Furthermore, by examining the arithmetic mean (AS), it can be noticed that, from a league basketball practice, there is a relatively bad ratio of values in *Steals* (AS=7,00) and *Rebounds* (AS=14,25) variables.

Table 4: Results of t-test for independent samples (AS-1- arithmetic mean of winners, AS-0- arithmetic mean for defeated, t – testing value while testing the statistical significance of differences between the arithmetic means, p – level of significance while testing the statistical significance of differences between the two observed groups in the arithmetic means, F-Var - test value while testing the statistical significance of differences between two observed groups in variances, p-Var - level of significance while testing the statistical significance of differences in variances).

	AS - 1	AS - 0	t	p	F-Var	p-Var
PM	89,25	76,63	3,36	0,005	1,50	0,61
2PT SUC	24,75	21,38	1,80	0,094	3,95	0,09
2PT TOT	43,88	44,50	-0,20	0,844	3,08	0,16
3PT SUC	7,25	6,38	0,93	0,367	2,56	0,24
3PT TOT	19,38	23,13	-3,38	0,004	1,76	0,47
FT SUC	18,00	14,75	1,29	0,217	6,77	0,02
FT TOT	25,25	19,50	2,17	0,048	2,39	0,27
DEF REB	26,37	22,75	3,01	0,009	1,29	0,74
OF REB	9,00	11,88	-1,27	0,223	2,10	0,35
ASSIS	14,38	11,63	1,61	0,130	4,14	0,08
STL	8,00	7,00	0,74	0,471	4,10	0,08
TO	12,63	14,25	-1,05	0,310	5,10	0,05
BL	1,00	2,88	-2,71	0,017	5,72	0,03
FTS	21,00	26,25	-4,11	0,001	1,86	0,43

Legend: PM – points made; 2PT SUC – two point shots successful; 2PT TOT – two point shots total; 3PT SUC – three point shots successful; 3PT TOT – three point shots total; FT SUC – free throws made; FT TOT – free throws total; DEF REB – defensive rebounds; OF REB – offensive rebounds; ASSIS – assists; STL – steals; TO – turnovers; BL – shot blocks; FTS – fouls made

From the Table 4 it is visible that variables *Points made*, *Defensive rebounds*, *Three point shots total*, *Free throws total* and *Fouls made* statistically differentiate the winning teams from the defeated teams.

There is also an interesting information that the defeated teams in variables of *Two points shots total* (AS=44,50) and *Three points shots total* (AS=23,13), mark higher values than those of the winner teams. On the other hand, the values of *Two point shots successful* (AS=21,38) and *Three point shots successful* (AS=6,38) variables are lower.

In Table 4 results of t-test for independent samples are presented. Previously calculated arithmetic values are shown and a testing value while testing the statistical significance of differences between the arithmetic means, level of significance while testing the statistical significance of differences between the two observed groups in the arithmetic means, test value while testing the statistical significance of differences between two observed groups in variances and level of significance while testing the statistical significance of differences in variances were calculated.

DISCUSSION

From Table 4 it is evident that high value of points made (PM=89,25), or in other words, an

efficient offense statistically significantly contributes to victory. In modern basketball, where defense is a very important segment of team strategy, a value of almost 90 points is usually classified as a high value of points made. On the other hand, from the same amount of value, it could be concluded that poor quality defense is the one that takes away the victory. Therefore a pointed question is asked: „Does the winning team have a quality offense or does the defeated team have poor quality defense?“ As it can be seen from tables 2 and 3, a high number of total shots from the game, shown in variables *Two point shots total* and *Three point shots total*, of the winning teams (2PT TOT =43,88; 3PT TOT =19,38) but also the defeated teams (2 PT TOT=44,50; 3PT TOT=23,13) marks a basketball match with a high number of offenses. Furthermore, considering the variable *Offensive rebounds* in winning teams (OF REB= 9,00), and defeated teams (OF REB=11,88) doesn't mark any slight deviation from the usual statistical values of a basketball match, it can be assumed that there weren't many chances for a second or a third attack (Ibanez, Garcia et al., 2008). So it is necessary to mention that, in a basketball match, team in the attack phase, after a missed jump shot in the offense, gets a chance for at least another attack while a big number of total shots is a result of a high game tempo. High game tempo in offense is characterised by shorter time of attacks, in which an attempt to score is realized in 10 or more seconds before the expiration of an allowed time of offense phase, and a large number of counterattacks. Unlike short attacks in which the attacking team, using a „quick shot“, decreases the chance of a successful realization because of the more quality defensive formation of the defending team and higher level of fatigue as a consequence of an inadequate physical recovery from previous defensive and offensive actions, the counterattacking team increases the chance of a successful realization because of the numerical superiority realized with a fast transition (conversion) from defense to offense. The prerequisite of every counterattack, primary (2:1) or secondary (5:4), is a defensive rebound in which the defending team in the defensive phase gains possession of the ball. Statistically significant difference between the winner and the defeated in the variable *Defensive rebounds* ($p=0.009$) indicates that the winning team (DEFREB=26,37) had significantly more overtaken balls than the defeated ones (DEF REB=22,75), and therefore more chances for counterattack and easier realization. The *Two*

point shots successful ($p=0,094$), although statistically not differentiating the winning team from the defeated team, indicates that the winning team (2 PT SUC=24,75) had a more successful realization than the defeated team (2 PT SUC=21,38) in that segment of the game which can be accomplished with a quality counterattack and a good selection of offence and shots in the set offence, respectively (Gomez, Lorenzo, Sampaio et al., 2008).

A team surely has a good shot selection when it, with various offensive maneuvers which do not allow the defense to adapt (good offense selection), finds a player who is, according to his own capability, in the best position for realization in relation to defense and the basket. It is partially visible from the *Three point shots total* variable ($p=0,004$) which statistically differentiates the winning team (3 PT TOT=19,38) from the defeated (3 PT TOT=23,13). The defeated teams had a higher number of *Three point shot total*, but lower number of *Three point shots successful* (3 PT SUC=6,38) than the winning team (3 PT SUC=7,25), which also indicates the possibility of worse three point shot selections emerging from the unilateral offensive maneuvers to which the defense has adapted (bad attack selection that lowered the efficiency of realization). In the other hand, it is possible that the winning teams were more „hot“, or that the defeated team was less „hot“ so the winning team took the conceptional risk and allowed more open shots. Shooting outside of the three point line is part of the basketball game and it is also the offensive strategy of many teams, so it can not and shouldn't be *a priori* characterised as a bad shot selection. Precisely speaking, bad shot selection is not a missed shot, rather it is a bad shot timing and poorly chosen shooting position, as well as a wrong choice of player for shooting (bad offense selection).

Because of the higher realization percentage, lots of different ways for realization and the nearness of the basket, and also the chance of extortion of a higher number of fouls, the two points shot is a more safer way to score than the three point shot. However, the following two variables which statistically differentiate the winner from the defeated, *Free throws total* ($p=0,048$) and *Fouls made* ($p=0,001$), indicate and almost prove a better shot selection of the winning team. The winners have a higher number of *Free throws total* (FT TOT=25,25) than the defeated (FT TOT=19,50), and the defeated - as expected but not necessary, have a higher number of *Fouls made* (FTS=26,26) than the winners

(FTS=21,00). The highest number of fouls is made or extorted inside the three point line when the attacker has obtained advantage (in position, in penetration, on the shot,...) in relation to the defense and is in a likely position for realization. Stopped by a foul, the attacker gains the ball on the side and a new attack or free throws or even both (in unsportsmanlike or intentional fouls).

The defeated teams had a higher number of *Two point shots total* (2 PT TOT=44,50) than the winners (2PT TOT=43,88) but as is already mentioned, also a lower number of *Two point shots successful* as well as *Free throw total*, while the winners had higher number of *Two point shots successful* and *Free throws total* with a lower number of *Two point shots total*. That probably indicates that the winners had more good opportunities from where with good shooting (and attack) selection have scored or extorted a higher number of fouls made from the defeated and, from the same reason, made more free throws (Gomez, Lorenzo, Barakat et al., 2008). As the significantly lower number of fouls is made on the three point shot than in the two point shot zone, it is probably that the winners were looking for a safer mean of scoring. Furthermore, a higher number of defensive rebounds in the winning team has opened more opportunities for counterattacks from which they have either scored or extorted a foul right after a missed shot, by which „easy points“ are prevented (tactical foul if the team isn't in bonus); or extorted a free throw foul. The block variable also statistically differentiates the winners from the defeated ($p=0,017$), but, although having a negative value ($t=-2,77$) because of the aforementioned, it goes in favor of the winning team because most of the shots are blocked below or in proximity of the basket which even further confirms that the winning team was constantly looking for a safer way of realization, which finally means, closer to the basket.

CONCLUSION

Basketball is an extremely complex sports game in which a continuous, nonlinear, hardly predictable and at moments even chaotic interactions within a team along with confrontations between two teams, takes place. Researches show that the structure of a basketball game is similar to the systems that describe dynamic systems and models of deterministic chaos (Jelaska, 2011). Analysis of the differences of situational efficiency indicators of the selected clubs, in this case Cibona and Zadar, can

surely only partially present all the relevant elements that affect the result efficiency in basketball games. In this research, relatively small number of indicators used (although used by standards) surely has a limited reach. A pointed question is asked: „To which extent is it even possible to present and explain the issues and course of events that take place in the match, based only on the statistical indicators, even if they are greatly numbered?“. Indicators of situational efficiency give thorough information, draw coaches' and players' attention and even educate, but they surely cannot present all of the elements that are to a greater or a lesser extent important for the ultimate outcome. This is not only because of the complexity of basketball as a sports game, but because of a series of other external and internal factors that are in reality extremely difficult, or even impossible, to accurately measure.

Thus, for example, the pure issues of the sports form, which defines itself as an optimal psychophysical condition of an athlete or a team, is of great importance in basketball as for a single match so for an entire season, which in real situations cannot be exactly measured or presented. The influence or pressure from the audience, positive or negative, has an impact on individuals and teams to such an extent that it makes them look like other persons or teams. From great significance is also the referee criterion, or in other words the possible subjective impact of the referee, which isn't exactly measurable but is an integral part of a basketball match. In basketball games there were situations in which one particular decision of a referee changed the outcome of the entire match. The sole basketball match tracked by educated statisticians consists of a series of situations which cannot be recorded on paper. As an example, a team with a great offensive player, who is also already renowned and has its „significance“ in the field, can be specified. Because the strategy of the defending team is focused on him, the attacking team will have different indicators of situational efficiency (for example more shots 'in the paint', more offensive rebounds etc.) than against a team with no such defensive strategy. Or, for instance, a team who has few attempts and a low percentage of two shot realizations, and only because the defending team has a tall player or an exceptional blocker who had "closed" access towards the basket. The presence of such a player on the floor can be recorded in minutes, the efficiency with recorded blocks and rebounds, but the deviation

from the shot execution or loss of confidence by the opposing team cannot be measured. These situations which in various factors have effect on the score and lots of unmentioned situations proved that the situational efficiency indicators aren't and shouldn't be the only measure in player and team efficiency. So, for instance: "How to record the pressure level in the defense?", or how to quantify a player who is, from a statistical point of view, among the worse players, but who has during the defensive phase "shut down" an opponent from all actions and minimized his effect?

REFERENCES

- Bartlett, R. (2006). Artificial intelligence in sports biomechanics: New dawn or false hope? *Journal of Sports Science and Medicine*. Vol 5, 474 – 479.
- Gomez, M.A., Lorenzo, A., Barakat, R., Ortega, E. & Palao, J.M. (2008). Differences in game-related statistics of basketball performance by game location for men's winning and losing teams. *Perceptual and Motor Skills*, 106, 43-50.
- Gomez, M.A., Lorenzo, A., Sampaio, J., Ibanez, S. J. & Ortega, E. (2008). Game related statistics that discriminated winning and losing teams from Spanish men's professional basketball teams. *Collegium Antropologicum*. 32, 451-456.
- Ibanez, S. J., Garcia, J., Feu, S., Lorenzo, A. and Sampaio, J. (2008.). Effects of consecutive basketball games on the game-related statistics that discriminate winner and losing teams. *Journal of Sports Science and Medicine*, 8(3), 458-462.
- Ibanez, S.J., Sampaio, J., Feu, S., Lorenzo, A., Gomez, M.A. & Ortega, E. (2008). Basketball game-related statistics that discriminate between teams' season-long success. *European Journal of Sport Science* 8(6), 369-372.
- Jelaska, I. (2011). Construction and application of the new model for efficiency evaluation in complex sport activities [Konstrukcija i aplikacija novog modela za evaluaciju uspešnosti u kompleksnim sportskim aktivnostima]. Unpublished Ph.D. Thesis, Split: Kineziološki fakultet u Splitu.
- Trninić, S. (2006). Selekcija, priprema i vođenje košarkaša i momčadi. „Vikta-Marko“ d.o.o Zagreb.
- Trninić, S., Jelaska, I. & V. Papić (2009). Kinesiological, antropological and methodological aspects of efficiency equation in team sport games. *Acta Kinesiologica*. 3(2), 7-18.
- Trninić, S., Dizdar, D. & B. Dežman (2002). Pragmatic validity of the combined expert system model for the evaluation and analysis of overall structure of actual quality in basketball players. *Collegium Atropologicum*, 26(1), 199-210.