Original Article

Pedagogical practice for development of coordination potential of MMA fighters and estimation of its efficiency

ALEXANDER BOLOTIN, VLADISLAV BAKAYEV

Institute of Physical Education, Sport and Tourism, Peter the Great St. Petersburg Polytechnic University, Russian Federation

ABSTRACT

The performed investigations have shown that development of coordination potential of MMA (Mixed Martial Arts) fighters represents a complex process. Training of fighters to use new different actions should be realized with gradual increase of their coordination complexity. It was established that while mastering new actions the sportsmen not only enrich their motional skill, but also develop a power to realize new forms of physical coordination. Such a treatment of development of coordination potential of MMA fighters was adopted as a basis for development of pedagogical practice comprised of three stages. At the first stage, estimation of developmental level of coordination potential of MMA fighters is carried out. At the second stage, mastering of new actions is fulfilled based on gradual increase of their coordination complexity as well as based on development of power to realize new forms of physical coordination. At the third stage, improvement of different types of coordination potential is carried out based on exercising of differentiated tools and methods of fighters training. **Key words:** PRACTICE, MMA FIGHTERS, DEVELOPMENT OF COORDINATION POTENTIAL, SPORTING TRAINING.

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Corresponding author. *Institute of Physical Education, Sport and Tourism, Peter the Great St. Petersburg Polytechnic University, Russian Federation.* http://orcid.org/0000-0001-9455-9662
E-mail: vlad.bakaev@gmail.com
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INTRODUCTION

Presently in many investigations it is pointed out that in the course of improvement of technique training of MMA fighters it is important to take into account the level of physical, psychomotor and coordination potential of sportsmen (Bakaev, Bolotin, & Aganov, 2016; Detanico, et al., 2015; Filimonov, et al., 1985). As a part of the study, it was established that coordination potential of sportsmen forms the basis of their technique (Bakaev, Bolotin, & Vasil'eva, 2015; Bakayev, 2015; Lee, & McGill, 2015; Lee, & McGill, 2016). That is why priority should be given to development of coordination potential of MMA fighters.

Meanwhile, items connected with grounding of development of coordination potential of MMA fighters have not been reflected in the scientific literature. Program of special physical training of MMA fighters includes perfect mastering of technique, punches and kicks methods with arms and legs, manner of throws fulfillment with subsequent fight continuance in prone position, release from holds, and fulfillment of submission holds. Mastering of these techniques requires high level of development of coordination potential of sportsmen (Lariosa, et al., 2017; Myers, Nevill, & Al-Nakeeb, 2013; Santos, et al., 2012; Bolotin, & Bakayev, 2016b).

The performed investigations have shown that development of coordination potential of MMA fighters represents a complex process. Different methodological procedures are used for development of coordination potential of sportsmen (Matveyev, 1981; Lee, & McGill, 2015). Training of fighters to use new different actions should be realized with gradual increase of their coordination complexity. While mastering new actions the sportsmen not only enrich own motional skill, but also develop a power to realize new forms of actions coordination. It was established that sportsmen possessing greater motion experience can easier and faster manage with new action tasks, which may suddenly appear during fight. This is reached via change of spatial, time and dynamic parameters of the used exercises. It was established that complexity of the physical exercises should be increased through change of external conditions (Sorensen, et al., 1996; Willardson, 2007; Bolotin, & Bakayev, 2016a; Bolotin, Bakayev, Vazhenin, 2016).

MATERIAL AND METHODS

Based on the abovementioned approaches towards arrangement of the training process, we have worked out a pedagogical practice for development of coordination potential comprised of three stages (Figure 1).

Figure 1. Pedagogical practice for development of coordination potential of MMA fighters.

At *the first stage*, estimation of developmental level of coordination potential of MMA fighters was carried out.

At *the second stage*, mastering of new actions was fulfilled based on gradual increase of their coordination complexity and on development of power to realize new forms of physical coordination.

At *the third stage*, improvement of different types of coordination potential was realized based on exercising of differentiated specific tools and methods of fighters training.

It was taken into account that during the duration of MMA fight different technical actions pertinent to both blow-type martial arts and wrestling will be used. Sportsman possessing greater variety of technical actions in combination has more chances to win.

Technical actions combinations used by MMA fighters were considered as the dynamic system realized in the fights. Technical actions combinations used by MMA fighters should be realized in specific ad hoc activity and functional feasibility. Accordingly actions should be fixed not only within definite structure of the sportsmen's technique based on coordination potential, but also should interact between each other via biomechanical, biological and functional linkages (Bolotin, 2015; Bolotin & Bakayev, 2017; Lee, & McGill, 2016; Bolotin, Bakayev, Vazhenin, 2015).

Stability metering researches were carried out using "MBN-Biomechanics" hardware and software system designed for clinical motion study and specifically for functional diagnostics of motor pathology, locomotor and nervous systems (Cubreac, & Grokhovsky, 2012; Bolotin, Bakayev, 2015).

Three basic research methods were used in package, namely:

1) goniometry – measuring of kinematical characteristics of joints movement;
2) dynamometry – monitoring (recording) of placing reactions;
3) stabilometry – monitoring (recording) of position and motions of common pressure center on supporting area.

"Stabilometry" technique made it possible to monitor position projections of common center of mass of the fighters during their movement and to measure its neutral position, deviations from neutral position and many other parameters. During stabilometrical researches, the following techniques have been realized: stability limit and index of equilibrium function (Romberg test, optokinetic analysis).

"Romberg test" technique consisted of two parts. The fighters have fulfilled first part of this research with open eyes, while the second part was fulfilled with closed eyes.

"Optokinetic analysis" technique was performed in conditions of visual stimulation lack.

"Stability limit" technique characterized the dynamic equilibrium with internal action and mild disturbance of equilibrium via sportsman's body tilt forward, backward, rightward and leftward. This technique consisted of five stages, namely: normal standing position, maximum body tilt forward, backward, rightward and leftward (Cubreac, & Grokhovsky, 2012; Hopkins, et al., 2009).

Stabilometric studies were performed for experimental and reference groups, each consisting of 15 sportsmen.

RESULTS AND DISCUSSION

During carrying out of the pedagogical experiment, dynamic characteristics of static equilibrium of the fighters within experimental and reference groups at the end of the performed experiment have been studied based on "Stability limit" and Romberg tests.

During MMA tests, sportsmen have to parry kicks and holds. On getting kick the fighter's body tilts, however in order to avoid falling it is necessary to keep equilibrium. "Stability limit" test performed on stabilometric platform characterizes static equilibrium with internal action and mild disturbance of equilibrium via sportsman's body tilt forward, backward, rightward and leftward. With the purpose of efficiency, checking of the worked out technique designed for development of motor- and coordination potentials the repeated examination of the fighters with determining of the static equilibrium has been performed at the end of pedagogical experiment. Four key figures of "Stability limit" test have been analyzed, which to a greater degree characterized development of the static equilibrium and which have been previously analyzed at the beginning of pedagogical experiment, namely: stability limit – Sst (mm), stability limit index – LoS (%), CPC speed (CPC is a common pressure center) – V (mm/s), stability index – Stab (%).

Test based on the analysis of the results of "Stability limit" performed during pedagogical experiment educed that stability limit data for the fighters from experimental group reliably improved ($T=3.856$; $p<0.05$). Stability limit indices for all studied four initial positions (body tilt forward, backward, rightward and leftward) for the fighters from experimental group reliably improved as well. For cases of body tilt backward, rightward and leftward stability limit indices reliably improved with more high confidence level ($p<0.01$) in comparison with body tilt forward ($p<0.05$).

CPC displacement speed for sportsmen from experimental group in all test positions reliably decreased at the end of experiment in comparison with the initial data. Reliable decreasing of CPC displacement speeds for fighters in normal standing position ($T=3.514$, $p<0.05$), forward tilt position ($T=6.110$, $p<0.01$), leftward tilt position ($T=2.891$, $p<0.05$), and rightward tilt position ($T=-4.101$, $p<0.01$) have been determined.

During experiment, stability index for the fighters from experimental group reliably improved for all test positions, while confidence level was especially high in normal standing position and in backward tilt position (Table 1).

Table 1. Behavior of "Stability limit" test indices for the fighters from experimental group during the performed experiment.

Indices	(M±m)	(M±m)	T	P
Sst (mm)	103.9±0.9	107.87±0.5	**3.856**	<0.05
LoS(forward) (%)	81.5±4.7	98.21±1.47	**3.393**	<0.05
LoS(backward) (%)	53.9±3.2	73.27±0.50	**5.981**	<0.01
LoS(rightward) (%)	92.7±6.4	138.65±6.7	**4.967**	<0.01
LoS(leftward) (%)	101.5±6.0	156.03±6.4	**6.211**	<0.01

Indices	(M±m)	(M±m)	T	P
V (mm/s) N.S.P.	11.9±0.93	8.27±0.45	**3.514**	<0.05
V (mm/s) (forward)	21.2±1.30	12.15±0.71	**6.110**	<0.01
V (mm/s) (backward)	19.5±1.63	14.03±0.69	**3.090**	<0.05
V (mm/s) (rightward)	17.9±0.98	13.07±0.65	**-4.101**	<0.01
V (mm/s) (leftward)	19.5±1.71	14.09±0.76	**2.891**	<0.05
Stab (%) (N.S.P.)	90.5±0.87	97.04±0.49	**6.022**	<0.01
Stab (%) (forward)	89,4±1,05	95,12±0,62	**4,691**	<0.01
Stab (%) (backward)	81.4±1.89	94.08±1.51	**5.242**	<0.01
Stab (%) (rightward)	88.54±1.56	93.83±1.12	**2.755**	<0.05
Stab (%) (leftward)	89.01±1.24	94.97±1.12	**3.567**	<0.05

Note: N.S.P. – normal standing position; Sst (mm) – stability limit; LoS (%) – stability limit index; V (mm/s) – CPC speed (CPC is a common pressure center); Stab (%) – stability index.

Test based on the analysis of the results of "Stability limit" for the fighters from reference group educed that the performed pedagogical experiment brought to positive changes; however, these changes were substantially lower in comparison with the results obtained for the fighters from experimental group.

Stability limit index in backward tilt position ($T=3.436$, $p<0.05$) and stability index in backward tilt position ($T=2.953$, $p<0.05$) have been reliably determined (Table 2).

Table 2. Behavior of "Stability limit" test indices for the fighters from reference group during the performed experiment.

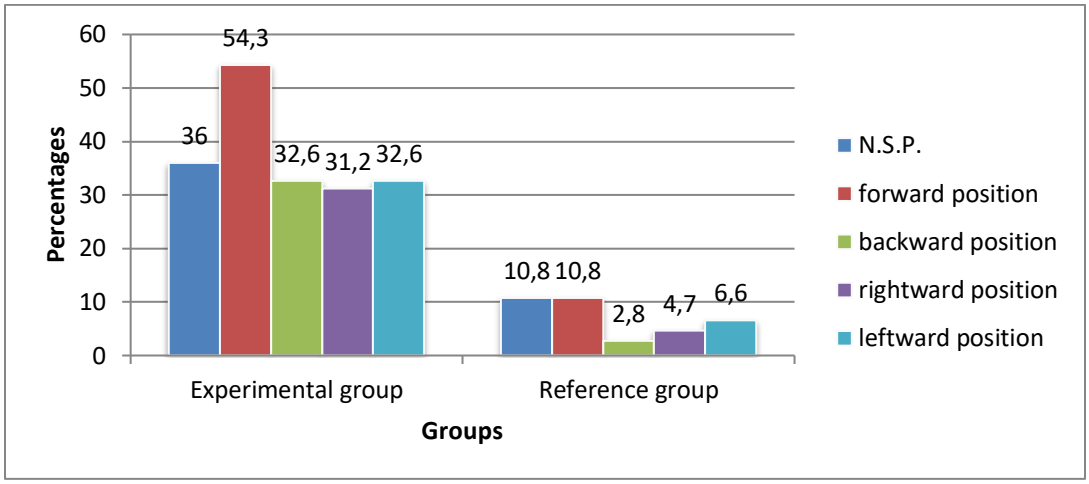
Indices	(M±m) at the beginning	(M±m) at the end	T	P
Sst (mm)	104.54±0.9	105.17±0.92	0.490	>0.05
LoS(forward) (%)	82.36±4.82	92.72±1.56	2.045	>0.05
LoS(backward) (%)	53.68±3.29	67.24±2.18	**3.436**	<0.05
LoS(rightward) (%)	93.12±7.0	113.69±6.1	2.215	>0.05
LoS(leftward) (%)	103.24±6.1	118.58±5.7	1.837	>0.05

Indices	(M±m) at the beginning	(M±m) at the end	T	P
V (mm/s) N.S.P.	12.28±0.92	11.02±0.84	-1.011	>0.05
V (mm/s) (forward)	20.56±1.37	17.54±1.20	-1.658	>0.05
V (mm/s) (backward)	17.57±1.70	17.08±0.88	-0.256	>0.05
V (mm/s) (rightward)	17.36±1.02	16.57±1.00	-0.553	>0.05
V (mm/s) (leftward)	18.46±1.78	17.28±0.98	-0.581	>0.05
Stab (%) (N.S.P.)	94.82±3.78	95.01±0.63	0.047	>0.05
Stab (%) (forward)	93.21±1.05	95.92±1.00	1.869	>0.05
Stab (%) (backward)	81.71±**1.86**	88.84±**1.54**	**2.953**	>0.05
Stab (%) (rightward)	92.79±1.78	93.97±1.67	0.483	>0.05
Stab (%) (leftward)	92.66±1.61	93.01±0 76	0.197	>0.05

Note: N.S.P. – normal standing position; Sst (mm) – stability limit; LoS (%) – stability limit index; V (mm/s) – CPC speed (CPC is a common pressure center); Stab (%) – stability index.

Growth of stability limit indices for the sportsmen from experimental group amounted 3.7%, while for the sportsmen from reference group – 0.6%. Growth of CPC displacement speed for the fighters from experimental group in normal standing position amounted 36.0%, for the fighters in forward tilt position – 54.3%, for the fighters in backward tilt position – 32.6%, for the fighters in rightward tilt position – 31.2%, and for the fighters in leftward tilt position – 36.2%, while for the fighters from reference group the determined growth amounted 10.8; 10.8; 2.8; 4.7%, and 6.6 %, respectively (Figures 2 and 3).

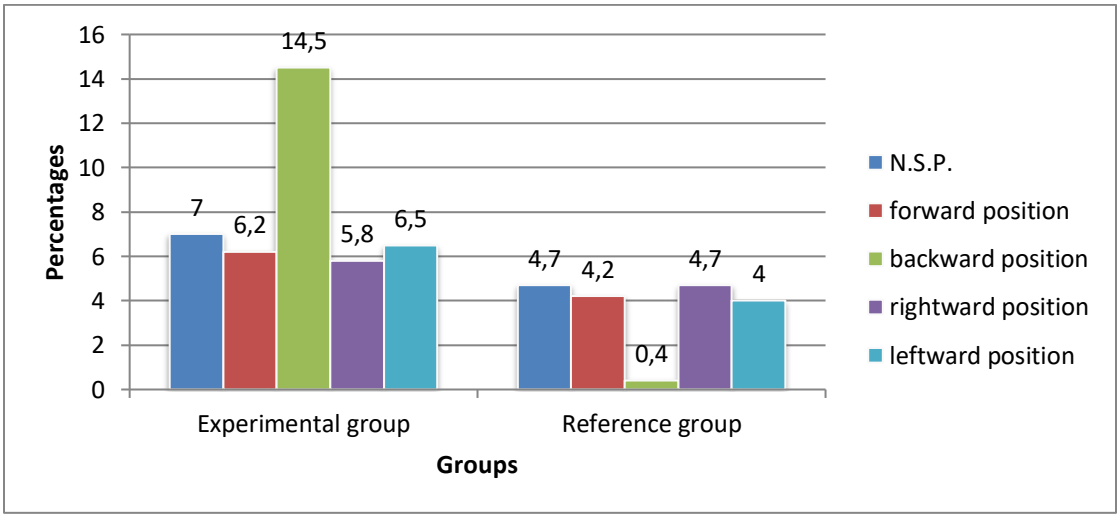
Growth of stability indices for the sportsmen from experimental and reference groups is illustrated by data in Figure 2.



Note: N.S.P. - normal standing position; CPC - common pressure center.

Figure 2. Growth of CPC displacement speed for the fighters from experimental and reference groups based on the results of "Stability limit" test.

Stability limit indices values for the sportsmen from experimental group have increased during performance of the experiment; their growth for the forward tilt position amounted 18.6% against the initial data, for the backward tilt position the growth amounted 30.5%, for the rightward tilt position the growth amounted 54.3%, and for the leftward tilt position the growth amounted 39.7% (Figure3).



Note: N.S.P. - normal standing position.

Figure 3. Growth of stability indices for the fighters from experimental and reference groups based on the results of "Stability limit" test.

Growth of stability limit indices for the sportsmen from reference group in forward tilt position amounted 11.8%, in backward tilt position – 22.4%, in rightward tilt position – 19.9%, and in leftward tilt position – 13.8%, which is substantially lower in comparison with the fighters from experimental group (Figure 4).

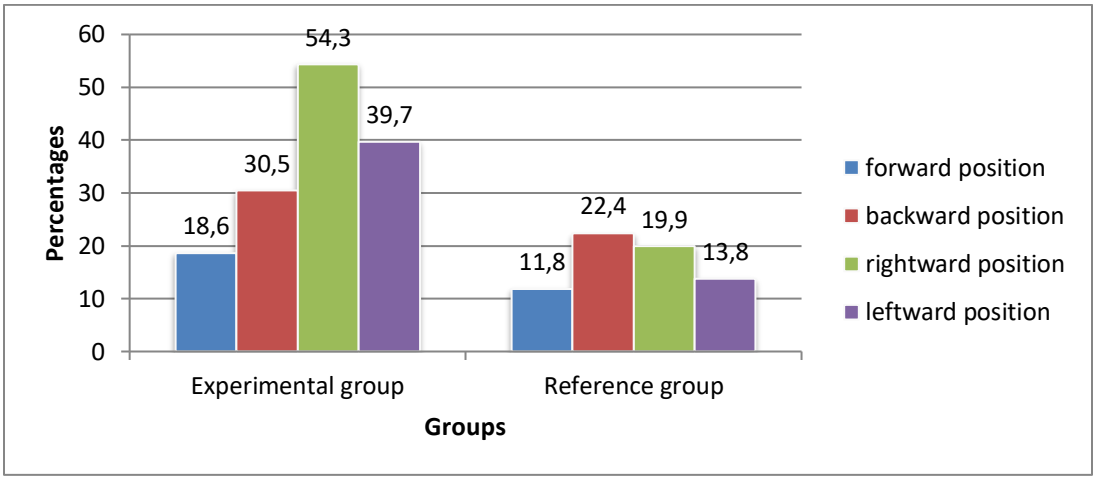


Figure 4. Growth of stability limit indices for the fighters from experimental and reference groups based on the results of "Stability limit" test.

Comparative analysis of "Stability limit" test indices for the fighters from experimental and reference groups, which was performed at the end of pedagogical experiment, has shown the reliable difference of 10 of total 15 indices for the fighters from experimental group.

It was found that "Stability limit" test indices characterizing static equilibrium with internal action and mild disturbance of equilibrium of the fighters included into experimental group via their bodies tilt forward, backward, rightward and leftward, were substantially improved due to the worked out practice of training process designed for development of coordination potential (Table 3).

Table 3. "Stability limit" test indices for the fighters from experimental and reference groups at the end of pedagogical experiment.

Indices	Experimental group (M±m)	Reference group (M±m)	T	P
Sst (mm)	107.87±0.5	105.17±0.92	**-2.579**	<0.05
LoS(forward) (%)	98.21±1.47	92.72±1.56	-2.561	>0.05
LoS(backward) (%)	73.27±0.5	67.24±2.18	**-2.696**	<0.05
LoS(rightward) (%)	138.65±6.7	113.69±6.1	**-3.499**	<0.05
LoS(leftward) (%)	156.03±6.4	118.58±5.7	**-4.370**	<0.01
V (mm/s) N.S.P.	8.27±0.45	11.02±0.84	**2.886**	<0.05
V (mm/s) (forward)	12.15±0.71	17.54±1.20	**3.866**	<0.05
V (mm/s) (backward)	14.03±0.69	17.08±0.88	**2.817**	<0.05
V (mm/s) (rightward)	13.07±0.65	16.57±1.00	**2.935**	<0.05

Indices	Experimental group (M±m)	Reference group (M±m)	T	P
V (mm/s) (leftward)	14.09±0.76	17.28±0.98	**2.572**	<0.05
Stab (%) (N.S.P.)	97.04±0.49	95.00±0.63	-2.556	<0.05
Stab (%) (forward)	95.12±0.62	95.92±1.00	0.680	<0.05
Stab (%) (backward)	94.08±1.51	88.84±1.54	**-2.592**	<0.05
Stab (%) (rightward)	93.83±1.12	93.97±1.67	0.070	>0.05
Stab (%) (leftward)	94.97±1.12	93.01±0.76	-2.547	>0.05

Note: N.S.P. – normal standing position; Sst (mm) – stability limit; LoS (%) – stability limit index; V (mm/s) - – CPC speed (CPC is a common pressure center); Stab (%) – stability index.

Static equilibrium development level has been estimated based on the results of Romberg test. Comparative analysis of Romberg test indices has shown that CPC displacement speeds for the fighters from experimental group at the end of the performed experiment have substantially decreased in comparison with the initial data, both for opened eyes and closed eyes positions.

Statokinezigram areas plotted for the fighters from experimental group at the end of the performed experiment have also reliably decreased for both considered positions in comparison with the initial data (Table 4).

Table 4. Romberg test indices for the fighters from experimental group at the end of pedagogical experiment.

Indices	At the beginning (M±m)	At the end (M±m)	T	P
V, mm/s, Romberg test, OE	10.78±0.32	8.27±0.24	**-6.275**	<0.05
V, mm/s, Romberg test, CE	21.48±0.73	13.83±0.56	**-8.315**	<0.05
S90, mm, Romberg test, OE	64.25±6.18	35.43±2.41	**-4.345**	<0.05
S90, mm, Romberg test, CE	128.0±10.17	59.38±5.22	**-6.036**	<0.05
SI, unit, Romberg test, OE	32.65±4.31	43.63±3.18	2.05	>0.05
SI, unit, Romberg test, CE	18.02±3.93	38.75±2.33	**4.537**	<0.05
DSI, unit, Romberg test, OE	60.60±6.38	79.79±4.41	2.474	>0.05
DSI, unit, Romberg test, CE	71.25±2.58	81.38±3.85	2.186	>0.05
QR,%	310.43±28.5	367.03±38.13	1.189	>0.05

Note: V, mm/s – speed of common pressure center displacement; S90, mm – statokinezigram area; SI, unit – stability index; DSI, unit – dynamic stability index; QR, % – Romberg index; OE – opened eyes; CE – closed eyes.

Stability indices values for the fighters from experimental group have reliably increased in closed eyes position in comparison with the initial data.

Analysis of dynamic stability indices in comparison with the initial data has shown growth of these indices for both opened eyes and closed eyes positions, however reliability of these differences has not been revealed.

Similar results were obtained in case of Romberg indices for the fighters from experimental group – growth of Romberg index from 310.43±28.,5 to 367.03±38.13 was found, however these differences were not reliable (T=1.189, p>0.05).

Comparative analysis of Romberg tests results for the fighters from reference group has shown improvement of all considered data, however reliability of these differences has been revealed only between the initial and final statokinezigram areas in opened eyes position (98.98±10.87 and 46.43±3.49, T=-4.603, p<0.05) (Table 5).

Table 5. Romberg test indices for the fighters from reference group at the end of pedagogical experiment.

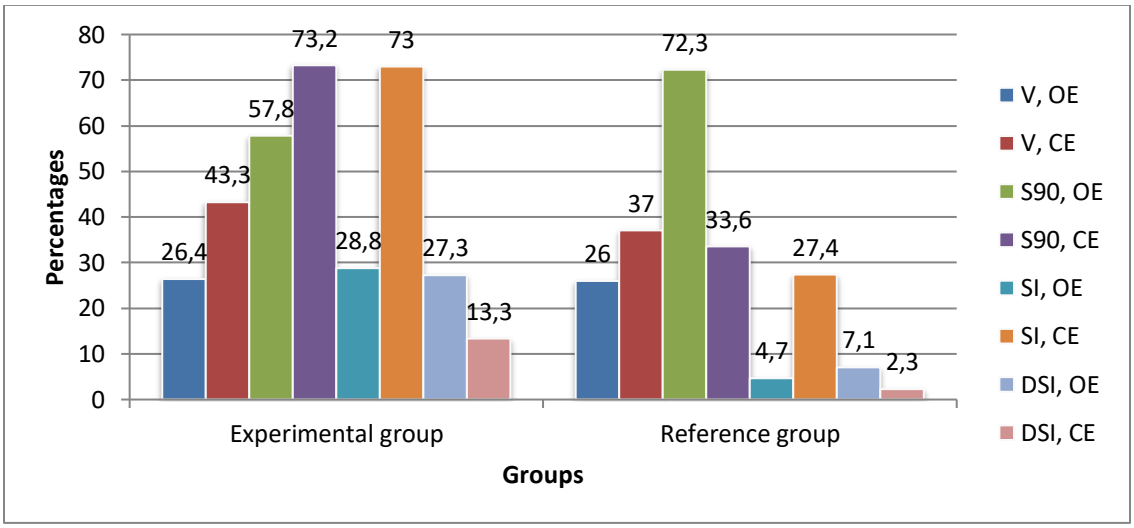
Indices	At the beginning (M±m)	At the end (M±m)	T	P
V, mm/s, Romberg test, OE	12.20±1.45	9.34±0.28	-1.937	>0.05
V, mm/s, Romberg test, CE	23.31±3.28	16.03±0.53	-2.191	>0.05
S90, mm, Romberg test, OE	98.98±10.87	46.43±3.49	**-4.603**	<0.05
S90, mm, Romberg test, CE	158.83±21.1	113.18±8.28	-2.014	>0.05
SI, unit, Romberg test, OE	32.62±4.37	34.18±4.29	0.255	>0.05
SI, unit, Romberg test, CE	18.23±2.89	24.03±3.08	1.373	>0.05
DSI, unit, Romberg test, OE	57.33±4.29	61.56±6.39	0.55	>0.05
DSI, unit, Romberg test, CE	71.05±2.56	72.68±2.71	0.437	>0.05
QR,%	308.85±26.1	321.15±30.06	0.309	>0.05

Note: V, mm/s – speed of common pressure center displacement; S90, mm – statokinezigram area; SI, unit – stability index; DSI, unit – dynamic stability index; QR, % – Romberg index; OE – opened eyes; CE – closed eyes.

The results of Romberg tests and comparative analysis of initial and final data for the fighters from experimental and control groups at the end of pedagogical experiment have shown that the developed

practice brings to more pronounced increasing of the static equilibrium in the experimental group, which is evidenced by growth characteristics.

Seven of eight Romberg test indices for the fighters from experimental group exceeded the indices for the fighters from reference group, save statokinezigram area in opened eyes position (Figure 5).



Note: V – speed of common pressure center displacement; S90 – statokinezigram area; SI – stability index; DSI – dynamic stability index; OE – opened eyes; CE – closed eyes.

Figure 5. Growth of Romberg test indices for MMA fighters from experimental and reference groups.

It was also established that at the end of pedagogical experiment six of nine Romberg test indices for the fighters from experimental group reliably differed from the corresponding indices for the fighters from reference group.

In comparison with the data for the fighters from reference group values of common pressure center displacement speed for the fighters from experimental group in opened yes position were lower by 1.07 mm/s, while in closed eyes position these values were lower by 2.2 mm/s; differences in statokinezigram areas amounted 11 mm and 53.8 mm, respectively; stability indices were higher by 9.45 units and 14.72 units, respectively; dynamic stability indices were higher by 18.23 units and 8.7 units, respectively; Romberg index was higher by 45.88% (Table 6).

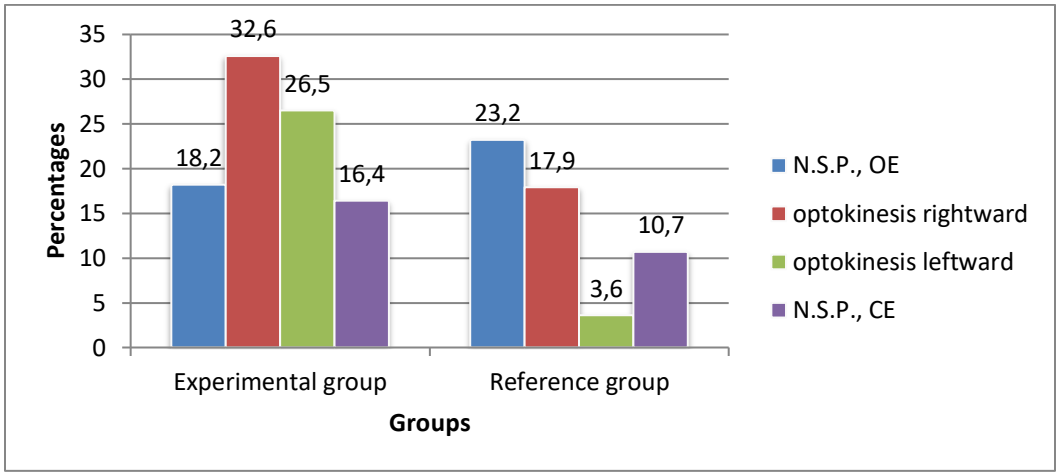
Table 6. Romberg test indices for the fighters from experimental and reference groups at the end of pedagogical experiment.

Indices	Experimental group (M±m)	Reference group (M±m)	T	P
V, mm/s, Romberg test, OE	8.27±0.24	9.34±0.28	**2.901**	<0.05
V, mm/s, Romberg test, CE	13.83±0.56	16.03±0.53	**2.853**	<0.05
S90, mm, Romberg test, OE	35.43±2.41	46.43±3.49	**2.594**	<0.05
S90, mm, Romberg test, CE	59.38±5.22	113.18±8.28	**5.525**	<0.05
SI, unit, Romberg test, OE	43.63±3.18	34.18±4.29	-1.77	>0.05
SI, unit, Romberg test, CE	38.75±2.33	24.03±3.08	**-3.811**	<0.05
DSI, unit, Romberg test, OE	79.79±4.41	61.56±6.39	**-2.618**	<0.05
DSI, unit, Romberg test, CE	81.38±3.85	72.68±2.71	-1.845	>0.05
QR,%	367.03±38.13	321.15±30.06	1.189	>0.05

Note: V, mm/s – speed of common pressure center displacement; S90, mm – statokinezigram area; SI, unit – stability index; DSI, unit – dynamic stability index; QR, % – Romberg index; OE – opened eyes; CE – closed eyes.

Romberg test results confirm once more effectiveness of the worked out technique designed for development of motor- and coordination potentials.

During carrying out of pedagogical experiment, dynamic of parameters behavior characterizing operation of basic sensory systems and interference tolerance of fighters participating in pedagogical experiment have been studied based on Optokinetic response test and universal equilibrium function index (EFI). Despite of the fact that common pressure center displacement speed of the examined fighters has decreased, reliability of differences between the initial and final values has not been revealed neither for the fighters from experimental group, nor for the fighters from reference group. However, growth values evidenced that speed of common pressure center displacement in all positions of Optokinetic response test for the fighters from experimental group have improved to a greater degree in comparison with corresponding data for the fighters from reference group (Figure6).



Note: N.S.P., OE – normal standing position, opened eyes; N.S.P., CE – normal standing position, closed eyes.

Figure 6. Growth of common pressure center displacement speed values for the fighters from experimental and control groups.

Only growth of common pressure center displacement speed for the fighters from reference group in normal standing position, opened eyes (23.2%) exceeded the corresponding parameter for the fighters from experimental group (18.2%). However, absolute values of common pressure center displacement speed for the fighters from experimental group (9.33 mm/s) were lower in comparison with the similar parameters for the fighters from reference group (9.75 mm/s).

Analysis of changes of statokinezigram area during the experiment for the fighters from experimental group has revealed reliable decreasing of the corresponding values in all four studied positions, while for the fighters from reference group reliable decreasing of statokinezigram area has been revealed in optokinesis leftward position (Table 7).

Table 7. Dynamic of statokinezigram area behavior based on the results of Optokinetic response test for the fighters from experimental and reference groups during pedagogical experiment.

S90, mm	(M±m) at the beginning	(M±m) at the end	T	P
	Experimental group			
N.S.P., OE	82.63±6.54	59.93±3.85	**-2.991**	-22.7
optokinesis rightward	89.15±7.03	60.22±3.11	**-3.763**	-28.93
optokinesis leftward	50.18±4.89	36.23±2.18	**-2.606**	-13.95
N.S.P., CE	165.38±11.8	120.14±9.01	**-3.047**	-45.24

S90, mm	(M±m) at the beginning	(M±m) at the end	T	P
	Reference group			
N.S.P., OE	103.83±8.13	80.15±5.91	-2.356	-23.68
optokinesis rightward	91.34±6.65	72.31±3.45	-2.54	-19.03
optokinesis leftward	66.96±5.32	45.85±3.03	**-3.448**	-21.11
N.S.P., CE	221.10±79.5	154.8±10.16	-0.827	-66.3

Note: N.S.P. – normal standing position; S90, mm – statokinezigram area; OE – opened eyes; CE – closed eyes.

Comparative analysis of the results of Optokinetic response test at the end of pedagogical experiment for the participating fighters has shown that 12 of 16 indices for the fighters from experimental group are reliably higher than those for the fighters from reference group (Table 8). The results of Optokinetic response test obtained for the fighters from experimental group evidenced once more that the worked out practice designed for development of motor- and coordination potentials is effective and exerts the positive effect on increasing of interference tolerance of MMA fighters.

Table 8. Optokinetic response test indices for the fighters from experimental and reference groups at the end of pedagogical experiment.

Indices	Experimental group (M±m)	Reference group(M±m)	T	P
V, mm/s, N.S.P., OE	9.33±0.93	9.75±0.89	0.26	0.42
V, mm/s, optokinesis rightward	9.06±0.48	10.98±0.56	**2.603**	1.92
V, mm/s, optokinesis leftward	9.32±0.54	11.64±0.65	**2.745**	2.32
V, mm/s, N.S.P., CE	15.56±0.49	18.09±0.65	**3.108**	2.53
S90, mm, N.S.P., OE	59.93±3.85	80.15±5.91	**2.867**	20.22
S90, mm, optokinesis rightward	60.22±3.11	72.31±3.45	**2.603**	12.09
S90, mm, optokinesis leftward	36.23±2.18	45.85±3.03	**2.577**	9.62
S90, mm, N.S.P., CE	120.14±9.01	154.8±10.16	2.552	34.06

Indices	Experimental group (M±m)	Reference group(M±m)	T	P
SI, unit, N.S.P., OE	42.86±2.87	31.67±3.21	**-2.599**	-11.19
SI, unit, optokinesis rightward	39.76±2.87	30.66±3.12	-2.147	-9.1
SI, unit, optokinesis leftward	40.56±2.28	31.82±2.54	-**2.561**	-8.74
SI, unit, N.S.P., CE	34.83±1.71	22.39±2.21	**-4.452**	-12.44
DSI, unit, N.S.P., OE	77.97±3.28	56.63±3.63	**-4.362**	-21.34
DSI, unit, optokinesis rightward	79.34±3.48	63.7±3.23	**-3.427**	-16.27
DSI, unit, optokinesis leftward	77.13±3.15	60.48±4.03	**-3.255**	-16.,65
DSI, unit, N.S.P., CE	80.89±4.33	73.36±4.28	-1.237	-7.53

Note: N.S.P. – normal standing position; V, mm/s – speed of common pressure center displacement; S90, mm – statokinezigram area; SI, unit – stability index; DSI, unit – dynamic stability index; OE – opened eyes; CE – closed eyes.

Comparing of estimates pertinent to technical and tactical actions in competitive fights of MMA fighters from reference group at the end of experiment with model characteristics has shown that neither of these estimates of technical actions corresponded to the model ones, and these estimates were substantially lower than the considered model characteristics.

It is important to note that the final estimates pertinent to technical and tactical actions in competitive fights of fighters from experimental and reference groups reliably differed for two technical actions, namely: kicks with legs and wrestling (Table 9).

Table 9. Estimates pertinent to technical and tactical actions in competitive fights of fighters from experimental and reference groups at the end of experiment.

Technical actions	Reference group (M±m)	Experimental group (M±m)	Model characteristics	T	P	Growth, %
Punches with arms	53.9±1.31	55.7±1.13	56±2%	1.040	>0.05	32.3

Technical actions	Reference group (M±m)	Experimental group (M±m)	Model characteristics	T	P	Growth, %
Kicks with legs	13.9±1.01	17.2±0.76	20±2%	**2.611**	<0.05	21.2
Wrestling	16.7±1.11	21.2±1.08	24±2%	**2.906**	<0.05	23.7

These results confirmed once more effectiveness of the worked out practice designed for development of motor- and coordination potentials of MMA fighters.

CONCLUSION

The worked out practice for development of coordination potential of MMA fighters has generated integration of different individual actions of sportsmen into functionally productive combinations of technical actions. Development of coordination potentials has been geared to general strategic progression of technical actions performed by sportsmen during fight. It has promoted integration of new-mastered actions based on orderly development of coordination potentials of the fighters.

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