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System of the Performance Evaluation Criteria Weighted per Positions in the Basketball Game

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A B S T R A C T

Based upon the expertise performed by ten basketball professionals relative importance coefficients with regard to positions in the game were determined for nineteen performance evaluation criteria. High degree of interobservers agreement was obtained concerning all positions (from 0.91 to 0.98). In concordance with the obtained results the particular play positions were explicitly described, as well as similarities and differences between them were determined from the aspect of the single criteria importance. The following criteria had an above average importance for the:

Position 1 – level of defensive pressure, transition defense efficiency, the ball control, passing skills, dribble penetration, outside shots, and transition offence efficiency;

Position 2 – level of defensive pressure, transition defense efficiency, outside shots, dribble penetration, offence without the ball, and transition offence efficiency;

Position 3 – transition defense efficiency, outside shots, dribble penetration, offense without the ball, free throws, and transition offence efficiency;

Position 4 – defensive and offensive rebounding efficiency, inside shots, dribble penetration, efficiency of screening, and free throws;

Position 5 – defensive and offensive rebounding efficiency, inside shots, dribble penetration, efficiency of screening, drawing fouls and three-point plays, and free throws.

The research results could be usefully applied by the basketball practitioners to selecting and following-up players, the teching-learning process directing and improving, the training process programming and the transformational effects controlling.

Introduction

The set of criteria for the actual quality or performance evaluation in basketball, that is efficiency estimation of manifested motor behaviour of individual players in a match, should inevitably enable assessment of the situation-related or

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game efficiency of a single player in relationship to the positions in the game, regions of the court, and phases of the game. That is regarded decisive from the standpoint of the high level competitive basketball praxis, that is under the imperative to win in a pursuit of significant sport achievements or in a *production* of sports results[1,2]. Namely, set of performance evaluation criteria, established and devised with regard to the abovementioned aspects, is the prerequisite for the rational and organized selection of players because it provides insight into the actual, authentic successfulness of each player in the stressful, hence performance hindering environment of a competition[2–5].

Contemporary trends to establishing comprehensive, integrative performance critearia for the individual and team aspects of an individual player's efficiency evaluation in sports games are based upon the growing agreement among sport science and sport pedagogy researches and practitioners (i.e. teachers and coaches) that performance in team sports, beyond the usual fitness components, results from the interaction of various facets of strategic and tactical efficiency as well as specific perceptual and motor skills [1,3,5–7]. That need for the authenticity of the performance assessment in the context of matches, that is in the »natural« competitive surrounding of sport, is equally apparent in education and in competitive sports in both the teaching-learning or training process and in the sports results »production«, that is winning. Top quality professional or, as they are usually refered to, »great« basketball clubs have at their disposal so called *corporative knowledge* [8], and managers have information on any high quality, either a mature or prospective basketball player. These informations are utilized for the decision making when selecting players for the particular positions and roles in the game during the process of creating a team.

For the evaluation of the basketball players quality of performance (players authentic, actual value estimation and characterization of his/her play) to be profound and balanced, authors established a set of nineteen criteria that allow adequate and maximally close assessment in regard to their competitive efficiency on defense (seven criteria) and offense (twelve criteria), applicable to all positions in the game[5]. However, despite the fact that the majority of experts in modern basketball do not advocate for the traditional classification of positions (from 1 to 5), except for the purposes of tactical alignment of players on the court within a set, game flow or phases of the game and concepts of the game or general strategy[2,9], the undeniable existence of differences between players who *primarily* play at a particular position should be taken into consideration[7,10]. These differences could be recognized as apparent differences in anthropological characteristics of players at different positions, hence different roles, assignments and tasks assigned to an individual player that are eventually manifested as players' behavour in a match that can be observed and measured as various performance or situation-related efficiency indicators that contribute variably to a team success. Therefore authors consider determination of a particular criterion relative importance coefficient or weight per a particular position in the game indispensable[2,5,7,9–12]. Namely, weighted criteria represent an optimal means for evaluating actual, authentic competitive qualities of players on both defense and offense. They facilitate assessment of performance or situation-related efficiency of a player as well as his/her self-evaluation during the training process and under the match stressful competitive conditions, which are target oriented to the

analysis of the strong and weak points in the individual and team aspect of play. Results of such an anylysis allow determination and planning of goals and substages in the process of improving (teaching-learning and perfecting) both the individual and team play of an individual. Such an integrative approach to the expert evaluation process or monitoring provides information on a player's game stability or consistency of performance in the long term.

Assessment of player's quality according to his/her actual, situation-related efficiency at a given points in time is one of the most fundamental and responsible aspects of coaching because adequate selection of players is the starting point in creating a »winning« team for the sports achievements production[2]. Recognition and understanding of the criteria relative importance (coefficients or weights) for a particular position provide a higher level of reliability and predictability of the selection process, that is the system of weighted criteria per positions decreases the possibilities for mistakes.

Previous research

One of the fundamental problems in the domain of the kinesiology of sport (i.e. applied kinesiology) is the crucial issue of the impracticability to measure objectively overall performance efficiency of individual players (entities) and a team in a game (the criterion variable[1,3–6,11,12]. The reason is undoubtedly a complex, multifactorial nature of the game itself, where reactions of players (decision making and execution of skills) are strongly influenced by constantly changing configuration of game (environment), on the one hand, and by his/her own abilities and network of knowledge or general and sport specific skills, on the other hand[1,5]. Due to the deficiency of the measurement instruments that could directly measure or assess quality of players, in many previous research studies the subjective estimation of the performance quality has been executed by independent basketball experts. On the basis of a suggested set of criteria they have usually estimated the effectiveness of a basketball player on a certain measurement scale (most frequently utilizing grades from 1 to 5).

Elbel and Allen[3] attempted, back in 1941, to better evaluate individual and team performance on the basis of registering play events (besides those evident in the official statistics of the game) that took place during the game (factors of success or failure) and had positive or negative influence on the eventual match score. Each factor/ item was subjectively weighted by grades that commensurated with its contribution to the winning success. Unfortunately, data concerning the opposing teams play were not recorded neither was the data acquisition procedure consistently applied through all the three observed seasons. Authors concluded that most of these events or factors occured frequently in the game, hence there was no doubt that they may actually spell the difference between victory and defeat. Therefore, the proposed model might be employed in the individual and team performance evaluation. For te present research it is important to point out that authors clearly discerned both the individual and team (a player's contribution to the team-mate's situation-related efficiency) aspect of one's play, thus making the basketball game analysis more profound and precise.

Dežman has devised[13–16] an expert system model that comprises the most important factors influencing directly the situation-related efficiency in a match. The model is applicable mainly in young players selection and in the training process control.

Swalgin[4] founded the national performance norms for the single game, sea-

son-to-date, and throughout the season overall situation-related efficiency of a player on the results of a three-year investigation on the American collegiate basketball players. The norms were established in relationship to position of play and time played. Author developed performance evaluation software (Basketball Evaluation System, BES) for assessing quality of play under the game conditions.

Trninić[2] analyzed the basketball game from the structural and functional aspect, defined states of the game and described playing positions and roles with regard to the players' assignments and tasks. It was pointed out that the existing official performance indicators are not sufficient for the individual and team play description and assessment. The author designated the desirable tendency in the player's development in accordance with the supposed changes of the rules of the game and conceptions of basketball in the future. In his/her vision author presumes that a player's successful game performance will be determined by how many tasks he/she is able to execute successfully during a game and not which position one plays (versatility or polyvalence within all the phases of the game course).

Gréhaigne, Bouthier and Godbout[6] proposed an original assessment procedure for the performance of individuals on attack in different team sports (basketball, team handball, rugby, football/soccer, volleyball). They have defined two derived indicators: the efficiency index and the volume of play. Combination of the two indices gives an insight into the authentic playing success based on the observation of players' offensive actions during matches. The study suggests the utilisation of general nomogram in various team sports in order to produce a single performance score by combining both indices.

Knowledge of the assessment results should be immanent to the teaching-learning process because it should provide each playerwith opportunity to be faced with both the strong and weak features of his/her game. That will inspire the problem approach to understanding the basketball game; players' reflection on their trials, success, and errors »feeds«, improves their tactical thinking. The described procedure is focused on the game events and actions that reflect situation-related efficiency of a player. They can be recorded during a match and coaches and players can use them the feed back for the corrections of play, i.e. for the team overall performance improvement.

Swalgin[7] conducted a research in order to determine validity of two basketball performance evaluation models. Within the research framework a group of top quality basketball coaches (n = 18) estimated the overall playing efficiency of the 45 NCAA players on the Likerts five grades measuring scale, where A equals 4.0, –A = 3.67, +B = 3.33, B = 3.0, –B = 2.67, +C = 2.33, C = 2.0, –C = 1.67, +D = 1.33, D = 1.0, –D = 0.67, F = 0.0. Author investigated relationship between unweighted (nonpondered) and weighted model of the BES by correlating them with a set of criterion scores established from another group of expert coaches. The results indicated both models correlated highly with the coaches' evaluation criteria. Additionally, the obtained results made it obvious that particularly four indicators of playing performance showed high variance between positions and distinguish each of them: rebounds, both offensive and defensive, as well as blockshots differentiate mostly centres from guards and forwards, assists distinguish guards from forwards and centres, while three-point field goals differentiate both forwards and guards from centres.

Trninić, Dizdar and Jaklinović[10] conducted research in order to determine the differences between the basketball players playing predominantly positions 1 and 2 – guards, 3 – forwards, and 4 and 5 – centres. The results of the discriminant analysis indicated that the anthropometric status distinguished players according to the playing position criteria, hence indirectly determining the roles, the tasks, and the jobs for each player in a game. These assignments manifest themselves in turn as the indicators of playing performance.

Trninić, Perica and Dizdar[5] proposed nineteen criteria for the overall performance evaluation (seven for the situation-related efficiency on defense and twelve on offense), applicable to all positions, in order to provide a means for profound monitoring and evaluating individual and team aspects of the quality of play of a single player.

The evaluation process based upon integrative, complex criteria, that is game oriented evaluation procedure is crucial for establishing expectations regarding consistent performance throughout the entire sports career of a player because it yields information reflecting both motor and tactical skills.

Therefore the research subject is determination of the relative importance coefficients (weights) of the performance evaluation criteria per positions in the basketball game. In concordance with the issue a special data acquisition procedure was designed, that is survey of the basketball experts opinions or estimations was accomplished, based upon requirements of the AHP (Analytic Hierarchy Process) method[17].

Obtained insights and cognitions present a basis for the analysis of necessary (obligatory, indispensable), basic and special skills needed for the successful performance at certain game position. Since each position has special requirements on the actual quality of a player, the obtained results should present the fundamental pressumption for the process of selecting players to a particular position in the game to be successful.

Methods

Performance evaluation criteria

In this research a system of criteria for the actual performance evaluation of basketball players at all positions was employed. Trninić, Perica and Dizdar[5] established a set of seven criteria for evaluating performance in the defensive phase of the game:

- 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 twelve criteria for evaluating performance of players at all positions in the offensive phase of the game

- THE BALL CONTROL (KL)
- PASSING SKILLS (VD)
- DRIBBLE PENETRATION (PL)
- OUTSIDE SHOTS (ŠVP)
- INSIDE SHOTS (ŠUP)
- FREE THROWS (SB)
- DRAWING FOULS AND THREE-POINT PLAYS (IOP)
- EFFICIENCY OF SCREENING (PUB)
- OFFENCE WITHOUT THE BALL (NBL)

– OFFENSIVE REBOUNDING EFFICIENCY (SUN)
– TRANSITION OFFENCE EFICIENCY (UTN)
– PLAYING MULTIPLE POSITIONS ON OFFENCE (IVPN).

Positions of players in the basketball game

Positions and roles assigned to players in the basketball game are nowadays defined variedly. In general, basketball coaches preferably classify basketball players into two groups: inside or post players (positions 4 and 5) and outside or perimeter players (positions 1, 2 and 3)[9,18]. Common or traditional division into guards (positions 1 and 2), forwards (position 3) and centers (positions 4 and 5), more precisely into: position 1 – play maker or point guard; position 2 – off guard or shooting guard; position 3 – small forward; position 4 – power or big forward; and position 5 – center, is mostly often used as the basic distribution or positioning of players on the court (set of positions, both the offensive and defensive) determined by particular game tactics[8,10]. Term swingman type player represents the notion of players who are able to fulfill the play requirements of two positions (positions 1 & 2, 2 & 3, 3 & 4, and 4 &5). Besides, one could differ among players from the aspect of roles they assume in the game (e.g. a shooter, rebounder, passer, blocker or others). That is mostly because tactics is easily represented by the role and tasks assignements to a particular player within the frame of certain concept of play, as well as by the regulated sequence of organised actions in all the phases of the game. Recently, classifications of players into inside and outside players or players specialists and polyvalent/versatile players are used most often. From the abovementioned it is obvious that experts name individual players on a certain position by the assumed roles.

Since in the basketball game the classical, common division recognizes five basic positions and associated roles (1– a point guard, 2 – a shooting guard, 3 – a small forward, 4 – a power forward, 5 – a centre), it is important to determine the significance (weighting factors) of each criterion in the performance evaluation regarding the particular position. Namely, each playing position (role) in a set demands specific abilities, traits and skills (motor knowledge) of players, hence the level of their development and harmonious interrelations indirectly dictate what tasks will be assigned to a particular player[2,10,16]. From there arises a presumption that the relative importance of certain criteria will vary across positions in the game. Therefore the establishment and operationalization of the functional model of criteria for the individual performance or actual quality evaluation regarding the playing positions on defense and offense was conncted with the notion of the expert system evaluation. The relationships/ correlations among criteria were determined and hierarchical structure and weighting factors for each criterion per positions established on the basis of the subjective expertise and assessment of eminent basketball professionals.

Basketball experts

Persons regarded as basketball experts in this research were expert players and expert coaches who had to pertain to a team (national or club) that had won:

- a medal at the European or World Championships or at the Olympic Games;
- the first place in one of the European club competitions (Club Championship Cup/ Champions League, Cup Winners Cup or the Radivoj Korač Cup);
- National Championship.

Data acquisition and processing methods

Coefficients of importance by positions in the game for the particular items within the defined set of criteria for the situation-related efficiency/ performance of basketball players on defense and offense (it will be refered to only as *criteria* in further text) were determined by means of the AHP (Analytic Hierarchy Process) method for the multicriterial decision-making by T.L. Saaty[17]. Application of the AHP method was executed through several steps:

The first step – Every basketball expert evaluated importance of each criterion by comparing it with the other ones in pairs and registrating the relative importance for a particular position in the game (thus each criterion was compared to all others on the subset of defense or offense – for example, if the criterion »A« is twice as important as the criterion »B«, then in the matrix of pairwise comparisons value 2 was assigned at the position AB, while 2 was assigned at the position BA). Thus each basketball expert (in further text *judge*) produced a square reciprocal matrix of grades for each position in the game, that is for each position on defense ten square reciprocal matrices (the number of judges was 10) were generated and the same was done for the positions on offense. In total, judges produced 50 square reciprocal matrices (number of positions was 5) for defense and 50 square reciprocal matrices for offense.

The second step – Vectors of the coefficients of importance were then computed from each matrix by employing the geometric mean method (GMM). In that way one vector of the coefficient of importance for each criterion was obtained from every one judge and the coefficients of importance matrix was formed for each position in the game:

– for defense:
  $5_{positions}$ matrices of the type
  $7_{criteria}$ 10_{judges}
– for offense:
  $5_{positions}$ matrices of the type
  $12_{criteria}$ 10_{judges}

The third step – Vectors of arithmetic means and standard deviations of the importance coefficients for each position in the game were then computed from the obtained matrices (5 vector for defense and 5 for offense).

The fourth step – Vectors of the arithmetic means of the coefficients of importance were then rescaled in the manner that their sum equaled one.

Reliability of the established importance coefficients (weights) of the performance criteria for each position in the game was determined by computing:

- correlation means of judges (RMS – rank means scores) agreement,
- Cronbach's reliability coefficient ( ).

Results and Discussion

Tables 1 and 3 present arithmetic means (A.S.) and standard deviations (S.D.) of grades, obtained from 10 basketball expert coaches or players, for the relative importance of 7 criteria for defensive and 12 criteria for offensive performance evaluation with regard to the particular positions in the game. Cronbach's measure of reliability or objectivity (alpha) ranges from 0.91 to 0.98, indicating a high degree of agreement among judges. The lowest degree of agreement in experts opinions was obtained when the position 3 – forward was regarded. The result is expected and sensible since players who primarily play at that position assume multiple roles, meaning that they execute both the inside and the outside game tasks and jobs during all the phases of the game. On defense, for example, a

player at the position 3 – forward must be able to control successfully the opposing both the post and perimeter players and must be a good rebounder at the same time. Since forwards frequently change their playing zones (perimeter or post space), the high level of adaptability to different roles in the game should be prominent feature of their performance quality. These characteristics played a role of hindering factor in expertise determination of the criteria relative importance for the forwards' performance evaluation.

TABLE 1
ARITHMETIC MEANS (AS) AND STANDARD DEVIATIONS (SD) OF THE GRADES GIVEN BY TEN EXPERT JUDGES FOR THE RELATIVE IMPORTANCE OF 7 EVALUATION CRITERIA FOR THE PERFORMANCE ON DEFENSE PER EACH POSITION IN THE GAME, AS WELL AS THE CORRELATION MEANS OF JUDGES (RMS) AND CRONBACH'S ALPHA ( )

	AS_1	SD_1	AS_2	SD_2	AS_3	SD_3	AS_4	SD_4	AS_5	SD_5
RPO	0.243	0.030	0.209	0.027	0.174	0.029	0.170	0.049	0.138	0.055
PO	0.156	0.017	0.161	0.014	0.145	0.011	0.159	0.028	0.171	0.037
BŠ	0.062	0.014	0.073	0.027	0.080	0.020	0.105	0.038	0.142	0.033
OL	0.179	0.025	0.163	0.027	0.134	0.028	0.101	0.026	0.099	0.022
SUO	0.094	0.024	0.115	0.029	0.168	0.040	0.242	0.043	0.257	0.034
UTO	0.170	0.034	0.165	0.031	0.167	0.030	0.138	0.031	0.112	0.030
IVPO	0.096	0.019	0.114	0.034	0.132	0.032	0.111	0.032	0.081	0.022
RMS	0.89		0.77		0.57		0.74		0.75	
	0.98		0.96		0.91		0.95		0.96	

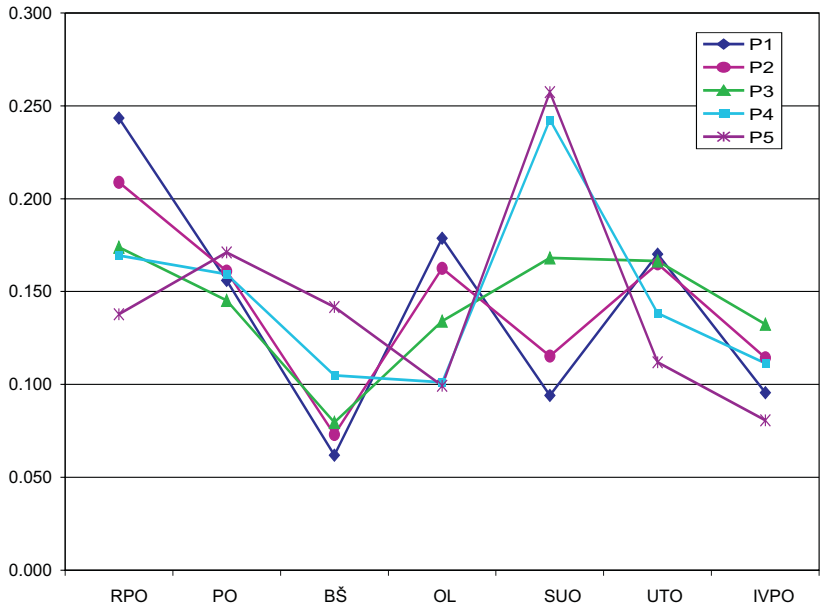

Fig. 1. Arithmetic means of the seven criteria relative importance coefficients per positions for the performance evaluation of a basketball player on both the transition and set defense.

TABLE 2
COMPARABLE SIMILARITIES AND DIFFERENCES BETWEEN THE RELATIVE IMPORTANCE COEFFICIENTS PER POSITIONS FOR THE DEFENSIVE PERFORMANCE EVALUATION CRITERIA OF PLAY

Criteria	Position 1 – point guard	Position 2 – shooting guard	Position 3 – small forward	Position 4 – power forward	Position 5 – center
Level of defensive pressure	Very high importance	Very high importance	Medium importance	Medium importance	Medium importance
Defensive help	Low to medium importance	Low to medium importance	Low to medium importance	Medium importance	Medium importance
Blocking shots	Very low importance	Very low importance	Low importance	Low to medium importance	Medium importance
The ball possession gained	Medium importance	Medium importance	Low to medium importance	Low importance	Low importance
Defensive rebounding efficiency	Very low importance	Low importance	Medium importance	Very high importance	Very high importance
Transition defense efficiency	Medium to high importance	Medium to high importance	Medium to high importance	Low to medium importance	Low to medium importance
Playing multiple positions on defense	Low importance	Low importance	Medium importance	Low to medium importance	Low importance

Defensive performance evaluation criteria

Tables 1 and 2, as well as the Figure 1 make it obvious that there exists similarity of the relative importance of single criteria for the situation-related efficiency assessment on both the transition and set defense between position 1 – play maker (point guard) and position 2 – shooting guard (guards), as well as between position 4 – power forward and position 5 – center (centers). The greatest differences of the criteria relative importance are apparent between guards and centers in the following criteria: in favour of centers *defensive rebounding efficiency* and *blocking shots*, while in favour of guards *level of defensive pressure, the ball possession gained* and *transition defense* efficiency. These differences should be taken into account, despite the general opinion among experts that in modern basketball all players must be able to exert high defensive pressure in their primary playing zones on both the transiton and set defense.

The obtained results (Tables 1 and 2) allow explicite description of the particular playing positions on defense from the criteria relative importance aspect. The distinctions between them become apparent as well. Namely, overall comprehension of the positions and roles significance is a foundation for the adequate concept of play design.

Position 1 – play maker (point guard) – the *level of defensive pressure* has very high importance, *transition defense effi-*

ciency has medium to high importance, *the ball possession gaining* ability has medium importance and *defensive help* somewhat lower, *playing multiple positions on defens e*(versatility) has low importance, and *defensive rebounding efficiency* and *blocking shots* have very low importance. Therefore, based on the obtained results, we can conclude that the main determinant of success of the players who play position 1 – play maker, is the level of defensive pressure that is evident in his/her ability to exert and maintain pressure on the opposing play maker (point guard) with the goal to prevent dribble penetration, to influence the direction and speed of the dribbler and to reduce opponents' preferable attack conclusions and potential successful scores. This player primarily plays on the top of the first defensive line and sets the tone for his/her teammates with his/her defensive play, primarily defensive pressure. Also, he/she creates difficulties for opponents' ball protection and control, bothers timely and precise passes, controls passing lanes which results in reduction of offensive options for the opponents. Because they guard fast opposing plyers, the players of such a profile should be the fastest in situation solving. Very often they are the best in the ball possession gaining. On transition defense this player must prevent opposing point guard to dribble down the middle or by the sideline and, by doing this, prevent development of opponents' transition game. We may say that these players are leaders of *set and transition defense.* Players playing this position have to be the source of communication on defense and encourage and help teammates adjust their position on defense. Therefore we can conclude that point guard, due to his/her role in the game, is the key player in establishing organization of team's play and control of the intensity of play because he determines level of defensive pressure on the top, which results in steering the direction and speed of the ball flow, slowing down opponents' offense and prevention of »easy points« by slowing down the ball progress. He/she helps his/her team-mates with timely communication in showing defensive signs, relaying coach's messages to co-plyers stimulating the speed of the defensive adjustment.

Position 2 – shooting guard – *level of defensive pressure* has very high importance, *transition defense efficiency* has medium to high importance, *the ball possession gaining* has medium importance and *defensive help* somewhat lower, ability to *play multiple positions* (versatility) and *defensive rebounding efficiency* have low importance, while *blocking shots* has very low importance. Consequently, main determinant of the shooting guard's defensive play is level of exertion and maintaining of the defensive pressure, as well. This player usually guards opponents' best shooter who as a rule gets screens in succession to set him free. Therefore his/her primary defensive role is to prevent his/her opponent from getting the ball at 45' angle to the basket or free throw line. In transition defense, together with point guard, he/she is responsible to close the initial phase of opponents' fast break in horizontal or vertical direction, to maintain defensive pressure and he/she is second in gaining the ball steals. The results show high similarity of players playing position 1 or 2. However, we can see that importance of defensive pressure criterion is larger for the point than for the shooting guard. Defensive rebounding and playing multiple positions on defense criteria are more important for the shooting guard since their opponents use more post up maneouvers on the transition or set defense. That is understandable since the shooting guards are taller than the point guards. That allows them more chances in defensive rebounding and makes

them more versatile players than the point guards.

Position 3 – *small forwards – transition defense efficiency* has medium to high importance, *level of defensive pressure, playing multiple positions on defense* and *defensive rebounding* has medium importance, while *the ball possession gaining* and ability to play *defensive help* somewhat lower and *blocking shots* has low importance. It can be seen from the results obtained that position 3 players are situated between guards and post players in all criteria (in *level of defensive pressure* criterion they are more similar to the post players and in other criteria to the guards). The previous does not apply *for playing multiple positions* criterion that is the most important for this position. So, it is obvious that the smallest variability of the criteria relative importance to determine performance on transition and set defense is with small forwards, which is understandable since they accomplish tasks both of the perimeter and inside players. Therefore, from the team point of view, it would be optimal if this player can play perimeter and interior defense since he/she can get the assignement to guard the opponents' best shooter, or their most versatile player. Therefore, small forwards should have both the perimeter and interior players' characteristics. On the set defense, they prevent guard – forward and wing – post passing lanes, disturb opponent's outside shot which requires good foot speed. On the other hand, they should be able to play solid post defense which requires adequate height, physical aggressiveness and absolute body strength in the contact play. On transition defense small forward and shooting guard have important role in preventing wide development of fast break, denying pass along side line and, by doing that, denying »easy points«. From the rebounding point of view his/her role is more important than the guards' one since he/she has to box out his/her assigned small forward who is usually second or third offensive rebounder. Therefore, small forward makes both interior and perimeter plays which makes him team's most versatile player. It is no coincidence that many most valuable players statistically are small forwards. For example, NBA's MVPs (most valuable players) are: 46.6% forwards, centers 33.4% and 20% guards. (H. Brown, Nike Euro Camp Barcelona, 1999 – personal communication).

Position 4 – power forward – *defesive rebounding efficiency* has very high importance, *level of defensive pressure* and *defensive help* have medium importance, *playing multiple positions on defense, transition defense efficiency* and *blocking shots* somewhat lower, while *the ball possession gaining* has low importance. For players playing positions 4 and 5 (center) high similarity in defined criteria is apparent. Nevertheless, importance of the *transition defense efficiency* and playing multiple positions on defense criteria is higher for the position 4, while the criteria of *defensive rebounding efficiency* and *blocking shots* are more important for the center position. So, power forwards cover larger court area by the range of moving (between perimeter and interior) than centers do, since they control opponents on the wings, corners and inside positions, and are also in control of team defense. Power forward has to rebound successfully on defense as team's best or second best rebounder.

Position 5 – center – *defensive rebounding efficieny* has very high importance, *level* of *defensive pressure, blocking shots* and *defensive help* medium importance, *transition defense efficiency* somewhat lower, *the ball possession gaining* and *playing multiple positions* (versatility) have low importance. Centers are the tallest and the strongest players and therefore most responsible for the team aspect of

defense (control of the middle, defensive rebounding and shot blocking). With respect to his/her position on the back of defense, center has to be »director« of defense since he directs his/her teammates defensive play from the back. That is manifested as timely communication, hedging, closing the passing lanes, timely rotations after dribble penetration, denying high percentage shot position to opposing center and denying the pass in »A« and »B« zones which marks the level of defensive pressure on the post positions. We can conclude that the centers have the most significant and demanding role in team defense since they have to be the toughest interior defenders, players who protect their »teammates backs« and best defensive rebounders. This is seen in establishing help in the lane (stopping the opposing team, not just »his/her« defensive assignment). So, centers control the lane and by doing that they try to deny penetration to the basket and opponents' inside play, actually, high percentage shot actions. This reduces offensive rebounding chances, opponents' ability to draw fouls, which creates difficulties for the opponent to set up transition defense. Many coaches consider their centers as most valuable players on transition and set defense since they have many individual and team responsibilities that are critical of successful team play.

Offensive performance evaluation criteria

Based on the results obtained (Tables 3 and 4) it is possible to describe explicitly particular positions in the game from the criteria importance aspect as well as differences between them.

Position 1 – point guard – ball control and passing skills are of very high importance, dribble penetration ability and offensive transition are very important, free throws and drawing fouls have low to medium importance, posts scoring ability and playing without the ball are of low importance, and setting solid screens, of-

TABLE 3
ARITHMETIC MEANS (AS) AND STANDARD DEVIATIONS (SD) OF THE GRADES GIVEN BY TEN EXPERT JUDGES FOR THE RELATIVE IMPORTANCE OF 12 EVALUATION CRITERIA FOR THE PERFORMANCE ON OFFENSE PER EACH POSITION IN THE GAME, AS WELL AS THE CORRELATION MEANS OF JUDGES (RMS) AND CRONBACH'S ALPHA ( )

	AS_1	SD_1	AS_2	SD_2	AS_3	SD_3	AS_4	SD_4	AS_5	SD_5
KL	0.124	0.019	0.066	0.021	0.056	0.024	0.050	0.020	0.057	0.023
VD	0.130	0.015	0.075	0.013	0.069	0.018	0.063	0.015	0.065	0.015
PL	0.112	0.013	0.113	0.013	0.103	0.012	0.091	0.021	0.105	0.027
ŠVP	0.115	0.017	0.133	0.013	0.122	0.014	0.075	0.030	0.046	0.020
ŠUP	0.063	0.021	0.074	0.027	0.091	0.021	0.119	0.016	0.128	0.021
SB	0.075	0.017	0.092	0.026	0.077	0.015	0.093	0.027	0.102	0.025
IOP	0.075	0.016	0.086	0.028	0.085	0.024	0.087	0.021	0.097	0.022
PUB	0.044	0.009	0.045	0.009	0.056	0.016	0.095	0.029	0.100	0.026
NBL	0.067	0.007	0.101	0.017	0.091	0.020	0.064	0.010	0.068	0.014
SUN	0.037	0.006	0.045	0.014	0.082	0.013	0.124	0.020	0.134	0.024
UTN	0.104	0.018	0.109	0.019	0.096	0.027	0.070	0.019	0.050	0.014
IVP	0.053	0.009	0.062	0.020	0.072	0.023	0.069	0.025	0.048	0.018
RMS	0.85		0.77		0.59		0.76		0.78	
	0.98		0.96		0.92		0.96		0.97	

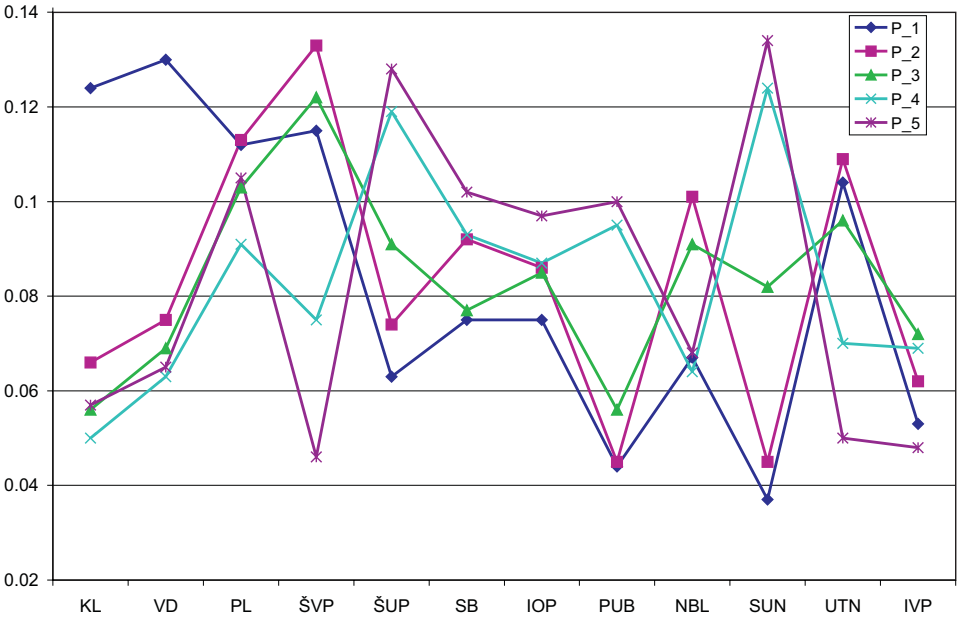

Fig. 2. Arithmetic means of the twelve criteria relative importance coefficients per positions for the performance evaluation of a basketball player on both the transition and set offense.

fensive rebounding and playing multiple positions (versatility) are rated very low. Based on the results we can conclude that ball control is a primary determinant of the point guard's success in the game, which is manifested in his/her ability to get the ball from defense to offense rapidly and safely, dribbling or passing the ball to the open man. Since he plays on the top of offense, he has to be able to penetrate in 1on1 and 1 on 2 situations. He also has to hit high percentage of shots from the outside to force the defense to «come up high« to pressure the ball and reduce defense's ability to help on other players. Finding solutions in offensive transition against various pressing defenses and to find different ways to finish the play marks this/her position. This/her all points out that basic tasks of the point guard is to control the ball, pass the ball on time to the man in best position, while we cannot expect him to set solid screens or play multiple positions on offense. Therefore, players playing this/her position have to concentrate on their responsibility to organize the offense and control the ball.

Position 2 – shooting guard – outside shot is of very high importance, dribble penetration ability, offensive transition and playing without the ball are very important, free throws and drawing fouls have medium importance, ball control, passing skills and post scoring ability are of low to medium importance, playing multiple positions (versatility) has low importance and setting solid screens, offensive rebounding are rated very low. This/her player has to be best outside shooter and be able to score in 1 on1 and 1 on 2 dribble penetration. Also, shooting guard has to run fast break and beat the opponents down the floor and realize that

TABLE 4
COMPARABLE SIMILARITIES AND DIFFERENCES BETWEEN THE RELATIVE IMPORTANCE COEFFICIENTS PER POSITIONS FOR THE OFFENSIVE PERFORMANCE EVALUATION CRITERIA OF PLAY

Criteria	Position 1 – point guard	Position 2 – shooting guard	Position 3 – small forward	Position 4 – power forward	Position 5 – center
The ball control	Very high importance	Low to medium importance	Low importance	Very low importance	Very low importance
Passing skills	Very high importance	Low to medium importance	Low to medium importance	Low importance	Low importance
Dribble penetration	High importance (facing the basket)	High importance (facing the basket)	High importance (with both the face and back towards the basket)	Medium to high importance (back towards the basket)	High importance (back towards the basket)
Outside shots	High importance	Very high importance	Very high importance	Low to medium importance	Very low importance
Inside shots	Low importance	Low to medium importance	Medium importance	Very high importance	Very high importance
Free throws	Low to medium importance	Medium importance	Medium to high importance	Medium to high importance	High importance
Drawing fouls and 3-point plays	Low to medium importance	Medium importance	Medium importance	Medium importance	Medium to high importance
Efficiency of screening	Very low importance	Very low importance	Low importance	Medium to high importance	Visoka važnost
Offense without the ball	Low importance	High importance	Medium to high importance	Low importance	Low importance
Offensive rebounding efficiency	Very low importance	Very low importance	Medium importance	Very high importance	Very high importance
Transition offense efficiency	High importance	High importance	Medium to high importance	Low to medium importance	Very low importance
Playing multiple positions on offense	Very low importance	Low importance	Low to medium importance	Low to medium importance	Very low importance

Notes

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advantage to get himself free to receive the ball. Shooting guard has to be the cornerstone of scoring in transition and set offense, so he has to develop scoring habits, confidence and will to score.

Position 3 – small forward – outside shot is of very high importance, dribble penetration ability is very important, offensive transition, offense without ball (playing without the balll on offense) and free throws have medium to high importance, post scoring ability, drawing fouls and offensive rebounding ability have medium importance, passing skills and playing multiple positions (versatility) are of low to medium importance, ball control and setting solid screens are rated low. Small forward, along with shooting guard is best outside shooter and he opens up the lane for his/her team's inside play. He has to be able to find the best option in 1 on 1 and 1 on 2 play in the middle and along the baseline. He also helps the guards beat the press. Small forward must beat the defense down the court in primary and secondary break and play in post up situations successfully, scoring and drawing fouls. This/her player has to be skilled enough to play without ball to »punish defensive positioning« by opening up inside or outside. As opposed to the guards, he must rebound on offense, and what separates him from all other positions is his/her presence in fighting for short and long rebounds due to his/her range of motion on the court. That allows small forward best position to get offensive rebound since the opponents primarily concentrate on closing the basket lanes to power forward and center. Also, as opposed to the guards, he must be able to play both inside and outside positions, actually, play multiple positions which allows him to be the team's most valuable player and as such greatly influence team's success. Small forward has to make timely pass into post and be a creator and the link between front and back line of offense. We can conclude that small forward is in the same time perimeter and interior player, second and third offensive rebounder, outside shooter and a creator and the link between front and back line of offense.

Position 4 – power forward – offensive rebounding and post scoring is of very high importance, dribble penetration ability, setting solid screens and free throw shooting have medium to high importance, ability to draw fouls has medium importance, low to medium importance outside shot, offensive transition and playing multiple positions (versatility), playing without ball and passing skills have low importance, while ball control is of very low importance.

It is important for this/her player to be successful rebounder (best or second best rebounder on the team) and to be able to score inside. Power forward often shoots in the crowd drawing large number of fouls, which emphasizes the importance of making high percentage of free throws. Also, his/her role is to set solid screens for outside shooters and cutting inside after defensive maneuvers to offset the screen. This/her player has to be able to draw fouls and score on the drive (primarily with his/her back to the basket). Player who plays this/her position must be able to hit open shots, not only inside, but also from outside as well.

Position 5 – center – offensive rebounding and post scoring is of very high importance, dribble penetration ability, setting solid screens and free throw shooting have high importance, ability to draw fouls has medium to high importance, low to medium importance playing without ball and passing skills have low importance, while outside shot, offensive transition and playing multiple positions (versatility), ball control is of very low importance. Position 5 player has the hardest assignments not only on defense, but on offense as well and those are: offensive

rebounding, inside scoring, setting solid screens, drawing fouls with additional free throw (3-point plays) as well as finding right option in 1 on 1 and 1 on 2 situations with his/her back to the basket in the area 3m from the hoop. Considering the fact that the center often shoots »squeezed« in the lane, and is fouled most frequently, he should be high percentage free throw shooter. Like power forwards, centers are responsible for setting solid screens and punishing opponents hedging. Center has to make timely and precise outlet pass while opening the fast break, get out of double teams by hitting the open cutter and be able to pass across the lane.

Conclusions

election of marquee players in modern basketball should be based on the set of criteria for the situation-related efficiency evaluation, the quality of reaction in game situations that are determined as significantly important for a certain position and role in the game[1,2,5,6]. Understanding the relative importance of each of the mentioned criterion and recognition of both the strong and weak points of each player's game is a precondition, not only for assigning the place and role for a player on a team, but to allow expert – coach as well to steer a player to what he can successfully accomplish within his/her authentic competitive abilities.

Results of this research show that there is a high degree of agreement among basketball experts about the importance of mentioned criteria for the performance evaluation on both the defense and offense for each position on a team. Also, it is possible to describe explicitly certain position from the aspect of the criteria relative importance.

Differences and similarities can be observed for all positions. Point guard organizes and controls offense, while on defense he dictates level of pressure due to his/her position on the court.

Shooting guard is team's best scorer (outside shot and ball penetration) and most often second best ballhandler. Defensively, he has to keep the pressure level up and avoid screens. As opposed to the point guard, shooting guard must rebound better because his/her defensive assignment shoots more, so he/she has to block him/her out. This player has to be able to play defense on perimeter and inside because shooting guard has more post up maneuvers in transition and set offense.

Small forward is similar to shooting guard (level of defensive pressure, transition defense), and what separates him from the perimeter players is rebounding (second or third rebounder on a team).

Power forward and center are primarily responsible for rebounding on offense and defense, finishing up inside plays on offense and control of the lane on defense (denying easy points by drive through the lane). Power forward, as opposed to center position, has to be able to play defense on perimeter and inside (for example, switching on a pick and roll).

Center must be the best inside defensive player (rebound on defense, help out on drives and be best shot – blocker) and the best inside scorer.

It is obvious that for all positions in the game level of defensive pressure and ball penetration are of above average importance.

We assume that, from the game situation-related efficiency aspect, all basketball players will have to be apt in playing together (co-operation), driving to the hoop facing and/or with the back to the hoop, hitting free throws, rebounding on defense, exerting defensive pressure in their playing area, transition defense and offense, defending the screens and other aspects of help defense[2,5,10].

To sum it up at the end, development of basketball game will presumably lead to players who can play all positions on the court, assuming various roles depending on the phase of the game and their place on the court. That is why the inside players will be able to play outside and vice versa. We find it most valuable how many critera a player can satisfy during particular phases of the game, and not just which position he/she plays. Therefore, evaluation of players based on the criteria of the situation-related efficiency in the context of the game is a foundation for rational and organized selection of a team, selection of adequate concept of play and for the programming integrated training technology, primarily directed at production of the marquee, top quality players.

Based on the results of our research it could be stated that a player who primarily plays certain position must, by all means, satisfy the criteria that are of above average relative importance for the position in question. This implies each player should satisfy basic conditions and possess primary and secondary skills and specials that allow him/her acceptable level of the situation-related efficiency at certain positions on the court. At present, only the most talented players are taught to and trained for the versatile play. Nevertheless, it is important to stress that versatile players must have their original or primary position on the court (despite polyvalent skills and tactics) that allows them to actualize and exploit optimally their abilities and strong sides entirely within the concept of play and phases of the game.

The above mentioned (Tables 1–4) underlines the importance of the structure of the above average important criteria or requirements a player must optimally meet to be acceptably successful at a particular position. That means it is possible to reduce the number of performance evaluation criteria with no significant reduction in amount of information on the actual quality of a player. Results suggest various combinations of different complex or multifacets authentic performance quality features exist and they allow for the most predictable prognosis of whether a player is going to be successful or not. That, certainly, does not exhaust the vast domain of relevant researchable issues in the performance assessment of an individual player.

It is important to point out in the conclusion that dynamics, complexity and everchanging nature of the basketball game are based on changes of the game rules, hence on innovations in skills and tactics. That further implies the relative importance of the performance evaluation criteria per positions will be subjected to changes as well. Since the cause-and-effect sequence of the relationship among the game rules, skills (techniques) and tactics directly influences the selection of players and game concepts, as well as teaching-learning process or training, permanent insight into it becomes conditio sine qua non of the continuos progress of players and teams in the elite basketball.

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PONDERIRANI SUSTAV KRITERIJA ZA PROCJENU SITUACIJSKE USPJEŠNOSTI IGRAČA PO POZICIJAMA U KOŠARKAŠKOJ IGRI

S A Ž E T A K

Na temelju ekspertne procjene deset eminentnih košarkaških stručnjaka, utvrđeni su koeficijenti važnosti devetnaest kriterija za procjenu situacijske uspješnosti igrača u obrani i napadu po pozicijama u košarkaškoj igri. Eksperti su pokazali visok stupanj slaganja (od 0,91 do 0,98) u procjeni važnosti kriterija za sve pozicije u košarkaškoj igri. U skladu s dobivenim rezultatima eksplicitno su opisane pojedine pozicije u igri kao i usporedne sličnosti i razlike između njih. Kriteriji koji imaju natprosječnu važnost za pojedinu poziciju u igri:

Pozicija 1 – razina pritiska u obrani, uspješnost u tranzicijskoj obrani, kontrola lopte, vještina dodavanja, prodor s loptom i šut s vanjskih pozicija i uspješnost u tranzicijskom napadu.

Pozicija 2 – razina pritiska u obrani, uspješnost u tranzicijskoj obrani, šut s vanjskih pozicija, prodor s loptom, napad bez lopte i uspješnost u tranzicijskom napadu.

Pozicija 3- uspješnost u tranzicijskoj obrani, šut s vanjskih pozicija, prodor s loptom, napad bez lopte, slobodna bacanja i uspješnost u tranzicijskom napadu.

Pozicija 4 – skakačka uspješnost u obrani i napadu, šut s unutarnjih pozicija, prodor s loptom, pravljenje uspješnih blokova i slobodna bacanja.

Pozicija 5 – skakačka uspješnost u obrani i napadu, šut s unutarnjih pozicija, prodor s loptom, pravljenje uspješnih blokova, iznuđivanje osobnih pogrešaka i realizacija te slobodna bacanja.

Dobiveni rezultati mogu značajno pomoći košarkaškim stručnjacima u selekciji igrača, planiranju i programiranju treninga te u vrednovanju transformacijskih efekata.