ANALYSIS OF INFLUENCE OF CERTAIN ELEMENTS OF BASKETBALL GAME ON FINAL RESULT BASED ON DIFFERETIANT AT THE XIII, XIV AND XV WORLD CHAMPIONSHIP

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Abstract
In a basketball game, in which two teams play against one another, following the official FIBA rules and regulations, a team which scores more points wins a game. To identify a better team in a game is not always an easy task. Therefore, to predict the final result of a basketball game (especially the exact result) is very difficult, particularly in cases when the opponents are equally good or bad. In sports, as in life generally speaking, not always does a better team win. Of course, it depends on the influence of various factors, which lead to an expected result to take place or not. We can never be completely sure of the final result of a basketball game. Although some factors may indicate that a certain team stands better chances to win a game, shown by the observed parameters, still we cannot predict the result itself. Gathering, processing and analyzing of statistical data are the only worthy method based on which the causes of a successful or unsuccessful outcome of the game can be explained. On the basis of the found regularities we can account for the fact of whether or not, and to what extent, certain observed parameters may have had an influence on the final score thus influencing those parameters as to expect the result with a greater degree of certainty.

Key words*: basketball, world championships, game efficiency, differentiation, regression*

Introduction

Based on the up-to-date research and by the means of scientific findings, it is possible to define some basic research directions in games of sport: (1) research connected to measuring base and specific anthropological characteristics and situational indicators of efficiency in certain sport games; (2) research of factorial studies which have the purpose to establish the latent structures of training session efficiency defined by the dominant characteristics, capabilities and motoric competencies of players; (3) research on the relation among capabilities, characteristics and motoric competencies, as well as the problems of relation of indicators of training session efficiency in respect to the game efficiency; (4) research on differences between groups of examinees according to their age, gender and the years of experience and quality in their sport; and (5) research that have a purpose to establish the influence of the designed training session practice on the change in capabilities, characteristics and motoric competencies in different cycles of training sessions. Applying the methods of canonical and regressive analysis in many examples, the relative value of certain manifested and latent characteristics in relation to player efficiency during the game has been estimated.

The same methodological approach may be applied in establishing the correlation of the standard performance indicators of situational efficiency and game efficiency, which may be defined by means of variables such as: victory – defeat, standings, ratio of total points by both teams, the course of result, etc. Victory in a game represents the difference in total points in favour of the team which has scored more points. Let us mark this difference with ΔPTS (total points scored). This difference is a consequence, or better to say, is in the function of all game parameters, and above all, all parameter differences of a game that has been observed by the official statistics. It can be therefore said that the difference in the total points is a consequence, first and foremost, of all observed game parameters.

This difference may be explained in the following way: if we assume that all the observed parameters are the same and the difference appears only in case of two-point shot, the difference in total number of points may only be present in the difference between two points total. It means that the difference in the final result is conditioned and in function of the difference of the mentioned parameter.

Still there is a another way of thinking: if a team scores for example 80 points in a game, it does not mean at the same time that it is sure to have won or lost the game, because the opponent may have scored more or less points, which significantly changes the position of the winning or losing team. When we observe the parameters in total, the reasoning, in total analogy with the previous one, indicates that the difference in total number of points appears as a result of all individual differences of the observed parameters.

Bearing this fact in mind, the main assumption in the evaluation of influence of certain factors is that the final difference in the number of total points (ΔPTS) is the function of all game parameters. Having concluded so, the formation of quantitative model for evaluation of influence of certain game parameters on the final result is based upon: (1) formation of versatile linear-regressive model, in which ΔPTS is a subordinate variable, whereas differences (Δ) of other game parameters are insubordinate variables; and (2) selection of variables in the regression set aiming to point out the specific weight of every observed variable.

Aim of research

Aim of this research has been to estimate the importance of every parameter in relation to the game result at the three last world championships for men, and to establish if the difference in the number of points at these competitions, which in the end decides upon the game winner, has been in the function of all differences quantitatively represented parameters of situational efficiency of basketball game.

Up-to-date research

Up-to-date research of basketball statistics can be divided into two groups. The first group has dealt with the standard indicators of situational efficiency (eg. Komić & Simović, 2003; Simović, 2006; Komić & Simović, 2007; Simović, 2008.

The second group of researchers refers to the works that estimated various methods in the evaluation of basketball players during a game.

Review of all researches in: Simović, 2008.

Methods

Course and conduct of research

While forming the data base we have used the standard indicators of basketball efficiency as regulated by the FIBA, which were registered in the time span of eight years at the world championships in Greece 1998, USA 2002 and Japan 2006. The data have been taken from the official web site of the international basketball federation, www.fiba.com. The evaluation of the standard indicators of situational efficiency has been realised under the same conditions. The process of data gathering is regulated by World Regulations – Official Statistics Sheet i Basketball Statistics Manual. The process is carried away by two data gatherers using the computer software designed for this special purpose. One data gatherer (data-keeper) is in charge of data input. The other, so called «prompter», is specially trained to identify properly the standard indicators of situational efficiency in basketball and to present data to the operator. In case of incorrect data there are sanctions imposed on the responsible person and organizer.

Sample of entities

A group sample is considered, which means the research is conducted under: 62 matches at the XIII Basketball World Championship in Athens, Greece in the period from 29 July to 9 August; 62 matches at the XIV Basketball World Championship in Indianapolis, USA in the period from 29 August to 8 September 2002; 80 matches at the XV Basketball World Championship in Shizuoka, Miyagi, Hokkaido, Hiroshima and Saitama, Japan in the period from 19 August to 3 September, 2006.

Sample of variables:

The manifested variables have been observed in standard way and the values of basketball efficiency properly derived:
PST (total points);
M2 (2 points made total);
A2 (2 points attempted total);
PCT2 (percentage two points $\frac{M2}{A2}\cdot 100$)
M3 (3 points made total);
A3 (3 points attempted total);
PCT3 (percentage three points $\frac{M3}{A3}\cdot 100$)
MFT (free throws made total);
AFT (free throws total);

PCTFT (percentage free throws $\frac{MFT}{AFT} \cdot 100$);
MFG (field goals made);
AFG (field goals attempted);
OR (offensive rebounds);

EPCTOR (efficiency percentage of offensive rebounds in relation to field points missed);
DR (defense rebounds);
EPCTDR (efficiency percentage of defense rebounds in relation to field points missed by opponent);
TOTOF (total number of team attacks according to Dean Smith's equation

$TOTOF = AFG + (AFT/2) + ST$)
AS (assists);
PCTAS (percentage of assist efficiency $\frac{AS}{MFG} \cdot 100$)
PF (personal fouls);
TO (turnovers);
PCTTO (turnover percentage of inefficiency $\frac{TO}{TOTOF} \cdot 100$)
ST (steals);
PCTST (steals percentage of efficiency $\frac{ST}{TOTOF} \cdot 100$);
BS (blocks);
PCTB (block percentage of efficiency $\frac{B}{TOTOF} \cdot 100$).

Based on the abovementioned, it is to be concluded that this research has dealt with 26 variables, and that only PF (personal fouls) variable has not been covered by the relative value as there is not a possibility to extract it due to the fact that the gathered data do not account for the nature of personal fouls themselves (whether a personal fouls bas been offensive or defensive). Another issue is that of expansion or reduction of the set.

It is worth noting that this issue primarily refers to measurable parameters of game, which in turn means that not everything can be measured and therefore the regressive model cannot include them all. Having in mind the basic assumptions of modelling, it is clear that composition of a consistent system of game parameters is not an easy task.

Also, all parameters cannot be measured or cannot be easily measured, i.e. there is no purpose in their measuring. In this context, the application of regressive analysis of the influence of certain elements of the observed game parameters on the final result may theoretically as well as empirically contribute to solution of this problem.

The variable of criterion in this research is represented by the number of total points, which results from the basic goal of the game of basketball, i.e. to score more points than your opponent.

Statistical data processing

The data extracted by this research have been processed by means of descriptive statistics and comparative analysis. Within the descriptive statistics, the following descriptive measures have been used: arithmetical mean, variation interval, standard deviation and variation quotient, and other measures if deemed necessary. The research of interrelations and relations among the established variables has been extracted on the basis of regressive and correlation analysis, at which the regressive models have been formed and based on a gradual regressive analyzing.

Suitable testing of the importance of established variables and their parameters (T-tests and F-tests) have been performed, with an aim to come to well-specified models, which should facilitate an adequate prediction and prognosis. The results have been processed by the means of mathematical and statistical programme Excel and 3B Stat. Appropriate procedures can be found in Johnson & Wichern, 1982; Karson, 1982; Kenneth, 2002; Kleinbaum & Kupper, 1978; Lovrić et al., 2006.

Results and discussion

Several regression models may be formed due to the fact that the observed parameters, i.e. variables within the model – absolute and relative – have been extracted from other variables. In this case, two main regression models have been formed. Both models contain the same subordinate variable ΔPTS. The first model is:

$$\Delta PTS = f(\Delta PCT2 + \Delta PCT3 + \Delta PCTFT + \Delta EPCTOR + \Delta EPCTDR + \Delta EPCTAS + \Delta PCTTO + \Delta PCTST + \Delta PCTBS)$$
$$Y_i = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \beta_3 x_{3i} + \beta_4 x_{4i} + \beta_5 x_{5i} + \beta_6 x_{6i} + \beta_7 x_{7i} + \beta_8 x_{8i} + \beta_9 x_{9i} + \varepsilon_i$$

with values of: x1i=ΔPCT2; x2i=ΔPCT3; x3i=ΔPCTFT; x4i=ΔEPCTOR; x5i=ΔEPCTDR; x6i=ΔEPCTAS; x7i=ΔPCTTO; x8i=ΔPCTST; and x9i=ΔPCTBS.

As it can be seen, the idea behind this model is to include, as insubordinate variables, all the relative indicators.

The second model has been formed in a way to have the set of insubordinate variables composed of differentiations of all parameters that have been under an absolute observation:

$$\Delta PTS = f(\Delta M2 + \Delta A2 + \Delta M3 + \Delta A3 + \Delta MFT + \Delta AFT + \Delta OR + \Delta DR + \Delta AS + \Delta PF + \Delta TO + \Delta ST + \Delta BS$$

$$Y_i = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \beta_3 x_{3i} + \beta_4 x_{4i} + \beta_5 x_{5i} + \beta_6 x_{6i}$$
$$\beta_7 x_{7i} + \beta_8 x_{8i} + \beta_9 x_{9i} + \beta_{10} x_{10i} + \beta_{11} x_{11i} + \beta_{12} x_{12i} + \beta_{13} x_{13i} + \varepsilon_i$$

with values of: x1i=ΔM2; x2i=ΔA2; x3i=ΔM3; x4i=ΔA3; x5i=ΔMFT; x6i=ΔAFT; x7i=ΔOR; x8i=ΔDR; x9i=ΔAS; x10i=ΔPF; x11i=ΔTO; x12i=ΔST; and x13i=ΔBS.

The second model stands more of a chance to cover variables of the observed parameters so that within the analysis an emphasis should be placed on the observation based on this model. The evaluation of the regressive model has been conducted by means of gradual regression (stepwise), at which the conditions of gradual regression are defined for inclusion and exclusion of variables in the model.

Standardization at this level provides consistency and result comparability at different levels and different time periods. Alongside the regressive models, the first information on mutual connections and relations of the observed variables may be extracted on the basis of the quotients of simple linear correlation. This information should be accepted in the light of quality information that can be provided by the quotient of simple linear correlation, and as the starting point for consideration of higher levels of foundation in complex correlation of the observed variables.

A special attention should be given to observation from the aspect of partial correlation, which is an important contribution to results in total. It is worth mentioning that the observation has been performed on a specific sample of the extreme type by its selection (top quality basketball teams that qualified for final tournament of world championships), and by the importance of games (medal matches, matches for standings, high publicity level, national prestige, etc.), but still it can point to the most important aspects of the game of basketball from the statistic point of view. The observation has been based on the standard observed parameters of basketball, as stipulated by the FIBA, and extracted parameters based on them.

For the World Championship in Greece in 1998, the parameters of the first regressive model are given in tables 1,2 and 3, whereas the model 2 shows its results in tables 4,5 and 6. The quotients of simple linear correlation of the included variables are represented in table 7. In stepwise regression, the criterion F for inclusion of the variables into the equation is a probability at .05 level, and for exclusion the level stands at .10 level (of the standard size).

Table 1 – Regressive and correlation analysis of the first model at the WC in Greece

Model	St err	t	Sign.	Part. R
Constant	.872	2.954	.005	-
ΔPCT2	.053	10.535	.000	.818
ΔPCTTO	.066	-8.901	.000	-.768
ΔPCT3	.045	7.292	.000	.701
ΔEPCTDR	.041	2.714	.009	.344
ΔEPCTOR	.047	3.985	.000	.473
ΔPCTFT	.040	3.348	.001	.411

* model obtained at the 6th iteration of Stepwise regression model

Table 2 – The first model at the WC in Greece – ANOVA

Model	Total	DF	Variance	F	P
Regression	4393.38	6	732.23	35.92	.000
Residual	1121.09	55	20.38		
Total	5514.47	61	-		

Table 3 – Multiple determination quotient of the first model at WC in Greece

R	R2	Corrected R2	St err
.893	.797	.775	4.5148

Table 4 – Regressive and correlation analysis of the second model at WC in Greece

Model	St err	t	Sign.	Part. R
Constant	.635	.918	.362	-
ΔM2	.085	22.108	.000	.945
ΔM3	.147	17.861	.000	.920
ΔMFT	.064	13.508	.000	.871

* model obtained at the 3rd iteration of Stepwise regression model

Table 5 – The second model at WC in Greece – ANOVA

Model	Total	DF	Variance	F	P
Regression	4973.95	3	1657.98	177.91	.000
Residual	540.52	58	9.32		
Total	5514.47	61	-		

Table 6 – Multiple determination quotient of the second model at WC in Greece

R	R2	Corrected R2	St err
.950	.902	.897	3.0527

For WC in the USA in 2002, the parameters of the first regressive model are shown in tables 8, 9 and 10, while model 2 is presented in tables 11, 12 and 13. The quotients of simple linear correlation of the included variables are shown in table 14.

Table 8 – Regressive and correlation analysis of the first model at WC in USA

Model	St err	t	Sign.	Part. R
Constant	1.480	5.76	.000	-
ΔPCT2	.088	6.51	.000	.650
ΔPCT3	.094	4.50	.000	.509
ΔEPCTDR	.066	-2.99	.004	-.365

* model obtained at the 3rd iteration of Stepwise regression model

Table 9 – The first model at WC in USA – ANOVA

Model	Total	DF	Variance	F	P
Regression	4741.90	3	1580.63	22.32	.000
Residual	4107.45	58	70.82		
Total	8849.36	61	-		

Table 10 – Multiple determination quotients of the first model at WC in USA

R	R2	Corrected R2	St err
.732	.536	.512	8.4154

Table 11 – Regressive and correlation analysis of the second model at WC in USA

Model	St err	t	Sign.	Part. R
Constant	.539	-.168	.867	-
ΔAS	.078	2.405	.020	.308
ΔDR	.091	2.563	.013	.327
ΔTO	.107	-3.641	.001	-.441
ΔM3	.136	18.984	.000	.931
ΔMFT	.054	16.520	.000	.912
ΔM2	.101	15.421	.000	.901

* model obtained at the 8th iteration of Stepwise regression model

Table 12 – The second model at WC in USA – ANOVA

Model	Total	DF	Variance	F	P
Regression	8535.51	6	1422.58	249.30	.000
Residual	313.85	55	5.71		
Total	8849.36	61	-		

Table 13 – Multiple determination quotients of the second model at WC in USA

R	R2	Corrected R2	St err
.982	.965	.961	2.3888

For WC in Japan in 2006, the parameters of the first regressive model are shown in tables 15, 16 and 17, while model 2 is presented in tables 18, 19 and 20. The quotients of simple linear correlation of the included variables are shown in table 21.

Table 15 – Regressive and correlation analysis of the first model at WC in Japan

Model	St err	t	Sign.	Part. R
Constant	.734	4.117	.000	-
ΔPCTTO	.042	-14.765	.000	-.864
ΔPCT2	.045	13.580	.000	.845
ΔPCT3	.037	13.718	.000	.847
ΔEPCTOR	.034	11.154	.000	.792
ΔPCTFT	.029	5.280	.000	.523

* model obtained at the 5th iteration of

Table 16 – The first model at WC in Japan

Model	Total	DF	Variance	F	P
Regression	11586.38	5	2317.28	125.14	.000
Residual	1370.31	74	18.52		
Total	12956.69	79	-		

Table 17 – Multiple determination quotients of the first model at WC in Japan

R	R2	Corrected R2	St err
.946	.894	.887	4.3032

Table 18 – Regressive and correlation analysis of the second model at WC in Japan

Model	St err	t	Sign.	Part. R
Constant	.125	.78	.440	-
ΔM2	.018	109.00	.000	.997
ΔM3	.024	123.74	.000	.998
ΔMFT	.013	76.25	.000	.994
ΔA2	.011	2.80	.006	.308

*model obtained at the 4th iteration

Table 19 – The second model at WC in Japan

Model	Total	DF	Variance	F	P
Regression	12925.18	4	3231.30	7692.71	.000
Residual	31.50	75	.42		
Total	12956.69	79	-		

Table 20 – Multiple determination quotient of the second model at WC in Japan

R	R2	Corrected R2	St err
.999	.998	.997	.6481

Based on the obtained results, the following can be concluded:

(1) the obtained regressive models are in total highly significant; and
(2) the obtained regressive models are statistically significant in comparison to the included variables, i.e. the observed parameters.

In other words, both examples show a significant correlation between subordinate variable (ΔPTS) and the sets of insubordinate variables included in the model. Given in terms of multiple determination quotient it means the first model includes relative indicators of situational analysis in basketball as follows:
(1) for regressive model based on data at World Championship in Greece, R2=.797;
(2) for regressive model based on data at World Championship in USA, R2=.512; and
(3) for regressive model based on data at World Championship in Japan, R2=.887.

For the second model, which includes the absolute indicators of situational efficiency in basketball:
(1) for regressive model based on data at World Championship in Greece, R2=.902;
(2) for regressive model based on data at World Championship in USA, R2=.965; and
(3) for regressive model based on data at World Championship in Japan, R2=.998.

Comparing the obtained results R2 it can be seen that, at all three world championships, they show better results at models that include the absolute indicators, which again indicates that this model stands more of a chance to cover variations of the observed parameters. The emphasis should therefore be put on this particular model.

From the obtained regressive models and on the basis of quotients of partial correlation, it can be concluded that the final results of games at WC in Greece are primarily been influenced by:
ΔPCT2 (efficiency of percentage for two points);
ΔPCTTO (inefficiency of percentage in turnovers);
ΔPCT3 (percentage three points);
ΔEPCTDR (efficiency percentage defensive rebounds);
ΔEPCTOR (efficiency percentage offensive rebounds); and
ΔPCTFT (efficiency percentage free throws).

The following factors have had the greatest influence in the second model:
ΔM2 (total number of two points made);
ΔM3 (total number of three points made);
ΔMFT (free throws made);

The final results in the first model at WC in USA have been primarily influenced by:
ΔPCT2 (two point efficiency percentage);
ΔPCT3 (three point efficiency percentage);
ΔEPCTDR (defensive rebound efficiency percentage).

The second model has been influenced by:
ΔAS (assists);
ΔDR (defensive rebounds);
ΔTO (turnovers);
ΔM3 (total number of three points made);
ΔMFT (total number of free throws made);
ΔM2 (total number of two points made);

The final results in the first model at WC in Japan have been primarily influenced by:
ΔPCTTO (efficiency percentage in turnovers);
ΔPCT2 (two point efficiency percentage);
ΔPCT3 (three point efficiency percentage);
ΔEPCTOR (defensive rebound efficiency percentage); and
ΔPCTFT (free throw efficiency percentage).

The second model has been influenced by:
ΔM2 (total number of two points made);
ΔM3 (total number of three points made);
ΔMFT (total number of free throws made);
ΔA2 (total number of two points attempted).

It can be seen that both models have stable parameters which determine the final result. These are ΔPCT2 (two point percentage) and ΔPCT3 (three point percentage) in the first model and ΔM2 (total number of two points made), ΔM3 (total number of three points made) and ΔMFT (total number of free throws made). The stable appearance of these parameters is not a surprise as previous experience and common sense tell us that the winning team need to have better statistics in the area of shot efficiency.

Besides these stable parameters, some parameters that can be defined as relatively stable appear in the first mode.

Those are:
ΔPCTFT (free throw efficiency percentage), which appears at WCs in Greece and Japan and contributes to the previous conclusion on the influence of efficiency onto the final result;

ΔEPCTDR (defensive rebound efficiency percentage), which appears at WCs in Greece and USA;
ΔEPCTOR (offensive rebound efficiency percentage), which appears at WCs in Greece and Japan.

Majority of coaches, and other individuals who use basketball statistics, underline the importance of rebounding in the final analysis of a basketball results. A weak representation of rebound parameters in the second model is confirmed by Dean Smith's assertion set in the late 1970s and later made into a system of statistical evaluation called 'Game evaluation based on ball possessions'. Namely, it is beyond any doubt that total number of rebounds, both defensive and offensive, significantly influence the final result.

Still, it is very important to emphasize that the absolute indicator of rebounds (its simple quantification) do not account for the quality but the relative indicators per se;
ΔPCTTO (turnover inefficiency percentage), which appears at WCs in Greece and Japan. As with rebounding, the same applies for turnovers. Here also the relative value itself accounts for the quality indicator.

The appearance of new parameters which according to the obtained second regressive model define the final result at WC in USA (ΔAS – assists, ΔDR – defense rebound and ΔTO – turnovers) may be interpreted by game acceleration which is in turn influenced by change in rules of the game. In the year of 2000, the attacking time period has been cut down from 30 to 24 seconds, and the time span for ball transition from the back part of the court to the front has changed from 10 to 8 seconds. These changes have had a goal to increase dynamics of game.

The concept of set offense, a tough defense with lots of personal fouls and ball control in the 1990s, which had been accepted by large number of basketball coaches primarily for the reason of reaching the desired result, has threatened the game of basketball to become an uninteresting and destructive sport. The change in rules has significantly influenced the game itself. It has lead to an increase in fast-breaks, second offense and fast offense with shot attempts and very little player movement, as well as individual talent of quality of players in positions 1 on 1 and 2 on 2.

The average number of offense of a single team from 75.468 at WC in Greece increased to 84.468 at WC in USA No wonder that the aforementioned parameters have shown their influence on the final result by game acceleration. Still, it should be noted that assist parameter must be taken into consideration with a slight uncertainty.

The analysis of statistical results and descriptive statistics showed a high increase in assists at WC in USA (10.290 average per game at WC in Greece, 17.758 at WC in USA and 13.288 at WC in Japan). Of course, the change in rules of the game and game acceleration has lead to an increase in assists per game, but the question is whether it has happened to the extent shown in descriptive statistics. Since it has happened at the WC in USA the possible solution should lie in data gathering. It is logical to assume that data gathering was performed by local staff (which is common to all similar competitions), who were trained to register assists in different manner than regulated by FIBA. As opposed to the last two WCs, we notice the appearance of ΔA2 parameter (total number of two point shot attempts) in Japan.

Conclusion

Statistical modelling of quantitative evaluation of the influence of certain basketball elements onto the final result by means of regressive analysis has enabled us to come to an answer regarding the quantitative parameters and their influence on the final result. The evaluation of regressive models is extracted on the basis of differentiation in the final result and differentiation of certain quantitative parameters as insubordinate variables.

Depending on the choice of quantitative parameters, their scope and the nature itself (absolute or relative), several different regressive models may be formed. The evaluation of influence of certain parameters on the final result has been extracted on the basis of the obtained regressive models and the correlation link between the observed variables which have been established on the basis of simple linear and partial correlation quotients. In this case two basic regressive models have been formed. Both models have the subordinate variable of ΔPTS. In the first model the idea has been to include all the relative indicators as insubordinate variables.

The second model has been formed so as to have the set of insubordinate variables made of differentiations of all parameters that have undergone an absolute observation.

Based on the obtained results the following can concluded:
(1) the obtained regressive models are in general statistically very significant; and
(2) the obtained regressive models are statistically significant in relation to the included variables, i.e. the observed parameters.

In other words, it means that in both cases there is a significant correlation between subordinate variables (difference in the total number of points) and the sets of insubordinate variables.

Presented by the quotient of multiple determination, it means that:

(1) for the first regressive model on the basis of data at WC in Greece R2 = .797, and for the second model;
(2) for the first regressive model on the basis of data at WC in USA R2 = .536, and for the second R2 = .965;
(3) for the first regressive model on the basis of data at WC in Japan R2 = .894, and for the second R2 = .998.

As the quotient of multiple determination at all three WCs is significantly higher and more stable over time in the second models, we have put an emphasis, in the course of our observation, on the second model. Based on the obtained regressive models and the quotients of partial correlation, the following can be concluded:
(1) The final result at the WC in Greece, in the first model, has primarily been influenced by two point efficiency percentage, turnover inefficiency percentage, three point efficiency percentage, defensive rebound efficiency percentage and free throw efficiency percentage, whereas in the second model we have total number of two points made, three point efficiency percentage and total number of free throws made;
(2) The final result at the WC in USA, in the first model and positive direction, has primarily been influenced by two point efficiency percentage, three point efficiency percentage and defensive rebound efficiency percentage, whereas in the second model we have assists, defensive rebounds, turnovers, total number of three points made, total number of free throws made and total number of two points made;
(3) The final result at the WC in USA, in the first model, has primarily been influenced by turnover inefficiency percentage, two point efficiency percentage, three point efficiency percentage, defensive rebound efficiency percentage and free throw efficiency percentage, whereas in the second model we have total number of two points made, total number of three points made, total number of free throws made and total number of two points attempted.

It can be noted that there is a difference between the results of the observed world championships. Therefore it can be assumed that there is a difference between the parameters themselves, which according to the obtained regressive model determine the final result (which is natural and realistic to be expected, first because of the time span of four years between two world championships). It further means that many elements have changed over time, starting with the participants themselves, the balance of basketball power of national teams, and other more or less significant dimensions, which refer to the observed competition.

Still, the most apparent are the stable elements which are connected to the efficiency of two and three point shots and free throws (in the second model), which statistically proves the empirical and logical assumption that these elements per se have a deciding influence on the final result. The appearance of larger number of parameters which have a significant influence on the final result of game at the World Championship in the USA is explained by one of the most important change in the rule of basketball game, i.e. cutting down the offense time from 30 to 24 seconds, which directly led to change in the game dynamics and its acceleration.

Thus we have proved the goal of this research, i.e. the difference in total number of points in top quality basketball, which in the end decides upon the winning team, is in the function of all differences quantitatively presented by situational efficiency parameters.

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ANALIZA UTJECAJA POJEDINIH ELEMENATA KOŠARKAŠKE IGRE NA KONAČAN REZULTAT NA TEMELJU DIFERENCIJA NA XIII, XIV I XV SVJETSKOM PRVENSTVU

Sažetak
U košarkaškim utakmicama, u kojima su dvije ekipe suprotstavljene jedna drugoj, shodno oficijelnim pravilima FIBA, pobjeđuje ekipa koja postigne više poena. Odrediti tko je bolji, a tko lošiji protivnik u utakmici nije uvijek jednostavan zadatak. Shodno tome, prognozirati ishod neke utakmice (a pogotovo točan rezultat) vrlo je teško, naročito u slučajevima kada su protivnici podjednako dobri, ili podjednako loši. U sportu, uostalom kao i u životu, ne pobjeđuje uvijek bolji. To, naravno, zavisi od utjecaja različitih faktora koji dovode do toga da se očekivani rezultat desi ili ne desi. Nikada ne možemo biti potpuno sigurni u ishod neke utakmice. Premda neki faktori mogu ukazati da određeni tim ima u utakmici veće izglede za pobjedu, na što ukazuju i parametri koji se prate, ipak ne možemo prognozirati i sam njezin rezultat. Prikupljanje, obrada i analiza statističkih podataka jedini su valjani način kojim možemo objasniti uzroke uspjeha, odnosno neuspjeha ekipe. Temeljom saznanja zakonitosti onoga što se desilo može se izvesti ocjena o tome da li, i koliko su, pojedini praćeni parametri imali utjecaja na konačan skor, te kako utjecati na te parametre kako bi se s većom sigurnošću mogao očekivati željeni rezultat.

Ključne riječi: *košarka, svjetska prvenstva, učinkovitost u igri, diferencija, regresijska analiza*

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