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EFFICIENCY OF BALL MANIPULATION IN BASKETBALL PLAYERS

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Abstract. *Basketball belongs to the type of sports where the skill of using one's arms is of the greatest significance for game success. Basketball technique elements which involve the use of the ball are realized solely with the use of the arms, and this is where the name "ball manipulation" stems from. Modern basketball requires top basketball players to display the greatest level of the mentioned ability, irrespective of the playing positions within the team. The aim of this research has been to determine the situational-motor skill of a basketball player's ball manipulation efficiency with regard to the basketball competition rank. A sample of 30 participants was analyzed, and split into two subsamples (the first subsample consisted of basketball players from the Super League, i.e. the players from the Konstantin basketball team from Niš – 15 participants, and other basketball players from the First Regional League for Men, the Junior Youth Basketball Club from Niš – 15 participants). The ball manipulation efficiency was estimated through the following tests: ball stopping, starting dribbling, ball dribbling around the body, ball dribbling through the legs and leading the ball with variants. In order to determine the inter-group differences, the Multivariate Analysis of Variance (MANOVA) was applied, while the differences between the groups were determined with the Analysis of Variance (ANOVA) for every measuring instrument separately. It was determined that the basketball players of the Super League display significantly greater values in almost all the variables, except one – ball stopping.*

Keywords: *basketball players, ball manipulation, competition rank, differences.*

INTRODUCTION

In basketball, specific motor skills are especially significant. The specific abilities which are essential for successfully practicing basketball are also called situational-motor

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skills (SMS) because they are mostly “composed of precisely determined combinations of basic motor skills and, to a smaller extent, functional and cognitive skills and conative characteristics” (Jovanovic, 1998, 47). Basketball belongs to the type of sports where the skill of using your arms is of the greatest importance for success in a game. The basketball technique elements which involve the use of the ball are realized solely with the use of the arms, which is where the name ball manipulation originates from (Kocic, 2007, 23). Basketball is a dynamic sport in which the players of each team move across the whole court for a limitless game. Assuming a favorable position for scoring is realized through a timely and swift movement of the player who plays offense without the ball to counter the opponents’ defense. Movement with the ball is realized solely when a player has possession of the ball, i.e. When his team is playing offense. A player can move with the ball in situations when he is leading the ball or dribbling, pivoting and shooting after taking a step, or the so-called basketball two-step. Only when leading the ball or dribbling and pivoting with the ball can this ability be precisely estimated by measuring the time (Kocic, 2007, 23). As part of the SMS that can be objectively assessed, a player’s movement with the ball depends on two factors: basic motor skills (speed, explosive power, coordination, flexibility, balance and precision, among others), as well as the level of the adopted elements of basketball techniques, which are primarily linked with ball leading or dribbling, and represent the basis of situational-motor tasks. In modern basketball, top basketball players are expected to display the highest level of the mentioned SMS, irrespective of the gaming positions within the team (Kocic, 2007, 23). New scientific research supports the thesis that the game result indisputably depends on the SMS basketball player (Jovanovic-Golubovic & Jovanovic, 2003; Andrejic, 2008; Bogdanis, Ziagos, Anastasiadis, & Maridaki, 2007; Brekalo, Maric, Blazevic, Kostovski, & Crnjac, 2013; Coelho E Silva et al., 2010; Kamandulis et al., 2013; Karalejic, Jakovljevic, & Macura, 2011; Kocic, 2005, 2007; Maric, Katic, & Jelcic 2013; Mirvic, 2006; Mladenovic & Bilic, 2008; Ortega, Palao, Gómez, Lorenzo, & Cárdenas, 2007; Pavlidou, Michalopoulou, Aggeloussis, & Kioumourtzoglou, 2006; Razanica, 2006; Rubin, 2009; Ceremidzic, 2006). Ball control entails holding the ball and the ability for fast and controlled manipulation of the ball in relation to a player’s body. In practice, a player who possesses good ball control is usually said to have a good ball handling sense. Such a player is most frequently successful in all the elements of ball play techniques. The aim of this research was to determine the SMS-efficiency of a basketball player’s ball manipulation with regard to the basketball competition rank.

METHOD

A sample of 30 participants was analyzed and split into two subsamples. The first subsample was comprised of the players from the Super League, more precisely the players of the *Konstantin* Basketball Club from Nis – 15 participants. The second subsample consisted of basketball players from the First Regional League for Men, i.e. those from the *Junior* club, a Youth Basketball Club from Nis – 15 participants. All the participants who are basketball players from the Super League have a professional contract with the club they are playing for. The measuring instruments for the estimation of anthropometric characteristics were the following: height (cm) and weight (kg). The efficiency of ball manipulation was estimated in the following tests: *ball stopping* (STOL), starting dribbling (ZAPD), ball dribbling around the

body (KLOT), ball dribbling through the legs (KLKN) and leading the ball with variants (VLSV). The measuring instruments for the estimation of the SMS – ball manipulation efficiency in basketball were taken from the research of Jovanovic – Golubovic et al (2003). In order to obtain scientific results, adequate steps were taken in the research, which corresponded to the nature of the presented research aim. The following was calculated: Fundamental descriptive parameters and Measurement discrimination (two procedures were applied: Skewness-SKEW and Kurtosis-KURT). The Multivariate Analysis of Variance (MANOVA) was used for the determination of inter-group differences, while the differences between the groups were determined with the Analysis of Variance (ANOVA) for every measuring instrument separately.

RESULTS

Table 1 Statistical parameters of anthropometric measures of the basketball players from the *Konstantin* Basketball Club

MI	N	MEAN	MIN	MAX	SD	ERROR	SKEW	KURT
TV	15	196.18	177.0	210.0	9.08	2.426	-0.795	0.860
TM	15	94.01	74.00	110.0	10.8	2.894	-0.243	-0.660

The results of the fundamental statistical parameters of anthropometric measurements of the players from the *Konstantin* basketball club, displayed in table 1, show that Skewness indicates a slight negative asymmetry in both measurements, as its value does not exceed the limit of ± 1.00 , while Kurtosis indicates a fuzzy or platykurtic distribution.

Table 2 Statistical parameters of the anthropometric measures for the basketball players of the *Junior Youth* Basketball Club

MI	N	MEAN	MIN	MAX	SD	ERROR	SKEW	KURT
TV	15	191.21	179.0	205.0	7.04	1.882	0.309	0.197
TM	15	89.86	70.00	116.0	11.9	3.190	0.557	0.481

The fundamental statistical parameters of anthropometric measurements for the basketball players of the *Junior Youth* Basketball Club are presented in table 2. In both measurements, the Skewness emphasizes a slight positive asymmetry (of ± 1.00). The values of the Kurtosis present results which are below 2.75, which represents a fuzzy or platykurtic distribution.

Table 3 Statistical parameters of the situational-motor skills of ball manipulation efficiency for the basketball players of the *Konstantin* Basketball Club.

MI-SMS	N	MEAN	MIN	MAX	SD	ERROR	SKEW	KURT
STOL	15	9.43	8.00	10.00	0.85	0.228	-1.050	-0.695
ZAPD	15	1.02	0.72	1.52	0.24	0.064	0.792	-0.235
KLOT	15	46.71	40.00	52.00	3.87	1.035	0.002	-1.282
KLKN	15	28.00	22.00	33.00	2.99	0.798	-0.424	-0.066
VLSV	15	4.58	4.10	5.25	0.39	0.103	0.452	-1.072

By analyzing the fundamental statistical parameters of the situational-motor skill of ball manipulation efficiency for the basketball players of the *Konstantin* Basketball Club, presented in table 3, it was noted that the distribution of the data calculated with the Skewness in most tests indicates a slight positive or negative asymmetry, as its value does not exceed the limit of ± 1.00 . However, in the case of *ball stopping* (STOL -1.050), we may notice values which are slightly above the determined limits. In all the tests, the values of Kurtosis show results which are below 2.75, which represents a fuzzy or platykurtic distribution.

Table 4 Statistical parameters of the situational-motor skill of ball manipulation efficiency for the basketball players of the *Junior* Youth Basketball Club

MI-SMS	N	MEAN	MIN	MAX	SD	ERROR	SKEW	KURT
STOL	15	9.00	7.00	10.00	1.11	0.296	-0.789	-0.609
ZAPD	15	1.29	0.74	1.89	0.32	0.086	0.229	-0.476
KLOT	15	41.21	38.00	46.00	2.42	0.648	0.957	0.536
KLKN	15	25.21	20.00	32.00	3.81	1.017	0.101	-1.022
VLSV	15	4.90	4.25	5.69	0.38	0.102	0.322	0.391

Table 4 shows the fundamental statistical parameters which represent the test results of the situational-motor skill of ball manipulation efficiency for the basketball players of the *Junior* Youth Basketball Club. In a large number of tests, Skewness indicates as lightly positive asymmetry (the existence of a greater number of numerically higher results than the arithmetic means), apart from *ball stopping* (STOL -0.789) with a slightly negative asymmetry. The values of Kurtosis show results below 2.75, which represents a fuzzy or platykurtic distribution.

Table 5 The Multivariate Analysis of Variance between the basketball players of the *Konstantin* Basketball Club and the *Junior* Youth Basketball Club in ball manipulation efficiency

Wilks' Lambda	F	P-level
.531	3.89	.011*

By calculating the significance of the difference between the levels of arithmetic mean values for all the tests between the basketball players of the *Konstantin* Basketball Club and the *Junior* Youth Basketball Club (Table 5), a statistically significant difference was determined, as Wilks' Lambda test equals .531, which shows the significance of the differences at the P-level = .011 with a unit F-ratio of 3.89. Therefore, statistically significant differences were determined in the applied system of the tested skills of the participants.

Table 6 The Analysis of Variance between the basketball players of the *Konstantin* Basketball Club and the *Junior* Youth Basketball Club in ball manipulation efficiency

MI-SMS	MEAN- KK <i>Konstantin</i>	MEAN- OKK <i>Junior</i>	F	P-level
STOL	9.43	9.00	1.31	.262
ZAPD	1.02	1.29	6.64	.016*
KLOT	46.71	41.21	20.30	.000**
KLKN	28.00	25.21	4.64	.041*
VLSV	4.58	4.90	4.94	.035*

By using the Analysis of Variance for ball manipulation efficiency between the basketball players of the *Konstantin* Basketball Club and the *Junior* Youth Basketball Club (Table 6), on the basis of the F-ratio coefficient and their relevance (P-level), it was determined that there is a statistically significant difference in starting dribbling (ZAPD .016), ball dribbling around the body (KLOT .000), ball dribbling through the legs (KLKN .041) and ball dribbling with variants (VLSV .035). In the case of ball stopping (STOL .262), a statistically significant difference was not recorded.

DISCUSSION

The mean values of height and weight present similar values when compared to previously published research. The Super League players dominate when it comes to maximum height value, which is the expected value when compared to the sample of participants and the expected results. Such values are explained through proper and adequate selection with regard to the competition rank, while the mentioned conclusion is supported by some of the previously published research (Nozinovic, Nozinovic, & Nozinovic, 2002; Coelho E Silva et al., 2010; Karalejic et al., 2011). The quantitative differences obtained in the mean values are not statistically different, which supports the claim that all the participants belong to the same population in qualitative terms. Considering the structural characteristics of basketball in which the dynamism, quick change of direction and rhythm of movement on all positions are the basic characteristic, this leads to the conclusion that special attention needs to be paid to the development of ball manipulation efficiency during the training process, regardless of the competition rank, if the aim is to succeed in the game. Practice has shown that a small amount of time is devoted to this situational-motor skill during training, which is also confirmed by the research of certain authors (Kocic, 2005; Trunic, 2006). As part of the SMS, ball manipulation efficiency occupies a dominant and relevant position in the equation of basketball success specification, so the acquired results in the subsample of participants from the Super League players show statistically far greater values in almost all variables, apart from one. The reasons for all this can be found in the significance which is ascribed to the adoption and development of the aforementioned due to the fact that other skills and traits which are important to succeed in basketball are developed through situational training. The greatest influence on the development of ball manipulation efficiency, as part of the SMS, lies in the training process, which is different for all team members, then the competition cycle, which is also different for all the team members, but which also serves the development

of the mentioned to practical applicability, as well as the impact of all other factors common to all team members. Based on this conclusion, the obtained quantitative differences between the tested subsamples are expected and in accordance with the conclusion on the very important emphasis on the perfection of the SMS (technique) of a basketball player. All the results in both subsamples are at a level which is obviously characteristic of a basketball player population which is registered in clubs and which competes in different competition ranks, which is also supported by previous research (Trunic, 2006; Kocic, 2007). A ball manipulation skill represents a skill needed to perform complex motor tasks (basketball techniques) in which the ball is the object which is to be manipulated during movement and when standing still, with or without bouncing off the ground, which specifically requires a fine regulation of arm movement. A high level of preparedness in ball manipulation enables the successful usage of other tactical skills of the players during the game. Therefore, the ball manipulation skill should be considered one of the key prerequisites in achieving the desired success in basketball. Based on this, it is our conclusion that the basketball players of the Super League have a better developed SMS of this type, and this conclusion is supported by previously published research (Andrejic, 2001; Kocic & Jovanovic, 2006; Maric et al., 2013; Kamandulis et al., 2013). Generally speaking, the basketball players of the Super League are better at ball manipulation efficiency than the basketball players of a lower competition rank. Since the efficiency of any subject directly depends on the level and interpersonal relations of anthropological characteristics, the obtained differences, which were expected, were the result of the following factor groups: systematic influence of the training, which is the same for the members of one team; less systematic impact of the played games, which changes from game to game and is different for the members of one team; non-systematic impact of all the other factors and the suitable distribution of the content which enabled the alternating activation of all the most important mechanisms responsible for the efficiency of the global type. In our opinion, the absence of the difference in ball stopping is the result of many factors which influence the quality of the players. Practice has shown that talent is most important, but only the most persistent stay in professional sports. In certain clubs, it sometimes happens that the players who are both the most talented and the most persistent stay in the club, while the best players of some other clubs do not stay for some reason.

CONCLUSION

The conclusions reached based on the discussion of the results indicate that there is good orientation in the work with tested basketball players. Furthermore, the existence of differences in ball manipulation efficiency of the basketball players competing in different competition ranks indicates high-quality work in basketball schools, starting from the lowest lineups. The fact that the lineup is different in different teams also supports the explanation concerning the difference in quality. In addition to the aforementioned, the differences in player quality between the clubs are also influenced by material, personnel, social and other conditions. The SMS of ball manipulation efficiency represents a significant factor in the equation of success specification in basketball. The dominant role of the aforementioned for achieving success in practicing basketball makes the issue of the mentioned skills current and particularly interesting to basketball experts. The results of this research may serve as a model for further study in the field of SMS basketball

players, as well as for getting answers to the questions that this research has not covered. The relevance of this paper would be reflected in the application of the obtained results during daily training practice. We believe that the right intensity, duration and persistence in basketball training can ensure an efficient way of a continuous improvement of SMS basketball players, especially the efficiency of ball manipulation. The contribution of this research lies in the determination of the state of training among the basketball players from the Super League and the First Regional League for Men, and the possibility of showing the direction in which the theory and practice of basketball player training should be directed with regard to the competition rank. The theoretical value of this research lies in the fact that basketball coaches and professionals in the field of basketball will increase the information level concerning the differences of the tested SMS in the basketball players of the Super League and the First Regional league for Men. The obtained results concerning the differences in ball manipulation efficiency within the SMS should enable a greater level of individualization of the training process, and would be especially useful for the adequate planning, scheduling and execution of the work.

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EFIKASNOST MANIPULISANJA LOPTOM KOD KOŠARKAŠA

Košarka spada u sportske igre gde umešnost korišćenja ruku ima najveći značaj za uspeh u igri. Elementi tehnike u košarci koji uključuju upotrebu lopte isključivo se realizuju rukama, pa otuda i dolazi naziv: manipulisanje loptom. Od vrhunskih košarkaša se u savremenoj košarci očekuje najviši stepen pomenute sposobnosti, bez obzira na igračke pozicije u ekipi. Cilj ovog istraživanja bio je utvrđivanje situaciono-motoričke sposobnosti, efikasnost manipulisanja loptom košarkaša u odnosu na rang takmičenja košarkaša. Analiziran je uzorak od 30 ispitanika, podeljen u dva subuzorka (prvi subuzorak činili su košarkaši Supr lige i to KK "Konstantin" iz Niša-15 ispitanika i drugi košarkaši Prve muške regionalne lige i to OKK "Junior" iz Niša-15 ispitanika). Efikasnost manipulisanja loptom procenjivana je sledećim testovima: štopovanje lopte, započinjanje driblinga, kruženje lopte oko tela, kruženje loptom kroz noge i vođenje lopte sa varijantama. Za utvrđivanje međugrupnih razlika je primenjena multivarijantna analiza varijanse (MANOVA), a razlike između grupa za svaki merni instrument pojedinačno, su utvrđivane univarijantnom analizom varijanse (ANOVA). Utvrđeno je da košarkaši Super lige imaju značajno veće vrednosti u gotovo svim varijablama, sem u jednoj-štopovanje lopte.

Ključne reči: košarkaši, manipulisanje loptom, rang takmičenja, razlike.