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Vestibulosomatic training as a tool of increasing the stability of aiming accuracy in basketball to the impact of various plane acceleration

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Abstract
The article analyzes the materials of an experimental study devoted to the study and justification of the possibility of increasing the stability of the aiming accuracy of shots in basketball to the effects of multi-plane accelerations by systematically training the function of the vestibular analyzer.

Keywords: Basketball player, throws, vestibulosomatic training, aiming accuracy, equilibrium, rotary motion efficiency.

Introduction

One of the pronounced tendencies of modern basketball is an increase in the volume of multidirectional high-speed motor acts performed both during the attack and defense, and which are saturated with such elements as jerks and instant stops, turns and rotations, jumps and jumps, inclinations, etc. There is no doubt that the total number of such actions, having a disturbing effect on the functional state of the vestibular apparatus, causes the phenomenon of body motion sickness, which is accompanied by loss of balance and discoordination of movements (Bezverhov, 2008; Pulatov, 2017; Pulatov, 2017). An example that confirms such a consequence in basketball can be cases when even the most leading players, when executing free throws, often make a mistake, although no one bothers them at this moment.

The aim of present study was to study the possibility of increasing the stability of precise throws in basketball players to the effects of multiplane accelerations in the way of vestibulosomatic training during the experiment.

Methods

The In this research, the tests were used to: determine the duration of maintaining the static balance of the body during rapid rotation of the head to the left; the same, to the right (modified test by Prof. A.I. Yarotskiy); determination of the duration of maintaining dynamic balance in the course of rapid rotation of the body to the left in the position of the trunk tilt forward by 90°, standing in a circle with a diameter of 70 sm; the same, to the right. Note: at the moment when the line of the circle is overstepped or exited from it, the test stops; determining the total number of free throws performed within one minute before and after irritation of the vestibular analyzer by 15-fold rotation of the body in a 90-degree forward tilt of the body (rotation is performed in a convenient direction). Note: the current research was carried out in the period from September 2016 to June, 2017, where 27 subjects from among the basketball players of the highest categories, studying at the “SKUF”, participated.

The pedagogical experiment was organized in the period from July 1, 2017 to May 30, 2018 with the involvement of the teams “SKUF” - the sports club of the Uzbek state university of physical education and sport (Chirchik) as an experimental group (EG) and "SC MDRU" - sports club of the Ministry of Defense of the Republic of Uzbekistan (Tashkent) as a control group (CG), the compositions of which were staffed by 12 people.

The period of the experiment and the time of testing the data under study were set in accordance with the regime of the annual cycle of training club teams in Uzbekistan.

The CG of basketball players trained according to a traditional program designed for club teams.

In the schedule of the annual cycle of sports training and educational and training sessions of the EG of basketball players (in the morning during the “exercise”, before and after training, on Thursdays during the physical training and SPP classes), the following complexes of exercises and outdoor games, specialized for training stability, were systematically used functions of the vestibular analyzer to the effects of multiplanar accelerations (rotations): arbitrary rotations around oneself, head rotation, body rotation in a tilt position, somersaults back and forth, rotations while sitting in a chair,

walking with rotation to the right and left, outdoor games: "who dances longer individual waltz" and "double waltz" , "whoever runs the longest" along the line of a circle with a diameter of 4 m - to the right side and to the left.

Note:

- all rotational exercises are performed to the right and left sides;
- due to the fact that there were very few left-handers among the tested basketball players, their data were not subjected to processing.

Results and discussion

In team sports, and in particular in basketball, any movement in any situation is performed with a certain target setting. However, in real conditions this is not always possible or the accuracy of actions is not ensured due to the influence of various confusing and disturbing factors of exogenous or endogenous origin. In basketball, for example, such factors can be, as already noted above, multiplane accelerations arising during training and competitions, and which, by irritating the receptors of the vestibular analyzer, cause imbalance in the static and dynamic balance of the body.

The results of a vestibulosomatic study of basketball players of the highest categories showed a low background picture of the level of manifestation of stability of maintaining both static and dynamic balance during rotation of the head (in the main posture) and the body around itself in a 90-degree forward bend. Moreover, the duration of maintaining these types of balance was relatively longer for rotations to the left than to the right. So, for example, the duration of maintaining static balance during head rotations to the left in the surveyed basketball players (all basketball players were right-handed) was 13.7 ± 4.32 seconds, and during head rotations to the right, this value was relatively low and equaled 9.6 ± 2, 18 sec. (Table 1). A similar orientation of the studied indicators was found according to the data on the duration of maintaining dynamic equilibrium when the body rotates around itself to the left and to the right: 11.9 ± 3.03 sec. and 7.5 ± 1.57 sec. respectively. It should be assumed that such an extremely low level of manifestation of stability of maintaining static and dynamic balance to the impact of violent accelerations is a negative factor that inhibits the process of improving the reliability of precision-target motor acts fulfillment in general, and throws in particular.

This is confirmed by the materials of unique research carried out back in the 60-70s of the twentieth century [2, 19-s; 3, 65-s; 4, 36-s; 7, 27-c], where A.A. Lomov, in particular, using the example of figure skaters, shows that right-sided athletes can easily, continuously and repeatedly perform rotational movements to the left side both in support and unsupported positions, left-sided - vice versa. And the symmetrization of asymmetrically manifested motor functions, including rotational movements, according to these authors, can lead to an expansion of the range of possibilities for mastering new technical elements for sports purposes.

Within the framework of this presentation, we studied the dynamics of the effectiveness of the execution of free throws in 1 min. before and after the application of a dosed rotational load in basketball players of the highest categories (Table 2). It can be seen from the table that the dosed rotational load in the form of a 15-short rapid rotational movement of the body in a circle with a diameter of 70 cm in a 90° forward tilt had a negative impact not only on the total volume of free throws in 1 minute, but also led to a significant decrease in the number of scored throws. For example, the total amount of free throws before the dosed rotational load is performed in 1 minute, averaged 10.8 ± 2.73 times, and the number of goals scored 6.3 ± 1.04 times. Immediately after completing the throwing load, the total number of free throws per minute. decreased significantly and amounted to 7.5 ± 1.09 times, and the number of scored throws decreased even more and turned out to be at the level of 3.37 ± 0.42

Table 1. Indicators of the duration of maintaining body balance in the course of rotational load among basketball players of the highest categories n=54 (X±σ)

Tests:	When rotating the head (static balance)		When the body rotates (dynamic balance)	
Duration of maintaining body balance (sec)	To the left	To the right	To the left	To the right
	13,7±4,32	9,6±2,18	11,9±3,03	7,5±1,57

Table 2. The dynamics of the effectiveness of the execution of free throws in 1 min. before and after the application of a dosed rotational load in basketball players of the highest categories n=54 (X±σ)

Test	Before the test		Immediately after the test	
	Number of throws taken	Shots scored	Number of throws taken	Number of throws taken
15-fold rapid rotation of the body in a circle with a diameter of 70 sm. In a posture of a 90 forward bend	10,8±1,53	6,3±1,04	7,5±1,09	3,37±0,42

times. It is also important to emphasize the fact that in the course of the rotation of the body around themselves a number of subjects (5 people in the first test and 7 people in the second), without completing this test task to the end, "lost" their balance and fell.

Such consequences once again confirm the presence of the fact of the phenomenon of insufficient development of the vestibular analyzer function of the examined basketball players, which was the basis for conducting a pedagogical experiment aimed at increasing the effectiveness of targeted motor actions on the example of free throws by improving the stability of maintaining body balance to the effects of various kinds of accelerations using the developed a complex of multiplanar swinging exercises. The results of this study, which are presented in Table 3, showed, as expected by the assumption, a multidirectional picture of the manifestation of the studied parameters by the end of the experiment or at the end of the one-year training cycle. So, for example, among the basketball players from the CG who trained according to the traditional program, the duration of maintaining the static balance of the body during head rotations to the left before the experiment or before the beginning of the one-year training cycle averaged 15.3 ± 3.56 sec., And in the EG, which during the period of the experiment, in the morning, before and after training, we systematically performed the multi-plane rotational exercises developed by us, this value was equal to 14.7 ± 3.83 sec. (Table 3). These approximately the same low indicators of stability of maintaining body balance suggest that traditional training sessions conducted with basketball players cannot effectively improve the function of the vestibular analyzer.

Table 3. Dynamics of indicators of the duration of maintaining body balance in the course of rotational load among basketball players of the control and experimental groups at different stages of the annual training cycle n=54 (X±σ)

Tests	Groups	1	2	3	t	P
Duration of maintaining body balance (sec): -when head rotates-to the left	CG EG	15,3±3,56 14,7±3,83	16,6±4,52 29,8±3,07	13,7±3,07 19,8±4,75	1,77 4,34	<0,05 <0,001
- the same, to the right	CG EG	11,5±1,79 12,3±2,16	12,2±1,37 25,5±2,23	12,4±1,87 14,3±2,30	1,81 3,29	>0,05 <0,01
- when rotating body-left	CG EG	13,4±3,01 12,3±3,02	14,7±3,63 27,2±2,77	15,2±3,26 15,9±3,15	2,11 4,29	<0,05 <0,001
the same, to the right	CG EG	10,3±1,63 9,9±1,59	11,7±2,53 23,8±2,17	11,6±2,07 12,1±2,04	2,56 4,42	<0,05 <0,001

Three months after the beginning of the experiment or before the beginning of the competitive period, the duration of maintaining body balance during head rotations to the left in the CG improved only by 1.3 sec., Averaging 16.6 ± 4.52 sec., And in the EG the resistance to preservation static balance with head tilt to the left progressed noticeably and reached 29.8 ± 3.07 sec. By the end of the experiment, this value in basketball players from the CG was characterized by a tendency to deterioration,

which decreased in the duration of maintaining balance to 13.7 ± 3.07 sec., Which, obviously, is a consequence of fatigue localized in the sphere of central - peripheral mechanisms of regulation of postural reactions. At the same time among basketball players from the EG by the time of the experiment completion the duration of maintaining body balance during head rotations to the left improved a lot and reached 19.8 ± 4.75 sec., Which occurred, in our opinion, due to the influence of directed vestibulosomatic training with the use of multiplanar rotary exercise.

Particular attention is paid to the fact that the stability of maintaining the balance of the body was noticeably lower when the head turned to the right than its value when the head turned to the left in both groups of basketball players and at all stages of the experiment. However, in the EG, the duration of body balance preservation and when the head turns to the right significantly increased three months after the beginning of the experiment, and especially it reached its peak by the end of the experiment or by the end of the one-year training cycle (19.8 ± 4.75 sec).

A similar orientation of the indices studied in both groups of basketball players (low in the CG, and a high-regressing orientation in the EG) was also revealed according to the data of testing the stability of maintaining dynamic balance in conditions of turning the body around itself to the left and to the right in a position of 90 нак forward bend. Such a clearly degenerated dynamics of the progression of stability indicators of maintaining static and dynamic balance under the influence of an intense rotational load, found among basketball players from the EG by the end of the experiment and at the end of the one-year training cycle, testifies to the high efficiency of the multi-plane exercises developed by us for improving the function of the vestibular analyzer.

Above, it was suggested that systematic training of the function of the vestibular analyzer leads not only to an increase in the stability of maintaining the static and dynamic balance of the body to the effects of various kinds of disturbing factors (jerks, turns, rotations, etc.), but initially increases the reliability of accuracy -targeted actions, including shots in basketball. To determine the consistency of this assumption, we carried out a study aimed at studying the possibility of increasing the accuracy of free throws among basketball players of the highest categories in the conditions of traditional and experimental variants of training sessions (Table 4). The table shows that the training ses-

Table 4. The dynamics of the effectiveness of aiming actions of basketball players on the example of free throws in 1 min. against the background of the aftereffect of the rotational load during the experiment carried out according to the regime of the annual training cycle n=54 (X±σ)

Free throws in 1 min	Group	Dosed load in the form of 15-fold rotation of the body in a 90-degree forward bend		
		Before loading	After loading	Difference
Total amount of throws (number)	CG EG	Before the experiment or before the start of the one-year training cycle (June 2017)		
		11,3±1,57 10,8±1,34	7,5±0,89 6,9±0,67	3,8 3,9
Scored (%)	CG EG	7,7±0,69 7,3±0,62	4,8±0,23 4,5±0,21	2,9 2,8
Total amount of throws (number)	CG EG	After 3 months or before the start of the competition cycles (October, 2017)		
		11,5±1,52 12,7±1,47	6,4±0,71 9,9±1,13	5,1 2,8
Scored (%)	CG EG	8,7±1,12 10,6±1,37	6,7±0,77 9,9±1,59	2,0 0,7
Total amount of throws (number)	CG EG	At the end of the experiment or at the end of the one-year training cycle (June, 2018)		
		11,9±1,46 14,4±1,52	6,9±0,75 13,5±1,23	5,0 0,9
Scored (%)	CG EG	7,6±0,57 13,2±1,03	4,8±0,27 12,7±0,89	2,8 0,5

sions, conducted according to the traditional and experimental programs, had a multidirectional effect on the dynamics of improving the accuracy of free throws among basketball players from the control and experimental groups. In particular, the total amount of free throws in 1 min. in the CG before the application of the dosed load in the form of 15-fold rotation of the body in the forward tilt position by 90 degrees before the beginning of the experiment (June, 2017) averaged 11.3 ± 1.57 times, and after the rotational load, the total number of throws significantly decreased and was 7.5 ± 0.89 times. The number of scored throws in this group before the rotational load was 7.7 ± 0.69 times, and after that it decreased significantly and amounted to 4.8 ± 0.23 times. The same indices, registered among the basketball players from the EG under the same conditions, almost did not have any special differences and were, respectively: the total volume of throws before the body rotation - 10.8 ± 1.34, after - 6.9 ± 0.67; the number of scored throws before turning the body - 7.3 ± 0.62, after - 4.5 ± 0.21.

Three months later or before the start of the competitive cycles (October, 2017), the above-mentioned dynamics of the studied indicators of free throws was demonstrated in the following ratios: CG-volume of throws before body rotation-11.5 ± 1.5 times, after -6.4 ± 0.71, the number of scored throws before body rotation 8.7 ± 1.12, after-6.7 ± 0.77; EC - respectively: 12.7 ± 1.47; 9.9 ± 1.13; 10.6 ± 1.37; 9.9 ± 1.59. It can be seen that in the EG even for three months of systematic fulfillment of the developed by us multiplanar throwing exercises, the studied parameters of free throws significantly increased in comparison with the same indicators, recorded among the basketball players from the CG. Moreover, the same indicators, found in the EG, progressed much more at the end of the experiment or at the end of the one-year training cycle, which confirms the sufficiently high efficiency of the vestibulosomatic training means developed by us, which led not only to a noticeable development of the stability of maintaining static and dynamic balance of the body, but also contributed to a significant increase in the accuracy of free throws against the background of the aftereffect of the thrust load.

Conclusion

The materials of this study have shown that the basketball players of the highest categories examined by us turned out to have extremely low stability of maintaining static and dynamic balance to the effects of rotational movements. Moreover, when the head and body rotated to the right, the duration of maintaining both static and dynamic balance was noticeably shorter than when they were rotated to the left. It should be assumed that the insufficient and asymmetric development of the stability of vestibulosomatic reactions, having a negative effect on the maintenance of static and dynamic balance, can lead to a breakdown in technique and a decrease in the effectiveness of throws performed, especially at the end of the 3x4 rounds of the game.

At least, this assumption was confirmed by the data of testing the dynamics of the effectiveness of free throws in 1 min. before and after the application of a dosed rotational load in the same basketball players. This was the basis for conducting a special pedagogical experiment, the results of which made it possible to reveal that systematic vestibulosomatic training with the use of a complex of different-plane rotational exercises developed by us in the training mode for basketball players can not only intensively develop the stability of maintaining the static and dynamic balance of the body, but it, as it turned out , can lead to a significant increase in the reliability of the performance of precision - target motor actions, including throws, under conditions of exposure to various kinds of accelerations of a disturbing nature.

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