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PECULIARITIES OF IMPROVING VESTIBULAR STABILITY FOR ACROBATS, AGED 9-10 YEARS

J. G. Bashtannyk

*Supervisors: N. G. Dolbysheva, S. M. Poleshchuk
Dnipropetrovsk State Institute of Physical Culture and Sport*

Анотація. У даній статті представлена методика вдосконалення розвитку вестибулярної стійкості акробатів віком 9-10 років.

Introduction. Acrobatics is one of difficult coordinating sports. By means of acrobatics the problems of different directions are solved successfully.

During sport acrobatics trainings a general rise in basic body tone systems and proportional development of the whole muscular system is reached, the work of all analyzer systems and especially the vestibular and proprioceptive ones is activated [1, 5].

Practical solution of aesthetic problems in sport acrobatics is the perfection and application of gymnastics, choreography and raising motor culture. It is generally accepted fact that acrobatics exercises are very important for increased resistance to acceleration in the straight and rotational loads [3, 4, 6].

In practice in the the training process of sports acrobatics exercises that make high demands on the muscular sensation by eliminating or limiting visual and auditory control of motor actions are used. [2, 6].

Analysis of sports and methodics materials and training process of acrobats didn't give possibility to determine specific training focused on the development of vestibular stability in acrobatics and children aged 9-10 years at the stage of previous base preparation.

In this regard, the relevant issue is the development of new methods of using physical exercises to develop coordination skills, such as vestibular stability in the process of sports acrobatics trainings.

The aim of the research is to experimentally test the method of improving the vestibular stability of acrobats, aged 9-10 years on the stage of previous base preparation.

Objectives of the research:

1. To investigate the level of vestibular stability of acrobats, aged 9-10 years;
2. To work out a method for improving the stability of the vestibular acrobats, aged 9-10 years and to determine its effectiveness.

Material and methods of the research. To solve this problem we have used the following research methods: analysis of scientific and technical literature; pedagogical supervision; pedagogical experiment; control testing; mathematical and statistical analysis. The investigation involved 20 boys, aged 9-10 years who are engaged in sports acrobatics.

Results and discussion. The basis for the development and implementation techniques of vestibular stability of acrobats were ascertaining experiment results (primary research). The aim of the experiment was to determine vestibular stability using vestibular testing load, which contained coordinating Romberg test, Yarotskiy test and technical training tests.

According to the results of the initial tests with the help of samples vestibular stability level was rather low. Thus, the level of vestibular stability according to Yarotskiy test both in the control and experimental groups averaged 17.4sec. \pm 1.95 and 17,0 sec. \pm 1.95, respectively, at a rate – 27-28 sec. Results of the complicated Romberg test match below average, as at the rate of 15 sec. in the control group it was 9.4 sec. \pm 1.3, and in the pilot group – 9.3 sec. \pm 0.65 (Table. 1).

Evaluation of vestibular stability level by technical preparedness tests according to the 10 point scale indicate somewhat higher results in comparison with coordination tests and ranged from 7.4 to 8.5 points (Table. 2). It can be explained by the fact that these exercises are technical standars in qualification programs.

Table 1

Level of Vestibular Stability by Coordination Tests during Ascertaining Experiment

Tests	Yarotskiy Test		Romberg Test	
	K (n=10)	E(n=10)	K(n=10)	E(n=10)
$\bar{X}_1 \pm \sigma_1$	17,4±1,95	17,0±1,95	9,4±1,3	9,3±0,65
$\pm m_1$	0,617	0,617	0,411	0,206
P_1	$P_1 > 0,05$		$P_1 > 0,05$	

Table 2

Level of Vestibular Stability by Tests for Technical Preparedness during Ascertaining Experiment

№	4-5 steps takeoff - somersault forward		Back handspring (Flic) - back flip		Jump from a height h=30 cm. with 360° turnover in "Stick" landing	
	GPA		GPA		GPA	
	K	E	K	E	K	E
$\bar{X}_1 \pm \sigma_1$	8,4±0,97	8,7±1,3	7,6±0,97	7,4±0,97	8,1±1,3	8,5±1,62
$\pm m_1$	0,615	0,613	0,412	0,207	0,546	0,581
p_1	$> 0,05$		$> 0,05$		$> 0,05$	

Based on results methods improving the vestibular stability of the acrobats were developed and implemented. They included four relatively independent sets of exercises, taking into account the specificity of motor activity:

1. A set of exercises in balance on a limited place of support (Gymnastic beam h = 30 cm). Choreographical exercises on the account and in any tempo are performed. Special attention is paid to the retaining of posture and balance preservation, plasticity and expressiveness of movement.

2. A set of exercises with rotation forward. Skill of landing after switching rotation forward is formed. Attention is paid to steady landing or rational position to move to another element.

3. A set of exercises with the rotation back. Exercises are performed from a place and "tempo". Skill of rational

distribution balance is formed. It depends on the tasks to be solved during the exercises (performance in "Stick"landidng", in transition).

4. A set of exercises with the rotation in the longitudinal plane, with a combined rotation. Skill of change-over both for axis and rotation power is formed.

Sets of exercises are performed at the start of each training session and they complement one another. The exercises are selected in conformity with the tasks which are solved at the training. Without visual control exercises were carried out only after perfect mastering of these exercises. To determine the effectiveness of the implemented methodology the repeated control test was conducted according to the results of Yarotskiy and Romberg coordination tests and technical preparedness tests.

Level of vestibular stability by standard tests (Table. 3), held in the control group before the experiment, points to a fairly low level of the vestibular apparatus. After the experiment, the control group showed a slight increase the results ($P_1 > 0.05$). After using the pilot program vestibular analysis showed that the level of vestibular function in the control group remained low, and the experimental group showed an average level.

Table 3

Evaluation of Vestibular Stability by Coordination Tests after Forming Experiment

Tests	Yarotskiy Test, c		Romberg Test, c	
	K	E	K	E
$\bar{X}_1 \pm \sigma_1$	17,40±1,95	17,00±1,95	9,40±1,30	9,30±0,65
$\pm m_1$	0,61	0,61	0,41	0,20
$\bar{X}_2 \pm \sigma_2$	20,00±1,62	23,60±1,62	11,20±1,30	14,20±0,65
$\pm m_2$	0,51	0,51	0,41	0,20
Difference	2,6	6,6	1,8	4,9
p_1	<0,05	<0,05	>0,05	<0,05
p	<0,05		<0,05	

According to the results of the tests on technical preparedness the increase in the quality of performance in both in the control and experimental group is observed, but significant difference by Student t-test is observed in the control group (Table. 4, 5).

Table 4

Level of Vestibular Stability Tests for Technical Preparedness after Forming Experiment

№ π/π	4-5 steps takeoff – somersault forward			Back handspring (Flic) – back flip			Jump from a height h=30 cm. with 360° turnover in “Stick” landing		
	GPA			GPA			GPA		
	before	after	diffe- rence	before	after	diffe- rence	before	after	diffe- rence
Control group									
\bar{x}_1	8,4	9,0	0,6	7,6	9,2	0,8	8,1	9,1	1,0
$\pm \sigma_1$	0,97	1,3	0,33	0,97	0,65	0,32	1,3	1,3	0,33
Experimental group									
\bar{x}_1	8,7	10,0	1,3	7,4	9,7	2,3	8,5	9,8	1,3
$\sigma \pm \sigma_1$	1,3	1,62	0,32	0,97	0,97	0,28	1,62	0,65	0,97

Table 5

Juvenile and Definitive Indicators of Technical Preparedness of Acrobats, Aged 9-10 years stage III (n=20)

Tests	Group	$\bar{x}_1 \pm \sigma_1$	$\bar{x}_2 \pm \sigma_2$	p ₁	p
4-5 steps takeoff – somersault forward	K	8,4 ± 0,97	9,0 ± 1,3	>0.05	<0.05
	E	8,7 ± 1,3	10,0 ± 1,62	<0.05	
Back handspring (Flic) – back flip	K	7,6 ± 0,97	9,2 ± 0,65	>0.05	>0.05
	E	7,4 ± 0,97	9,7 ± 0,97	<0.05	
Jump from a height h = 30 cm. with 360° turnover in “Stick” landing	K	8,1 ± 1,3	9,1 ± 1,3	>0.05	<0.05
	E	8,5 ± 1,62	9,8 ± 0,65	<0.05	

It should be noted that the increase in the technical preparedness results is: in the control group – test "4-5 steps takeoff –front somersault" – $0,6 \pm 0,33$, in the experimental group – $1,3 \pm 0,32$ ($p < 0,05$); test " back handspring (Flic) – back flip" in the control group – $0,8 \pm 0,32$, in the experimental group – $2,3 \pm 0,27$ ($p < 0,05$), test "jump from a height $h = 30$ cm with 360° turnover in "Stick" landing " in the control group – $1,0 \pm 0,33$, in the experimental group – $1,3 \pm 0,97$ ($p < 0,05$) (Table. 5)

According to the results of the tests for technical preparedness in the control group there is no authentic difference ($P_1 > 0,05$). Authenticity in difference of the results is observed during the performance of these exercises in the experimental group ($P_1 < 0,05$).

Between the control and experimental groups in the performance of the first and the third set of exercises authenticity in difference of the results was defined, in the performance of the second set of exercises no difference in authenticity was defined.

Conclusions:

1. After the experiment on the basis of the data it was found out that the use of the set of physical exercises with specific motor activity consideration has contributed to the improvement of the vestibular function stability, primarily to the retaining of body balance during rotational and rectilinear accelerations.

2. Suggested methods of improving vestibular stability of young acrobats can be instilled in the training process at the stage of previous base preparation.

Prospects for further research expect to continue the development of improving the vestibular stability methods of acrobats at the stage of specialized basic training.

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