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Improvement of coordination abilities of sportsmen of 13–15 years old in fighting sambo

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Purpose: *to determine the level of coordination abilities of sportsmen of 13–15 years old in fighting sambo.*

Material & Methods: *the following methods of the research were used: theoretical analysis and synthesis of data of special scientific and methodical literature; pedagogical supervision; pedagogical testing; methods of mathematical statistics. 12 sportsmen of fighting sambo are tested for ability of support of static and dynamic balance before and after the pedagogical experiment.*

Results: *the metrological control of coordination abilities of sportsmen of fighting sambo is considered. The individual estimated results are received on ability of support of static and dynamic balance. The dynamics of the level of the development of coordination abilities of sportsmen of 13–15 years old in fighting sambo is defined.*

Conclusions: *the positive changes of the level of the development of coordination abilities, which are received under the influence of a technique of improvement of statodynamic firmness and sensomotor coordination, allow us to recommend this technique for application in the educational-training process of sportsmen of fighting sambo.*

Keywords: *coordination abilities, sportsmen of fighting sambo, static and dynamic balance.*

Introduction

Fighting sambo is the unique system of self-defense, which is made in real fighting activity, grounded on the principles of conducting a real fight with one or several opponents (standing and lying), on the principles of natural movements and special preparation of mentality in the conditions of a stressful situation. The development of coordination abilities is represented to one of actual and significant problems in fighting sambo [11].

The coordination abilities, which are based on manifestations of motive reactions, are the cornerstone of activity of sportsmen in fighting sambo. To provide remote interactions with partners and an opponent, to switch from one action to another, to choose a moment to start actions – are the most wide-apread specialized abilities of sportsmen of fighting sambo who demand the subsequent development of their abilities. The prompt development of world sport constantly demands the incessant search of more and more effective remedies, methods and forms of training of sportsmen [4; 6; 7].

The purpose of the research

To develop and to prove experimentally a technique of improvement of coordination abilities of sportsmen of 13–15 years old in fighting sambo.

Tasks of the research:

1. The analysis of scientifically methodical literature on the problem of development of coordination abilities of sportsmen of 13–15 years in fighting sambo.

2. To define maintenance and influence of an experimental technique on the level of coordination abilities of sportsmen of 13–15 years old in fighting sambo.

3. To prove efficiency of a technique of improvement of coordination abilities of sportsmen of 13–15 years old in fighting sambo and to analyze dynamics of indicators of the level of their development.

Material and Methods of the research

Th research was conducted from September, 2015 till March, 2016 on the basis of SC "Hermes" Kyiv. 6 sportsmen of – 15 years old of fighting sambo of the control group (CG) and 6 sportsmen of 13–15 years old of fighting sambo of the experimental group (EG) took part in the researches (the 1st category, candidates of the Master of Sports). We tested sportsmen for static and dynamic balance, and also the test for ability to orientation in space was carried out for identification of the level of development of vestibular function [9].

The following methods of research were used in the research: theoretical analysis and synthesis of data of special scientifically methodical literature; pedagogical supervision; pedagogical testing; methods of mathematical statistics.

Results of the research and their discussion

Statistics of testing of sportsmen of fighting sambo of CG for static and dynamic balance and on ability to orientation in space were received at the beginning of pedagogical experiment.

Four sportsmen showed the maximum result, two sports-

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men – closer to maximum in the test (No. 1) of Bondarevsky for static balance with open eyes.

Sportsmen showed average results in the group in the test (No. 10) blindly on a limited and unstable support (on a stuffed ball) – 40,2 s that is much lower than a standard indicator – 60 s. Individual results are very different in the group – from 13 s to maximum 60 s (V – 55,3%).

Individual results make from 23 till 60 s in a rack on one leg blindly by a technique of Bondarevsky (No. 2) that is also much lower than a standard indicator – 60 s (pic. 1).

In the dynamic balance tests: average results of a deviation from a straight line back – 39,2 sm and 33,5 sm respectively received walking of 5 m blindly forward and back (No. 8, 9). One of sportsmen managed to pass a straight line without deviation, and the maximum deviation made 99 sm. After ten turns blindly (No. 13) one sportsman evaded from initial situation on 180° and one sportsman executed the test unmistakably. Average result of a deviation from a straight line in group – 45,8°. Heterogeneity of group is the highest (V – 146%) by this test. After rotations in a bent standing position blindly throughout 10 s (No. 3) sportsmen of fighting sambo could stay on tiptoe on average 16,5 s from 30 standard.

All sportsmen could stay maximum 30 s, except one (24 s) after 10 turns with a head inclination down and open eyes (No. 12). But one sportsman hasn't coped with the test with a head up and one fixed balance only of 3 s in the similar test (No. 11). An adequate irritant of the vestibular system is lack of visual control and unusual position of a head in tests No. 3 and No. 12 that became the forcing-down factors for this group of sportsmen.

At the implementation of the combined test (No. 7): throwings over in combination with jumps with turn on 360°, results were found which testify to heterogeneity of the studied group (V – 60%).

Results of nine tests indicate that sportsmen didn't use special exercises on the development of vestibular function earlier. Wide intervals of results are received answer specific features of vestibular function of sportsmen.

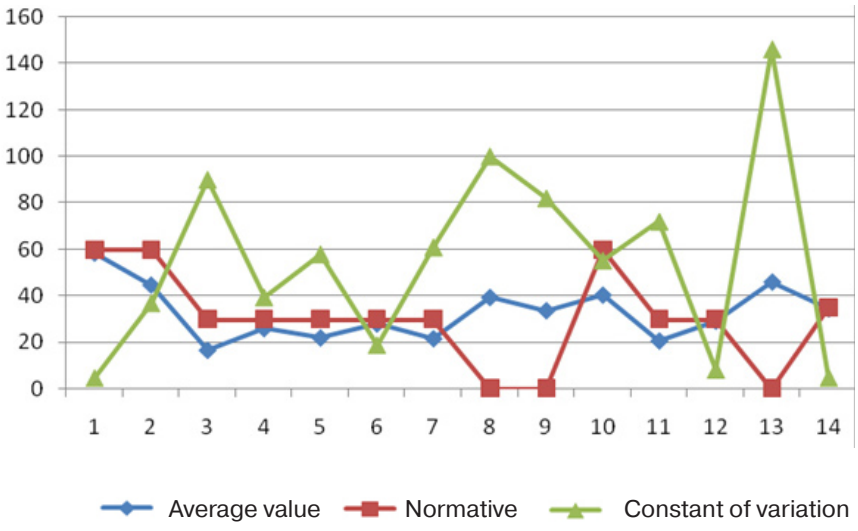
In the statodynamic test (No. 5), the average result in group made 21,8 s, the worst, – 3 s, after three throwings over forward to stand in balance on one leg. the average result is better (No. 6) – 27,8 s in balance after three throwings over back. Throwings over are carried out more slowly back that is connected with safety measures.

In the test for statodynamic firmness with the performance of simple acrobatic exercises and the maintenance of balance in different racks (No. 4): five sportsmen shown the maximum contents (30 s), one – 5 s after five over turns by a side.

Statistics of testing of sportsmen of fighting sambo of EG at the beginning of the pedagogical experiment were the following.

With open eyes five sportsmen shown the maximum result in the test (No. 1) of Bondarevsky for static balance, and one sportsman showed approximately maximum result.

Sportsmen showed average results in the group – 38,8 s that below a standard indicator – 60 s in the test (No. 10) blindly on a limited and unstable support (on a stuffed ball). Individual results in the group are very different – from 5 s till maximum



Pic. 1. Indicators of statodynamic firmness of sportsmen of fighting sambo at the beginning of the pedagogical experiment (CG, n=6):

Average value of results in tests:

1. Bondarevsky with open eyes, s – 58,2; 2. Bondarevsky blindly, s – 44,5; 3. Balance after rotations in a bent standing position for 10 s – 16,5; 4. Balance after five overturns, s – 25,8; 5. Three throwings over forward, balance on one leg, s – 21,8; 6. Three throwings over back, balance on one leg, s – 27,8; 7. Balance after throwings over and jumps with turn, s – 21,5; 8. Walking of 5 m blindly forward, sm – 39,2; 9. Walking of 5 m blindly back, sm – 33,5; 10. Balancing on a stuffed ball, s– 40,2; 11. Balance after 10 turns with a head up, s – 20,5; 12. Balance after 10 turns with a head down, s – 29,0; 13. The test for ability to orientation in space, degree. – 45,8; 14. Rotation by a head 35 s – 34,3.

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60 s (V – 59,7%).
Individual results make from 22 till 60 s that is also much lower than a standard indicator – 60 s in a rack on one leg blindly (pic. 2) by the technique of Bondarevsky (No. 2).

In the dynamic balance tests: average results of a deviation from a straight line back – 34,5 and 33,5 sm respectively were received walking of 5 m blindly forward and back (No. 8, 9). One of sportsmen managed to pass a straight line without deviation, and the maximum deviation made 90 sm.

One sportsman evaded from initial situation on 160° after ten turns blindly (No. 13), and one sportsman executed the test with the minimum deviation – 3°. Average result of a deviation from a straight line in the group – 43,8°. Heterogeneity of the group is the highest by this test (V – 131,8%).

Sportsmen of fighting sambo could stay on tiptoe on average 17,5 s from 30 standard after rotations in a bent standing position blindly throughout 10 s (No. 3).

Four sportsmen could stay the maximum 30 s after 10 turns with a head inclination down and open eyes (No. 12). But one sportsman didn't cope with the test with a head up and one fixed balance only of 5 s in the similar test (No. 11). At the implementation of the combined test (No. 7): throwings over in combination with jumps with turn on 360°, results which testify to heterogeneity of the studied group were found (V – 50,3%).

Results of nine tests indicate that sportsmen didn't use special exercises on the development of vestibular function earlier. The received wide intervals of results answer specific features of vestibular function of sportsmen.

In the statodynamic test (No. 5), to stand in balance on one after three throwings over forward, average result in the group made 22,8 s, the worst, – 7 s. The average result is better in balance after three throwings over back (No. 6) – 26,3 s. Throwings over are carried out more slowly back that is connected with safety measures.

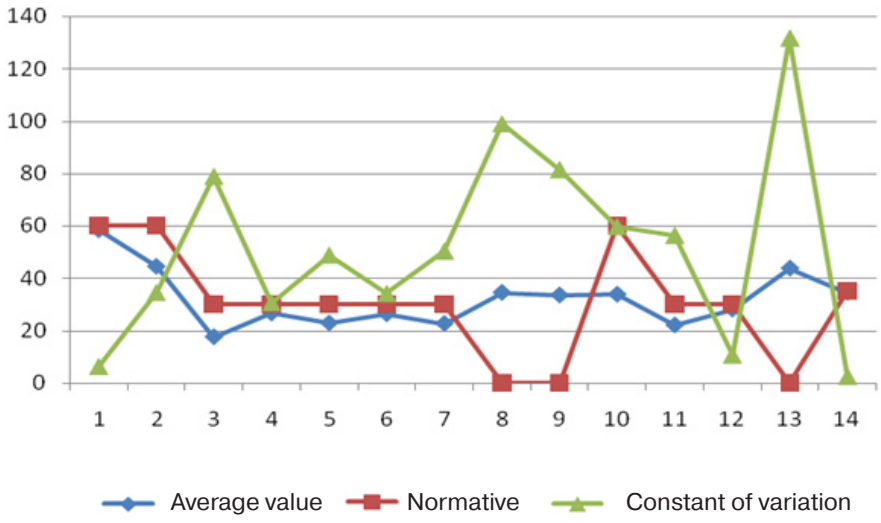
In the test for statodynamic firmness with the performance of simple acrobatic exercises and the maintenance of balance in different racks (No. 4): 5 sportsmen showed the maximum contents (30 s) and only one – 10 s after five overturns by a side.

We developed the technique of increase of coordination abilities of sportsmen of 13–15 years old in fighting sambo on the basis of the conducted research. Exercises for the development of a vestibular mechanism without visual control, on a mobile and not resistant support, throwings over forward with imitation of different blows, throwings over towards and from a rack with imitation of different blows, jumps with rotation for the help and without hands, jumps with imitation – fight with "shadow", rotation around a vertical axis in a bent standing position with performance of different blows are included to it for the first time.

We applied the technique of improvement of statodynamic firmness and sensomotorny coordination of sportsmen of fighting sambo in the experimental group (EG, n=6). The educational and training process was carried by a traditional technique of training of sportsmen in the control group (CG, n=6). Exercises were used in the preparatory, main and finishing part of training.

We received statistics of testing of sportsmen of fighting sambo of CG at the end of the pedagogical experiment.

Four sportsmen showed the maximum result in the test (No. 1)



Pic. 2. Indicators of statodynamic firmness of sportsmen of fighting sambo at the beginning of the pedagogical experiment (EG, n=6)

Average value of results in tests:

1. Bondarevsky with open eyes, s – 58,5; 2. Bondarevsky blindly, s – 44,5; 3. Balance after overturns in a bent standing position for 10 s – 17,5; 4. Balance after five overturns side, s – 26,6; 5. Three throwings over forward, balance on one leg, s – 22,8; 6. Three throwings over back, balance on one leg, s – 26,3; 7. Balance after throwings over and jumps with turn, s – 22,6; 8. Walking of 5 m blindly forward, sm – 34,5; 9. Walking of 5 m blindly back, sm – 33,5; 10. Balancing on a stuffed ball, s – 33,8; 11. Balance after 10 turns with a head up, s – 22,0; 12. Balance after 10 turns with a head down, s – 28,1; 13. The test for ability to orientation in space, degree. – 43,8; 14. Rotation by a head 35 s – 34,6.

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of Bondarevsky for static balance with open eyes. Two sportsmen showed result less maximum, but it is more, than before the experiment.

Sportsmen showed average results in the group in the test (No. 10) blindly on a limited and unstable support (on a stuffed ball) – 42,8 s that is closer to a standard indicator – 60 s. Individual results in the group are rather different – from 15 s till maximum 60 s (V – 46%).

Individual results make from 24 till 60 seconds in a rack on one leg blindly by the technique of Bondarevsky (No. 2) that is also much lower than a standard indicator – 60 s (pic. 3).

Average results of a deviation from a straight line back – 29,6 cm and 27,1 respectively were received in the dynamic balance tests: walking of 5 m blindly forward and back (No. 8, 9). One of sportsmen managed to pass a straight line without deviation, and the maximum deviation made 70 sm. After ten turns blindly (No. 13) one of sportsmen evaded from initial situation on 170°, and one sportsman executed the test unmistakably. Average result of a deviation from a straight line in group – 39,1°. Heterogeneity of the group is the highest by this test (V – 165,4%).

Five sportsmen could stay the maximum 30 s after 10 turns with a head's inclination down and open eyes (No. 12). But one sportsman fixed balance only 5 s from 30 s with a head up in the similar test (No. 11).

At the implementation of the combined test (No. 7): throwings over in combination with jumps with turn on 360°, results from 14 s and 15 s till 30 s were found that made an aberration of 17,3%.

Results of nine tests indicate that sportsmen didn't use special exercises on the development of vestibular function and the educational and training process was carried out by a traditional technique during the experiment. The received wide intervals of results answer specific features of vestibular function of sportsmens.

In the statodynamic test (No. 5), after three throwings over forward to stand in balance on one leg, the average result in the group made 25,2 s, the worst, – 13 s. The average result is better (No. 6) in balance after three throwings over back – 28,3 s. Throwings over are carried out more slowly back that is connected with safety measures.

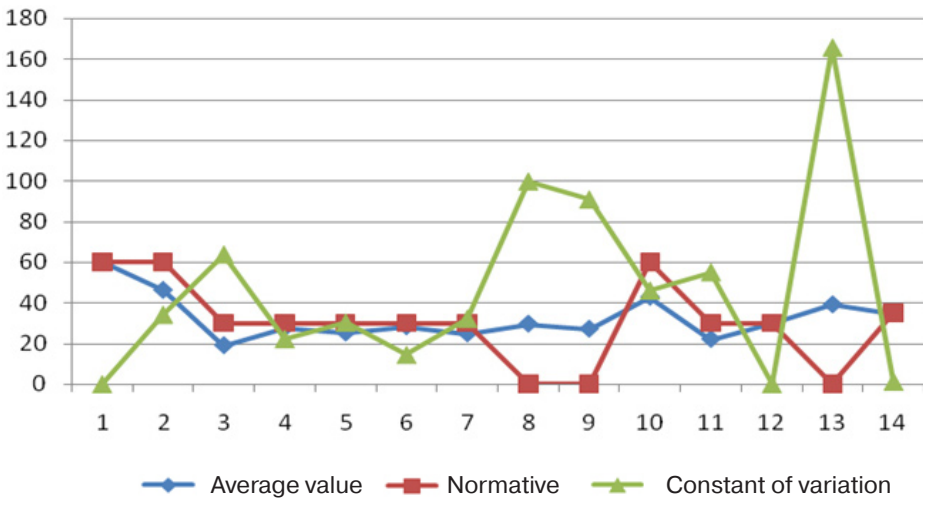
In the test for statodynamic firmness with the performance of simple acrobatic exercises and the maintenance of balance in different racks (No. 4): five sportsmen showed the maximum results (30 s) after five overturns by a side, one sportsman showed result of 15 s.

We received statistics of testing of sportsmen of fighting sambo of EG at the end of the pedagogical experiment.

Five sportsmen showed the maximum result in the test (No. 1) of Bondarevsky for static balance with open eyes, and one sportsman showed the result which is brought closer to maximum.

Sportsmen showed average results in the group in the test (No. 10) – 51,3 s blindly on a limited and unstable support (on a stuffed ball) that is much higher than average result at the beginning of the experiment (38,8 s). Individual results in the group grew from 40 s till maximum 60 s (V – 16,1%) in comparison with results at the beginning of the experiment from 5 s to maximum 60 s (V – 59,7%).

Individual results grew and made from 43 till 60 s (V – 16,1%)



Pic. 3. Indicators of statodynamic firmness of sportsmen of fighting sambo at the end of the pedagogical experiment of CG (n=6)

Average value of results in tests:

1. Bondarevsky with open eyes, s – 58,8; 2. Bondarevsky blindly, s – 46,2; 3. Balance after rotations in a bent standing position for 10 s – 19,0; 4. Balance after five overturns side, s – 27,5; 5. Three throwings over forward, balance on one leg, s – 25,2; 6. Three throwings over back, balance on one leg, s – 28,3; 7. Balance after throwings over and jumps with turn, s – 24,8; 8. Walking of 5 m blindly, sm, – 29,6; 9. Walking of 5 m blindly back, sm – 27,1; 10. Balancing on a stuffed ball, s – 42,8; 11. Balance after 10 turns with a head up, s– 22,1; 12. Balance after 10 turns with a head down, s – 29,3; 13. The test for ability to orientation in space, degree. – 39,1; 14. Rotation by a head 35 s – 34,8.

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in a rack on one leg blindly by the technique Bondarevsky (No. 2) in comparison with results at the beginning of the experiment from 22 till 60 s (V – 34,5%) (pic. 4).

In the dynamic balance tests: average results of a deviation from a straight line – 22,5 sm and 21,3 sm respectively were received walking of 5 m blindly forward and back (No. 8, 9), in comparison with 34,5 sm and 33,5 sm before the experiment. One of sportsmen managed to pass a straight line without deviation, and the maximum deviation made 60 sm.

After ten turns blindly (No. 13) one of sportsmen evaded from initial situation on 100°, and one sportsman executed the test with the minimum deviation – 10°. Average result of a deviation from a straight line in the group – 25,8° in comparison with average result before the experiment – 43,8°. Heterogeneity of group is the highest by this test (V – 144,2%).

Sportsmen of fighting sambo could stay on tiptoe on average 27,5 s from 30 standard after rotations in bent standing position blindly throughout 10 s (No. 3).

Only four sportsmen could stay the maximum 30 s after 10 turns with a head's inclination down and open eyes (No. 12). In the similar test (No. 11), but one sportsman fixed balance only of 22 s with a head up. At the implementation of the combined test (No. 7): throwings over in combination with jumps with turn on 360°, results were found which testify to uniformity of the studied group (V – 10,2%).

Results of nine tests indicate that sportsmen raised the level of the development of vestibular function.

In the statodynamic test (No. 5), after three throwings over forward to stand in balance on one leg, the average result in the group made 28,1 s, the worst, – 22 s. The average result is better (No. 6) in balance after three throwings over back – 28 s. Throwings over are carried out more slowly back that is connected with safety measures.

In the test for statodynamic firmness with the performance of simple acrobatic exercises and the maintenance of balance in different racks (No. 4): five sportsmen showed the maximum results (30 s) after five overturns side, except one sportsman.

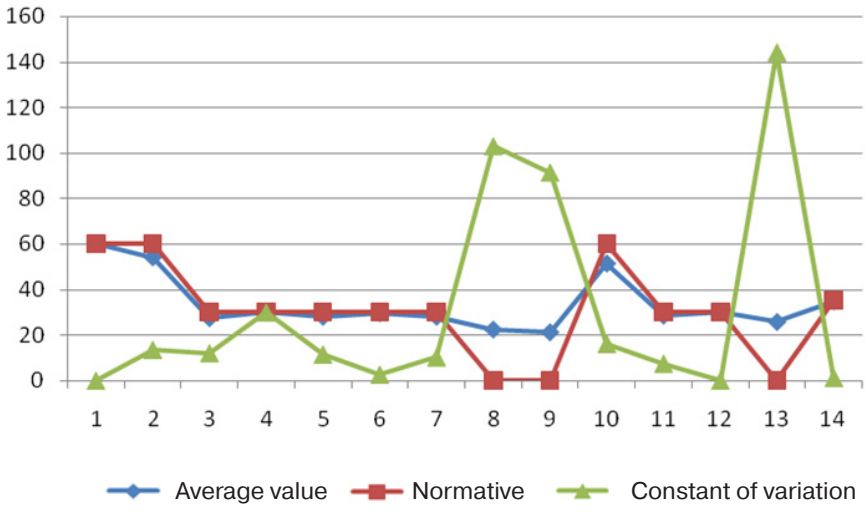
Statistics of the level of the development of coordination abilities of sportsmen of fighting sambo of CG (n=6), EG (n=6) at the beginning and at the end of the pedagogical experiment are shown in tab. 1 and tab. 2.

Using methods of mathematical statistics, it is possible to claim that:

1) difference of average values on the whole experimental group (EG) grew – by 25,1%; 2) difference of average values on the whole control group (CG) grew – by 9,6%;

– the difference of ditinctions of average values of the experimental and control groups of the pedagogical experiment makes 15,5%.

It is improved average value of a percentage ratio of an aberration for 12,6% by all tests by means of the offered technique of improvement of coordination abilities of sportsmen of fighting sambo in the experimental group in indicators of statodynamic firmness. The worst result (6,2%) is shown considerably in the control group which confirms efficiency of the offered technique of improvement of coordination abilities of sportsmen of fighting sambo in the experimental group during the pedagogical experiment.



Pic. 4. Indicators of statodynamic firmness of sportsmen of fighting sambo at the end of the pedagogical experiment of EG (n=6)

Average values of results in tests:

1. Bondarevsky with open eyes, s – 58,8; 2. Bondarevsky blindly, s – 54; 3. Balance after rotations in bent standing position-for 10 s – 27,5; 4. Balance after five overturns side, s – 27,5; 5. Three throwings over forward, balance on one leg, s – 28,1; 6. Three throwings over back, balance on one leg, s – 29,6; 7. Balance after throwings over and jumps with turn, s – 28,1; 8. Walking of 5 m blindly, sm, – 22,5; 9. Walking of 5 m blindly back, sm – 21,3; 10. Balancing on a stuffed ball, s – 51,3; 11. Balance after 10 turns with a head up, s – 28,6; 12. Balance after 10 turns with a head down, s – 28,8; 13. The test for ability to orientation in space, degree – 25,8; 14. Rotation by a head 35 s– 34,8.

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Table 1

Level of development of coordination abilities of sportsmen of fighting sambo at the beginning of the experiment (p<0,05)

Tests	Experimental group (n=6)	Control group (n=6)	t	$t_{gr.}$	p
	$\bar{X}$±m				
1. Bondarevsky with open eyes, s	58,5±1,64	58,2±1,27	0,14	2,45	>0,05
2. Bondarevsky blindly, s	44,5±6,88	44,5±7,32	0	2,45	>0,05
3. Balance after rotations in bent standing positionfor 10 s	17,5±6,19	16,5±6,68	0,10	2,45	>0,05
4. Balance after five overturns side, s	26,6±3,65	25,8±4,57	0,13	2,45	>0,05
5. Three throwings over forward, balance on one leg, s	22,8±4,9	21,8±5,71	0,13	2,45	>0,05
6. Three throwings over back, balance on one leg, s	26,3±4,02	27,8±2,38	0,32	2,45	>0,05
7. Balance after throwings over and jumps with turn, s	22,6±5,09	21,5±5,9	0,14	2,45	>0,05
8. Walking of 5 m blindly, sm	34,5±15,38	39,2±17,6	0,20	2,45	>0,05
9. Walking of 5 m blindly back, sm	33,5±12,2	33,5±12,32	0	2,45	>0,05
10. Balancing on a stuffed ball, s	33,8±9,05	40,2±9,96	0,47	2,45	>0,05
11. Balance after 10 turns with a head up, s	22,0±5,56	20,5±6,6	0,17	2,45	>0,05
12. Balance after 10 turns with a head down, s	28,1±1,34	29±1,09	0,52	2,45	>0,05
13. The test for ability to orientation in space, degree	43,8±25,9	45,8±29,89	0,05	2,45	>0,05
14. Rotation by a head 35 s	34,6±0,36	34,3±0,73	0,36	2,45	>0,05

Table 2

Dynamics of development of coordination abilities of sportsmen of fighting sambo at the end of the experiment (p<0,05)

Tests	Experimental group (n=6)	Control group (n=6)	t	$t_{rp.}$	p
	$\bar{X}$±m				
1. Bondarevsky with open eyes, s	58,8±1,27	58,8±0,82	0	2,45	>0,05
2. Bondarevsky blindly, s	54±3,2	46,2±7,05	1,0	2,45	>0,05
3. Balance after rotations in bent standing positionfor 10 s	27,5±1,5	19±5,43	1,5	2,45	>0,05
4. Balance after five overturns side, s	27,5±2,74	27,5±2,74	0	2,45	>0,05
5. Three throwings over forward, balance on one leg, s	28,1±1,45	25,2±3,43	0,77	2,45	>0,05
6. Three throwings over back, balance on one leg, s	29,6±0,36	28,3±1,83	0,69	2,45	>0,05
7. Balance after throwings over and jumps with turn, s	28,1±1,28	24,8±3,59	0,86	2,45	>0,05
8. Walking of 5 m blindly, sm	22,5±10,4	29,6±13,2	0,42	2,45	>0,05
9. Walking of 5 m blindly back, sm	21,3±8,74	27,1±11,04	0,41	2,45	>0,05
10. Balancing on a stuffed ball, s	51,3±3,7	42,8±8,83	0,88	2,45	>0,05
11. Balance after 10 turns with a head up, s	28,6±0,96	22,1±5,45	1,17	2,45	>0,05
12. Balance after 10 turns with a head down, s	28,8±0,9	29,3±0,72	0,43	2,45	>0,05
13. The test for ability to orientation in space, degree	25,8±16,7	39,1±29	0,39	2,45	>0,05
14. Rotation by a head 35 s	34,8±0,18	34,8±0,18	0	2,45	>0,05

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Conclusions

1. The analysis of scientifically methodical literature confirms the insufficient level of researches of coordination abilities of sportsmen of fighting sambo.

2. The content of the educational and training process is developed which is directed to the improvement of coordination abilities of sportsmen of fighting sambo. The level of statodynamic firmness and sensomotorny coordination of sportsmen of 13–15 years old of fighting sambo in EG and CG was defined.

3. The technique of improvement of coordination abilities of sportsmen of 13–15 years old in fighting sambo is developed.

4. The offered experimental technique influenced effectively the increase of the level of coordination abilities of sportsmen of fighting sambo.

Using methods of mathematical statistics, we can say that: 1) Difference of average values on the whole experimental group (EG) grew by 25,1%; 2) Difference of average values on the whole control group (CG) grew by 9,6%; 3) The difference of ditinctions of average values of the experimental and control groups makes 15,5% at the end of carrying out pedagogical experiment.

Dynamics of indicators of average value of a percentage ratio of an aberration by all tests of statodynamic firmness for 12,6% is found during the pedagogical experiment in the experimental group. The worst result (6,2%) is shown considerably in the control group which confirms efficiency of the offered technique of improvement of coordination abilities of sportsmen of fighting sambo in the experimental group during the pedagogical experiment.

Prospects of the subsequent researches will be sent to the search for new means and methods of physical training of sportsmen of fighting sambo and improvement of an arsenal of techniques.

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