

The dynamics of somatic indicators of basketball players under the influence of the special exercises which are directed to the increase of stability of the vestibular analyzer

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Purpose: to determine stability of the vestibular analyzer of basketball players of the team of KhSAPC by indicators of somatic displacements after the standard vestibular irritations on the Barany chair, after the introduction of the special exercises in the educational – training process, which are directed on the increase of stability of the vestibular sensor-based system.

Material & Methods: the analysis of references, methods of definition of a functional condition of the vestibular analyzer on indicators of somatic displacements before and after the irritation on the Barany chair, methods of mathematical statistics. 12 boys – basketball players of the men's national team of KhSAPC took part in the researches.

Results: somatic indicators of a functional condition of the vestibular analyzer of students – basketball players of the team of KhSAPC, and, their changes under the influence of rotary loadings before the pedagogical experiment are given in the article.

Conclusions: the analysis of the results which were received after the experiment showed the considerable improvement of indicators, according to the testing of the motive test (4x9 m (s)), hand dynamometry of 100% of a maximum and 50% of a maximum of the right and left hands ($p < 0,05$), both before and after a rotation. The exception was made by indicators of dynamometry of the left hand of 50% of a maximum, both before and after a rotation where changes weren't essential and statistically doubtful ($p > 0,05$).

Keywords: vestibular analyzer, basketball players, rotary loadings.

Introduction

One of the most important conditions for the achievement of high sports results in sports games is ability of a sportsman to keep balance and to be guided freely in space, despite considerable exercise stresses and counteraction of the opponent. Generally these functions are carried out due to the functional activity of visual and vestibular sensor-based systems.

Sports activity of a basketball player is caused by the continuous activity of the vestibular analyzer which receptors perceive any change of a position of a head and a body in space. Level of functioning of vestibular sensor-based system directly depends on intensity of adequate rectilinear and angular accelerations.

Therefore studying of reactions of organism to vestibular irritations, and also search of the new ways, allowing to improve the studied function, is essentially important for the improvement of the training process in sports games.

Methodological basics of training of the vestibular analyzer of the different contingent of people were covered in the works of A. S. Rovnyi (2001), L. Ye. Shesterova (2004), I. P. Maslyak (2007), Ye. K. Moiseyenko (2015) [1–11]. The authors point to the rather high degree of interrelation between indicators of the development of physical qualities and separate indicators of the vestibular sensor-based system in their researches [1; 4; 5]. However the works, which are devoted to the determi-

nation of vestibular stability under the influence of the special exercises, which are directed to activation of vestibular functions of students-basketball players in the available literature, are revealed insufficiently.

Purpose of the research

The determination of stability of the vestibular analyzer of basketball players of the team of KhSAPC on indicators of somatic displacements after standard vestibular irritations on the Barany chair, after introduction of the special exercises in the educational training process, which are directed to the increase of stability of the vestibular sensor-based system.

The stated purpose defines the following tasks of the research:

1. To study the features of functioning of the vestibular sensor-based system on the basis of the analysis of scientific and methodical literature.
2. To investigate the level of activity of the vestibular analyzer before and after the standard vestibular irritation on the Barany chair of basketball players of the team of KhSAPC.
3. To carry out the comparative analysis of stability of the vestibular analyzer of basketball players of the team of KhSAPC before and after rotary loadings before the pedagogical experiment.

Material and Methods of the research

12 boys – basketball players of the men's national team of KhSAPC took part in the research. All students were rather healthy and were under supervision of the sports doctor.

Research methods: analysis of references, methods of definition of functional condition of the vestibular analyzer on indicators of somatic displacements before and after irritation on the Barany chair, methods of mathematical statistics.

Results of the research and their discussion

The program material of the educational-training process of basketball players was added complexes of the special exercises and outdoor games, which are directed to the increase of stability of the vestibular analyzer during 6 months. The preparatory and the main part of classes included acrobatic exercises, various accelerations and jumps with various starting positions, both before, and after rotary loadings, instant stops, roll overs and so on which were carried out with the gradual increase of their coordination and functional complexity.

However, the greatest effect was observed from those exercises, which were the part of this or that technique. So, the modified exercises consisting of kinds of throws, passes, dribblings, in couples, three, four, which are carried out on various distance with various speed and trajectory of flight, by one and two balls, after turns on 90, 180, 360 degrees, also after falling, roll overs, acceleration, were used in the work.

The adapted exercises were also included into the section of special physical training. The repeated rotations with various position of a head were used, then various complicated-coordinating tasks on the coach's signal were performed, and also the modified outdoor games, relays were applied.

The increase in loading was once a month, and it made about 60 percent of all exercises, which were used in trainings, and it was distributed in equal shares between the exercises, which are aimed at the functionality development the semicircular channels and the otolithic device.

The research of indicators of speed of performance of the task (4x9 m), hand dynamometry of the right and left hands of 100% of a maximum and 50% of a maximum before the pedagogical experiment, before and after the standard vestibular irritation established that the data of sportsmen-basketball players worsened after rotations, however reliable distinctions between them weren't revealed ($p > 0,05$) (tab. 1).

The analysis of data of definition of the set time (10 s) established the improvement of results of testing after rotation on the Barany chair. This function, according to experts experts, is connected with the definition of temporary intervals in the game, is rather stable size and more depends on the number of repetitions ($p > 0,05$) (tab. 1).

It should be noted that this research was conducted before the educational -training classes at the end of the preparatory period of the year macrocycle, however the analysis of the data, which were obtained when testing, revealed rather big differences before and after the vestibular irritation. So, the difference in indicators of speed of performance of the task (4x9 m (s)) before the rotation made 1 s, dynamometry indicators – on average about 2 kg.

Thus, it is possible to note that the separate functions of the vestibular analyzer are developed insufficiently at the studied contingent of sportsmen and demand introduction in the educational-training process of complexes of the specially-selected exercises, which are directed to the stabilization of vestibular functions and elimination of vestibulo-vegetative and vestibulo-somatic manifestations.

As a result of the research of indicators of accuracy of the set time (10 s) before and after the vestibular irritation after the pedagogical experiment, it is established that these distinctions were insignificant and had a doubtful character ($p > 0,05$) (tab. 2).

The implementation of the motive test (4x9 m (s)) after vestibular loading, after application of the special exercises, which are directed to activation of vestibular functions established the reliable distinctions between indicators, both before, and after rotation ($p < 0,05$) (tab. 2).

The analysis of data of hand dynamometry of 100% of a maximum and 50% of a maximum of the right and left hands after the pedagogical experiment, both before, and after rotary loadings, established the statistical distinctions between the studied indicators ($p < 0,05$) (tab. 2).

The exception was made by indicators of dynamometry of the left hand of 50% of a maximum, both before, and after rotation on the Barany chair where changes are not essential and statistically doubtful ($p > 0,05$) (tab. 2).

Conclusions

1. The analysis of references on this problem demonstrates that it remains relevant and requires the solution of number of questions among which the research of development of the

Table 1

Indicators of vestibular stability of basketball players of the team of KhSAPC before and after rotary loadings on the Barany chair before the pedagogical experiment, $\bar{X} \pm m$ (n=12)

Tests for the determination of the vestibular stability	Before rotations	After rotations	t	p
Definition of the set time (10 s)	1,2±0,9	0,3±0,4	0,9	>0,05
Speed of performance of task (4x9), s	10,1±0,9	11,1±0,9	0,8	>0,05
Dynamometry of 100% of maximum (right), kg	49,8±2,4	51,2±2,6	0,4	>0,05
Dynamometry of 100% of maximum (left), kg	43,3±2,9	45,1±3,4	0,4	>0,05
Dynamometry of 50% of maximum (right), kg	34,8±2,7	27,4±2,9	1,9	>0,05
Dynamometry of 50% of maximum (left), kg	26,6±3,1	27,1±3,4	0,1	>0,05

Table 2
Indicators of vestibular stability of basketball players of the team of KhSAPC before the pedagogical experiment, $\bar{X} \pm m$ (n=12)

Period of measurement of indicators	Before the experiment	After the experiment	t	p
Definition of the set time (10 s)				
before rotation	1,2±0,9	0,5±0,2	0,8	>0,05
after rotation	0,3±0,4	0,2±0,1	0,2	>0,05
Speed of performance of task (4x9), s				
before rotation	10,1±0,9	8,2±0,3	2,0	<0,05
after rotation	11,1±0,9	8,9±0,4	2,2	<0,05
Dynamometry 100% of a maximum (right), kg				
before rotation	49,8±2,4	55,6±1,5	2,1	<0,05
after rotation	51,2±2,6	58,4±2,1	2,1	<0,05
Dynamometry 100% of a maximum (left), kg				
before rotation	43,3±2,9	36,1±2,1	2,1	<0,05
after rotation	45,1±3,4	36,8±2,1	2,1	<0,05
Dynamometry 50% of a maximum (right), kg				
before rotation	34,8±2,7	27,9±2,1	2,1	<0,05
after rotation	27,4±2,9	28,7±2,1	0,4	>0,05
Dynamometry 50% of a maximum (left), kg				
before rotation	26,6±3,1	21,1±1,2	1,7	>0,05
after rotation	27,1±3,4	19,2±1,9	2,1	<0,05

vestibular analyzer under the influence of various factors is the leader.

2. The research of indicators of functional condition of the vestibular analyzer before the pedagogical experiment, before and after rotary loads of basketball players of the team of KhSAPC didn't reveal the reliable distinctions between them ($p > 0,05$), however the majority of indicators worsened, that is became the reason for introduction of the sets of exercises in the educational-training process of basketball players, which are directed to the activation of vestibular functions.

3. The analysis of the results, which were received after the

experiment showed the considerable improvement of indicators according to the testing of the motive test (4x9 m (s)), hand dynamometry of 100% of a maximum and 50% of a maximum of the right and left hands ($p < 0,05$), both before, and after rotation. The exception was made by indicators of dynamometry of the left hand of 50% of a maximum, both before, and after rotation, where changes were not essential and statistically doubtful ($p > 0,05$).

Prospect of further researches. Questions of the research of vestibular functions after training loads, different in size, in the different periods of the year macrocycle are interesting.

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