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Empirical Verification of the Weighted System of Criteria for the Elite Basketball Players Quality Evaluation

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A B S T R A C T

This article is a continuation of research aimed at formation of a system of criteria for the expert evaluation of the basketball players' actual quality. So far, the external standards for assessing players' performance have been defined and described and the relative importance coefficients of each criterion for the performance evaluation per positions in the game have been established as well. The purpose of this research was to test empirically the latter – the weighted system of criteria for evaluating the actual quality of basketball players proposed by Trninić and Dizdar (2000). Based on the determined descriptive indicators and the coefficients of importance of criteria, and on the degree of the objectivity level (interobservers' agreement) of the expert evaluations, it can be concluded that the measuring attributes (objectivity and sensitivity) for most of the criteria are in accordance with their relative importance coefficients for a particular position in the game. Consequently, the structure of the relevant criteria for each play position in the basketball is proposed.

Introduction

This article is a continuation of research aimed at formation of a system of criteria, that is a measuring instrument for the expert evaluation of the actual quality (performance) of elite basketball players, established by Trninić and associates[1]. Starting from the expert synthetic – analytic understanding and observing the reactions of players in the game, authors have established criteria, defined and described the external measurements for assessing efficiency of the observed player's performance in various game situations[2]. The coefficients of rela-

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tive importance of criteria per positions in the game have been also determined[1].

A comprehensive body of scientific works has been written on the ethical, scientific and practical reasons for evaluating the behavior of players and teams during authentic situations of competition. Perhaps only one empirical fact should be added here: in the sphere of the elite professional sports, that are under the growing influence of the economic – entrepreneurial laws and/or show-business laws[3–7], the process of selecting athletes becomes more and more important if not the most important factor or component of sports successes. Athletes, protagonists of sports events, are under the growing demands to continuously provide and increase successfulness of their clubs in order to justify invested funds and return expected profit.

Many research studies have dealt with the issue of the complex phenomenon of the individual quality of players in team sports. Here just a few articles dealing with that issue in the domain of basketball[8–16] should be pointed out. In spite of the established constraints of the objective methods, primarily because of the non-linear relations among the success and multi-dimensional factors, as well as because of the relative unpredictability of behavior of individuals in the authentic, constantly changing game conditions[9], both the scientists and coaches are constantly trying to generate the systems of criteria that would help in selection and training of players, in selection of the efficient and safe training techniques, as well as in selection of strategic and tactical ideas that produce expected results. That optimism is reflected in the Pat Riley's words: »Not all the skills, I'm sure, can be measured mechanically, but I'll bet they're all measured pretty specifically.«[17]

Trninić[4] believes that the situation-related efficiency of players in a game can be measured by the level of accomplishing the game assignments. He distinguishes between the individual and team tasks in a game, individual and collective responsibilities of players, consequently, the individual and team aspects of a player's success. All mentioned increases complexity of the manifested reactions of players in the game and makes it harder for an expert to observe game events systematically. On the other hand, realization of the individual responsibilities of each player greatly depends on the teammates' realization of the collective responsibilities and vice versa. This implies that basketball is the game of controversy where the concept of play exists simultaneously with the vast number of possibilities for solving the concrete game situations, whereas on the team level basketball is characterized by the cooperation – opposition model[9]. Therefore it requires a great skill to balance between the individual and team goals, in other words, between the individual and team aspect of dealing with almost endless variety of game situations[1,2,10].

Basketball is a team sport where collective play determines the essence of an individual behavior on the court. What the play is going to be like, depends primarily on the profile of players that make coach create his/her concept, style and system of play. If the notion is accepted that successful defense determines opponents offensive options, interrupts its timing and decreases number of high percentage scoring opportunities, and vice versa, if successful offense outplays position of defense, punishes errors on defense and opens up the key, we then speak of two aspects of the one, indivisible game whose attributes are dynamics, sudden changes of rhythm and play[18,4].

To use the system of criteria to follow and evaluate both the individual and team aspect of players' success throughout their entire sports career, from cadet to senior teams, it is necessary to verify

its applicability in basketball practice. Namely, measurement instrument, whether either for the diagnostic or prognostic purposes, must have certain measuring attributes. Most of the proposed criteria have multidimensional character, and players' reactions are complex from the technical – tactical and psychological point of view.

Authors believe that expert interactive understanding of the positions and roles in the game is necessary for comprehension of criteria and their complexity, as well as understanding of overall importance of criteria for the game of basketball, for which is of utmost necessity the longer periods of time to be spend in practical and theoretical work in top-level basketball. For example, passing skills is a priority criterion for the position 1, but the basis of success of all players at each position in the game, as well.

Situation indicators of success in the game are functionally indivisible. »Obsession« with indicators of situation efficiency and negligence of interactive processes in the flow of a game is not acceptable way of explaining facts. Research studies have shown[19,11] that all indicators of situation efficiency have not got equal influence on the outcome of a basketball game nor »even weight« for all positions in the game[2]. From the general situation approach it can be said that there are one-dimensional and multi-dimensional criteria for a position and role in the game.

The purpose of this research is to evaluate empirically the weighted system of criteria for evaluation of actual quality of basketball players. Authors expect invaluable revelations from the establishment of degree of agreement between evaluators/experts and from the determination of contribution of each criterion to overall quality of a player at certain position in the game. The fundamental question of this work, from the practice aspect, is related to recognition of relevant, priority criteria for evaluation of actual quality of basketball players with respect to their position and role in the game.

From the aspect of general situation approach it can be said that there are one-dimensional and multidimensional criteria* for each position and role in the game, so one of the goals of this research is to propose the structure of optimal number of the ***most important*** criteria for evaluation of quality of players' performance concerning a position on defense, offense, and overall, to allow economic, quick and proper diagnostics, player selection and design of training programs. The system of criteria with such a structure should enable ***precision of selection by setting the frame of reference***, consisting of the structure of the most important criteria for each position, and by defining the ***reference point*** defined as the measurement of top basketball players' performance. Integrated approach to quality evaluation, presented in this article, differentiates important from the less important criteria for each position in the game, but allows keeping the register of effort exerted in reaching the top basketball performance (for example, level of defensive pressure, defensive help, defending the screens successfully, or/and defensive rebounding efficiency...). Such a system of criteria reduces entropy in the decision-making process of an expert and gives him/her a clear picture of what each player has to work on to raise the level of his/her play and carry his/her team to the top level of basketball, or at the end of a season, reveals the areas of basketball

* One-dimensional criteria are defined by the single variable in players' reactions (for exmple, blocking shots, free throws), while multidimensional criteria evaluate players' reactions from several aspects of the game (for example, level of defensive pressure, defensive help, playing multiple positions..)

where some players did not fulfill their given roles. Uninterrupted flow of information as to what ought to be changed and how to change it, and setting of more realistic goals creates a habit of overcoming existing performance levels.

The synthetic – analytic approach in evaluation, based on expert analysis, has to take all individual specific attributes into consideration, not only the common characteristics being part of all players' performance at a certain position in the game. Such expert approach does not neglect personality and character of a particular player, but distinguishes his/her assertive, colorful, unique attributes that are yielded exclusively through observation of the player in different game situations. From the expert experience point of view, authors believe that selection of the highest level has to be based on the attributes of a player, not only on the most important desired quality for a certain position.

Methods

Population and the sample of entities

The entity sample consists of 149 players from 12 basketball clubs (Cibona, Zadar, Benston, Split, Zrinjevac, Zagreb, Šibenik, Svjetlost Brod, Kandit Olimpija, Telekomp, Croatia Line and Vajda) from the Croatian First Division League that played at least a minute in the season 1998/1999. Authors selected for this research from the entire group 98 players that played at least 10 minutes in at least 10 games. From this selection a sample of 60 players (12 at each position in the game) has been randomly created for the Croatian First Division League.

System of criteria for the actual quality of basketball players evaluation

Actual quality of basketball players has been evaluated by means of the weighted system of criteria for evaluation of the basketball players performance for all positions in the game set by Trninić, Perica and Dizdar[1] and Trninić and Dizdar[2]. The mentioned system of criteria consists of the seven criteria for evaluating the performance on defense:

- level of defensive pressure (RPO),
- defensive help (PO),
- blocking shots (BŠ),
- the ball possession gained (OL),
- defensive rebounding efficiency (SUO),
- transition defense efficiency (UTO),
- playing multiple positions on defense (IVPO),

and the twelve criteria for evaluating the performance on offense:

- ball control (KL),
- passing skills (VD),
- dribble penetration (PL)
- outside shot (ŠVP)
- inside shot (ŠUP)
- free throws (SB)
- drawing fouls (IOP)
- efficiency of screening (PUB)
- offense without the ball (NBL)
- offensive rebounding efficiency (SUN)
- transition offense efficiency (UTN)
- playing multiple positions on offense (IVPN)

Data acquisition and processing methods

The actual quality of basketball players was executed by the 10 basketball coaches who were coaching the mentioned teams in the season 1998/1999. Each coach used the following grades:

1 – very poor (far below average quality)
2 – poor (below average quality)
3 – good (average quality)
4 – very good (above average quality)
5 – excellent (far above average quality)

to evaluate performance quality of the players according to the seven criteria for de-

fense and twelve for offense. The players were classified in groups by their coaches with regard to the position predominantly played on their teams/clubs. Since there are significant differences in the importance of each criteria for evaluation of quality on offense with respect to the position a player primarily played[2], authors weighted grades in each criteria with respect to the position. Based on such a calculation the basic descriptive parameters were determined (arithmetic mean, standard deviation, minimum and maximum); correlation of each criterion with the over- all result was calculated as an average weighted grade and the degree of uniformity (objectivity) among evaluators was assessed by the Cronbach reliability method. Data were processed by the statistical – graphic software Statistica for Windows, release 5.0, at the Faculty of Physical Education, University of Zagreb.

Results and Discussion

Analysis of measuring attributes of criteria for evaluating the basketball players performance on defense

Position 1 – point guard

Descriptive parameters results (Table 1), and in particular the Box-Whisker

TABLE 1
ARITHMETIC MEANS (M), MINIMUM (Min) AND MAXIMUM (Max), AND STANDARD DEVIATIONS (S.D.) OF THE WEIGHTED GRADES GIVEN BY 10 BASKETBALL EXPERTS FOR THE 7 CRITERIA FOR THE DEFENSIVE PERFORMANCE QUALITY EVALUATION AND CORRELATIONS OF EACH CRITERION WITH THE OVERALL RESULT (r_{PLK}), CRONBACH'S COEFFICIENTS OF RELIABILITY AND THE RELATIVE IMPORTANCE COEFFICIENTS – WEIGHTS (WC)

	Mean	Min	Max	S.D.	r_{PLK}		WC
RPO	**0.80**	**0.46**	**1.17**	**0.17**	**0.90**	**0.95**	**0.24**
PO	**0.48**	**0.36**	**0.59**	**0.06**	**0.84**	**0.83**	**0.16**
BŠ	0.14	0.11	0.23	0.03	0.34	0.93	0.06
OL	**0.58**	**0.43**	**0.71**	**0.09**	**0.88**	**0.84**	**0.18**
SUO	0.26	0.18	0.35	0.05	0.63	0.83	0.09
UTO	**0.54**	**0.34**	**0.73**	**0.09**	**0.89**	**0.92**	**0.17**
IVPO	0.26	0.18	0.33	0.04	0.31	0.85	0.10

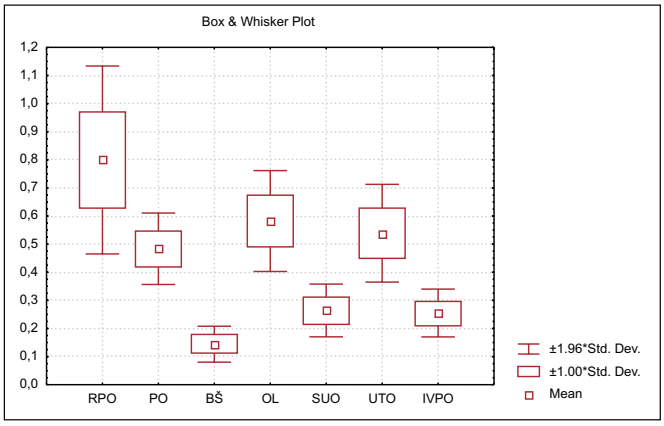

Fig. 1. Box – Whisker plot presents arithmetic means and standard deviations of the performance grades given by 10 basketball experts in seven criteria for evaluating the quality of play on defense.

plot (Figure 1) clearly show theffect of weighting. Namely, with regard to the coefficients of importance used to ponder the results of players who primarily play position 1 – point guard, it is obvious that the criterion *level of defensive pressure (PO)* has the greatest arithmetic mean and standard deviation, consequently it is going to have the greatest effect in defining the position of a player in the variable of the overall play quality on defense (calculated as linear combination of weighted results). The probable reason might be the fact that a defensive player at position 1 pressures the opponent's point guard and regulates intensity of entire defensive pressure of his/her team. Also, *the ball possession gained (OL)*, *transition defense efficiency (UTO)* and *defensive help (PO)* are the criteria distinguished by their greatest contribution to the overall quality of a player, and they probably have great influence on the successful performance of set patterns of play where the roles of the players at given positions are clearly defined. This statement is supported by the correlation coefficients of those criteria with the variable *overall quality of players on defense*.

The number of criteria can be reduced on the basis of the gathered results without losing larger quantity of information. Roles of the criteria *blocking shots (BŠ)*, *playing multiple positions on defense (IVPO)* and *defensive rebounding efficiency (SUO)* are almost negligible in evaluation of quality of players playing position 1 and they can be safely omitted from the structure of the optimal number of the most important criteria.

Position 2 – shooting guard

The greatest arithmetic means and standard deviations are obtained in the following criteria: *level of defensive pressure (RPO)*, *transition defense efficienyc (UTO)*, *the ball possession gained (OL)* and *defensive help (PO)*, which gives them greater weight with the variable *overall defensive quality of a basketball player*. Weight of the criteria *defensive rebounding efficiency (SUO)* and *playing multiple positions on defense (IVPO)* with the variable *overall defensive quality of a basketball player* is greater for the position 2 than with players at position 1, which is in accordance with the greater coefficients of importance of those criteria for position 2. The criterion *blocking shots (BŠ)* has negligible effect for this position as well. Objectivity coefficients range from 0.83 (*playing multiple positions on defense – IVPO*) to 0.93 (*the ball possession gained – OL*), which is satisfactory.

With regard to the data gathered, and in order to form the optimal system of criteria for evaluating quality of performan-

TABLE 2
ARITHMETIC MEANS (M), MINIMUM (Min) AND MAXIMUM (Max), AND STANDARD DEVIATIONS (S.D.) OF THE WEIGHTED GRADES GIVEN BY 10 BASKETBALL EXPERTS FOR THE 7 CRITERIA FOR THE DEFENSIVE PERFORMANCE QUALITY EVALUATION AND CORRELATIONS OF EACH CRITERION WITH THE OVERALL RESULT (r_{PLK}), CRONBACH'S COEFFICIENTS OF RELIABILITY AND THE RELATIVE IMPORTANCE COEFFICIENTS – WEIGHTS (WC)

	MEAN	Min	Max	S.D.	r_{PLK}		WC
RPO	**0.64**	**0.50**	**0.86**	**0.10**	**0.88**	0.91	**0.21**
PO	**0.48**	**0.40**	**0.63**	**0.06**	**0.85**	0.85	**0.16**
BŠ	0.19	0.15	0.24	0.03	0.58	0.85	0.07
OL	**0.48**	**0.39**	**0.63**	**0.07**	**0.84**	0.83	**0.16**
SUO	0.35	0.28	0.45	0.06	0.75	0.89	0.12
UTO	**0.49**	**0.43**	**0.61**	**0.06**	**0.91**	0.84	**0.17**
IVPO	0.36	0.30	0.43	0.05	0.81	0.83	0.11

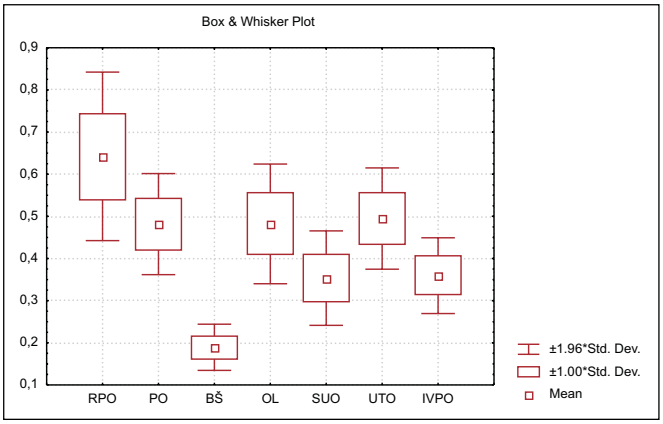

Fig. 2. Box – Whisker plot presents arithmetic means and standard deviations of the performance grades given by 10 basketball experts in seven criteria for evaluating the quality of play on defense.

ce on defense, the following criteria can be proposed for application: *level of defensive pressure (RPO)*, *transition defense efficiency (UTO)*, *the ball possession gained (OL)* and *defensive help (PO)* (similar as for position 1). An assumption can be made that by using these criteria the lost quantity of information on the overall quality of players on defense will be larger than it was the case with position 1 because of the greater impact of the criteria *defensive rebounding efficiency (SUO)* and *playing multiple positions on defense (IVPO)*. That is because the position-2--players defend opponents (shooting guard) who execute more inside cuts than the point guards.

Position 3 – small forward

Based on the descriptive parameters of weighted results (Table 3), and especially for Box-Whisker plot (Figure 3), increase of arithmetic mean and standard deviation of the criterion *defensive rebounding efficiency (SUO)* can be noticed with regard to other positions, consequently having a greater impact on the *overall quality of players on defense*. Objectivity coefficients range from 0.83 (*tran- sition defense efficiency – UTO*) to 0.94 (*level of de-*

TABLE 3
ARITHMETIC MEANS (M), MINIMUM (Min) AND MAXIMUM (Max), AND STANDARD DEVIATIONS (S.D.) OF THE WEIGHTED GRADES GIVEN BY 10 BASKETBALL EXPERTS FOR THE 7 CRITERIA FOR THE DEFENSIVE PERFORMANCE QUALITY EVALUATION AND CORRELATIONS OF EACH CRITERION WITH THE OVERALL RESULT (r_{PLK}), CRONBACH'S COEFFICIENTS OF RELIABILITY AND THE RELATIVE IMPORTANCE COEFFICIENTS – WEIGHTS (WC)

	MEAN	Min	Max	S.D.	r_{PLK}		WC
RPO	**0.54**	**0.38**	**0.73**	**0.11**	**0.92**	0.94	**0.17**
PO	**0.44**	**0.33**	**0.58**	**0.07**	**0.91**	0.90	**0.15**
BŠ	0.24	0.19	0.33	0.04	0.62	0.87	0.08
OL	**0.40**	**0.31**	**0.56**	**0.07**	**0.92**	0.88	**0.13**
SUO	**0.57**	**0.42**	**0.69**	**0.10**	**0.84**	0.87	**0.17**
UTO	**0.51**	**0.43**	**0.65**	**0.06**	**0.83**	0.84	**0.17**
IVPO	**0.44**	**0.32**	**0.57**	**0.06**	**0.95**	0.91	**0.13**

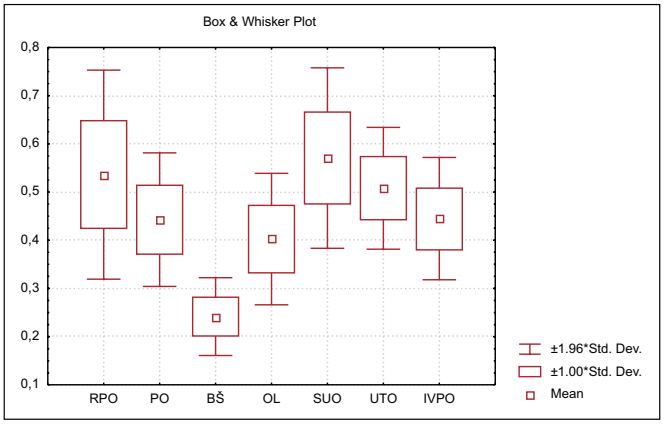

Fig. 3. Box – Whisker plot presents arithmetic means and standard deviations of the performance grades given by 10 basketball experts in seven criteria for evaluating the quality of play on defense.

fensive pressure – PO) which can be considered satisfactory.

Also, a more balanced impact of other criteria (except for the criterion *blocking shots – BŠ*) on the overall quality of defensive performance is noticable for players predominantly playing position 3, which is reinforced by their correlation coefficients. Therefore, in order to reduce number of criteria for this position *the blocked shots (BŠ)* criterion is suggested to be excluded since it has the smallest arithmetic means and standard deviation and, consequently, the smallest impact on the evaluation of the overall quality of players on defense.

Position 4 – power forward

Effect of the criteria weighting is obvious in descriptive parameters (Table 4) and the Box-Whisker plot (Figure 4). Relative importance coefficients of the criterion *defensive rebounding efficiency (SUO)* is very high and that implies rise of the arithmetic mean and standard deviation of this criterion, giving it a predominant role in determination of the overall quality of performance on defense for the position in question. Beside this criterion, the following criteria have significant impact: *level of defensive pressure (RPO)* and *defensive help (PO)*. Also, the greater weight

TABLE 4
ARITHMETIC MEANS (M), MINIMUM (Min) AND MAXIMUM (Max), AND STANDARD DEVIATIONS (S.D.) OF THE WEIGHTED GRADES GIVEN BY 10 BASKETBALL EXPERTS FOR THE 7 CRITERIA FOR THE DEFENSIVE PERFORMANCE QUALITY EVALUATION AND CORRELATIONS OF EACH CRITERION WITH THE OVERALL RESULT (r_{PLK}), CRONBACH'S COEFFICIENTS OF RELIABILITY AND THE RELATIVE IMPORTANCE COEFFICIENTS – WEIGHTS (WC)

	MEAN	Min	Max	S.D.	r_{PLK}		WC
RPO	**0.55**	**0.44**	**0.68**	**0.08**	**0.92**	0.86	**0.17**
PO	**0.49**	**0.33**	**0.61**	**0.08**	**0.90**	0.89	**0.16**
BŠ	0.31	0.23	0.41	0.06	0.72	0.87	0.11
OL	0.32	0.22	0.37	0.05	0.87	0.87	0.10
SUO	**0.81**	**0.56**	**1.04**	**0.17**	**0.92**	0.94	**0.24**
UTO	**0.41**	**0.33**	**0.51**	**0.05**	**0.53**	0.80	**0.14**
IVPO	0.33	0.26	0.40	0.04	0.80	0.83	0.11

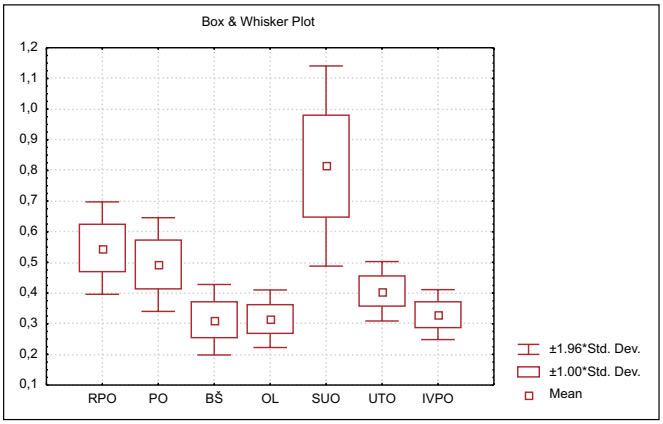

Fig. 4. Box – Whisker plot presents arithmetic means and standard deviations of the performance grades given by 10 basketball experts in seven criteria for evaluating the quality of play on defense.

of the *criterion blocking shots (BŠ)* is obvious, but it is not great enough. The degree of objectivity of evaluation ranges from 0.80, for *transition defense efficiency (UTO)*, to 0.94, for *defensive rebounding efficiency (SUO)*, which has the greatest sensitivity and importance coefficients for position 4. Therefore, the following criteria can be proposed for evaluation of quality of players at this position: *defensive rebounding efficiency (SUO)*, l*evel of defensive pressure (RPO)*, *defensive help (PO)* and *transition defense efficiency (UTO)*.

Position 5 – center

Objectivity coefficients are satisfactory (ranging from 0.88 to 0.96), except for the criterion *playing multiple positions on defense (IVPO)*, which has the smallest importance coefficients for position 5. Weighted results of players primarily playing position 5 clearly show that *defensive rebounding efficiency (SUO)* is the most significant factor in evaluation of the overall quality of the center defense. This result is a consequence of not only the greatest value of importance coefficients (0.26) for the criterion *defensive rebounding efficiency (SUO)*, but also because of the

TABLE 5
ARITHMETIC MEANS (M), MINIMUM (Min) AND MAXIMUM (Max), AND STANDARD DEVIATIONS (S.D.) OF THE WEIGHTED GRADES GIVEN BY 10 BASKETBALL EXPERTS FOR THE 7 CRITERIA FOR THE DEFENSIVE PERFORMANCE QUALITY EVALUATION AND CORRELATIONS OF EACH CRITERION WITH THE OVERALL RESULT (r_{PLK}), CRONBACH'S COEFFICIENTS OF RELIABILITY AND THE RELATIVE IMPORTANCE COEFFICIENTS – WEIGHTS (WC)

	MEAN	Min	Max	S.D.	r_{PLK}		WC
RPO	**0.43**	**0.32**	**0.56**	**0.07**	**0.85**	0.88	**0.14**
PO	**0.53**	**0.43**	**0.72**	**0.08**	**0.91**	0.89	**0.17**
BŠ	**0.45**	**0.28**	**0.64**	**0.12**	**0.79**	0.94	**0.14**
OL	0.30	0.23	0.41	0.06	0.91	0.91	0.10
SUO	**0.92**	**0.70**	**1.26**	**0.17**	**0.94**	0.96	**0.26**
UTO	0.32	0.23	0.46	0.07	0.90	0.91	0.11
IVPO	0.23	0.19	0.27	0.03	0.83	0.80	0.08

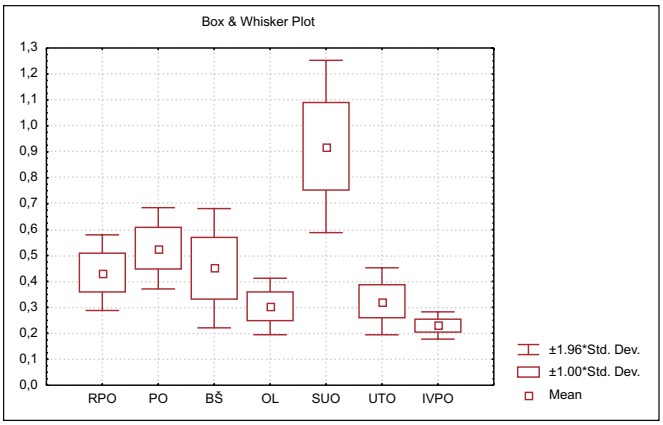

Fig. 5. Box – Whisker'plot presents arithmetic means and standard deviations of the performance grades given by 10 basketball experts in seven criteria for evaluating the quality of play on defense.

greater values of arithmetic means and standard deviation of non-weighted results in comparison with other criteria. Beside this criterion, the following criteria have more significant weight in evaluation of the overall quality performance on defense: level of *defensive pressure (RPO)*, *defensive help (PO)* and *blocking shots (BŠ)*, and should necessarily be included in the optimal system of criteria. Namely, the player at this position has to be the best team defender who organizes defense and erases errors committed by the other players on a team; he/she is a »master of paint« who makes decisions when to hedge, double-team, switch, or block shots and becomes an »intimidation factor« in paint to other team.

If the value of 0.87 is taken as a criterion for the objectivity coefficients assessment, which is commonly used in psychometric practice (because usual criterion for the error tolerance is 1/3 of standard deviation), it can be stated that the grades gathered from 10 basketball experts have satisfactory objectivity for the following criteria level of *defensive pressure (RPO)*, *blocking shots (BŠ)* and *defensive rebounding efficiency (SUO)*, while the criteria the *ball possession gained (OL)*, *transition defense efficiency (UTO)*, *playing multiple positions on defense (IVPO)* and *defensive help (PO)* are on the borderline level of objectivity. A reason for such results is due probably to the complexity, multidimensionality of certain criteria, which imply difficulties in precise definition. That makes, authors assume, harder for experts to recognize the attributes of the performance quality contained in some criteria. That specially concerns criteria *defensive help (PO)*, *transition defense efficiency (UTO)* and *playing multiple positions on defense (IVPO)*. The authors should assume that this exceptionally complex system of criteria, primarily dedicated to top level basketball experts, will be subjected to some changes and additions as the feedback from practice returns. That changes and adjustment should contribute to even better measuring attributes of the criterion system.

Based on the data gathered, and in order to create optimal system of criteria to evaluate players' performance on defense, the Table 6 has been created to clearly show that only criteria *level of defensive pressure (RPO)* and *defensive help (PO)* have significant influence (weught) on evaluation of the defensive quality on all

TABLE 6
PROPOSED STRUCTURE OF THE MOST IMPORTANT CRITERIA FOR THE PERFORMANCE QUALITY EVALUATION PER POSITIONS ON DEFENSE

CRITERIA	Position 1 – point guard	Position 2 – shooting guard	Position 3 – small forward	Position 4 – power forward	Position 5 – center
Level of defensive pressure (RPO)					
Defensive help (PO)					
Blocking shots (BŠ)					
The ball possession gained (OL)					
Defensive rebounding efficiency (SUO)					
Transition defense efficiency (UTO)					
Multiple positions playing on defense (IVPO)					

positions. The criterion *blocking shots (BŠ)* is important for position 5 – center, and *playing multiple positions on defense (IVPO)* for position 3 – small forward. Criteria *the ball possession gained (OL)* and *transition defense efficiency (UTO)* are used to evaluate defense performance for positions 1 – point guard, 2 – shooting guard and 3 – small forward (perimeter players), while the criterion *defensive rebounding efficiency (SUO)* is used for evaluating the inside players (4 – power forward and 5 – center) and players at position 3 – small forward. It should be noted here that the performance evaluation of players at position 3 – small forward is the most demanding because these players assume multiple roles, executing tasks of both the inside and perimeter players. Therefore the number of criteria applied in evaluation of their per- formance is the greatest. Also, it should be emphasized that the criterion *defensive help (PO)* has the smallest sensitivity and objectivity of all analyzed criteria. On the other hand, *defensive rebounding efficiency (SUO)* and *the level of defensive pressure (RPO)*, along with *blocking shots (BŠ)*, which is the least significant for evaluation of the defensive performance because it is important only for position 5, have the greatest objectivity and sensitivity.

Analysis of measuring attributes of criteria for evaluating the basketball players performance on offense

Position 1 – point guard

Degree of uniformity (objectivity) of basketball experts is the lowest with *efficieny of screening (PUB)* and *offense without the ball (NBL)* criteria which has been expected because these criteria have the lowest arithmetic means values, standard deviations and the position related importance coefficients. For other criteria the objectivity coefficients range from 0.85 to 0.95, which can be considered satisfactory, because they are in proportion with the importance coefficients (sole exception is a criterion *passing skills – VD*).

Effect of weighting is obvious in the results of descriptive parameters (Table 7), and especially in Box-Whisker plot

TABLE 7
ARITHMETIC MEANS (M), MINIMUM (Min) AND MAXIMUM (Max), AND STANDARD DEVIATIONS (S.D.) OF THE WEIGHTED GRADES GIVEN BY 10 BASKETBALL EXPERTS FOR THE 12 CRITERIA FOR THE OFFENSIVE PERFORMANCE QUALITY EVALUATION AND CORRELATIONS OF EACH CRITERION WITH THE OVERALL RESULT (r_{PLK}), CRONBACH'S COEFFICIENTS OF RELIABILITY AND THE RELATIVE IMPORTANCE COEFFICIENTS – WEIGHTS (WC)

	MEAN	Min	Max	S.D.	r		WC
KL	**0.43**	**0.35**	**0.51**	**0.06**	**0.93**	0.91	**0.124**
VD	**0.46**	**0.36**	**0.53**	**0.05**	**0.85**	0.85	**0.130**
PL	**0.38**	**0.27**	**0.49**	**0.06**	**0.96**	0.90	**0.112**
ŠVP	**0.38**	**0.28**	**0.49**	**0.07**	**0.86**	0.94	**0.115**
ŠUP	0.19	0.15	0.25	0.03	0.84	0.89	0.063
SB	**0.26**	**0.21**	**0.34**	**0.05**	**0.85**	0.93	**0.075**
IOP	**0.25**	**0.18**	**0.32**	**0.04**	**0.93**	0.92	**0.075**
PUB	0.12	0.11	0.15	0.01	0.29	0.62	0.044
NBL	0.19	0.17	0.22	0.02	0.52	0.64	0.067
SUN	0.10	0.07	0.12	0.02	0.53	0.85	0.037
UTN	**0.38**	**0.28**	**0.45**	**0.05**	**0.82**	0.85	**0.104**
IVPN	0.15	0.11	0.19	0.03	0.46	0.89	0.053

(Figure 6). Regarding the importance coefficients to weight the data of players primarily playing position 1 – point guard, one can see that criteria *passing skills (VD)*, *ball control (KL)*, *outside shot (ŠVP)*, *dribble penetration (PL)* and *transition offense efficiency (UTN)* have the highest arithmetic means and standard deviations, and consequently, greatest influence on determining the overall quality of performance on offense.

Beside those criteria, the criteria *free throws and drawing fouls* can pointed out as the criteria that have the greatest impact on determination of the overall quality of performance on offense. This statement is reinforced by the correlation coefficients of these criteria with the overall quality of players on offense variable. Based on these results the number of criteria can be reduced. It is obvious that for evaluating the quality of players who

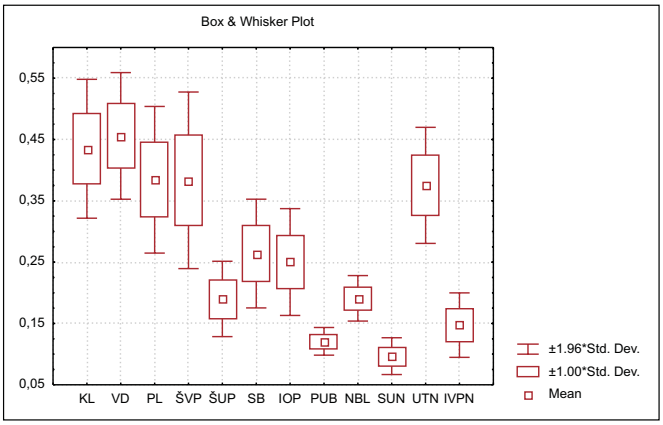

Fig. 6. Box – Whisker plot presents arithmetic means and standard deviations of the performance grades given by 10 basketball experts in twelve criteria for evaluating the quality of play on offense.

predominantly play this position on offense the criteria *inside shot, offense without the ball, efficieny of screening (PUB)*, and *playing multiple positions on offense (IVPN)* can be neglected and omitted from the optimal system of criteria without taking a risk. The same is not applicable for »special« plays that assign top players special tasks. Also, it is obvious that criteria b*all control (KL)*, *passing skills (VD)* and *transition offense efficiency (UTN)* differentiate this position from the others, because they significantly influence the evaluation of the overall quality of basketball players on offense for this position, being less significant for other positions. These results are in accordance with the ***primary role*** of the players at this position: to control the rhythm and flow of the game, in other words, the ability to decide on his/her own when and why to speed up or slow down the rhythm of the game and the ability to spot cracks in the opponents' defense and to direct offensive actions to use those cracks. This factor is directly linked with the fact that a player at this position must handle the ball and pass the ball without mistakes (he/she is due to find the player with the best open outside shot or dribble penetration) and has to make high percentage of open shots. A point guard must also be able to get his/her opponent off balance in one-on-one and one-on-two play.

Position 2 – shooting guard

Based on the descriptive indicators (Table 8 and Figure 7) of the criteria for evaluation of quality of basketball players on offense for position 2 – shooting guard, it can be concluded that criteria *outside shot (ŠVP)*, *free throws (SB)*, *dribble penetration (PL)*, *drawing fouls (IOP)* and *transition offense efficiency (UTN)* have the highest values of arithmetic means, the highest standard deviation values and very good objectivity coefficients, which is in accordance with their importance coefficients for this position. Single exception can be the *offense without the ball (NBL)* criterion that has lower objectivity and sensitivity. Therefore, those criteria will have critical role in evaluating the quality of basketball players at this position on offense.

Greatest arithmetic means and standard deviation of weighted grades are represented by criteria *outside shot (ŠVP)*

TABLE 8
ARITHMETIC MEANS (M), MINIMUM (Min) AND MAXIMUM (Max), AND STANDARD DEVIATIONS (S.D.) OF THE WEIGHTED GRADES GIVEN BY 10 BASKETBALL EXPERTS FOR THE 12 CRITERIA FOR THE OFFENSIVE PERFORMANCE QUALITY EVALUATION AND CORRELATIONS OF EACH CRITERION WITH THE OVERALL RESULT (r_{PLK}), CRONBACH'S COEFFICIENTS OF RELIABILITY AND THE RELATIVE IMPORTANCE COEFFICIENTS – WEIGHTS (WC)

	MEAN	Min	Max	S.D.	r		WC
KL	0.21	0.18	0.26	0.03	0.63	0.86	0.066
VD	0.22	0.18	0.30	0.03	0.72	0.87	0.075
PL	**0.39**	**0.29**	**0.53**	**0.09**	**0.89**	0.94	**0.113**
ŠVP	**0.52**	**0.39**	**0.62**	**0.09**	**0.85**	0.93	**0.133**
ŠUP	0.24	0.19	0.29	0.04	0.86	0.91	0.074
SB	**0.36**	**0.28**	**0.43**	**0.05**	**0.78**	0.93	**0.092**
IOP	**0.29**	**0.21**	**0.36**	**0.06**	**0.93**	0.94	**0.086**
PUB	0.13	0.10	0.17	0.02	0.41	0.90	0.045
NBL	**0.32**	**0.27**	**0.37**	**0.03**	**0.54**	0.72	**0.101**
SUN	0.13	0.11	0.17	0.02	0.13	0.89	0.045
UTN	**0.37**	**0.32**	**0.49**	**0.06**	**0.88**	0.92	**0.109**
IVPN	0.20	0.16	0.25	0.03	0.88	0.88	0.062

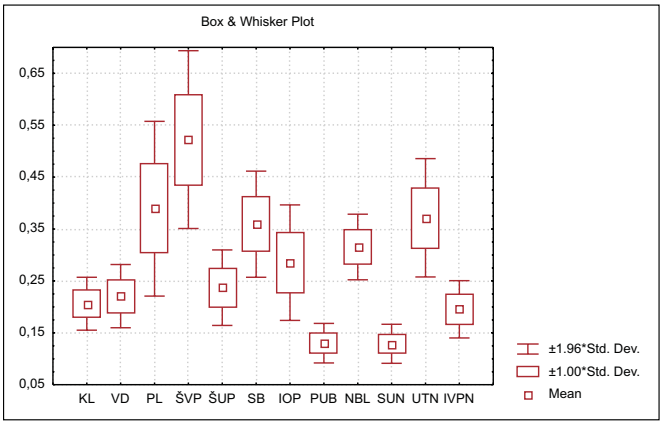

Fig. 7. Box – Whisker'plot presents arithmetic means and standard deviations of the performance grades given by 10 basketball experts in twelve criteria for evaluating the quality of play on offense.

and *dribble penetration (PL)*, giving them the greater weight on the overall performance quality of basketball players on offense.

Besides these important criteria, and in order to create the optimal system of criteria for evaluation of quality of players on offense, the following criteria can be proposed: *transition offense efficiency (UTN)*, *free throws (SB)*, *drawing fouls (IOP)* and *offense without the bal (NBL)l*, which would greatly optimize application of this system. The obtained results support the ***primary role*** of players playing this position (that is he/she is the prime finisher on both the transition and set offense),that is manifested in high percentage of outside shots, successfully finishing one-on-one and one-on-two situations with the ball, out-hustling opponents' defense in the transition offense and in ability to get a step ahead to receive the ball, since timely cuts into the gaps opponents' defense enable »player without the ball to score«. Therefore, players at this position have to be a constant »threat« to the rivals' defense creating room for others.

Position 3 – small forward

The lowest values of standard deviations and objectivity coefficients are for the criteria ball control, passing skills and efficieny of screening, namely, those are the criteria with the lowest importance coefficients for evaluation of quality at this position. All other criteria have satisfactory sensitivity and objectivity except for criteria dribble penetration (0.77), drawing fouls (0.82) and offense without the ball (0.82).

Analyzing descriptive parameters we can see dominant value of arithmetic mean and standard deviation of criterion outside shot, while other criteria have a more balanced weight (except for criteria ball control, passing skills and efficieny of screening), which is confirmed by correlation coefficients of those center with overall quality of players on offense variable. Also, in comparison with position 2 – shooting guard players, we can notice more weight of criteria offensive rebounding efficiency, playing multiple positions on offense and inside shot. That is in accordance with the role of players who ***primarily play*** this position, and is seen in their ability to score in transition and set offense (hitting outside shot, scoring one--on-one and one-on-two situations, out--hustling opponents in transition and ability to get open for to receive the ball). As

TABLE 9
ARITHMETIC MEANS (M), MINIMUM (Min) AND MAXIMUM (Max), AND STANDARD DEVIATIONS (S.D.) OF THE WEIGHTED GRADES GIVEN BY 10 BASKETBALL EXPERTS FOR THE 12 CRITERIA FOR THE OFFENSIVE PERFORMANCE QUALITY EVALUATION AND CORRELATIONS OF EACH CRITERION WITH THE OVERALL RESULT (r_{PLK}), CRONBACH'S COEFFICIENTS OF RELIABILITY AND THE RELATIVE IMPORTANCE COEFFICIENTS – WEIGHTS (WC)

	MEAN	Min	Max	S.D.	r		WC
KL	0.17	0.14	0.19	0.01	0.68	0.60	0.056
VD	0.20	0.16	0.23	0.02	0.72	0.71	0.069
PL	**0.31**	**0.25**	**0.37**	**0.04**	**0.77**	0.77	**0.103**
ŠVP	**0.45**	**0.35**	**0.56**	**0.06**	**0.75**	0.90	**0.122**
ŠUP	**0.29**	**0.21**	**0.36**	**0.04**	**0.80**	0.90	**0.091**
SB	**0.29**	**0.25**	**0.34**	**0.03**	**0.76**	0.89	**0.077**
IOP	**0.26**	**0.22**	**0.32**	**0.03**	**0.90**	0.82	**0.085**
PUB	0.17	0.14	0.20	0.02	0.65	0.75	0.056
NBL	**0.28**	**0.24**	**0.36**	**0.04**	**0.87**	0.82	**0.091**
SUN	**0.26**	**0.19**	**0.35**	**0.05**	**0.73**	0.90	**0.082**
UTN	**0.30**	**0.24**	**0.39**	**0.04**	**0.92**	0.86	**0.096**
IVPN	**0.24**	**0.17**	**0.28**	**0.04**	**0.92**	0.93	**0.072**

opposed to the guards, these players are more active in grabbing missed shots, scoring inside and drawing fouls.

Players at this position are in the same time perimeter and post players, linking back and front line of offense, therefore the highest number of criteria for evaluation of quality of players who primarily play this position. Moreover, we can say that criteria with less importance for this position are ball control, passing skills and efficieny of screening whose arithmetic means and standard deviations are the lowest by far and consequently, bear the least weight for evaluation of overall quality of players on offense for this position. We can see from the gathered data importance of criterion free throws, and the fact that players at this position, regarding number of important criteria, have to be versatile, in other words, capable

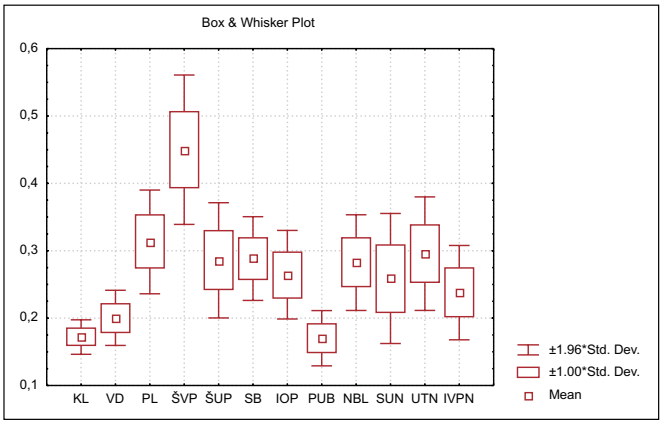

Fig. 8. Box – Whisker plot presents arithmetic means and standard deviations of the performance grades given by 10 basketball experts in twelve criteria for evaluating the quality of play on offense.

of playing equally several positions on the team (perimeter, post). That gives them a large number of tactical options, and allows their coach more freedom in creating various concepts of play in transition and set offense.

Position 4 – power forward

Arithmetic means and standard deviations of criteria or, efficieny of screening, inside shot, free throws, outside shot, drawing fouls and dribble penetration have somewhat higher values than other criteria. Above criteria have larger values of importance coefficients and very good objectivity coefficients (from 0.89 to 0.94). Good sensitivity and objectivity is shown by the criteria ball control and passing skills, even though their importance coefficients are very low, while the criteria offense without the ball, transition offense efficiency and playing multiple positions on offense have the poorest measuring attributes.

Effect of weighting is visible from descriptive parameters results (Table 10) and Box-Whisker plot (Figure 9). Considering that the importance coefficients for criteria offensive rebounding efficiency and inside shot are very high, there is a tremendous rise of their arithmetic means and standard deviations of these criteria giving them dominant role in evaluation of overall quality of basketball players at this position. Besides those criteria, efficieny of screening, drawing fouls, free throws, dribble penetration and outside shot have significant weight and have to be included in formation of optimal system of criteria for this position. In comparison to players at position 3 – small forward, we can see significant increase of weight of criteria inside shot, offensive rebounding efficiency and efficieny of screening, and decrease of weight of criteria outside shot and transition offense efficiency. That is in accordance with the role of players who ***primarily play*** this position and that is high efficiency of or (first or second rebounder on a team), scoring inside paint, efficieny of screening for perimeter shooters, drawing fouls and finishing dribble penetration with his back to the basket, and, in contrast to position 5 – center, better outside shot.

TABLE 10
ARITHMETIC MEANS (M), MINIMUM (Min) AND MAXIMUM (Max), AND STANDARD DEVIATIONS (S.D.) OF THE WEIGHTED GRADES GIVEN BY 10 BASKETBALL EXPERTS FOR THE 12 CRITERIA FOR THE OFFENSIVE PERFORMANCE QUALITY EVALUATION AND CORRELATIONS OF EACH CRITERION WITH THE OVERALL RESULT (r_{PLK}), CRONBACH'S COEFFICIENTS OF RELIABILITY AND THE RELATIVE IMPORTANCE COEFFICIENTS – WEIGHTS (WC)

	MEAN	Min.	Max	S.D.	r_{PLK}		WC
KL	0.16	0.13	0.20	0.02	0.82	0.90	0.050
VDP	0.18	0.13	0.24	0.03	0.77	0.92	0.063
PL	**0.28**	**0.21**	**0.35**	**0.05**	**0.95**	**0.89**	**0.091**
ŠVP	**0.24**	**0.19**	**0.32**	**0.04**	**0.60**	**0.90**	**0.075**
ŠUP	**0.40**	**0.29**	**0.54**	**0.07**	**0.91**	**0.94**	**0.119**
SB	**0.31**	**0.25**	**0.39**	**0.04**	**0.89**	**0.89**	**0.093**
IOP	**0.28**	**0.21**	**0.39**	**0.06**	**0.91**	**0.94**	**0.087**
PUB	**0.32**	**0.23**	**0.40**	**0.05**	**0.71**	**0.92**	**0.095**
NBL	0.19	0.17	0.23	0.02	0.76	0.77	0.064
SUN	**0.44**	**0.32**	**0.59**	**0.08**	**0.73**	**0.94**	**0.124**
UTN	0.22	0.19	0.25	0.02	0.63	0.65	0.070
IVPN	0.22	0.19	0.27	0.02	0.82	0.70	0.069

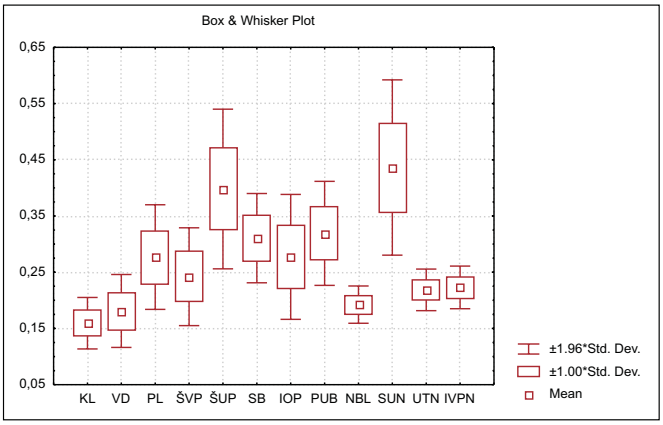

Fig. 9. Box – Whisker plot presents arithmetic means and standard deviations of the performance grades given by 10 basketball experts in twelve criteria for evaluating the quality of play on offense.

Position 5 – center

From the results of descriptive indicators and objectivity coefficients (Table 11 and Figure 10) we can see higher values of arithmetic means, standard deviations and objectivity coefficients (ranging from 0.87 to 0.94) for criteria inside shot, free throws, efficieny of screening, offensive rebounding efficiency, dribble penetration and drawing fouls. Other criteria have somewhat lower values of their arithmetic means, standard deviations and objectivity coefficients. Gathered results are completely in agreement with importance coefficients of those criteria giving us a clear indication of a choice of optimal number of important criteria for evaluation of quality of basketball players primarily playing position 5.

TABLE 11
ARITHMETIC MEANS (M), MINIMUM (Min) AND MAXIMUM (Max), AND STANDARD DEVIATIONS (S.D.) OF THE WEIGHTED GRADES GIVEN BY 10 BASKETBALL EXPERTS FOR THE 12 CRITERIA FOR THE OFFENSIVE PERFORMANCE QUALITY EVALUATION AND CORRELATIONS OF EACH CRITERION WITH THE OVERALL RESULT (r_{PLK}), CRONBACH'S COEFFICIENTS OF RELIABILITY AND THE RELATIVE IMPORTANCE COEFFICIENTS – WEIGHTS (WC)

	MEAN	Min	Max	S.D.	r		WC
KL	0.16	0.12	0.19	0.02	0.85	0.84	0.057
VD	0.18	0.15	0.23	0.02	0.84	0.84	0.065
PL	**0.32**	**0.22**	**0.46**	**0.07**	**0.95**	0.94	**0.105**
ŠVP	0.14	0.12	0.18	0.02	0.45	0.80	0.046
ŠUP	**0.43**	**0.32**	**0.58**	**0.08**	**0.91**	0.91	**0.128**
SB	**0.34**	**0.26**	**0.44**	**0.05**	**0.85**	0.89	**0.102**
IOP	**0.30**	**0.20**	**0.41**	**0.05**	**0.97**	0.92	**0.097**
PUB	**0.35**	**0.28**	**0.44**	**0.05**	**0.77**	0.87	**0.100**
NBL	0.20	0.16	0.24	0.02	0.95	0.84	0.068
SUN	**0.45**	**0.36**	**0.60**	**0.08**	**0.88**	0.91	**0.134**
UTN	0.15	0.11	0.21	0.03	0.86	0.95	0.050
IVPN	0.14	0.10	0.17	0.02	0.89	0.85	0.048

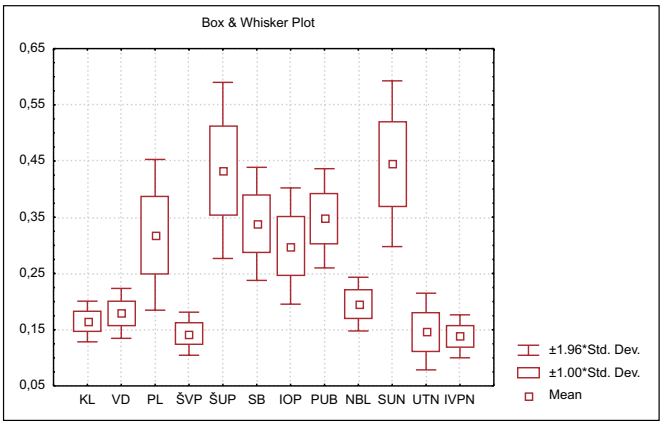

Fig. 10. Box – Whisker plot presents arithmetic means and standard deviations of the performance grades given by 10 basketball experts in twelve criteria for evaluating the quality of play on offense.

Weighting the gathered data for position 5, we can clearly see distinction of criteria with significant weight in quality evaluation. We can point out inside shot and offensive rebounding efficiency as the most significant criteria, and along with those criteria dribble penetration, free throws, drawing fouls and efficieny of screening have significant weight and ought to be include in formation of optimal system of criteria for this position. This result is consequence of not only the highest values of importance coefficients of those criteria, but also higher values of arithmetic means and standard deviations of non-weighted results in comparison with other criteria, and their objectivity coefficients are on satisfactory level (ranging from 0.87 to 0.94). Those results fully support many experts' opinions that primary role of players at this position are offensive rebounding efficiency, inside scoring, efficieny of screening for perimeter players, drawing fouls and scoring in one-on-one and one-on-two situations near the basket at low or medium post. Center's contribution on offense materializes in constant threat to most vulnerable area of defense with his play around the basket and great number of individual and team options with high percentage scoring options. Each pass received in the paint is potential score, drawn foul or three-point play (score and foul).

Based on the data gathered, in order to present more clearly, we formed Table 12 where we can clearly see that only criteria dribble penetration (inside players – back to the basket, outside players – facing the basket), free throws and drawing fouls have significant weight in evaluation of quality of players at all positions, while ball control and passing skills have significant weight just for position 1 – point guard, and playing multiple positions on offense is significant just for position 3 – small forward (multiple roles in the game).

The criterion *outside shots* is used to evaluate players at positions 1, 2,3,4, and *inside shot* and/or are used to evaluate players at positions 3,4,5. Transition offense efficiency is used for positions 2 and 3. We can see (like in the case of defense) that the most demanding evaluation is for position 3 players – small forward because those players have multiple roles, completing tasks of inside and outside players, linking back and front line of offense, and therefore, number of criteria for their evaluation is the greatest.

TABLE 12
PROPOSED STRUCTURE OF THE MOST IMPORTANT CRITERIA FOR THE PERFORMANCE QUALITY EVALUATION PER POSITIONS ON OFFENSE

CRITERIA	Position 1 – point guard	Position 2 – shooting guard	Position 3 – small forward	Position 4 – power forward	Position 5 – center
Ball control (KL)	■				
Passing skills (VD)	■				
Dribble penetration (PL)	■	■	■	■	■
Outside shot (ŠVP)	■	■	■	■	
Inside shot (ŠUP)			■	■	■
Free throws (SB)	■	■	■	■	■
Drawing fouls (IOP)	■	■	■	■	■
Efficiency of screening (PUB)				■	■
Offense without the ball (NBL)		■	■		
Offensive rebounding efficiency (SUN)			■	■	■
Transition offense efficiency (UTN)	■	■	■		
Playing multiple positions on offense (IVPN)			■		

Conclusion

The purpose of the research was to test empirically the weighted system of criteria for evaluating the actual quality of basketball players proposed by Trninić and Dizdar[2]. Based on the determined descriptive indicators, the coefficients of the relative importance of criteria, and on the degree of the objectivity level (interobservers' agreement) of the expert evaluations, it can be concluded that the measuring attributes (objectivity and sensitivity) for most of the criteria are in accordance with their relative importance coefficients for a particular position in the game. Consequently, a structure of the relevant criteria for each play position in the basketball is proposed:

Position 1 – point guard

- defense: level of defensive pressure, (RPO), the ball possession gained (OL), transition defense efficiency (UTO) and defensive help (PO)
- offense: passing skills (VD), ball control (KL), outside shot (ŠVP), dribble penetration (PL), transition offense efficiency (UTN), drawing fouls (IOP) and free throws (SB)

Position 2 – shooting guard:

- defense: level of defensive pressure (RPO), transition defense efficiency (UTO), the ball possession gained (OL) and defensive help (PO)
- offense: outside shot (ŠVP), free throws (SB), dribble penetration (PL), drawing fouls (IOP), transition offense efficiency (UTN) and offense without the ball (NBL)

Position 3 – small forward

- defense: level of defensive pressure (RPO), defensive rebounding efficiency (SUO), the ball possession gained (OL), transition defense efficiency (UTO), defensive help (PO) and playing multiple positions on defense (IVPO)
- offense: outside shot (ŠVP), dribble penetration (PL), transition offense efficiency (UTN), inside shot (ŠUP), drawing fouls (IOP), or (OR), free throws (SB) and offense without the ball (NBL)

Position 4 – power forward:

- defense: defensive rebounding efficiency (SUO), level of defensive pressure (RPO), defensive help (PO) and transition defense efficiency (UTO)
- offense: offensive rebounding efficiency (SUN), inside shot (ŠUP), drawing fouls (IOP), efficiency of screening (PUB), free throws (SB), dribble penetration (PL) and outside shot (ŠVP)

Position 5 – center :

- defense: defensive rebounding efficiency (SUO), defensive help (PO), blocked shots (BŠ) and level of defensive pressure (RPO)
- offense: offensive rebounding efficiency (SUN), inside shot (ŠUP), dribble penetration (PL), free throws (SB), efficiency of screening (PUB) and drawing fouls (IOP)

It is necessary to emphasize that criterion *defensive help* has above average importance for all positions and is, accordingly, included in the quality evaluation of basketball players at all positions, even though it has somewhat a lower sensitivity and objectivity among the all analyzed criteria on defense (0.83–0.90). It is probably a consequence of different understanding of the criterion among the experts – evaluators because of its definition and complex manifestation in the game. Namely, the criterion *defensive help* transcends the immediate perception level of various defensive helps, and undoubtedly is the most complex aspect of the collective responsibility on defense. Therefore a correction and simplifying of the definition of the criterion is needed in the terms of clarity and precise determination of the evaluation object. Hence a new criterion, named *defending the screens* is proposed. It would incorporate two individual aspects of play on defense: avoiding the screens and helping the screen defense, which were previously comprised in the criterion *defensive help*. That will allow to consider the *defensive help* criterion exclusively through the multiple aspects of helping on a player with the ball and as the integral part of a team defense responsible to stop the ball. Introduction of a new criterion should eventually increase the degree of the expert opinions uniformity.

Among all the criteria for the basketball players quality of play on offense evaluation, the criterion *offense without the ball*, which is among the most important criteria for the positions 2 and 3, has the smallest degree of uniformity of experts (0.72–0.87). Reasons for that difference between the relative importance coefficients and the degree of the uniformity of evaluators should be searched in differences among evaluators regarding the roles these players have in their own concepts of play.

The established instrument for evaluation of the elite players actual quality, besides the traditional gauges of the basketball performance, consists of other im-

portant criteria providing in that way the premises for the selection and direction system from the cadet to senior teams throughout players' sports careers. It can be applied in:

- directing young players (especially during the phase of specialization from the age of 16 to 20 years) to certain primary and secondary positions and roles in the game (testing momentary aptitude of a player to play a particular position),
- selection of players within the particular position (testing momentary level of the actual quality of play of an individual),
- following-up the situation-related performance per positions in the game
- following-up and control of the training process effects
- selection of individual and team solutions within the set concept of the game
- selection of individual and team play within a set system of play
- formation of a player's profile making his/her unique qualities obvious
- choice of the training programs that help develop and reinforce the stronger and correct the weak player's suits
- comparing players per positions and roles in the game within their team and with players at the same positions on other teams, given that their roles are equally defined, which helps the coach to discover whether that player creates advantage over his/her opponents in the game. While doing that, one must continuously have in mind that realization of a player's role is always a consequence of the coordination and cooperation between him/her and his/her teammates within the team system of play[17].
- comparing the changes in situation-related efficiency of a player in various time frames throughout his/her sports career[17].
- motivating players to self-evaluation

Experts are not able to utilize adequately all the aspects of the set criteria without systematic observation of a team of fellow experts, each of whom is assigned certain criteria (evaluates individual reactions in the game), based on the observed and registered performances in the game and on the analysis of the video – records covering the entire court length. Result of the video-records analysis is a ludogram – a graphic presentation of the records of players and ball's motion in the game. Ludogram is a kind of the »game letter« that allows notification of overall sequence of situations or event development in the game. That record makes it obvious which players and how they complete their game roles in various phases of the game. The so gathered facts, like mirrors, competently reflect precise image of each player and help deeper understanding of the most important performance criteria per positions in the game. A coach should use this to encourage players to analyze their performance and to self-improve their tactical and technical skills in order to minimize the number of errors in the game.

The authors have determined the attributes of the measurement instrument for the actual quality of top basketball players evaluation. To increase diagnostic and prognostic validity of the measurement instrument it is necessary to further improve the main measuring attributes and results gathered through its application. In succeeding steps of developing the system of criteria and its applicability, the latent structure of the criteria variables should be determined as well as overall importance of criteria with respect to the game of basketball. Additionally, to gain a better insight into the structure of an individual player quality, it is necessary to set and develop a system of criteria for evaluation of the specific desirable player's abilities, skills and

personal attributes that true values of top basketball players are built on. It is necessary to observe the criteria interactively and create a model for grading players performance, in other words, the players' efficiency index for games and practices. System of grading has to be in accordance with a system of play of each coach, since concept of play determines the the weight of the each performance criterion per positions on defense and offense. Each player has to be evaluated within his/her role in a system of play. That will allow following-up of his/ /her actual quality, and in particular, what is the most important in the high level sports, consistency in top performance.

However, it is important to notice that individual differences between elite players, and especially exceptional quality of some players, are determined by so-called »less important« criteria. *Differentia specifica* for a certain player will not be mere fulfillment of main criteria, but existence of skills that are not usually standard for that position. For example, for the position 1 on offense that could be the ability to score inside shots, or playing multiple positions or efficieny of screening in relation small – big player or, on defense, substantial rebounding contribution. The expert experience suggests that successful specialized players satisfy the most important criteria for a position, while universal, versatile players satisfy greater number of criteria for more positions. In other words, they can assume many roles in the game. The authors believe that high level and harmony of various abilities, skills and attributes make great players superior.

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EMPIRIJSKA PROVJERA PONDERIRANOG SUSTAVA KRITERIJA PROCJENE STVARNE KVALITETE VRHUNSKIH KOŠARKAŠA

S A Ž E T A K

Rad je nastavak istraživanja usmjerenih na oblikovanje sustava kriterija za ekspertnu procjenu stvarne kvalitete vrhunskih košarkaša. Dosad su definirana i opisana vanjska mjerila za procjenu igračke izvedbe, tj. mjere učinkovitosti opserviranih reakcija igrača u različitim situacijama i utvrđeni su koeficijenti važnosti kriterija po pojedinim pozicijama. Cilj ovog istraživanja bila je empirijska provjera ponderiranog sustava kriterija za procjenu stvarne kvalitete košarkaša koji su predložili Trninić i Dizdar (2000). Na temelju utvrđenih deskriptivnih pokazatelja i koeficijenata važnosti kriterija te stupnja objektivnosti (slaganja) ekspertnih ocjena moguće je zaključiti kako su za većinu kriterija metrijska svojstava (objektivnost i osjetljivost) u skladu s njihovim koeficijentima važnosti za pojedinu poziciju. U skladu s time predložena je struktura relevantnih kriterija za svaku poziciju u košarkaškoj igri.