

## VARIABILITY OF PHYSICAL PERFORMANCE IN ADOLESCENT VOLLEYBALL PLAYERS

Original paper

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### **Abstract**

A high level of motor activities is the basis for excellence in the field of volleyball. All motor qualities known to us from the theory and methodology of physical education and sport, are manifested to a certain degree in the game and together with the technical elements fill its content. The control of these two aspects of the volleyball player's training is an important factor in the improvement of sports performance. In the present study, after establishing the level of certain indicators of physical ability and analyzing the results obtained, we identify the current physical condition of adolescent volleyball players. The study was conducted on a sample of 83 prospective volleyball athletes representing different clubs in Bulgaria. They were tested in special speed in volleyball, upper limbs' explosive power and lower limbs' explosive power. Analyses of variance and comparative analyses were applied. Obtained results suggested on lack of technical training and need for greater synchronization of physical and technical training as well as independent training were needed.

**Keywords:** *volleyball, motor ability, physical performance, adolescents*

### **INTRODUCTION**

Sports training in the field of volleyball is a purposeful use of means, methods and forms with the help of which technical-tactical skills are acquired, developed and improved and high sporting achievements are realized. Its aim is to reach the highest possible level of conditioning, technical, tactical, psychological and competitive training to achieve high sporting results (Petrov, Zetova & Dimitrov (Петров, Зетова & Димитров), 2022).

The motor abilities of man are manifested in the form of certain motor actions of varying complexity. They are a part of the household, work, sports, etc. activities that a person performs. In physical culture and sport, these actions have a more purposeful character and are united in complexes of physical exercises, which are conscious, socially determined actions, that influence the personality of a person (Rachev (Рачев), 1998).

In volleyball, motor abilities depend on complex physical qualities and functional abilities, which are distinctly manifested in in-game activity. The success of the motor activity is determined by the heterogeneity of these qualities, which in turn ensures the making of correct decisions and selection of game approaches under various conditions and situations characterized by a serious time deficit.

The complex manifestation of motor qualities is the basis of the athlete's physical training. Together with the other aspects of sports training - technical, tactical, and psychological, it is a necessary and obligatory element in sports activity (Aladgov (Аладжов), 1992).

Physical training is absolutely necessary, although being an auxiliary side in the training process. Despite the fact that in training with ball athletes also develop a number of physical qualities, in modern sports it is required to perform more targeted work with measurable values in the field of athleticism (Gospodinov (Господинов), 2014).

The importance of physical training and the level of motor fitness for excellence in the field of volleyball sport is a leading theme in the work of numerous authors.

Modern volleyball is an athletic game characterized by the extremely high motor activity of volleyball players. The effective execution of game actions, techniques and tactical combinations during a game is based on the high level of development of volleyball players' motor abilities (Gelezniak & Beliaev (Гелезник & Беляев), 2005).

Physical training of volleyball players is very important for competitive activities. The level of motor abilities of athletes is the basis of technical and tactical mastery individually and of the team as a whole. Its improvement takes place in conjunction with other aspects of training (Zaciorski (Зациорский), 2009, pp: 200).

The effectiveness of technical methods and tactical interactions application during a game is directly dependent on the optimal level of manifestation of motor qualities (Antonova (Антонова), 2015).

The continuous increase in the volume and intensity of training, characteristic of modern volleyball, enormously increases the demands on physical training (Ivanov (Иванов), 2020).

The physical preparation of volleyball players is an essential part of the training process. Training for the development of physical qualities is inextricably linked to improving the overall level of the body's functional capabilities, all-round physical development and strengthening health. For volleyball players, physical training is the basis for the improvement of their skills (Furmanov & Akulich (Фурманов & Акулич), 2019, pp: 371).

Successful solving of the physical training tasks is a pledge for effective mastering of technical and tactical techniques of the game (Guba, Bulkina & Pustoshilo (Губа, Булькина & Пустошило), 2019, pp: 14).

The physically fit and healthy person is the most complete, active and efficient, he is durable, not absent from work, motivated

and expects a positive result from his work. Therefore, we believe that physical training and physical development are important factors for success in work and sports activities (Ignatov & Peltekova (Игнатов & Пелтекова), 2017).

It is not possible to be successful in the training and sports competition process without a high level of preparation. Modern volleyball places high demands on the development of various aspects of their preparation – technical, physical, tactical, psychological, and theoretical (Kolev (Колев), 2019). At the same time, the process of improving the physical abilities of an athlete is tightly bound to systematic pedagogical control (Petrov, Zetova & Dimitrov (Петров, Зетова & Димитров), 2022).

The aim of the present study was to trace the variability of motor ability indicators of boys, adolescent volleyball players in the age range below 16 years and establish the level of motor abilities.

Study objectives:

1. To determine the level of certain physical qualities of boys training volleyball;
2. Calculating the average values of the studied indicators;
3. Establishing the current level of training by comparing the average values of the studied indicators with the maximum values;
4. Formulate relevant conclusions about the state of their physical fitness.

**METHODS**

The subject of the study was certain physical qualities directly related to the high level of training in the field of volleyball.

The object of study are the physical abilities of adolescent volleyball players.

The scope of the study are 83 prospective volleyball athletes representing clubs from all over the country (born in the period January – December 2007).

The study was conducted in May 2022 and aimed at selecting an expanded pool of athletes for the Bulgarian national under-16 boys' team.

Methods used:

- ✓ Method of control and evaluation - sport-pedagogical testing;
- ✓ Variance analysis to establish mean values of the physical ability indicators studied;
- ✓ Comparative analysis - comparing the average values of the studied indicators with their maximum values achieved by the athletes.

Volleyball players are tested once. The following indicators were taken (Table 1.) to determine the level of:

- ✓ Special speed in volleyball;
- ✓ Upper limbs' explosive power;
- ✓ Lower limbs' explosive power.

All three motor qualities are determinants of the level of general /physical, technical, tactical, and game/ preparation in the sport of volleyball and are decisive for the final result in a sports competition.

*Table 1. Physical ability indicators*

№	Indicators	Measuring units	Accuracy in measurement
1.	Shuttle running 9-3-6-3-9	sec	0,01
2.	Long jump from place	cm	0,01
3.	Vertical leap from place	cm	1
4.	Vertical leap with velocity (vertical flyer)	cm	1
5.	3 kg. solid ball throwing	m	0,01

The data from the surveyed indicators are analyzed along three lines:

- ✓ determining the homogeneity of the group studied;
- ✓ study of the normal distribution of the variables;
- ✓ comparing the mean values with the maximum values.

**RESULTS AND DISCUSSION**

The beginning of the analysis is connected with the establishment of the mean values and variability of the studied indicators.

The results obtained after processing the test data with Variance Analysis are presented in Table 2. From the value of variation coefficient – V %, Fig. 1 it is clear that the examined group of volleyball players appears to be homogeneous in two of

the examined indicators /for special speed and explosive power of lower limbs in length jump from place/. The values of the coefficient of variation are respectively – V = 6,9 % and V = 9,2 %. For the remaining three indicators, the group appeared approximately homogeneous with a coefficient of variation values respectively – V = 15 % for the vertical rebound from the place indicator, V = 17.7 % for a vertical rebound after stepping and V = 14.3 % for the upper limb explosive power indicator.

Table 2. Variance analysis of physical abilities scores

№	Indicators	n	Xmin	Xmax	R	X	S	V %	As	Ex
1	Shuttle running 9-3-6-3-9	83	7	9	2	8.16	0,561	6.9	0,206	- 0,563
2	Long jump from place	83	185	285	100	231.2	21.2	9.2	0.301	- 0.386
3	Vertical rebound from place	83	42	79	37	54,8	8,19	15	0.825	0.321
4	Vertical rebound with velocity (vertical flyer)	83	43	98	55	67.2	11.9	17.7	0.513	0.523
5	3 kg. solid ball throwing	83	6	12	6	8.46	1.207	14.3	0.542	0.545

It is an interesting finding that the tests of length jump from place and height rebound from a place and after stepping, which are aimed at investigating the same quality (lower limb explosive power), on the one hand, define the group as homogeneous and on the other as approximately homogeneous. Our explanation of this

fact is that a certain proportion of the examined athletes have not yet mastered at a sufficiently high level the technique of stepping and high rebound in volleyball. To a particular extent, this is manifested in the rebound after stepping.

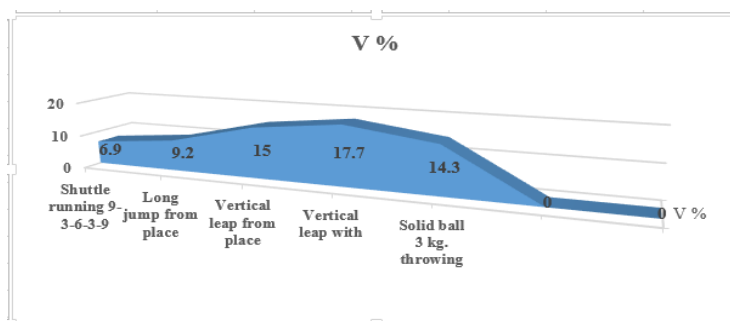


Fig. 1. Coefficient of variation V % of the studied indicators

From the obtained values of the coefficients of asymmetry (As) and excess (Ex) at the level of significance, we come to the conclusion that with the volume of athletes studied  $n = 83$  the critical value  $As_{crit}$  is 0.528. For three of the indicators (No. 1., No. 2., and No. 4.) there is a normal distribution of the data. For indicators No. 3. and No. 5., the coefficient obtained for  $As_{crit} > As_{obt}$  indicates the asymmetry of data for these two indicators. As for the coefficient for the excess, the critical value  $Es_{crit} = 0.528$  in the examined indicators  $Es_{obt} < Es_{crit}$  indicates normality in the distribution of the variables.

After the initial analysis, we aim to establish the current state of readiness in terms of the physical qualities of the volleyball players studied. For this purpose, we perform a comparison of the average values of the indicators achieved by all the participants in the experiment and the best results given by them.

Fig. 2., 3. and 4. show the correlation between average values and the best results in the studied physical ability indicators of volleyball players.

The results show that we have big differences between average and best scores. Especially big differences we report in the indicators of explosive strength of lower and upper limbs. If upper limb strength is a quality that at this age depends on the physical development of the body (anthropometry) and such a difference would be justified, then in the case of lower limb explosive strength, an extremely important quality for sports performance, these large deviations indicate the need for targeted work towards improving the level. Only for the indicator of special speed in volleyball (9/3/6/3/9) we get closer values between average and best performance, which in this case is 8.16 sec. But even this fact does not bring much optimism taking into account that volleyball specialists point out a high level for the mentioned quality result below 7.4 sec. for the examined age group (Petrov, Zetova & Dimitrov (Петров, Зетова & Димитров,) 2022).

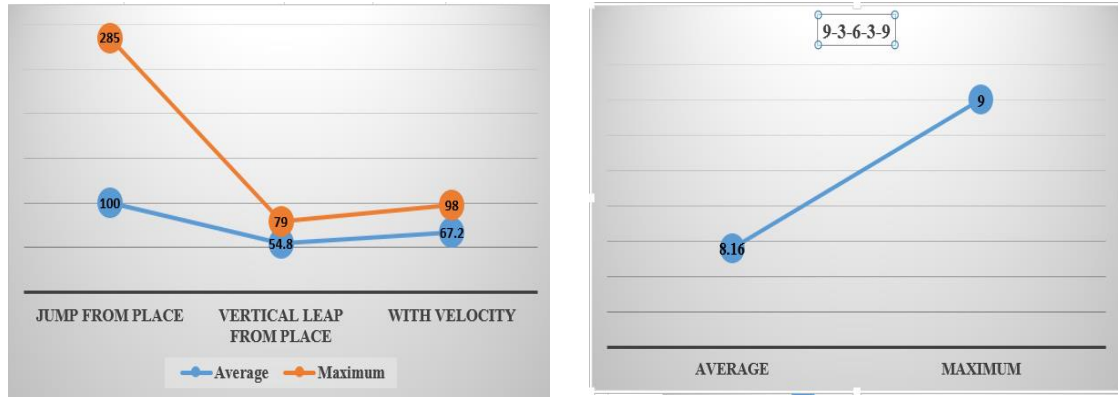


Figure 2, & 3. Comparison between average levels and best scores on physical fitness indicators

The situation is a little different with lower limb explosive quality. Out of the 83 athletes tested, only a small proportion achieved scores equal to or higher than those recommended by experts in the field at an age-appropriate level. Only 14 athletes met the required level in the long jump from a place, and a total of 11 athletes met the required level in the long jump with velocity.

When we also look into the fact that only one athlete per club, in a single case of two athletes, showed such a result, it becomes clear that it is more a consequence of genotypic factors and not so much of a specialized methodology to raise the level of this motor quality.

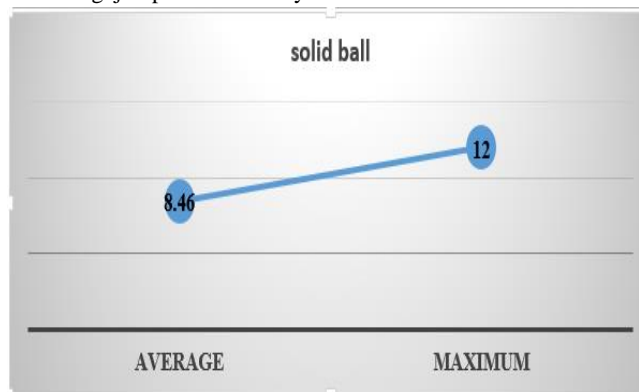


Figure 4. Comparison between average levels and best scores in physical ability indicators

## CONCLUSIONS

Taking into account the results obtained from the testing and after processing them with the appropriate methodology, we can formulate the following conclusions and recommendations:

- Carry out an annual control on the indicators of physical abilities at all levels of training;
- A small part of the tested athletes cover the required level as far as the lower limb explosive strength attribute is concerned. Considering the high importance of this attribute for the final success in the game, targeted work is needed to improve it;
- Speed, like strength, is an important quality that influences the level of readiness in volleyball. The studied athletes showed a lower-than-needed level of special quickness. It is a quality that is difficult to develop if the appropriate critical, (sensitive) period for suitable training is missed (experts indicate that it is beneficial to do so by the age of 14-15). We recommend daily work to improve the level of this motor quality in the year-round training cycle;

- The asymmetry of data distribution of lower limbs explosive power indicators in a high rebound from a place and explosive power of upper limbs is expressed in the fact that a too large number of the examined athletes /more than half/ achieved a score lower than the average for the group. This indicates a low (below average) level of these motor qualities;
- The results still show an insufficient level of technical training. The lack of perfect stepping and rebound technique negatively affects the final result, i.e. the rebounding height and the effectiveness of the game elements related to this element. Physical and technical training should be well synchronized.

Taking into account the fact that at the examined age the time spent on training guided by a specialist /coach/ is insufficient to solve so many tasks important for the game, we recommend independent work in order to increase the level of preparation. A significant place in modern volleyball is also given to independent training. The necessity of systematic and continuous mastering of an impressive volume of training material is impossible to reach only through team training. For many specialists, individual

training of the volleyball player is a modern form of work for effective training and improvement. According to Bob Miller (2005), individual training finds a place in all periods of a volleyball player's year-round training, and it can reach up to 20-25% of the total training work (Miller, 2005).

## REFERENCES

- Аладжов, К. (1992). *Физическата подготовка на спортиста* [Physical preparation of the athlete. In Bulgarian]. София: Издателска къща АСТРА.
- Антонова, М. (2015). *Вариативност на физически и технически показатели на волейболисти от спортните училища* [Variability of physical and technical indicators of volleyball players from sports schools. In Bulgarian]. *Научни трудове на Русенския университет, том 54, серия 8.2*, 131-134 ISSN 1311-3321
- Фурманов, А.Г., & Акулич, Л.И. (2019). *Волейбол*, [Volleyball. In Russian], Учебного пособия, Минск: БГУФК. ISBN 978-985-569-325-4.
- Галезниак, У. Д., & Белиаев, А. В. (2005). *Волейбол методическое пособие по обучению игре* [Volleyball teaching aid for the game. In Bulgarian]. София: Терра-спорт, ISBN 5-93127-244-5
- Господинов, В. (2014). *Живот отдаден на волейбола, спомени, анализи, тренировъчни практики* [Life dedicated to volleyball, memories, analysis, training practices. In Bulgarian], София: Изд Българи, ISBN 978-954-8425-22-3
- Губа В.П., Булкина, Л.В., & Пустошило, П.В. (2019), *Волейбол основы подготовки, тренировки, судейства* [Volleyball basics of preparation, training, refereeing. In Russian], Москва: Издательство Спорт. ISBN 978-5-9500184-1-1
- Ignatov G., I. Peltekova (2017). Physical preparation results indicators and physical development of students from Sofia University – Republic of Bulgaria *Research in Kinesiology*, 45(1), 49-52.
- Иванов, П. (2020). Съвременни концепции в тренировката по волейбол [Modern concepts in volleyball training. In Bulgarian]. *Научни трудове на УНСС, том 4*, (9-85), ИК – УНСС, София, ISSN 2534-8957
- Kolev P. (2017). Relations and dependencies between different aspects of adolescent volleyball players training, *Research in Kinesiology*, 47(1—2), 16-18.
- Miller, B. (2005). *The volleyball handbook*. Human kinetics. USA. ISBN 0-7360-5610-6
- Петров Г., Зетова, А., & Димитров Н. (2022) *Ние играем волейбол* [We play volleyball. In Bulgarian]. Треньорско помагало. София: ISBN 978-619-91967-5-5
- Рачев, К. (1998), *Теория и методика на физическото възпитание, част 2*, [Theory and Methodology of Physical Education, Part 2 In Bulgarian]. Методика на физическото възпитание. Учебник за студентите от НСА. София: НСА
- Зацiorски В. М. (2009). Физические качества спортсмена: основы теории и методики воспитания [Physical qualities of an athlete: basics of theory and methodology of education. In Russian]. Москва: *Советский спорт*. ISBN 978-5-907225-01-5

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