

Original research article

DIFFERENCES IN THE SITUATIONAL-MOTOR SKILLS (PRECISION) AND EFFECTIVENESS OF SERBIAN VOLLEYBALL PLAYERS OF THE FIRST AND SECOND LEAGUE

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Abstract. *The aim of this research was to determine the differences in situational-motor skills (precision) and effectiveness between the First and Second Volleyball League players. The research was conducted on a sample of 100 elite and sub-elite, male volleyball players, members of the First and Second League Team, who volunteered to participate in the study. An analysis of the effectiveness of the players and the teams is based on the evaluation of the effectiveness of at least four technical-tactical elements: service, setting, serve receive and the spike. Situational-motor tests for precision were conducted in volleyball elements: service, setting, serve receive and spike. A statistically significant ($p \leq 0.05$) difference was found in almost all the situational-motor precision variables. A significant difference was not found only in the PRPVO, PRPVE and DIPRIZ variables (≥ 0.05). The differences ($p \leq 0.05$) in the effectiveness of the game between the teams from the First and Second League exist only for the variables Sep, SE+, SE-, PS=, SMp. In all the other variables a difference could be found, but without statistical significance ($p \leq 0.05$). The importance of elementary technique at different competition levels could be confirmed with this kind of research. Further studies should deal with performing volleyball accuracy tests under conditions of physical exertion because performing after physical exertion is what is expected of volleyball players during actual games.*

Key words: volleyball, skills, evaluation, accuracy.

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INTRODUCTION

Today, volleyball, after a century of existence, is a modern branch of sport, with one million registered players of both genders, a whole 'army' of recreational players, top sports events, with over 220 countries that are members of FIVB (The World Volleyball Federation). Volleyball is very attractive, interesting, complex and dynamic sport, with a constant quick transfer of action from one half of the court to the other, in which the teams attempt to achieve victory by scoring a greater number of points, achieved by successful spikes and 'scheming' on the part of the opposing team. (Stojanović, Kostić, & Nesić, 2005). In addition, it is a sport that requires players to compete in frequent short bouts of high-intensity exercise, followed by periods of low-intensity activity (Kunstlinger, Ludwig, & Stegemann, 1987; Viitasalo et al., 1987). The high-intensity bouts of exercise, coupled with the total duration of the match (approximately 90 minutes), requires players to have well-developed aerobic and anaerobic alactic (ATPCP) energy systems (Viitasalo et al., 1987). Considerable demands are also placed on the neuromuscular system during the various sprints, jumps (blocking and spiking), and high-intensity court movement that occurs repeatedly during competition (Hakkinen, Pakarinen, & Kallinen, 1993). Although volleyball players rely on well-developed physiological capacities, volleyball is also a game that requires high levels of tactical and technical skill (Gabbett et al., 2006).

Some of the early skill tests have focused on passing (Liba & Stauff, 1963) and serving (Kronqvist & Brumbach, 1968). In each of these tests only one basic volleyball skill was assessed. In more recent skill tests, a battery of fundamental volleyball skills was evaluated. Bartlett, Smith, Davis & Peel (1991) evaluated a test composed of serving, receiving a ball with the forearm pass (coming across the net), and setting a ball (coming from different angles). Thissen-Milder & Mayhew (1992) developed a battery that combined (a) specific volleyball activities such as spiking (throwing the ball up and hitting it into the floor), receiving the ball with the forearm pass, and passing the ball at a rectangle target apparatus marked on the wall; (b) physical tests; and (c) motor tests. Coaches often use skill tests to assess their athletes' skill level in the basic fundamentals of the game, such as serving, passing, or spiking i.e., attacking (Lidor, Arnon, Hershko, Maayan & Falk, 2007). In addition, skill-based testing is useful for monitoring the development of junior volleyball players (Gabbett et al., 2006).

During motion analysis in volleyball, we can note that we are dealing with very complex motor skills with a 'polystructural' basis. The successful performance of these movements depends on various human skills and abilities, but there is also reason enough to claim that player moves and their movements are based both on motor skills and motor information (Strahonja, 1978). The specific skills which are relevant for success in volleyball, as could be seen, are known as situational-motor skills (SMS) because they are primarily 'composed of precisely determined combinations of basic motor skills and to a smaller extent of cognitive and functional skills, as well as conative characteristics (Janković, 1976). There are several types of objective criteria for the analysis of volleyball: on the basis of the game technique, on the basis of physical fitness, the degree of preparedness or 'technical-tactical mastery' (TTM), the success of the attack phase, or the defense phase, as well as many other factors. With the help of this type of analysis it can be stated that in volleyball, specific motor skills have special importance, independently of whether these specific abilities have been achieved as a result of training or whether they were genetically determined, that is, whether they are dependent on hereditary factors

(Gajić, 2005). A positive correlation obviously exists between the cited categories of the SMS abilities. The manifestation of players in motion with the ball is to a great extent dependent on the level of basic motor skills (Strahonja, 1974). Thus, we could point out that the degree of volleyball motor skills directly depends on the extent of the development of certain basic motor skills (Strahonja, 1956).

Smith, Roberts & Watson (1992) compared physical, physiological, and performance characteristics of national-level and college-level volleyball players and found significantly higher block and spike jumps, 20-m speed, and VO₂max in the national-level players, suggesting that physiological capacity plays an important role in the preparation and selection of elite volleyball players.

Palao, Santos & Ureña (2004) have found a significant difference in male volleyball players between team levels for the skills of spiking and blocking. The block is the skill that differentiates level 1 teams from level 2 teams. In females, a significant difference in the performance of the spike in level 1 teams was found. An increase in the success of reception, spike, block and dig in relation to the level of the team was observed.

Concerning the above mentioned facts, the aim of this research was to determine the differences in situational-motor skills (precision) and effectiveness between the First and Second Volleyball League players.

METHODS

Participants

The research was conducted on a sample of 100 elite and sub-elite, male volleyball players, members of the First and Second League Team, who volunteered to participate in the study. The sample was divided into two sub-samples. The first sub-sample consisted of one half of the participants – volleyball players, active competitors, who compete for three clubs in the First League. The second sub-sample also consisted of half of the participants – volleyball players, active competitors, who compete for three clubs in the Second League. All the participants provided written consent after being informed of the test protocol. The protocol of the study was approved by the Ethical Committee of the Faculty of Sport and Physical Education, University of Belgrade and according to the revised Helsinki Declaration. Each player had at least 5 years of training experience, corresponding to 2-hour training sessions, and at least 1 competition per week.

Procedures

Players underwent situational-precision test assessments in an indoor stadium. Before each testing, the participants performed a standard 15 minute warm-up. During the test, air temperature ranged from 22°C to 25°C. The test began at 10 am and finished by 1 pm. The players were instructed not to be involved in strenuous exercise for at least 48 hours before the testing session and followed their normal pre-training diet before the testing session. None of the participants had been injured 3 months before the initial testing. Measurements were taken on Monday morning because the athletes had rested during the weekend.

The sample of variables

The variables used to monitor the game of the volleyball teams at competitions and the analysis of the effectiveness of the players and teams

An analysis of the effectiveness of the players and the teams is based on the evaluation of the effectiveness of at least four technical-tactical elements: service, setting, serve receive and the spike.

- **service (SE)**
SEp winning serve, SE+ positive serve, SE- negative serve and SE= improper serve.
- **setting (DI)**
DI- adjusted setting, DI+ safe setting and DI= ideal setting.
- **serve receive (PS)**
PSi ideal receive, PS+ positive receive, PS- negative receive, PS= improper receive.
- **attack - spike (SM)**
SMp winning spike, SM+ positive spike, SM- negative spike and SM= spike error.

Once all of the necessary information has been gathered, it is possible to establish a suitable game model and the basic preliminary tactical concept for a certain match.

In this example, tactical preparation was carried out in two phases:

1. watching a tape (recording) of the opponent's game with the entire team and forming a tactical plan 'around the table' and
2. imitating the opponent's game during training by means of certain situational exercises and at matches by means of sparing partners (a team which in a tactical sense plays in a similar fashion).

The listed variables serve to monitor the volleyball game and analyze the effectiveness of certain players at volleyball games by registering their quantification in manifest form, and their role in this research is to serve as dependent variables, that is, they play the role of the criterion for successive regression analyses. The statistical effectiveness of the game from six matches of the teams from the First and Second League was analyzed.

Situational-motor tests of precision in volleyball elements

- **Service** – hitting the target in zones I, II, III, IV, V and VI (**SE**)
- **Serve receive** – Hitting the horizontal target using the fingers to guide the ball from zone VI into position III while passing the ball from zone VI, from the same side of the court (**PRPVO**)
 - hitting the horizontal target by bumping the ball from zone VI into position III while passing the ball from zone VI, from the same side of the court (**PRCVO**)
 - hitting the vertical target using the fingers to guide the ball from zone VI into position III while passing the ball from zone VI, from the same side of the court (**PRPVE**)
 - hitting the vertical target by bumping the ball from zone VI into position III while passing the ball from zone VI, from the same side of the court (**PRCVE**)
- **Setting** – hitting the horizontal target from an underhand position from zone III into position IV while passing the ball from zone VI, from the same side of the court (**DIPRIS**)
 - hitting the horizontal target from an overhand position from zone III into position II, while passing the ball from zone VI, from the same side of the court (**DIPRIZ**)

- **Spike** - hitting the horizontal target by spiking from a jump from zone IV into position V from the other side of the court (**SMIV-V**)
 - hitting the horizontal aim by spiking from a jump from zone IV into position VI, from the other side of the court. (**SMIV-VI**)
 - hitting the horizontal target by spiking from a jump from zone IV into position I, from the other side of the court. (**SMIV-I**)

The above mentioned variables are quantified in their manifest form through testing, and their secondary role in this research is to explain or predict the variable with the same name, that is, they have a predictor role in successive regression analyses. The tests for the assessment of situational motor parameters were taken from Milić (2011).

Statistical analyses

The statistical Package for Social Sciences SPSS (v18.0, SPSS Inc., Chicago, IL) was used for the statistical analysis. Descriptive statistics were calculated for all the experimental data. In order to determine the differences between the volleyball players from the First and Second League we used the t-test. The level of significance was set at $p \leq 0.05$.

RESULTS

Table 1. The t-test for situational-motor precision between the volleyball players of the First and Second League.

Variables	First league (N=50) Mean±SD	Second league (N=50) Mean±SD	F-ratio Variances	t-value	p
SE I	2.34±1.20	1.44±0.99	1.46	3.98	0.00
SE II	2.41±1.30	1.54±1.15	1.28	3.44	0.00
SE III	2.50±1.07	1.46±1.33	1.55	4.15	0.00
SE IV	2.16±1.35	1.48±1.01	1.76	2.78	0.01
SE V	2.64±1.43	1.54±1.20	1.43	4.04	0.00
SE VI	3.09±1.16	1.60±1.32	1.31	5.77	0.00
PRPVO	2.00±1.10	1.74±1.12	1.04	1.13	0.26
PRPVE	2.05±1.28	1.76±1.08	1.39	1.18	0.24
PRCVO	2.18±1.06	1.44±0.99	1.14	3.50	0.00
PRCVE	2.05±1.01	0.94±0.89	1.29	5.64	0.00
DIPRIS	1.70±0.82	1.32±0.87	1.11	2.20	0.03
DIPRIZ	0.75±0.75	0.62±0.73	1.07	0.85	0.40
SMIV-V	2.86±1.15	1.94±1.27	1.21	3.68	0.00
SM IV-VI	2.91±1.25	2.00±1.31	1.09	3.43	0.00
SM IV-I	3.93±0.87	2.98±1.32	2.27	4.07	0.00

Table 1 shows the differences in situational-motor precision between the volleyball players of the First and Second League. A statistically significant ($p \leq 0.05$) difference was found in almost all the situational-motor precision variables. A significant difference was not found only in variables PRPVO, PRPVE and DIPRIZ ($p \geq 0.05$).

Table 2. The t-test of the differences in the effectiveness of the game between the teams from the First and Second League.

Variables	First league (N=50) Mean±SD	Second league (N=50) Mean±SD	t-value	F-ratio Variances	p
Sep	0.46±0.82	0.19±0.52	3.1	2.49	0.00
SE+	2.33±2.16	1.67±1.61	2.7	1.80	0.01
SE-	3.80±2.95	2.55±1.80	4.1	2.70	0.00
SE=	1.28±1.53	0.99±0.93	1.8	2.72	0.07
DI-	0.82±2.26	0.63±1.77	0.7	1.64	0.48
DI+	1.37±3.41	0.90±2.41	1.3	2.01	0.21
DI=	3.26±8.16	2.63±6.89	0.7	1.40	0.51
Psi	3.40±4.87	2.52±3.53	1.6	1.90	0.10
PS+	1.10±1.74	1.44±2.05	-1.4	1.38	0.17
PS-	0.99±1.73	0.74±1.40	1.3	1.52	0.20
PS=	0.25±0.63	0.58±1.01	-3.1	2.58	0.00
SMP	3.05±3.44	2.19±2.21	2.4	2.43	0.02
SM+	1.08±1.41	1.40±1.33	-1.8	1.12	0.07
SM-	0.87±1.21	0.76±0.92	0.8	1.72	0.41
SM=	1.16±1.85	1.00±1.17	0.8	2.50	0.42

Table 2 shows the differences in the effectiveness of the game between the teams from the First and Second League. Statistically significant differences (≤ 0.05) were found for the variables Sep, SE+, SE-, PS=, SMP. In all the other variables a difference could be found, but without statistical significance at the 0.05 level.

DISCUSSION

The aim of this study was to determine the differences in situational-motor skills (precision) and effectiveness between the First and Second Volleyball League players. By analyzing table 1, which shows the univariate differences in the motor skills between the participants from the First and Second League, we can note that there are statistically significant differences in the case of most variables, at a very high level ($p \leq 0.01$), in favor of the participants from the First League. Only in the case of the variables of hitting the horizontal target using fingers to guide the ball from zone VI into position III by passing the ball from zone VI, from the same side of the court (PRPVO), hitting the vertical target using fingers to guide the ball from zone VI into position III by passing the ball from zone VI, from the same side of the court (PRPVE) and hitting the horizontal target from an overhand position from zone III into zone II by passing the ball from zone VI, from the same side of the court (DIPRIZ), were no statistically significant differences determined. These results were expected considering the fact that the volleyball players who compete at higher competitive levels, that is, who play in the First League, are probably at a higher technical-tactical level, in terms of volleyball elements, than those players playing for the Second League, and were thus more precise in performing these elements, and achieved better results. Statistically significant differences were not determined for

the PRPVO, PRPVE and DIPRIZ variables. The reason for the lack of any statistically significant differences in the first two variables (PRPVO and PRPVE) could be found in the fact that this is a case of very simple volleyball elements. Passing the ball using one's fingers to guide it and bumping the ball from zone VI into zone III does not represent a problem for volleyball players from the First and Second League, considering the distance of the volleyball players from the net (two meters from the line of attack), passing the ball along a straight line and body position in relation to the net and target. For the variable hitting a horizontal target by hitting the ball from an overhand position from zone III into zone II, by passing the ball from zone VI, from the same side of the court (DIPRIZ), no statistically significant differences were determined between the volleyball players from the First and Second League. Nevertheless, it is not justifiable that we look for an explanation of this occurrence in the simplicity of the performance of the element, since the overhand setting in volleyball, considering the structure and technical characteristics, is definitely not a simple element, and instead, is technically complex, and that volleyball players who are not setters on the team in most cases avoid using this setting technique. We can assume that this test was sufficiently difficult, and thus can be considered one of the reasons for these results. The results in Table 2 have showed statistically significant differences only in the case of the winning serve Sep variable, positive serve SE+ variable, improper serve SE- variable and the winning spike SMp variable in favor of the participants of the First League, as well as the variable the improper serve PS=, in favor of the participants of the Second League. For the remaining variables, no statistically significant differences were determined. The statistically significant differences in the variable winning serve (SEp), positive serve (SE+) and negative serve SE-, can lead us to the conclusion that the volleyball players of the First League were more effective in the game in terms of serving than the volleyball players of the Second League, but at the same time had more negative serves. In volleyball, it is certainly a frequent occurrence that volleyball players serving more aggressively during a match risk that their error percentage in serving becoming greater. The case is the same with the winning spike variable (SMp), whose statistically significant differences favor the volleyball players from the First League, which once again, considering the technical-tactical level of the volleyball players of the First League, was expected. For the same reason we can explain the statistically significant differences in the improper serve (PS=) variable in favor of the Second League volleyball players. Grgantov, Katić & Janković (2006) have stated that the elementary technique of all volleyball elements is important for competition success and have indicated that the mastering of the technique of volleyball elements is a longstanding process that should be paid due attention in all age groups. The importance of elementary technique at different competition levels could be confirmed with this kind of research.

CONCLUSION

On the basis of the obtained results, it can be concluded that statistically significant differences in situational-motor precision between the volleyball players from the First and Second League do exist. This was not the case for effectiveness, where significant differences were not found. Volleyball elements are technically very demanding, especially those performed with a jump (spike, block, jump service, and jump set). A great number of repeats over years of training are needed for the technique of volleyball ele-

ments to improve and become automatic. Further research should deal with performing volleyball accuracy tests under physical exertion conditions because performing after physical exertion is what is expected of volleyball players during actual games.

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RAZLIKE U SITUACIONO-MOTORIČKIM SPOSOBNOSTIMA (PRECIZNOSTI) I EFIKASNOSTI U IGRI ODBOJKAŠA PRVE I DRUGE LIGE SRBIJE

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Cilj ovog istraživanja je da se utvrde razlike u situaciono-motoričkim sposobnostima (preciznosti) i efikasnosti u igri odbojkaša Prve i Druge lige Srbije. Istraživanjem je obuhvaćeno 100 ispitanika - odbojkaša, aktivnih takmičara podjeljenih u dva subuzorka: Prvi subuzorak sačinjavala je polovina ispitanika - odbojkaša, aktivnih takmičara, koji nastupaju za tri kluba Prve lige. Drugi subuzorak je sačinjavala takođe polovina ispitanika - odbojkaša, aktivnih takmičara, koji nastupaju za tri kluba Druge lige. Analiza efikasnosti igrača i ekipa bazira se na ocenjivanju efikasnosti četiri tehničko-taktičkih varijabli: servis, dizanje, prijem servisa i smeč. Situaciono-motorička preciznost je procenjena testovima koji procenjuju takođe četiri tehnike: servis, dizanje, prijem servisa i smeč. Statistički značajna razlika je pronađena u skoro svim varijablama situaciono-motoričke preciznosti. Značajna razlika nije pronađena kod varijabli PRPVO, PRPVE and DIPRIZ. Razlike u efektivnosti između igrača prve i druge lige postoje jedino kod varijabli Sep, SE+, SE-, PS=, SMp. U svim ostalim varijablama pronašene su razlike, ali nisu bile statistički značajne ($p \leq 0.05$). Značajnost elementarne tehnike na različitim nivoima takmičenja može biti potvrđeno ovakvim radovima. Buduća istraživanja bi trebalo da se bave testovima preciznosti u odbojci ali u uslovima fizičkog zamora, jer izvođenje nakon zamora je ono što se očekuje tokom meča.

Ključne reči: odbojka, tehnika, procena, preciznost.