

Pedagogical Conditions for Swimming Skills Development in Students of Pedagogical Educational Institutions

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Abstract: The purpose of this study was to determine pedagogical conditions for effective swimming training of students of pedagogical educational institutions.

Materials and methods. The experimental group (EG) consisted of 45 first-year female students of the schools of foreign philology, physics and mathematics education, natural geography and ecology (special medical group) who had a sufficient physical fitness level and could not swim. The control group (CG) was composed of 40 first-year female students of the schools of foreign philology, physics and mathematics education, natural geography and ecology (special medical group) who had a sufficient physical fitness level, could float, swim short distances (3-5 meters).

Results. After the experiment, there was a significant improvement in the test results. Specifically, the experimental group students showed increase in all parameters of the cardiorespiratory system functional state – an increase in breath-holding time in the Stange’s test and the Genci’s test ($p = 0.001$) and, accordingly, in the Harvard step test ($p = 0.001$). The results of the experimental group students improved in the Harvard step test by 13.56%; in the Stange’s test – by 9.26%; in the Genci’s test – by 13.15% ($p = 0.001$).

The experimental group students showed a statistically significant improvement in the test results of physical fitness. Specifically, in the tests: “Standing long jump”, the result increased by 4.70%; “Sit-ups in 30 seconds” – by 10.59%; “Jumping rope” – by 6.91%; “Push-ups” – by 17.62% ($p = 0.001$).

Conclusions. The study revealed a statistically significant effectiveness of the suggested methods of teaching swimming to special medical group students. On the basis of discriminant analysis, the researchers ascertained a statistically significant influence of the experimental methods on the dynamics of the students’ physical and functional fitness. Positive dynamics of change was found in the indicators of high level of anxiety during swimming training.

Keywords: *students; swimming; psychophysical condition; motivation; motor fitness.*

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1. Introduction

The optimization of students' motor activity and health preservation during professional education is an urgent problem in Europe (Sigmundová, Chmelík, Sigmund, Feltlová & Frömel, 2013; Chernenko, Iermakov, Oliinyk & Dolynnyi, 2018; Zuzda, Latosiewicz & Augustyńska, 2017). Zuzda et al. (2017) demonstrate that Polish students achieve the level of physical activity recommended by experts for the prevention of chronic diseases, which allows them to understand their health issues through self-assessments of personal risk factors for cardiac events, pulmonary and musculoskeletal injury. According to Sigmundová et al. (2013), standard motor activity (10,000 steps per day) is the basis for health improvement among Czech university students. Sanchez Sanchez and Espada Mateos (2018) point to the influence of information and communication technologies on increasing students' motor activity.

Motor activity of students with health problems is considered separately (Pryimakov, Eider, Nosko & Iermakov, 2017; Koryahin, Blavt & Stadnyk, 2017). Female students with impaired health have a worse ability to learn accurate movements. They have less pronounced compensation reserves for the effects of negative factors and obstacles (Pryimakov et al., 2017). The implementation of a preventive program for students with a visual organ pathology has a positive effect on their subjective evaluation of their visual analyzer performance (Pashkevich & Kriventsova, 2017).

Motor activity is interconnected with the development of motor abilities and motor function (Kolokoltsev, Iermakov & Prusik, 2018; Nosko & Arkhypov, 2013; Chernenko et al., 2018). The features of motor skills and functional parameters of students of different somatotypes allow to concretize provisions of methodology of planning the individual differentiated training in physical education (Kolokoltsev et al., 2018). The results of classification of 1st-5th year students by motor and functional preparedness indicate that third-year students have the lowest level of development and the lowest motor activity among students (Chernenko et al., 2018). Biomechanical properties of muscles (contraction and stretching, stiffness, elasticity, strength, viscosity, relaxation) and their complex manifestation are the basis of methods for improving the quality of physical education, motor activity, physical performance and student health (Nosko & Arkhypov, 2013).

The papers by Zelenskiy B. and Zelenskiy R. (2018), Zelenskiy R., Popova, Sokolovskiy and Stashchak (2018), Batilani, Belem and Both (2018) presented motivation as an important factor of successful activity in physical

education and emotional and volitional culture development of students. It was found that the dominant motives for physical education among female students of higher education institutions regardless of the year of study are to improve body shapes, to improve health, to lose weight. (Zelenskyi B. et al. 2018). According to Canales-Lacruz and Martinez-Manero (2018), a comparison of the levels of students' fitness and using it as a basis for group formation does not promote positive motivation for physical activity.

Leuciuc F. (2018) argues that a minimum of 150 minutes of physical education classes per week are required to ensure a sufficient level of motor fitness. Fitness programs, basic gymnastics, swimming are viewed as the main means of physical education (Tcaregorodtceva & Tiunova, 2005; Serrano Ramon & Ferriz Valero, 2018). The peculiarities of conducting classes with special medical group students are outlined in the papers by Koryahin, Blavt and Tsiovkh (2018), Pashkevich and Kriventsova (2017), Osipov, Kudryavtsev, Markov, Kuzmin, Nikolaeva, Zemba and Yanova (2018). According to the authors, pedagogical control in physical education, preventive orientation of classes, as well as their various forms increase students' weekly level of physical activity and improve their health. Pedagogical control in physical education of students is regarded as a necessary condition for organizing the educational process (Ivashchenko, 2016; Drogomeretsky, Kopeikina, Kondakov & Iermakov, 2017; Koryahin & Blavt, 2018).

The need to teach swimming to students has socially important functions: firstly, it is the main means for preventing water accidents; secondly, it is one of the effective health improvement measures of non-medicated rehabilitation; and thirdly, it significantly improves physical, intellectual and mental development of the individual (Filatova & Shtanheieva, 2004; Blavt & Tsiovkh, 2009; Filatova, 2015).

Consequently, swimming is an educational subject and an essential component of students' personality development and health improvement. It thus became necessary to clarify and expand the content, forms and methods of swimming skills development in students, which makes this paper relevant.

1.1. The purpose of this study was to determine pedagogical conditions for effective swimming training of students of pedagogical educational institutions.

2. Materials and methods

2.1. Study participants

The experimental group (EG) consisted of 45 first-year female students of the schools of foreign philology, physics and mathematics education, natural geography and ecology who had a sufficient physical fitness level and could not swim. The EG students belonged to a special medical group and had doubts about the possibility of using the acquired swimming skills later in life. And nine of them (20%) even had a fear of water (caused by a dangerous situation on the water during independent attempts to learn to swim).

The control group (CG) was composed of 40 first-year female students of the schools of foreign philology, physics and mathematics education, natural geography and ecology (special medical group) who had a sufficient physical fitness level, could float, swim short distances (3-5 meters), had a sufficient motivation to master swimming skills and the desire to participate in competitions, almost had no fear of water.

2.2. Research methods

The following research methods were used to solve the tasks set: pedagogical observation, survey, expert evaluation, questionnaire, testing, statistical data processing.

2.3. Study organization

The experimental group students were asked to perform physical exercises in accordance with their psychophysical capabilities, in a general fitness training gym (a set of selective physical exercises, with a ratio of their performance to active and passive rest). A specific feature of teaching swimming to the EG students was the use of methodical techniques and special means aimed at overcoming the fear of water, a sense of anxiety and imminent danger when in the pool. Classes were conducted depending on the purpose and tasks set.

The methods of swimming training included three stages. The stages and exercises for teaching swimming to the experimental and control group students are presented in Table 1.

Table 1. The stages and exercises for teaching swimming to the experimental and control group students

N of stage	Types of exercises	Experimental group	Control group
1	Games and exercises with elements of swimming for perceiving water environment	Exercises in support position “star”, “jellyfish”, “float”, walking and running along the bottom of the pool, sliding on water, playing; exercises with elements of swimming aimed at overcoming the fear of water and mastering swimming skills	
2	Learning and improvement of swimming skills and movements. Games that develop and reinforce swimming skills	Exercises in shallow water: a) predominant use of swimming aids (boards, belts, cuffs); b) games: “Hold the board”, “Caterpillar”, “Fountain”, “Mill”, “The sea is waving”; c) elements of swimming exercises without swimming aids	Exercises with elements of swimming: a) work of arms, legs, coordinated “front crawl” and “back crawl”; b) exercise “Arms-dolphin – legs-crawl”; c) covering a distance of 10 m using a favorite stroke. Exercises for learning turns, jumps into water
3	Exercises for developing physical qualities. Gradual increase in motor activity. Use of coordinationaly difficult exercises, longer distance covered	Moving along the bottom of the pool in pairs, relays, games “Steam train”, “Camomile”, “Who is higher?”, swimming with and without a board, covering a distance of 7, 12 m, jumps into water	Improvement and learning of swimming strokes: a) “front crawl”, “back crawl”; b) learning “breaststroke”, “dolphin”. Covering a distance of 12, 12x2 m, start
1, 2, 3	Use of exercises for developing the flexibility of the back of the thigh, stretching of arm, leg muscles, performed in pairs and alone at the side of the pool.		

The suggested methods of conducting classes provided for a safety-based swimming skills development in students, which positively influenced their motivation.

When mastering swimming skills, the students learned to prevent and overcome dangerous “choking” situations (see Table 2).

Table 2. Actions to prevent and overcome dangerous “choking” situations

N	Conditions to create dangerous situations	Actions to prevent “choking”
1	Accidental release of hands from a stationary support (a ladder, etc.)	Advice on how to grip the support, helping with a pole
2	Reflexive backward immersion of the head into water	Exercise performance in pairs, supporting each other; helping with a pole, rescue aids, etc., if needed
3	Reflexive forward immersion of the head into water	Exercises in pairs, supporting each other; helping with a pole, rescue aids, etc., if needed
4	Strong fear of water	Overcoming fear of water homework
5	Sudden inhalation underwater	Use a system of breathing exercises, end the breath into the air
6	Fall while descending into water	Giving necessary assistance; helping with a pole, rescue aids, etc., if needed
7	Choking of students with vision and hearing impairments	Increased attention; helping with a pole
8	Unexpected jump into water	Availability of rescue aids on the side of the pool
9	“Choking”	Increase attention, assistance with a pole, etc.
10	Loss of balance in water, loss of “earth-sky” feeling	Ensure necessary assistance using rescue aids, a pole
11	Bumping into each other; hit with a board, etc.	Ensure necessary assistance; availability of rescue aids, etc.

2.4. Testing procedure

To determine a psychological readiness of students for mastering swimming skill, the study used the adapted Volkov (2002) Taylor method: where the total score 40-50 points is considered as an indicator of a very high level of personal anxiety; 25-40 points – a high level; 15-25 points – an

average level (with a tendency for a high one); 5-15 points – an average level (with a tendency for a low one); 0-5 points – a low anxiety level.

To determine the level of functional and motor fitness, commonly known tests were used: Harvard step test, Stange's test, Genci's test, Standing long jump, Throwing the ball against the wall in 30 seconds (times), Sit-ups in 30 seconds (times), Jumping rope in 30 seconds (times), Push-ups (times).

2.5. Statistical analysis

To determine the peculiarities of strength effort assessment, the study used a t-test for paired observations and a t-test for independent samples.

The study materials were processed by the IBM SPSS 20 statistical analysis software. In the process of discriminant analysis, the study created a prognostic model for group membership. This model develops a discriminant function (or, when there are more than two groups — a set of discriminant functions) in the form of a linear combination of predictor variables, ensuring the best division of groups. These functions are developed according to a set of observations, for which their group membership is known. These functions can continue to be used for new observations with known values of predictor variables and unknown group membership.

For each canonical discriminant function, the study calculated: eigenvalue, dispersion percentage, canonical correlation, Wilks' Lambda, Chi-square.

3. Results

At the beginning of the study, a survey was conducted among the EG and CG students, which showed that before entering the higher education institution they:

- did not know that swimming training groups for students existed – 61 persons (72%);
- had concerns about a possible lack of attention from instructors – 40 persons (47%);
- had negative memories of independent attempts to learn to swim – 9 persons (11%);
- expressed doubts about the feasibility of mastering swimming skills and the possibility of their further use – 52 persons (61%).

When evaluating the motivation for swimming, the study observed the absence of special knowledge that would allow to understand the importance of the ability to swim, which would give an impetus for conscious class attendance.

Table 3 shows the test results of the experimental group and control group students at the beginning and after the experiment.

Table 3. Test results of functional and motor fitness of the experimental and control group students

N	Test	Group	N	Before experiment		After experiment		Paired Differences	t	P
				Mean	SD	Mean	SD			
1	Harvard step test (relative units)	e	45	56.58	8.95	64.25	9.82	-7.67	-7.362	.000
		c	40	56.60	7.12	59.14	6.79	-2.55	11.579	.000
2	Stange's test (s)	e	45	35.98	8.16	39.31	7.96	-3.33	-	.000
		c	40	34.93	8.20	35.93	8.08	-1	11.726	.014
3	Genci's test (s)	e	45	24.33	6.68	27.53	6.55	-3.20	-	.000
		c	40	27.48	7.86	27.73	7.71	-.25	11.357	.391
4	Standing long jump (cm)	e	45	149.71	11.84	156.76	10.76	-7.04	-	.000
		c	40	148.90	23.41	150.83	22.10	-1.93	11.282	.000
5	Throwing the ball against the wall in 30 seconds (times)	e	45	29.44	5.69	31.44	7.23	-2.00	-2.180	.035
		c	40	32.83	9.13	33.85	8.48	-1.03	-3.914	.000
6	Sit-ups in 30 seconds (times)	e	45	15.49	3.14	17.13	2.94	-1.64	-	.000
		c	40	19.98	3.64	20.48	4.68	-.50	11.525	.315
7	Jumping	e	45	40.53	4.73	43.33	4.99	-2.80	-6.888	.000

	rope in 30 seconds (times)	c	40	40.05	8.57	41.73	7.85	-1.68	-4.815	.000
8	Push-ups (times)	e	45	9.82	2.41	11.56	2.40	-1.73	-9.892	.000
		c	40	10.33	3.47	11.50	3.69	-1.18	-3.954	.000

At the beginning of the experiment, the level of physical fitness and physical performance of the EG and CG students was assessed as low.

After the experiment, there was a significant increase in the test results. Specifically, the experimental group students showed an increase in all parameters of the cardiorespiratory system functional state – an increase in breath-holding time in the Stange’s test and the Genci’s test ($p = 0.001$) and, accordingly, in the Harvard step test ($p = 0.001$) (Table 3).

The results of the experimental group students improved in the Harvard step test by 13.56%; in the Stange’s test – by 9.26%; in the Genci’s test – by 13.15% ($p = 0.001$) (Table 3).

The control group students also showed positive changes in all the parameters characterizing the functional state (see Table 3). Specifically, the control group students’ results in the Harvard step test increased by 4.51% ($p = 0.001$), the Stange’s test result – by 2.86% ($p = 0.014$); the Genci’s test – by 0.91% ($p > 0.05$).

The experimental group students showed a statistically significant improvement in the test results of physical fitness. Specifically, in the tests: “Standing long jump”, the result increased by 4.70%; “Sit-ups in 30 seconds” – by 10.59%; “Jumping rope” – by 6.91%; “Push-ups” – by 17.62% ($p = 0.001$).

The control group students showed a statistically significant improvement in the test results of physical fitness. Specifically, in the tests: “Standing long jump”, the result increased by 1.30%; “Jumping rope” – by 4.19%; “Push-ups” – by 11.42% ($p = 0.001$).

In order to clarify the impact of the experimental methods, the study performed a discriminant analysis (see Table 4).

The first canonical function explains 100% of the variation in results, which indicates its high informativity ($r = 0.591$). The materials of the canonical function analysis show its statistical significance ($\lambda = .650$; $p = 0.001$). The first function has a high discriminative ability and value of interpretation with respect to the general totality.

Table 4. Results of discriminant analysis

N	Test	Standardized	Structure	Unstandardized
		Function	Function	Coefficients
		Coefficients	Coefficients	
		1	2	3
1	Harvard step test (relative units)	.518	.563	.055
2	Stange's test (s)	.209	.285	.026
3	Genci's test (s)	.274	.334	.041
4	Standing long jump (cm)	.378	.430	.033
5	Throwing the ball against the wall in 30 seconds (times)	-.064	.212	-.010
6	Sit-ups in 30 seconds (times)	.028	.373	.009
7	Jumping rope in 30 seconds (times)	.493	.397	.101
8	Push-ups (times)	.407	.498	.169
	(Constant)			-16.405

Table 4 presents standardized canonical discriminant function coefficients (1) allowing to determine the ratio of variables' contribution to the function result. The Harvard step test (0.518), "Jumping rope in 30 seconds" (0.493), "Push-ups" (0.407) have the largest contribution to the first canonical function, which provides evidence on the impact of the experimental methods on improving the students' performance, jumping endurance and strength of arm muscles.

The structure coefficients (2) of the first canonical discriminant function show that the function is most substantially related to the results of the Harvard step test (0.563), "Push-ups" (0.498), "Standing long jump" (0.430): thus, a significant difference between the results at the beginning and after the experiment is observed in the level of performance, relative and speed strength.

Table 5 shows the classification results of the groups, 75.6% of the original grouped observations were classified correctly. Therefore, a canonical discriminant function can be used to classify students' motor fitness during swimming skills development.

The centroid coordinates for two groups make it possible to interpret the canonical function in relation to the classification role (see Table 5). By calculating the function value (3) and comparing it with centroid values, it is possible to carry out pedagogical control over the effectiveness of students' physical education.

Table 5. Classification results

	Special Group Girls	Medical	Predicted Group Total		Functions at Group Centroids	
			Membership			
			1	2		
Original	Count	1 – before experiment	35	10	45	-.725
		2 – after experiment	12	33	45	.725
		Ungrouped cases	47	33	80	
%	%	1 – before experiment	77.8	22.2	100.0	
		2 – after experiment	26.7	73.3	100.0	
		Ungrouped cases	58.8	41.3	100.0	

The study found that the experimental group and control group students had:

- a high level of anxiety – 6%, (experimental group students);
- an average level of anxiety with a tendency for a high one – 38%, (experimental group students);
- an average level of anxiety with a tendency for a low one – 50%, (control and partly experimental group students);
- a low level of anxiety – 6% (control group students).

The experimental group students showed significant positive changes in the indicators of high level of anxiety during swimming training (overcoming the fear of water) – reduction from 55% (beginning of the study) to 3% (end of the study), the control group – from 7% to 1%. The experimental group average indicator with a tendency for a high one changed from 32% to 8%, the control group – from 24% to 5%. The indicator of the average anxiety level with a tendency for a low one underwent the following changes: in the experimental group – from 17% at the beginning of the study to 5% at the end; in the control group – from 56% to 3%. Thus, a low level of anxiety was observed at the end of the

study: the experimental group students – 74%, control group students – 91%.

The obtained data and the results of the questionnaire survey demonstrated positive dynamics of change in the control and experimental group students' motivational aspirations to master swimming skills and the possibility to apply the acquired knowledge in further professional activity.

All the students showed a change in motivation to learn to swim. Specifically, 92% of the experimental group students and 89% of the control group students expressed a positive attitude and understanding of the vital need for swimming skills as a result of conscious rethinking. 8% of the experimental group students and 11% of the control group students failed to clearly define their attitude to the importance of the ability to swim in life. No negative responses were given in either group of testees.

Each stage of swimming training ended with a control test. By the results of the study, the experimental and control group students mastered swimming skills and swam a distance of 25 meters in a large pool, using sports strokes (Table 9). 87% of the experimental group and 86% of the control group students learned the “back crawl” swimming technique, 58% of the experimental group students and only 43% of the control group students learned the “breaststroke”, 90% of the experimental group and 86% of the control group students mastered the “front crawl”.

4. Discussion

The study results confirm the assumption that the implementation of methods for developing the need to master swimming skills in students during the educational process will contribute to increasing the motivation to exercise, to learn swimming skills, to improve physical and functional fitness and motor activity in general.

The study showed that the mastering of swimming skills by students of higher education institutions depends on a number of objective factors: a positive attitude to achieve good final results; meaningful and methodical swimming training; rational organization of teaching the subject, student-student and student-instructor interaction.

The obtained data supplement findings of Sidorov (1990), Sirenko (2005) on the factors that influence students' motivation for engaging in physical activity. It was found that activity approach positively influences students' motivation. Specifically, 92% of the experimental group students and 89% of the control group students expressed a positive attitude and understanding of the vital need for swimming skills as a result of conscious

rethinking. 8% of the experimental group students and 11% of the control group students failed to clearly define their attitude to the importance of the ability to swim in life.

The study results supplement the data of Filatova and Shtanheieva (2004); Blavt and Tsiovkh (2009); Filatova (2015) on the effectiveness of teaching swimming to students. As in the papers by Chacón-Cuberos, Badicu, Zurita-Ortega and Castro-Sánchez (2018), Chernenko et al. (2018), the study ascertained a positive effect of motor activity on the dynamics of students' physical and functional fitness.

The obtained data confirm the possibility of using discriminant analysis to assess the effectiveness of training methods in physical education of students. As in the papers by Ivashchenko (2016), Chernenko et al. (2018), the study found that a canonical discriminant function can be used to classify students' motor fitness when mastering swimming skills. For practical application, it is necessary to substitute a student's test results in the regression equation and compare them with the centroid values:

$Y = -16.405 + 0.055x_1 + 0.026x_2 + 0.041x_3 + 0.033x_4 - 0.010x_5 + 0.009x_6 + 0.101x_7 + 0.169x_8$, where Y is the value of the function, x_1 – x_8 is the student's test results.

Consequently, the key principles for implementing the methods are: prevention of the fear of dangerous situations during swimming training; improvement of the body health by adjusting the means of physical activity (exercises in the “dry swimming” gym and “in the water”); regular health monitoring; conscious intention to master swimming skills, based on positive motivation development. A discriminant function can be used for pedagogical control.

5. Conclusions

The main reason for low efficiency of teaching swimming to students in higher education institutions is the lack of well-developed professional and applied curricula ensuring safety of the educational process. The purposes of swimming training are: to improve students' physical and psycho-emotional state, to create a positive motivation for mastering swimming skills, to increase students' motor activity, to encourage their engagement in physical activity and healthy lifestyle.

The study revealed a statistically significant effectiveness of the suggested methods of teaching swimming to special medical group students. On the basis of discriminant analysis, the researchers ascertained a statistically significant influence of the experimental methods on the

dynamics of the students' physical and functional fitness. Positive dynamics of change was found in the indicators of high level of anxiety during swimming training.

References

- Batilani, T. G., Belem, I. C., & Both, J. (2018). Different Profiles in Terms of Motivation and Concerns of Physical Education Students. *Movimento*, 24(2), 619–632. doi:10.22456/1982-8918.74947
- Blavt, O. Z., & Tsiovkh, L. P. (2009). Plavannia yak zasib rehabilitatsii studentiv, yaki zaimaiutsia u spetsialnykh medychnykh hrupakh (v umovakh vuzu). *Sportyva nauka Ukrainy*, (2), 42–54. (in Ukrainian)
- Canales-Lacruz, I., & Martinez-Manero, A. (2018). Motor Inefficacy in Physical Education: Female perspective. *Retos-Nuevas Tendencias En Educacion Fisica Deporte Y Recreacion*, (33), 81–84.
- Chacón-Cuberos, R., Badicu, G., Zurita-Ortega, F., & Castro-Sánchez, M. (2018). Mediterranean Diet and Motivation in Sport: A Comparative Study Between University Students from Spain and Romania. *Nutrients*, 11(1). doi:10.3390/nu11010030
- Chernenko, S., Iermakov, S., Oliinyk, O., & Dolynnyi, Y. (2018). Pattern Recognition: Description of Functional and Motor Preparedness of Students of Higher Educational Institutions. *Teoriâ Ta Metodika Fizychnogo Vibovannâ*, 18(4), 200-206. (in Ukrainian) doi:10.17309/tmfv.2018.4.06
- Drogomeretsky, V., Kopeikina, E., Kondakov, V., & Iermakov, S. (2017). Adaptation of ruffier's test for assessment of heart workability of students with health problems. *Pedagogics, Psychology, Medical-Biological Problems of Physical Training and Sports*, 21(1), 4-10. doi:10.15561/18189172.2017.0101
- Filatova, Z. I. (2015). Osoblyvosti skladannia dyferentsiiovanykh prohram z navchannia plavannia studentiv VNZ. *Naukovyi chasopys Nats. ped. un-tu im. M. P. Drabomanova. Serii N 15. Naukovo-pedagogichni problemy fizychnoi kultury / fizychna kultura i sport. K.: Vyd-vo NPU im. M. P. Drabomanova*, 15(56), 370–373. (in Ukrainian)
- Filatova, Z. I., & Shtanheieva, O. O. (2004). Formuvannia motyvatsii u studentiv VNZ na osnovi kontroliu za stanom zdorovia v dynamitsi zaniat z plavannia. *Pedagogika, psykholohiia ta med.-biol. probl. fiz. vykhovannia i sportu: zhb. nauk. pr. za red. Yermakova S. S. Kharkiv: KhDADM (KhKhPI)*, (9), 36–40. (in Ukrainian)
- Ivashchenko, O. (2016). Methodic of pedagogic control of 16-17 years' age girls' motor fitness. *Pedagogics, Psychology, Medical-Biological Problems of Physical Training and Sports*, 20(5), 26-32. doi:10.15561/18189172.2016.0504

- Ivashchenko, O., Khudolii, O., Yermakova, T., Iermakov, S., Nosko, M., & Nosko, Y. (2016). Factorial and discriminant analysis as methodological basis of pedagogic control over motor and functional fitness of 14-16 year old girls. *Journal of physical education and sport*, 16(2), 442. doi:10.7752/jpes.2016.02068
- Kolokoltsev, M., Iermakov, S., & Prusik, K. (2018). Motor skills and functional characteristics of students of different somatotypes. *Physical Education of Students*, 22(1), 31-37. doi:10.15561/20755279.2018.0105
- Koryahin, V., & Blavt, O. (2018). The Use of Information and Communication Technology for Determining the Level Mobility in Joint in Physical Education of Students. *Teoriã Ta Metodika Fizičnogo Vibovannã*, 18(3), 107-113. doi:10.17309/tmfv.2018.3.01
- Koryahin, V., Blavt, O., & Stadnyk, V. (2017). Control of psycho-physiological functions of students with ophthalmologic diseases in the process of physical education. *Pedagogics, Psychology, Medical-Biological Problems of Physical Training and Sports*, 21(1), 23-30. doi:10.15561/18189172.2017.0104
- Koryahin, V., Blavt, O., & Tsiovkh, L. (2018). Regulation of Pedagogical Principles of Control in Physical Education of Students of Special Medical Groups. *Teoriã Ta Metodika Fizičnogo Vibovannã*, 18(1), 3-11. (in Ukrainian) doi:10.17309/tmfv.2018.1.01
- Leuciuc, F. (2018). Perception on Physical Education among Students. *Revista Romaneasca Pentru Educatie Multidimensionala*, 10(2), 134-143. doi:10.18662/rrem/51
- Nosko, M.O., & Arkhypov, O.A. (2013). Rukhovi yakosti yak osnovni kryteriii rukhovoï funktsii liudyny. *Visnyk ChNPU. Seriya: pedabohichni nauky. Fizychni vykhovannia ta sport. Chernihiv : ChNPU*, 2(107), 67-71. (in Ukraine)
- Osipov, A., Kudryavtsev, M., Markov, K., Kuzmin, V., Nikolaeva, O., Zemba, E. A., & Yanova, M. (2018). Application of various forms of physical education as a factor of increase in the level of physical activity of medical students. *Physical Education of Students*, 22(3), 139-145. doi:10.15561/20755279.2018.0305
- Pashkevich, S., & Kriventsova, I. (2017). Secondary Prevention of Visual Impairment in Students with Medium Degree Myopia by Means of Physical Therapy in a Vocational School. *Teoriã Ta Metodika Fizičnogo Vibovannã*, 17(4), 159-168. (in Ukraine) doi:10.17309/tmfv.2017.4.1200
- Pryimakov, A., Eider, E., Nosko, M., & Iermakov, S. (2017). Reliability of functioning and reserves of system, controlling movements with different coordination structure of special health group girl students in physical education process. *Physical Education of Students*, 21(2), 84-89. doi:10.15561/20755279.2017.0206
- Sanchez Sanchez, M. L., & Espada Mateos, M. (2018). Evaluation of an intervention program based on the use of ICT to increase the satisfaction

- of students regard to Physical Education. *Revista Fuentes*, 20(1), 77–86. doi:10.12795/revistafuentes.2018.v20.i1.05
- Serrano Ramon, J. M., & Ferriz Valero, A. (2018). Use of Floating Material in Swimming. *Apunts Educacion Física Y Deportes*, (132), 48–59. doi:10.5672/apunts.2014-0983.es.(2018/2).132.04
- Sidorov, V. V. (1990). Motivatsionno-tcennostnoe otnoshenie studentov k fizicheskomu vospitaniiu. L., 47. (in Russian)
- Sigmundová, D., Chmelík, F., Sigmund, E., Feltlová, D., & Frömel, K. (2013). Physical activity in the lifestyle of Czech university students: Meeting health recommendations. *Eur J Sport Sci*, 13(6), 744–50. doi:10.1080/17461391.2013.776638
- Sirenko, R. R. (2005). Faktory, shcho vplyvaiut na rukhovu aktyvnist ta motyvatsiiu do zaniat fizychnym vykhovanniam studentiv vyshchyykh navchalnykh zakladiv. *Pedagogika, psykholohiia ta medyko-biolohichni problemy fizychnoho vykhovannia i sportu: zhb. nauk. pr. Kharkiv : KbDADM (KbKhPI)*, (15), 44–51. (in Ukrainian)
- Tcaregorodtceva, L. D., & Tiunova, O. V. (2005). Uluchshenie psikhofizicheskogo sostoiannia studentov sredstvami ozdorovitel'nogo plavannia. *Fizicheskaia kultura: vospitanie, obrazovanie, trenirovka*, (1), 22–26. (in Russian)
- Volkov, I. P. (2002). Praktikum po sportivnoi psikhologii. *S-Pb.: Piter*, 288. (seriia «praktikum po psikhologii»). (in Russian)
- Zelenskiy, R., Popova, O., Sokolovskiy, V., & Stashchak, M. (2018). Formation Of Emotional-Volitional Culture Of Future Policemen In The Course Of Vocational Training. *Revista Romaneasca pentru Educatie Multidimensionala*, 10(2), 198–209. doi:10.18662/rrem/56
- Zelenskiy, B., & Zelenskiy, R. (2018). Motivation: Attitude of Students of Higher Education Institutions of the I-II Accreditation Levels Toward Physical Education Classes. *Teoriia Ta Metodika Fizychnoho Vibovannia*, 18(3), 114–125. (in Ukraine). doi:10.17309/tmfv.2018.3.02
- Zuzda, J. G., Latosiewicz, R., & Augustyńska, B. (2017). Risk assessment and level of physical activity of students in Poland. *Physical Education of Students*, 21(4), 193–199. doi:10.15561/20755279.2017.0408