

Spatio-time psychomotor references of motor characteristics in volleyball

UDC 7967012.68, ББК: 75.1



Postgraduate student **A.A. Rzhanov**¹
PhD, Professor **A.A. Akhmatgatin**³
Dr. Med., Professor **V.Yu. Lebedinsky**^{1, 2}
PhD **A.G. Kharkovskaya**³
¹Irkutsk National Research Technical University, Irkutsk
²Irkutsk State University, Irkutsk
³Kuban State Agrarian University named after I.T. Trubilin, Krasnodar

Corresponding author: volley-angarsk@ya.ru

Abstract

Objective of the study was to determination of the significance and interpretation of the influence of psychomotor spatio-temporal characteristics of volleyball players on the game process, search for ways and methods to effectively form and develop these abilities.

Methods and structure of the study. The novelty of the developed methodology for the development of psychomotor spatio-temporal characteristics of volleyball players lies in their effective assessment and selection of training tools that develop the motor capabilities of athletes. The experimental group (EG) trained using the developed methodological tools that form the psychomotor spatial and temporal orientations of volleyball players. The control group (CG) trained according to the program for sports schools. The experiment involved 72 pupils of the Angarsk secondary school, aged 9-13 years. The experiment lasted from September 2019 to September 2021.

Results and conclusions. In the course of the study, it was found that in the CG there were no significant changes in the distinctive sensitivity of movements (DSM), and in the EG it was significantly improved. The evaluation of the results of the psychomotor activity of athletes in tests with game techniques, carried out at the end of the experiment, showed significant differences between the groups, characterizing the improvement in the accuracy of performing the EG techniques relative to the CG.

Keywords: volleyball, psychomotor, movement sensitivity.

Introduction. It is assumed that the correct perception and effective regulation of the spatio-temporal parameters of movements is the most important indicator that determines the effectiveness of the game actions of volleyball players [11]. At the same time, experts note a close relationship between time intervals and the correction of their own motor sensations, stabilizing the accuracy of hitting them [9].

Spatio-temporal motor procedures are controlled by a set of perceptions of visual, auditory, tactile analyzers, through sensations and their analysis [10]. Players' individual capabilities are characterized by a general psychomotor ability [1, 7], which consists of more subtle components: simple and complex choice reactions, vestibular characteristics, and distinctive sensitivity of one's own movements.

Experts note that the sense of time and space determines the accuracy of performing difficult-coordinating technical elements [4, 5]. Situational processes that are not programmable and inaccessible for

assessment during the game are corrected due to the described psychomotor characteristics.

Objective of the study was to determination of the significance and interpretation of the influence of psychomotor spatio-temporal characteristics of volleyball players on the game process, search for ways and methods to effectively form and develop these abilities.

Methods and structure of the study. The experiment was carried out for two years with pupils of sports schools in the city of Angarsk - from September 2019 to September 2021. The CG consisted of 37 boys aged 9-13, studying at the volleyball department of the sports school of the Olympic reserve "Ermak", and the EG - 35 boys of the sports school of the Olympic reserve "Angara" of the same age. Athletes were included in the EG and CG of their own free will and with the permission of their parents. The CG and EG were tested for homogeneity of psychomotor spatio-temporal perceptions at the beginning and at the end of the experiment.

**Table 1.** *Developmental exercises*

Orientation of the exercise	Description of the exercise
On the development of spatial-distinctive sensitivity	Pass from above from your throw from the front mark, as close to the net as possible, to the opposite side (possible with touching the top cable)
	Pass through the entire playing field to the corner of the marking line touching the marking line. Variations: Serve, offensive hit with space control
	The athlete stands facing the net, the coach behind him throws the ball to the right / left to the side marking area. The player's task is to play from below only those balls that do not go out of bounds. He can turn on the ball only at the signal of the coach. Variants of the exercise for outgoing balls: from the block, from the serve, etc.
On the development of distinctive sensitivity over time	<p>At the command of the coach with the simultaneous activation of the stopwatch, the players begin to perform a set of game techniques with switching. Players must complete the complex as accurately as possible in a predetermined period of time (7, 10 or 12 seconds). The number of repetitions of playing techniques is determined by the player independently according to his own sense of time.</p> <p>Based on the results of the exercise, the coach makes adjustments: a little earlier, a little later</p>

The CG trained in the usual mode, provided for by the training program of the sports school of the Olympic reserve, and the EG - using the developed methodology, including a set of special exercises (Table 1) and methods for assessing the distinctive sensitivity of movements (DSM).

According to the technology of sports training, in the 1st and 2nd years of training, the use of the developed methodology was 30 minutes in each training session. The total time of its application for two years was 192 hours. At each lesson with athletes, the theoretical aspects of psychomotor connections were discussed [9, 10], approaching exercises that developed one's own sensations were used, vestibular and hypoxic loads were applied between contacts with the ball [6, 8], exercises were performed aimed at developing a reaction to sound and light signals with a gradual transition to a reaction of choice.

The methodology included tests for DSM in time and space and for the assessment of playing techniques associated with developed psychomotor reactions.

Distinctive sensitivity of movements in spatial perception was tested:

1.1. With the help of the "curvimeter" device, with which the athlete had to draw a curved line 50, 90, 130 mm long.

1.2. An alternative method involving the performance of a task in which the best result of a long jump from a place was taken as 100%, after which the athlete on the task had to get into the space parameter

without visual control of the scale, reducing this result to 80, 70, 60%.

1.3. DSM in time was tested using a stopwatch, while the athlete had to stop the stopwatch according to the task without visual control of the scale in 7, 12, 19 s after its start.

During the analysis of test results (1.1.; 1.2.; 1.3.), the degree of hit by the athlete in the given parameters was determined as a percentage and its arithmetic mean values were calculated.

The assessment of playing techniques was carried out using the following tests:

2.1. Testing the basic game technique of "serving" for accuracy. Each player was offered 6 attempts to serve to a given zone - two attempts each to zones 1, 6 and 5.

2.2. Testing the basic game technique of the "attacking strike" - for technique and accuracy. Each player was offered 6 attempts to perform an attacking shot from the pass to the 4th zone. Only passes that were successful for the attack were taken into account. Then the attacking blow was carried out from its throw - two attempts each in zones 1, 6 and 5.

2.3. Testing the basic game technique "passing from below and above" - for accuracy. Each player was given six attempts to complete passes after hitting the floor from below into the ball cart and from above into the basketball hoop.

In tests (2.1, 2.2, 2.3), the accuracy of the hit in the first attempt was estimated at 2 points, in the remaining attempts - at 1 point.

Table 2. Results of introductory and final testing of DSM athletes

Test 1.1	Measurement results, %		
	CG; Me (25; 75)	EG; Me (25; 75)	p
Start	88,584 (81,4; 93,6)	88,282 (80,8; 93,2)	p>0,05
End	90,077(83,5; 94,2)	94,094 (87,4; 96,6)	p<0,05
p	>0,05	<0,05)	
Test 1.2	Measurement results		
	CG; Me (25; 75)	EG; Me (25; 75)	p
Start	72,62 (68,6; 76,8)	74,248 (70,1; 78,3)	p>0,05
End	73,52 (69,4; 77,5)	94,285 (85,2; 97,6)	p<0,05
p	p>0,05	p<0,05	

Note: Test 1.1 - determination of DSM in time, Test 1.2 - determination of DSM in space

Results of the study and their discussion. The results of testing the distinctive sensitivity of movements (DSM) in athletes from the EG and CG at the beginning and at the end of the experiment are shown in Table. 2.

The results of the evaluation of the performance of game tests (2.1; 2.2; 2.3) by EG and KG athletes at the end of the experiment are shown in Table 3.

During the experiment, it was found that at its initial stage, there were no statistically significant differences in the values of the parameters characterizing the distinctive sensitivity of the movements of athletes from the EG and CG. At the end of the experiment, there were statistically significant differences between the values of these parameters in athletes from the EG and CG, as well as athletes from the CG compared with the initial data (p<0.05).

Analysis of the results of playing techniques fulfillment, carried out at the end of the experiment, showed a statistically significantly better fulfillment of them by athletes from the EG compared to the CG (p<0.05).

Distinctive sensitivity of movements and its components develop from congenital inclinations, representing a part of the general complex structure of the formation of motor psychomotor characteristics. The results of evaluating game techniques reflect the effectiveness and applicability of the methodology that develops it.

Conclusion. In the course of the study, a methodology was developed for improving the psychomotor spatio-temporal characteristics of young volleyball

players using special methodological influences and developing exercises. The pedagogical experiment showed the effectiveness of this technique, expressed in a significant improvement in the characteristics of DSM in athletes and the quality of their performance of game techniques.

References

1. Balsevich VC., Bolshenkov V.G., Ryabintsev F.P. Kontseptsiya fizicheskogo vospitaniya s ozdorovitelnoy napravlennoy uchashchikhsya nachalnykh klassov obshcheobrazovatelnykh shkol [The concept of physical education with a health-improving orientation of primary school students of general education schools]. Fizicheskaya kultura: vospitaniye, obrazovaniye, trenirovka. 1996. No. 2. pp. 13-18.
2. Bril M.S., Kleshchev Yu.N. Otbor v sportivnyye shkoly po voleybolu na osnove modelnykh kharakteristik sportsmenov vysshey kvalifikatsii [Selection in sports schools in volleyball based on the model characteristics of highly qualified athletes]. Methodological recommendations. Moscow, 1988. 45 p.
3. Zheleznyak Yu.D., Kostyukov V.V., Chachin A.V. Primernaya programma sportivnoy podgotovki po vidu sporta «Voleybol» (sportivnyye distsipliny «voleybol» i «plyazhnyy voleybol») [Approximate

Table 3. Results of playing techniques at the end of the experiment.

Test	Measurement results		
2.1.	CG; Me (25; 75)	EG; Me (25; 75)	p
	3 (2; 4)	6 (4; 7)	<0,05
2.2.	CG; Me (25; 75)	EG; Me (25; 75)	p
	4 (2; 5)	5 (3; 6)	<0,05
2.3.	CG; Me (25; 75)	EG; Me (25; 75)	p
	4 (3; 5)	6 (5; 7)	<0,05



- program of sports training for the sport "Volleyball" (sports disciplines "volleyball" and "beach volleyball"). Moscow, 2016. 223 p.
4. Lesheva N.S., Getman V.D., Lutkova N.V. et al. Soderzhaniye psikhomotornogo tsikla i yego primeneniye pri sovershenstvovanii peredachi myacha dvumya rukami sverkhu u voleybolistok [The content of the psychomotor cycle and its application in improving the transfer of the ball with two hands from above among volleyball players]. *Teoriya i praktika fizicheskoy kultury*. 2015. No. 9. pp. 56-58.
 5. Markov K.K., Nikolaeva O.O. Formirovaniye psikhomotornykh kachestv v sovremennom sporte: teoreticheskiye i metodologicheskiye problemy [Formation of psychomotor qualities in modern sports: theoretical and methodological problems]. *Fundamentalnyye issledovaniya*. 2013. No. 8 (4). pp. 943-947.
 6. Platonov V.N. Sistema podgotovki sportsmenov v olimpiyskom sporte. Obshchaya teoriya i yeye prakticheskiye prilozheniya [The system of training athletes in Olympic sports. General theory and its practical applications]. Textbook (for trainers): 2 books. Moscow: Olimp. lit. publ., 2015. Book 1 - 680 p.; Book 2 - 752 p.
 7. Rzhhanov A.A., Akhmatgatin A.A., Galtsev S.A. et al. Formirovaniye reaktsii vybora v voleybole [Formation of the reaction of choice in volleyball]. *Teoriya i praktika fizicheskoy kultury*. 2021. No. 10. pp. 92-94.
 8. Rzhhanov A.A. Metodika sportivnogo otbora podrostkov s uchetom ikh sposobnosti k resheniyu dvigatelnykh zadach [Methods of sports selection of adolescents, taking into account their ability to solve motor problems]. *Nauchnyy zhurnal: Vestnik KGPU im. V.P. Astafyeva*. 2021. No. 1 (55). pp. 133-143.
 9. Tinyukov A.B., Klyuchnikova S.N., Kochurova L.A. Metodika formirovaniya navykov prostranstvenno-vremennoy oriyentirovki v igrovoy deyatelnosti voleybolistok na osnove ekstrapolyatsii dvigatelnykh deystviy. [Methodology of spatio-temporal orientation skills formation in female volleyball players' playing activity based on motor actions extrapolation]. *Pedagogiko-psikhologicheskiye i mediko-biologicheskiye problemy fizicheskoy kultury i sporta*. 2017. Vol. 12. No. 1. pp. 96-103.
 10. Shestakov M.M., Kulekin I.V., Anikienko Zh.G. et al. Izmeneniye tochnosti razlicheniya prostanstvennykh i silovykh parametrov dvizheniy u yunykh futbolistov 13-15 let pod vozdeystviyem utomleniya [Changes in the accuracy of distinguishing spatial and power parameters of movements in young football players aged 13-15 years under the influence of fatigue]. *Teoriya i metodika sportivnoy trenirovki*. 2019. No. 3. pp. 26-30.
 11. Dumek J. Complete Description of Forces Acting on a Flying Beach Volleyball / J. Dumek, P. Šafařík // *EPJ Web of Conferences* 180. 02021, 2018. p. 1-6.