MOTOR ABILITIES OF VOLLEYBALL PLAYERS AND TESTS FOR THEIR ESTIMATION

Abstract
The subject of the research in this paper is the motor abilities of volleyball players and tests for their assessment. Under the term general motor abilities we imply the motor abilities which can be found in other kinds of sport according to their general characteristics: coordination, strength, speed, endurance, flexibility, balance, and precision. Specific motor abilities are the motor abilities that are specifically developed in each sports branch, taking into account that they are not completely new motor abilities, but the abilities that are “built” out of the general motor abilities by specific training or they are combined into specific motor abilities for each individual sport. On the basis of consulted works, the majority of volleyball experts under the term of specific motor abilities imply the following: explosive strength and agility, flexibility, body coordination, alternative movements speed, limbs coordination. In the concluding part of the work there are tests that are most often used for estimation of general and specific motor abilities of volleyball players.

Key words: VOLLEYBALL PLAYERS / GENERAL MOTOR ABILITIES / SPECIFIC MOTOR ABILITIES

INTRODUCTION

The objective of the research in this paper is motor abilities of a man in the most general sense.

Motor ability is only one of the sub systems which, in interaction with the others, make a complex structure of a man. Therefore it is often said that a man as a system represents the most perfect and also the most complicated system comprising many subsystems, out of which the most important are: morphological, motor, cognitive, conative and sociological.

All these subsystems act in unity and harmony, with prevailing of some of the subsystems in individual phases of human development. Therefore, it often happens in physical culture, especially in its sports entity, that athlete’s personality integrity is emphasized, and adequately, this paper is about the dimensional integrity of volleyball player’s personality.

To research motor abilities of volleyball players means to know the facts about general and specific motor movements in collective sports game –
volleyball and its implication in imminent volleyball practice aimed at increasing of the efficiency during sports competition.

In every sports activity and in volleyball as well, there is neither a technical element that can be adequately played without an adequate motor ability, nor the motor ability can be fully expressed without a rational technique of movement performance.

It is in this sense that the uniqueness of motorics can be seen, i.e. interactive influence of motor abilities and motor habits, so it is unthinkable to talk about the development and improvement of motor abilities isolated from the improvement and development of motor knowledge.

Besides, there is an interactive connection between motor abilities and motor knowledge expressed through explained unity of motility; these two sides of motility are in a certain way independent one from another, to the extent which depends on a way of movement, i.e. technique. In this sense the motor abilities and the tests for their assessment in volleyball players shall be observed in this work, together with all previous knowledge about the unity of dimensions of a personality and the unity of motility.

In the context of the aforesaid theoretic views from the field of anthropometrics, in this paper an attempt shall be made to collect in one place the majority of important knowledge connected to the space of general and specific motor abilities of volleyball players and tests for their estimation.

In this sense it is good to emphasize that under the term general motor abilities we think about those motor abilities that can be found in other kinds of sport by their general characteristics. On the other hand, specific motor abilities are the motor abilities that are developed specifically in each separate sports branch, taking into account that these are not completely new motor abilities, but the abilities that are “built out” of the general motor abilities by specific training or they are combined into specific motor abilities for each individual sport.

Starting from the listed knowledge, it becomes clear why it is necessary to know general and specific motor abilities in every sports activity, and separate motor tests for estimation of these activities in accordance with it, as a prerequisite of a successful selection for certain sports, and in the late phase, as a prerequisite of successful training procedures.

MOTOR ABILITIES OF VOLLEYBALL PLAYERS

General Motor Abilities

The term “general” or “basic” motor ability is determined in expert and scientific literature, and it implies fundamental, general or basic motor abilities. These abilities are genetically determined in larger or less degree, and they, as latent (hidden) dimensions or characteristics, are written in genetic code of every man/human, and in imminent testing situation or live sports activity they are expressed manifestly, so they are given in term of manifested dimensions.

On the basis of research of domestic and foreign authors, Nicin (2000) made a list of widely accepted basic motor abilities: coordination, strength, speed, endurance, flexibility, balance, and precision.

In the third edition of Anthropometry, Kukolj (2006) has made a clear view of the Structure of motor abilities, according to opinions of certain number of domestic and foreign authors:

- Farfelj (1960): Speed, strength, endurance, flexibility, feeling of balance, skill to relax muscles, feeling of time and space;
- Wazni (1970): Strength, speed, endurance, coordination;
- Fidelius (1972): Strength, speed, (endurance);
- de Vris (1976): Strength, speed, agility, endurance, power, coordination, balance, flexibility, body control;
- Bompa (1999): Power, speed, endurance, strength, agility and flexibility, movability;
- Zeljaskov (2004): Power, endurance, speed, coordination and flexibility”.

Generally observed, coordination is a primary framework that activity organization depends on, which is the reason why the authors put this motor ability on the first place regarding more recent researches while strength, as a motor ability, makes high intensity of activities possible, which is the reason why some authors put it on the first place. The real truth is that all these components together contribute to success in the greatest number of activities, i.e. in the largest number of sports disciplines, while...
some abilities have only the leading function, together with other abilities (the principle of motor unity).

With regard to theoretical conception, the authors who study the structure of motor abilities, have most often, for the purpose of their researches, suggested an adequate structure of motor tests that covered theoretical model of motor tests. That is why in these researches we can notice a wider range of different batteries of tests, as well as a certain consistency, at least at these motor abilities in which there were no theoretical disagreements.

Among the authors that specifically studied volleyball, in relation to given general laws of anthropometry and fundamentals of sports trainings, there is the view of Strahonja (1975), who, regarding the training of elite volleyball team, states: “Players who want to achieve sports fitness, in accordance with the competition schedule, develop, during trainings, parallel general and special physical preparation, as well as technical, tactical and psychological preparation. Such training makes inseparable unity, despite the fact that certain types of trainings are sometimes separately organized. General physical preparation is developed by chosen exercises of basic and potential functions of organism. It develops basic strength, specific speed strength, basic endurance and comprehensive movement coordination”.

Specific Motor Abilities

On the basis of the opinion of authors who dealt with these issues, almost every sport built, apart from general (basic) motor abilities, its own authentic set of tests for estimating specific motor abilities. That is why their determination, according to Nicin’s opinion (2000), relies exactly to this specificity: “Specific motor abilities are acquired in life and especially in certain sports, and they are the result of specific training, i.e. personal motor functioning.”

During training process in a certain sport, basic motor abilities are modified according to demands of this sport. They are a basis on which specific motor abilities are upgraded. They can be regarded as subsystems in overall motor system and they have their structure, i.e. elements in certain proportion.

The leading variables, i.e. the most important abilities, differ from sport to sport, even in players’ places in teams. Sports success depends, in large proportion on numerous specific motor, as well as other abilities.

Kukolj (2006) declares his attitude about the interactive influence of motor activities and the development of specific motor abilities: “Encouragement to develop specific character is done through solving tasks of specific motor exercising that should enable the optimization of kinematic and dynamic characteristics of motor abilities. In the first place, this means that motor abilities are improved through technical and technical-tactical conditionals of showing certain activities.”

On the basis on stated authors’ opinions concerning general and specific motor abilities, it can be said that volleyball players possess and show, besides general, specific motor abilities in training and playing process. What are these specific motor abilities?

The above mentioned author Strahonja (1975) states the following attitude concerning specific motor abilities: “Special physical preparation serves the development of special qualities of volleyball players. It is most closely connected to the technical-tactical preparation and it is most efficiently done by situational method of trainings during longer part of annual training cycle (75%). (...) In the beginning the players have special physical preparation once or twice a week, improving jumping ability, speed, flexibility, movement coordination, peripheral type and technical elements of the game. It is preferable to do, once or twice a week, independent exercises that last 2-2.5 hours; they develop specific speed endurance, special strength and jumping ability.”

Tomic (1978) gives the following attitude: “It cannot be said which psychophysical characteristic has a dominant role in volleyball play. However, on the grounds of experience we can say that one of important characteristic of elite volleyball players is over-average skills and agility helped by emphasized muscular strength and speed to react to visual stimuli.”

In another work Tomic and Nemec (2002) give the following attitude: “In relation to training and improvement of volleyball technique, the development of coordinative abilities is distinguished as a fundamental part of volleyball players’ exercise.”

One more opinion of Tomic and Nemec (2002) about the specific motor abilities is important to further work on this problem: “If fitness is reduced to improvement of the fewest possible number of abilities such as strength, speed, skill, agility, and if we form them into fitness-like model meaning to add them the dimension of a long time, we can talk about
Motor Abilities of Volleyball Players and Tests for Their Estimation

Motor abilities data are obtained by measuring or testing. Since motor abilities cannot be determined directly by measuring, but indirectly through motor tests, in expert circles is often talked about manifesting variables, i.e. motor appearance, on the bases of which the estimation of latent dimensions is made. As Nicin (2000) points out: “Motor abilities cannot be measured, but, on the basis of variables obtained by tests which metric characteristics are determined, it can be estimated or assumed the existence of a certain number (kind) and the level of ability. Out of the unity of variables got from tests, we can pick those with the greatest coefficients, i.e. difficulty factors, so that they represent a factor (latent dimension) in the best way.”

In scientific researches, because of emphasized integral functioning of athletes in motor activities, the so called “test batteries” are used, covering the integral structure of athlete’s personality: morphological characteristics, motor abilities, cognitive abilities, conative characteristics and sociological dimensions.

The term test in physical culture implies a (motor) exam or a (motor) trial, used to check the level of a certain appearance or its condition taking into account given normative. A test is a standardized procedure which causes a real activity, and which results are measured and valued, so that individual result can be compared to the results obtained from other individuals in an identical situation.

For application of efficient motor researches, good and verified metrical instruments (tests) must be used, those which imply the following metrical characteristics: objectivity, reliability, validity, sensitivity, grading, and cost-efficiency.

This paper shall present only those motor tests for general and specific motor abilities of volleyball players, since working on all the dimensions of volleyball player’s personality dimensions of would overextend the framework of this paper.

**General Motor Ability Estimation Tests**

In one of fundamental researches in our area, on the representative sample of subjects aged 11-17, in the total sample N=3413 subjects (m=1727, f=1686) a research was conducted, concerning morphological and motor qualities of the young, using...
18 parameters for morphological and 37 for motor abilities (Kurelic et al. 1975).

Since it is about a general battery of motor tests, that covers almost all motor abilities, it can be applied to different sports and volleyball as well. Therefore, this test battery for motor abilities shall be presented, but without a detailed description of the tests that can be found in the original work of named authors:

- **Explosive strength**: 3 hop jump, standing long jump, throwing a ball.
- **Repetitive strength**: trunk sit up, 30 seconds crunch up, bench curl up, mixed hangs, push ups.
- **Static strength**: hand dynamometry, handgrip test, semi crouch.
- **Topologically determined strength**:
  - *Arms and thoracic girdle strength*: power ball throw, hand dynamometry, reverse hang, mixed hangs push ups.
  - *Leg strength*: 50m dash, 20m dash, 20m endurance shuttle run, 4x15m shuttle run, 3 hop jump, standing long jump, semi crouch
  - *Torso strength*: sit up, 30 s crunch up, back saver sit and reach.
- **Segmentary speed**: hand tapping, foot tapping, trunk-bending forwards, plate tapping
- **Sprint speed**: 50m dash, 20m dash, 20m shuttle run, 4x15m shuttle run.
- **Flexibility**: sit ups to the right, bench curl up, forward split, sideways sit ups.
- **Balance**: standing on one leg with eyes closed, reversed bench stand, side low beam stand, and one leg balance stand.
- **Precision**: darts, hitting a horizontal aim with a ball, stilt, hitting an aim with a leg.
- **Coordination**: coordination with a bat, skipping rope, slalom with three medicine balls, agility in the air, 20 lunges with a bat, and non-slip surface agility.

Since all the named motor variables applied in this research did not show sufficient metrical characteristics, together with economical and optimal testing, at the end of the research the authors suggested one optimal test battery for estimation of latent motor abilities, consisting of 10 tests for 4 different hierarchical mechanisms:

- **For the mechanism of moving structuring**: non-slip surface agility, foot tapping;
- **For the mechanism of functional synergy and tonus regulation**: side beam stand, curl up;
- **For the mechanism of excitation endurance regulation**: bent arm test, sit and reach flexibility test, semi crouch.

At the end, as the narrowest battery, which provides the largest amount of information in condition of applying the fewest number of metrical instruments, the authors suggested 4 tests for 4 hierarchy mechanisms:

- **For the mechanism of moving structuring**: non-slip surface agility;
- **For the mechanism of functional synergy and tonus regulation**: side beam stand;
- **For the mechanism of excitation intensity regulation**: 3 hop jumps;
- **For the mechanism of excitation lasting regulation**: bent arm test.

This narrowest battery of motor tests could be implemented in certain starting volleyball selection, but for more serious expert and scientific enterprises more appropriate would be middle, or optimal battery of motor tests, comprising 10 motor tests.

Between 50s and 60s of 20th century, new test batteries appeared for body development and motor abilities of school population evaluation, both in Europe and in America. The commission for sport development of EC formulated the starting fundaments for monitoring body development and motor abilities of children and adolescents (Eurofit motor tests battery).

In the period from 1980 to 1990 testing of motor abilities and body development was conducted in 18 European counties, while a number of our researches has adopted the battery of motor tests and applied them on our subjects.

That was the primary reason why this test battery for motor abilities, due to its universality and the possibility for comparing with the samples from many countries that apply this test battery, was suggested as a possibility for usage for general motor tests for volleyball players.

Schedule of motor tests realization is as follows:

- Balance test: Flamingo,
- Alternative movements speed test: Plate,
- Trunk flexibility test: Curl up,
- Explosive leg power test: Standing long (broad) jump,
• Dominant arm static power test: *Arm dynamometry*,
• Repetition maximum tests for the abdominals and hip-flexors: *Sit-up*,
• Static power upper limbs test: *Bent arm test*,
• Acceleration tests over a short distance with changing direction: *Cone markers run 10x5m*,
• Maximum aerobic endurance test: *Endurance cone markers run*.

The description of these tests is possible to find in the sources Nicin (2000) and Kukolj (2005), which was the primary reason not to describe these tests in detail in this work.

**Tests for Estimation of Specific Motor Abilities of Volleyball Players**

Although there are more and more disputes in expert and especially in sports practice about the need to form specific motor tests for specific motor abilities estimation, they are merely the beginner’s steps in this field. Similar situation is in volleyball as well.

However, in the majority of expert sources dedicated to volleyball it can be concluded which specific motor abilities and their correspondent motor tests are necessary for training and play estimation in volleyball.

Out of the list of works in references that have been consulted for writing this paper, the author shall try to highlight and show in graphic those motor tests which, according to present expert and scientific knowledge belong to specific motorics of volleyball players.

Besides specific motor tests for volleyball players from the listed work of Vukovic (1989), motor tests suggested by Tomic (1978) and Kalajdzic (1984) could be listed as the specific motor battery tests for volleyball players. Since in the cited works specific motor tests for volleyball players were used, which are almost the same, but with minor differences and with special tests in each of these works, the test battery from the work of Vukovic (1989) is represented in this paper. The description of these tests can be found in the listed primary sources.

The list of specific motor abilities of volleyball players:

1. **Standing Long (Broad) Jump Test**

2. **Vertical Jump Test (Sargent Jump)**

3. **Lying Medicine Ball Throw 1kg**

4. **Sit up**
5. Sit-and-Reach

6. Sit-and-Reach to the right

7. Hand tapping

8. Leg tapping

9. Plate tapping

10. Limbs tapping

11. Agility in the air

12. Agility with a bat

13. Japan test
Under the term of general motor abilities are those motor abilities which, according to their generality can be found in other kinds of sport. The following attributes are considered to be general motor abilities: coordination, strength, speed, endurance, flexibility, balance and precision. Out of the structure of general motor tests, there are two batteries that are suggested in this paper: Kurelic et al. (1975) and The Eurofit motor Test Battery (1980).

Specific motor abilities are those motor abilities that are developed specifically for each separate sports branch, and result from specific training, i.e. special motor functioning. However, they are not completely new motor abilities, but the abilities that are “built” out of general motor abilities by specific training, or they are combined in specific MOTOR abilities for every specific sport. On the basis of consulted works, the largest number of volleyball experts under the term of specific motor abilities means the following: explosive strength and agility, flexibility, body coordination, alternative movements speed, limbs coordination. From the structure of specific motor tests, there is a specific test battery for volleyball players suggested in this paper: the one invented by Vukovic (1989, 1996) in his researches:

- **Explosive strength**: Standing Long (Broad) Jump Test, Vertical Jump Test (Sargent Jump), lying medicine ball throw 1kg;
- **Flexibility**: sit-and-reach, sit-and-reach hamstring, sit-and-reach to the right;
- **Alternative movements speed**: hand tapping, leg tapping, plate tapping;
- **Body coordination**: plate tapping, agility in the air, agility with a bat;
- **Agility**: Japan test, 3x9m run, Jelka test.


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