

ORIGINAL SCIENTIFIC PAPER

Influence of Sambo Wrestling Training on Students' Physical Fitness

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Abstract

Concerning the low level of physical fitness of Ukrainian students and insufficient motivation to do physical exercises, one potential solution is the implementation of specific sport-oriented physical education classes, taking into account students' choice of sport. The influence of sambo (self-defence without arms) wrestling training on the level and dynamics of students' physical fitness when studying at higher educational institutions is examined in the article. The investigation of students' physical fitness was conducted according to the following tests: 100-metre race, pull-ups (male), push-ups (female), 3000-metre race (male), 2000-metre race (female), shuttle run 4 × 9 m, sit-ups (per 1 min), standing long jumps, forward inclinations of the body in sitting position. The significantly better ($p < 0.05-0.001$) physical fitness level of students who were involved in the sambo wrestling training during studying in comparison with students who were involved in the current system of physical education was determined, which proves the efficiency of sambo wrestling training. The improvement of students' physical fitness during sambo wrestling classes will have a positive influence on their physical working capacity and the efficiency of their studying and future professional activities.

Keywords: *physical fitness, students, sambo wrestling*

Introduction

Increasing study load and the intensification of the pedagogical process at Ukrainian higher educational institutions (HEI) are connected with ensuring the psycho-physical readiness of future specialists for professional activity. Physical education is an essential component of higher education aimed at the formation of a harmoniously developed modern specialist in the conditions of rationally organized motor activity (Radziyevsky, 2017; L. Shuba & V. Shuba, 2017). It has been proven that systematic physical training promotes health, the improvement of physical and men-

tal capacities, and increases the quality of studying (Wernbom, Augustsson, & Thomee, 2007; Costa et al., 2016). However, according to the data of many scientists (Bolotin & Bakayev, 2015; Semeniv, Babych, Bilenkyi, Prystavskyi, & Kovban, 2018), the level of physical fitness and health of the students of HEI has decreased significantly during the recent years; it has been reported that most of the students have had certain health problems. Also, to increase the motivation of students to perform physical exercises systematically to ensure their health and professional longevity is an acute problem (Batilani, Belem, & Both, 2018; Leuciuc, 2018;



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Mehmeti & Halila, 2018). A low motivation level of students is reflected in their attendance in physical education classes. The scientists (Mandic, Wilson, Clark-Gril, & O'Neill, 2018; Mozolev et al., 2019; Prontenko et al., 2019) consider that the low level of the students' physical fitness is caused by the following: a low level of physical fitness of school graduates; studying conditions in modern HEI characterized by increased study load and a low physical activity level; the lack of the students' interest in traditional classes in physical education; the lack of possibility to choose the type of physical activity. Concerning the data of many scientists (Altin & Demir, 2019; Bergier et al., 2017; Prontenko et al., 2020), one potential means of improving the physical fitness of Ukrainian students is the implementation of sport-oriented physical education classes into the educational process, taking into account the students' free choice of sport. Additionally, the popularity of the type of sport among the students, the training base of an HEI, and the specialists among the teaching staff of the departments of physical education should be taken into account. The analysis of the literature (Trojanov, 2002; Osipov et al., 2017; Slimani, Davis, Franchini, & Moalla, 2017) showed that the most popular sports among students are modern martial arts and various kinds of wrestling.

The present study aims to investigate the influence of sambo wrestling training on the level and dynamics of students' physical fitness at Ukrainian higher educational institutions.

Methods

Ninety-four students (51 male and 43 female) of Zhytomyr Ivan Franko State University took part in the research. Two experimental and two control groups were formed: experimental group - EG1 (N=25) and control group - CG1 (N=26) involved male students (N=51); experimental group - EG2 (N=21) and control group - CG2 (N=22) involved female students (N=43). The experimental and control groups included the students of the first year of study, aged 17–20, who had significantly identical indicators of physical fitness at the beginning of the study ($p > 0.05$). The students of EG1 and EG2 were engaged in sambo wrestling classes according to the programme of the authors of the present paper (during physical education classes (sports department)); the students of CG1 and CG2 were engaged in classes according to the current programme of physical education (main department). The total number of hours spent on physical education per week by the students of both groups was the same and it equaled 4 hours.

The implementation of the authors' programme meant that students would master the following minimum required range of sambo techniques: self-insurance techniques (falling forward, backward, to the right side, to the left side); gymnastic exercises

(forward and backward rolling, backward rolling with jumping, exercises cartwheel, round off, crab position); exercises for the development of neck muscles (running around the neck, jumping on the neck, rolling over the neck, etc.); common basic techniques for sambo wrestling (the ability to move correctly on the mat during a fight in pairs, different options for grips, etc.); the skills of simple methods of fighting in lying position and standing (disturbing the balance, back and front chips, throw through the thigh, grape-vine, leg takedown, throw taking popliteal arch, in standing and on the knees, foot lean on the abdomen, grip of feet, side sweep and pace of steps, painful techniques for arm and leg, side holding, holding from the head side, holding from the legs side, cross-holding, holding above); initial judicial practice.

To achieve the aim of the investigation, we conducted a pedagogical experiment from 2017 to 2019. The analysis of the indicators of students' physical fitness was conducted according to the following tests: 100 m race, pull-ups (male), push-ups (female), 3000 m race (male), 2000 m race (female), shuttle run 4×9 m, sit-ups in 1 min, standing long jumps, forward inclinations of body from a sitting position. The examination was conducted according to the Regulation on the State Tests and Standards of Evaluation of the Physical Fitness of the Population of Ukraine (2014). The levels of students' physical fitness were defined through the total points in seven tests. To receive an individual assessment as excellent and a high level of physical fitness, the total points should be 45–50; the higher than the middle level 35–44 points; a middle level 25–34 points; below the middle level 15–24 points; a low level 10–14 points. Monitoring of the level and dynamics of the indicators of students' physical fitness was carried out four times during the first and the second years of study (in 1st–4th terms); i.e., there were four stages of the investigation. Research methods included theoretical analysis and generalization of literature, pedagogical observation, questionnaire survey, testing, pedagogical experiment, and methods of mathematical statistics. During the study, the authenticity of the difference between the indicators of students by means of Student's t-test was determined. The significance was set at $p < 0.05$ for all statistical tests.

This study complies with the ethical standards of the Act of Ukraine "On Higher Education" No. 1556-VII dated 01.07.2014 and the Letter from the Ministry of Education and Science of Ukraine "On the Academic Plagiarism Prevention" No. 1/11-8681 dated 15.08.2018, and also the principles of the Helsinki Declaration of the World Medical Association. Informed consent has been obtained from all individuals included in this study.

Results

According to regulatory documents regarding the organization of the educational process in physical education at

Table 1. The types of sport in which students would like to be engaged in during physical education classes

Types of sport	Males (N=238)	Rating	Females (N=197)	Rating
Football	31.5%	1	3.7%	8
Volleyball	4.2%	7	32.9%	1
Basketball	9.2%	4	4.1%	7
Track and field athletics	5.1%	5	5.1%	4
Sambo wrestling	29.8%	2	31.5%	2
Kettlebell lifting	4.2%	6	4.6%	5
Powerlifting	13.5%	3	4.1%	6
Badminton	2.5%	8	14.2%	3

Ukrainian HEIs, the sections of the department of physical education and relevant studying groups are completed in the 1st year of study at the beginning of the academic year concerning the sports interests of students, their level of health, physical fitness, and sport qualification. The data necessary to complete the sections of the department were obtained by questioning the students. The sports section involved the students who wanted to improve their sports qualification in the kinds of sport suggested. The results of the students' questionnaire conducted at the beginning of the 1st year of study (2017) (238 male students and 197 female students) determined that 81.5% of male and 84.8% of female students prefer optional classes. Moreover, most of them wanted to be engaged in sport sections (football: 31.5% male, volleyball: 32.9% female students) and sambo wrestling (29.8% male and 31.5% female) (Table 1).

Sambo wrestling benefits from the vast amount of practical experience gained by all kinds of wrestling, which does not require excessive material for mastering skills and which is available for self-development and self-improvement (Tron et al., 2018; Polat, Cetin, Yarim, Bulgay, & Cicioglu, 2018; Dzenzeliuk, 2015). Due to a wide range of technical and tactical actions and high dynamism, sambo wrestling is popular among young people. In addition, sambo wrestling has an applied orientation of skill relevant for various professions, and it is used for military physical training in the army and police in almost all countries of the world. The range of technical and tactical actions recommended and used in the process of applied training includes protection against various types of attack, as well as throws, strokes, and pain and suffocating techniques. The use of special protective equipment when studying and improving the sambo wrestling technique helps to bring the learning process closer to real situations and does not reduce the quality of the performance. The analysis of the works of scientists who investigated the influence of different martial arts on the body (Dornowski, Jagiello, & Smaruj, 2011; Chernozub et al., 2019) proves their positive effect on functional state, physical fitness, working capacity, health and volitional qualities.

Concerning the results of personal investigations, we created and grounded the authors' programme of the students' physical qualities development by the means of sambo wrestling. The tasks of the program are: 1) the increase of the students' desire and interest in physical education classes; 2) the improvement of the systematic attendance of physical education classes; 3) the increase in the level of students' physical fitness and health; 4) the formation of motivation for regular physical exercises; 5) the formation of knowledge, skills and abilities of technical and tactical actions in sambo wrestling; 6) gaining experience of creative use of physical health-improving and sports activities for the achievement of personal and professional goals.

In the authors' programme, the classes are based on the methodical principles of physical education (consciousness and activity, visibility, simplicity and individualization, systematic and consistency, progression), and principles of sports training (continuity, insightful specialization, the unity of gradual increase in load and tendency to maximum loads, undulating and variable loads changes, cycle). The main methods of training are steady, variable, interval, repeated, and competitive. The load at the stages of the authors' programme was adjusted by the changes in its volume and intensity, magnitude

and orientation taking into account the individual abilities of each student, the level of readiness, weight category, gender; it was determined by the specifics of application and the order of combination of the next components: the type, duration and character of individual exercises, the number of repetitions, fights, the intensity of work during their performance (the tempo of movements, the speed and time of their performance), the weight of load (partner), the technical complexity of methods, the duration and nature of the pauses between separate repetitions, and the number of exercises. The results of the study of the level and dynamics of physical fitness of students of both genders are given in Table 2.

The analysis of the results in the 100 m race showed that the difference in the indicators of EG1 and CG1, EG2, and CG2 was not determined at the beginning of the experiment ($p > 0.05$). At the second and the third stages, the speed indicators of experimental groups were 0.1–0.3 sec better than those of control groups, but the difference was not significant ($p > 0.05$). The considerably better results of the students of experimental groups are discovered at the fourth stage: the difference of the male students in 100 m race is 0.4 sec ($p < 0.05$); for female students, it is 0.4 sec ($p < 0.05$).

A comparative analysis of the results of students in pull-ups showed that only at the first stage; the strength indicators of male students did not differ significantly ($p > 0.05$). At all other stages, the results of the EG1 students were significantly better than the CG1 students ($p < 0.01$ – 0.001) (Table 2). During the experiment, the results of the EG1 students in pull-ups were 7.4 times increased ($p < 0.001$); among the CG1 students, it was 0.9 times increased ($p > 0.05$). The investigation of the female students' results in push-ups showed that at the first stage, the strength qualities of both groups did not differ significantly ($p > 0.05$). At the second stage, the results of the EG2 started to be better significantly ($p < 0.001$) than the result of the CG2: 5.1 times better at the second stage, 9.3 times better at the third stage, and 12.6 times better at the 4th stage, which proves a positive influence of the classes according to the authors' programme on the female students' strength qualities development. The analysis of the dynamics of female students' strength indicators during the experiment showed that the results of EG2 were increased significantly (by 13.2 times, $p < 0.001$); CG2 was just 0.7 times increased ($p > 0.05$).

The investigation of the level of students' endurance development proved that the male students' results in 3000 m race were equal at the 1st stage (14 min 41 sec and 14 min 43 sec, $p > 0.05$) (Table 2). The endurance development indicators of the EG1 students were significantly better than those of the CG1 students at the second and further stages of the research. The analysis of the dynamics of the students' results during the experiment showed that the indicators of EG1 were significantly improved by 1 min 50 sec ($p < 0.001$) and equal 12 min 51 sec at the fourth stage. The results of CG1 were not changed; the difference in the initial and final data is just 7.6 sec ($p > 0.05$). The analysis of the dynamics of female students results in 2000 m race proved the similar tendency: the results of EG2 were improved significantly during the experiment ($p < 0.001$), the endurance development indicators of CG2 remained unchanged. Additionally, no authentic difference in the indicators of EG2 and CG2 was determined just at the first stage ($p > 0.05$), the results of the female students of EG2 were significantly better than the ones of CG2 at the other stages.

The analysis of the results in 4 × 9 m shuttle run showed

Table 2. The dynamics of the physical qualities development of the EG and CG students during the experiment (N=94)

The stages of the experiment	Male students			Female students		
	EG1 (N=25) M±SD	CG1 (N=26) M±SD	p (EG1-CG1)	EG2 (N=21) M±SD	CG2 (N=22) M±SD	p (EG2-CG2)
100 m race, sec						
1 st term	14.4±0.16	14.3±0.14	>0.05	16.9±0.14	17.0±0.15	>0.05
2 nd term	14.1±0.15	14.2±0.13	>0.05	16.6±0.12	16.8±0.14	>0.05
3 rd term	13.9±0.15	14.2±0.12	>0.05	16.5±0.12	16.8±0.15	>0.05
4 th term	13.8±0.14	14.2±0.12	<0.05	16.3±0.11	16.7±0.13	<0.05
p (1-4)	<0.01	>0.05		<0.01	>0.05	
Pull-ups (male), push-ups (female), reps						
1 st term	9.4±0.52	9.6±0.49	>0.05	13.2±0.60	13.1±0.58	>0.05
2 nd term	12.5±0.49	10.3±0.51	<0.01	18.7±0.57	13.6±0.57	<0.001
3 rd term	14.9±0.46	10.2±0.48	<0.001	23.1±0.55	13.8±0.56	<0.001
4 th term	16.8±0.46	10.5±0.47	<0.001	26.4±0.54	13.8±0.55	<0.001
p (1-4)	<0.001	>0.05		<0.001	>0.05	
3000 m race (male), 2000 m race (female), sec						
1 st term	881.2±12.71	882.9±12.88	>0.05	802.3±10.91	797.7±10.43	>0.05
2 nd term	835.8±12.55	880.4±12.81	<0.05	728.4±10.62	800.2±10.32	<0.001
3 rd term	796.4±12.47	877.0±12.75	<0.001	690.7±10.53	804.9±10.25	<0.001
4 th term	771.1±12.36	875.3±12.69	<0.001	667.2±10.39	799.1±10.27	<0.001
p (1-4)	<0.001	>0.05		<0.001	>0.05	
Shuttle run 4 x 9 m, sec						
1 st term	9.9±0.49	9.8±0.47	>0.05	11.2±0.65	11.3±0.68	>0.05
2 nd term	9.6±0.43	9.6±0.45	>0.05	10.9±0.62	11.0±0.65	>0.05
3 rd term	9.3±0.42	9.5±0.43	>0.05	10.6±0.61	10.8±0.69	>0.05
4 th term	9.1±0.39	9.4±0.42	>0.05	10.4±0.59	10.7±0.62	>0.05
p (1-4)	>0.05	>0.05		>0.05	>0.05	
Sit-ups in 1 min, reps						
1 st term	39.2±1.14	39.1±1.17	>0.05	29.3±1.23	30.1±1.19	>0.05
2 nd term	42.8±1.13	40.3±1.13	>0.05	36.6±1.25	32.6±1.17	<0.05
3 rd term	45.6±1.15	41.6±1.12	<0.05	38.4±1.22	33.2±1.17	<0.01
4 th term	48.9±1.16	42.2±1.10	<0.001	42.1±1.18	33.5±1.16	<0.001
p (1-4)	<0.001	>0.05		<0.001	>0.05	
Standing long jump, cm						
1 st term	219.3±2.93	220.4±2.89	>0.05	170.2±2.48	171.3±2.55	>0.05
2 nd term	228.4±2.95	225.8±2.85	>0.05	177.9±2.52	173.7±2.54	>0.05
3 rd term	236.9±3.02	226.1±2.83	<0.05	184.3±2.47	175.9±2.51	<0.05
4 th term	243.2±2.96	227.6±2.81	<0.001	188.5±2.43	176.3±2.49	<0.001
p (1-4)	<0.001	>0.05		<0.001	>0.05	
Forward inclination of body from a sitting position, cm						
1 st term	8.1±1.07	8.0±1.12	>0.05	12.7±1.05	12.6±1.06	>0.05
2 nd term	14.7±1.04	7.8±1.11	<0.001	16.5±1.03	13.5±1.02	<0.05
3 rd term	16.2±1.02	7.8±1.10	<0.001	19.8±1.05	14.1±1.06	<0.01
4 th term	18.6±0.98	7.7±1.10	<0.001	21.2±1.04	14.5±1.05	<0.001
p (1-4)	<0.001	>0.05		<0.001	>0.05	

Legend: Mean: arithmetical average; SD: standard deviation; N: number of subjects; EG1 – Experimental group 1; CG1 Control group 1; p (EG1–CG1): significance of difference between the indicators of EG1 and CG1 due to the t-test; p (1–4): significance of difference between the indicators of each group at the beginning and at the end of the experiment due to the t-test

that the indicators of dexterity development of the students of both groups did not differ authentically at the first, second, third, and fourth stages of the investigation ($p>0.05$) (Table 2). The dynamics of the results of students (male and female) in 4×9 m shuttle run have a positive character during the experiment: the indicators were improved in all groups: EG1: 0.8 sec, CG1: 0.4 sec, EG2: 0.8 sec, and CG2: 0.6 sec ($p>0.05$).

The analysis of the male students' results in sit-ups in 1 min showed that the results of EG1 and CG1 did not differ significantly at the first and the second stages of the experiment ($p>0.05$) (Table 2). The results of EG1 were four times better significantly than the indicators of CG1 at the third stage ($p<0.05$), and 6.7 times better at the fourth stage ($p<0.001$). The indicators of EG1 were 9.7 times increased ($p<0.001$), and those of CG1 were not changed ($p>0.05$) during the experiment. The difference in the results in sit-ups of the female students of EG2 and CG2 was not defined at the 1st stage of the experiment ($p>0.05$), and the difference was authentic at the further stages. The results of EG2 in this exercise were increased 12.8 times ($p<0.001$), while in CG2 it was increased 3.4 times ($p>0.05$) during the experiment.

The examination of the students' results in standing long jump proved that the results of both male and female students did not differ significantly at the first and the second stages

of the experiment ($p>0.05$) (Table 2). The result of EG1 was 10.8 cm better significantly than the one of CG1 ($p<0.05$) at the third stage, and 15.6 cm at the fourth stage ($p<0.001$). The results of EG2 were 8.4 cm better than the results of CG2 ($p<0.05$) at the third stage, and 12.2 cm at the fourth stage ($p<0.001$).

The implementation of the authors' program promoted more efficient development of flexibility of both male and female students of EG, in comparison to CG. Therefore, the results in forward inclination of body from a sitting position were better significantly in experimental groups than in control groups even at the second stage ($p<0.05-0.001$) (Table 2). During the experiment, the indicators of the students of experimental groups were 10.5 cm increased in EG1 and 8.5 cm in EG2 ($p<0.001$).

An individual grade, as well as the level of physical fitness of students in accordance with the regulations on the state tests and standards, was determined by the total points of the results in seven control exercises. The study of the level of physical fitness of the students of experimental and control groups by the total points showed that at the beginning of the experiment, total points were the same in EG1 and CG1, which equalled 13 points and corresponded to the low level of physical fitness (Table 3).

Table 3. The dynamics of the physical fitness level of EG1 (N=25) and CG1 (N=26) male students during the experiment (in points)

Tests	1 st term		2 nd term		3 rd term		4 th term	
	EG1	CG1	EG1	CG1	EG1	CG1	EG1	CG1
100 m race	3	3	4	3	4	3	4	3
Pull-ups	1	1	3	2	4	2	5	2
3000 m race	2	2	3	2	3	2	4	2
Shuttle run 4 x 9 m	2	3	3	3	3	3	4	3
Sit-ups in 1 min	2	2	3	2	3	3	4	3
Standing long jump	1	1	1	1	4	2	4	3
Forward inclination of body	2	1	2	1	4	1	4	1
Sum of points	13	13	19	14	25	16	29	17

During the experiment, the level of physical fitness increased in both groups: the total points were 29 points in EG1 at the fourth stage, which corresponds to the middle level of physical fitness, and 17 points in CG1, which corresponds to the below the middle level. The greatest increase of grade of the students of EG1 was found in the development of strength,

endurance, speed and strength qualities, and the flexibility test.

The sum of points of EG2 and CG2 was the same at the beginning of the experiment (11 points in every group), which corresponded to a low level. During the experiment, the sum of points was increased: 27 points in EG2 (the middle level), 15 points in CG2 (below the middle level) (Table 4).

Table 4. The dynamics of the physical fitness level of the EG2 (N=21) and CG2 (N=22) female students during the experiment (in points)

Tests	1 st term		2 nd term		3 rd term		4 th term	
	EG2	CG2	EG2	CG2	EG2	CG2	EG2	CG2
100 m race	2	2	2	2	2	2	3	2
Push-ups	2	2	3	2	4	2	5	2
2000 m race	1	1	2	1	2	1	3	1
Shuttle run 4 x 9 m	2	2	3	3	3	3	4	3
Sit-ups in 1 min	1	1	2	2	3	2	4	2
Standing long jump	1	1	2	1	3	2	3	2
Forward inclination of body	2	2	3	2	4	2	5	3
Sum of points	11	11	17	13	21	14	27	15

Taking into account the dynamics of students' level of physical fitness during their first and second years of studies, we may predict a further increase in the level of physical fitness in the senior years of study on the condition of sambo wrestling classes in the sports section of the department of physical education at the HEI.

Discussion

The works of scientists (Azhyppo et al., 2018; Prontenko et al., 2019) determine that the level of physical fitness of students of Ukrainian HEIs is not satisfactory and has a downward trend; the number of students who have health problems increases every year. This leads to the students' excess weight, decreased health and efficiency of studying, and significant limitations on the ability of young people to choose a profession and job.

Researchers (Montesano & Mazzeo, 2019; Mozolev et al., 2019) consider one of the possible ways to solve this problem to be a students' free choice of the type of physical health-improvement and sports activity, taking into account the popularity of the sport among students, the possibility of

the educational and sports base of the HEI and the specialists among the teaching staff of the department of physical education. Researchers (Prysiazhniuk et al., 2018) mention that the number of students who would like to participate in sports sections during their studying at the HEI ranges from 50 to 80%, which proves the necessity to adjust the physical educational process to the interests, motivations, and needs of students. Consequently, we developed and substantiated the authors' program of the development of the physical qualities of the students by means of sambo wrestling. The results of the experiment showed that the physical education classes according to the authors' programme had a positive effect on the level of physical fitness of both male and female students. Thus, under the influence of organized sambo wrestling classes, an authentic improvement in the level of speed, strength, endurance, speed and strength, a flexibility of both male and female students is observed. In general, improved physical fitness will have a positive effect on the students' mental and physical capacity, their health, well-being, and the effectiveness of their senior studying and future professional activity.

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Conflict of Interest

The authors declare that there are no conflicts of interest.

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