

**MOISEYENKO O., GORCHANYUK YU., GORCHANYUK V.**

*Kharkov state academy of physical culture*

## **Definition of a functional condition of the vestibular analyzer of volleyball players of 14 – 15 years old under the influence of specially directed exercises**

**Abstract. Purpose:** indicators of a functional condition of the vestibular analyzer and their changes under the influence of specially directed exercises at volleyball players of 14 – 15 years old are given in the article. **Results:** the carried-out analysis of a functional condition of the vestibular analyzer, both before, and after rotary loadings to the pedagogical experiment testifies to insufficient development of a vestibular function of young volleyball players. **Conclusions:** the comparison of results of the studied groups after the introduction in the educational-training process of special exercises directed on the improvement of operation of the vestibular analyzer revealed considerable changes of indicators of volleyball players of the experimental group.

**Keywords:** the vestibular analyzer, sensor-based systems, specially directed exercises, volleyball players of 14-15 years old of groups of the preliminary basic training.

**Relevance.** Physical actions of volleyball players consist of a set of starts and accelerations, high jumps up on maximum and optimum height, a large number of explosive movements at long, fast and almost continuous response to changes of circumstances that causes a big loading on a vestibular function of a volleyball player.

Irritations of the vestibular analyzer cause a delay of speed of movement, incoordination, deterioration of visual perceptions, and considerably influences indicators of attention that is displayed in the increase of number of mistakes.

Rovny A.S. 2001, Shesterova L.Ye. 2005, Maslyak I.P. 2007, Pomeshchikova I.P. 2014 dealt with tasks of the interconnection of physical fitness with a functional condition of sensor-based systems. Authors point to rather high degree of interconnection between indicators of the development of physical qualities and separate indicators of sensor-based systems in their works.

However the question of influence of special exercises of young volleyball players directed on the improvement of functioning of the vestibular analyzer in available literature is studied insufficiently.

Therefore, the **definition** of change of indicators of a functional condition of the vestibular sensor-based system of volleyball players of 14 – 15 years old under the influence of the exercises directed on the improvement of functioning of the vestibular analyzer became the **purpose** of this research.

The stated purpose defines the following tasks of the research:

### **Tasks of the research.**

1. To learn theoretical and methodological features of training of young volleyball players on the basis of the analysis of scientifically – methodical literature.

2. To investigate the level of indicators of the vestibular sensor-based systems of volleyball players of 14 – 15 years old.

3. To carry out the comparative analysis of the studied indicators before and after the introduction in the educational-training process of young volleyball players of the exercises directed on the improvement of functioning of the vestibular analyzer.

**The subject of the research:** the educational – training process of volleyball players of 14 – 15 years old.

**The object of the research:** the functional condition of the vestibular analyzer of volleyball players of 14 – 15 years old.

**Methods of the research:** theoretical analysis and generalization of scientifically methodical literature, studying of documentary materials and pedagogical supervision, methods of definition of separate indicators of the vestibular analyzer after standard rotary loadings in the Barany chair (on indicators: a deviation when walking on the 5th meter piece, speed of the performance of a task, methods of mathematical statistics).

### **The organization of the research.**

24 sportsmen at the age of 14 – 15 years old took part in the research. From them are 12 boys – volleyball

players who study in groups of the preliminary basic training of the third year of study of CYSS No. 12 of which were carried to the experimental group and 12 boys – volleyball players who study in groups of the previous basic training of the third year of study of CYSS No. 6 in Kharkov which were carried to the control group. Groups were identical on age and sex indicators.

All children who took part in the research were almost healthy and were under the supervision of sports doctors.

The research was conducted step by step from September, 2013 to May, 2014.

At the first stage (September, 2013) the pedagogical observation was conducted and the purpose, the task, the object, the subject and methods of the research were defined. And also guidance literature from the chosen subject was analyzed.

At the second stage (October, 2013 – April, 2014) the pedagogical experiment which included the previous and total testing of a functional condition of the vestibular sensor-based system was conducted. Indicators of a functional condition of the vestibular analyzer were measured before carrying out educational-training classes.

### **Results of the research.**

Attacking throws, fast movements, jumps, unexpected changes of a direction of movements, sharp jerks, falls, fast turns of a head at orientation – all this causes considerable displacements of all departments of the vestibular system of the volleyball player.

It is noted by practice that a feature of the vestibular analyzer is possibility of its training. Such training has to include exercises which suppress topical and vegetative reflexes, and also exercises are directed on a perfect performance of precisely coordination movements in unprofitable conditions for the vestibular mechanism.

So, complexes of special exercises and outdoor games aimed at the development of functionality of the vestibular analyzer were included in addition the educational – training process of volleyball players of the experimental group, with program material within 6 months.

Also for the development of vestibular firmness it was included difficult- coordination exercises which demand counteraction by unpleasant subjective feeling at their performance. These are different types of acrobatic and gymnastic exercises, kinds of jumps, rotary motions, various accelerations, instant stops, and so on. However the greatest action was taken by those exercises which included at the performance of this or that technique of a game. For example, the performance of a pass of a ball after a roll up action or a rotary motion, or after a sharp acceleration forward, back, to the right, to the left and so forth.

The vestibular firmness of volleyball players was measured before and after standard vestibular loading five turns for 10 s.

The analysis of activity of the vestibular analyzer didn't find considerable divergences between indicators of sportsmen of the control and the experimental groups ( $p > 0,05$ ) to the pedagogical experiment on indicators of deviation during the walking and speed of the performance of the task, both before and after the received vestibular irritation.

It should be noted that displacements were observed both from the side of somatic, and vegetative nervous systems when carrying out functional tests. After the received rotary loadings sportsmen complained of dizziness and nausea and much worse performed tests. Received data of the previous testing also pointed to the insufficient development of the vestibular function of volleyball players of 14 – 15 years old.

Therefore, it was recommended to include complexes of specially directed exercises on the stabilization of the vestibular reflexes and the avoidance of vestibular-somatic manifestations for the development of the vestibular analyzer of volleyball players in the educational and training process.

The comparison of results of the vestibular function of volleyball players of the control and the experimental groups established considerable divergences between them after the pedagogical experiment. So, the data of a direct walking improved and had statistically reliable differences after the vestibular loading and speed of the performance of the task, both before and after rotation of the experimental group, ( $p > 0,05$ ).

The exception is made by indicators of deviation when walking to the standard rotation on the Barany chair where differences aren't essential and had no reliable character ( $p > 0,05$ ).

The analysis of the obtained data, testifies that complexes of specially –selected exercises directed on the improvement of functioning of the vestibular analyzer influence positively the functionality of an organ of equilibrium, reducing its reactivity.

Table 1

**Indicators of the vestibular firmness of volleyball players of 14 – 15 years old before and after the pedagogical experiment**

Before the pedagogical experiment				
Tests for the determination of the vestibular firmness	CG (n=12)	EG (n=12)	t	p
	$\bar{X} \pm m$			
<b>deviation during the walking</b>				
before rotation (sm)	28,2±0,65	27,12±0,52	1,30	> 0,05
after rotation (sm)	42,91±2,39	41,23±1,87	0,50	> 0,05
<b>speed of the performance of the task</b>				
before rotation (s)	3,1±0,35	2,9±0,15	0,53	> 0,05
after rotation (s)	3,5±0,53	3,4±0,26	0,12	> 0,05
After the pedagogical experiment				
<b>deviation during the walking</b>				
before rotation (sm)	24,62±0,77	23,12±1,63	0,83	> 0,05
after rotation (sm)	41,13±2,30	36,72±1,20	2,54	<0,05
<b>speed of the performance of the task</b>				
before rotation (s)	2,9±0,15	2,5±0,12	2,08	<0,05
after rotation (s)	3,3±0,13	2,7±0,23	2,27	<0,05

Testing of the vestibular firmness established the considerable improvement of results after the pedagogical experiment at volleyball players of the experimental group. Received data testify that indicators of functional tests, deviations during the walking and speed of the performance of the task authentically improved (<0,05), both before and after standard vestibular loadings.

Functional displacements at sportsmen after the performance of complexes of specially – offered exercises after the vestibular irritation took place much easier, than at unexercised volleyball players.

Table 2

**The comparative characteristic of indicators of the vestibular firmness of volleyball players of the experimental group before and after the pedagogical experiment**

Tests for the determination of the vestibular firmness	EG before the pedagogical experiment	EG after the pedagogical experiment	t	p
	$\bar{X} \pm m$			
<b>Deviation during the walking (sm)</b>				
before rotation (sm)	27,12±0,52	23,12±1,63	2,34	<0,05
after rotation (sm)	41,23±1,87	36,72±1,20	2,03	<0,05
<b>Speed of the performance of the task</b>				
before rotation (s)	2,9±0,15	2,5±0,12	2,08	<0,05
after rotation (s)	3,4±0,26	2,7±0,23	2,02	<0,05

Therefore it is possible to consider that the offered exercises by us positively affected the functionality of an organ of the equilibrium and improved the majority of its functions.

The received by us indicators allow to include series of exercises of technique in the educational-training process of young volleyball players, namely, performance of passes by two hands from above and from below in couples, the three and the fours, after throws, movements, accelerations, turns, with the change of places and on different distances (in couples with additional over themselves); serial methods of forwards of blows by two hands from below after falling and movements in different directions and zones volleyball to a platform; imitation of blocking and forwards of blows after accelerations and falling).

The modified exercises for the development of hopping endurance are also included in trainings (jumps on a place and with advance with turns on 90, 180, 360 degrees, also with reaching a metric marking, also with blow to the fixed ball forward). Duration of one series of 15 – 20 jumps, quantity of series 5 – 7 in training, a rest interval between series is till 2 minutes.

The modified outdoor games, relays are.

### Conclusions

1. Comparing indicators of volleyball players of the control and the experimental groups after carrying out the pedagogical experiment it is established that the data of the vestibular firmness improved at boys – volleyball players of the experimental group, and these divergences have a reliable character ( $p < 0,05$ ), the exception is made by indicators of deviation when walking to rotation.

2. The introduction in the educational-training process of complexes of the specially directed exercises on the improvement of functionality of the vestibular analyzer established the considerable improvement of the vestibular firmness of volleyball players of the experimental group. The comparison of results of speed of the performance of the task and the deviation when walking, both before and after rotation of boys of the experimental group on the Barany chair established a statistically reliable difference ( $<0,05$ ) between indicators before and after the pedagogical experiment.

**In perspective**, the definition of the interconnection of the development of vestibular functions and manifestation of different physical qualities of volleyball players of 14 – 15 years old are interesting in this direction.

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**Olena Moiseyenko:** *Kharkiv State Academy of Physical Culture: Klochkivska str. 99, Kharkiv, 61058, Ukraine.*

**ORCID.ORG/0000-0002-4169-4446**

**E-mail: pinchyk1974@yandex.ua**

**Yurii Gorchanyuk:** *PhD (Physical Education and Sport), Associate Professor; Kharkiv State Academy of Physical Culture: Klochkivska str. 99, Kharkiv, 61058, Ukraine.*

**ORCID.ORG/0000-0001-7158-3061**

**E-mail: pinchyk1974@yandex.ua**

**Valerii Gorchanyuk:** *Ukrainian State Academy of Railway Transport: Feyerbakha sq. 7, Kharkov, 61001, Ukraine.*

**ORCID.ORG/0000-0002-8218-5648**

**E-mail: pinchyk1974@yandex.ua**