

## Social aspects of physical education of students with deviations in health status

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### Abstract:

Purpose: experimental substantiation of the effectiveness of the model of physical education of students with various nosologies for strengthening their health, successful social adaptation in the educational environment of the University. Materials and methods: first-year students assigned to a special medical group (SMG) for physical exercises (n=40) took part in an experiment at the Plekhanov Russian University of Economics (Moscow). To determine the physical health of SMG bachelors and develop recommendations for their physical activity, diagnostics was performed (electronic body composition analyzer MS WELLNESS-OXi MS FIT). The author's online questionnaire was used to study students' values; in the study of the level of physical fitness of students, the most informative control tests were used. In the experimental group (N1, n=20), classes were held according to the developed methodology using ICT and digital technologies. In the control group (N2, n=20), training was conducted according to The University's work program for SMG students. Results: during the experiment in group N1, in comparison with group N2, there was an increase in the number of students (5% - 85%) using mobile fitness applications as a tool for self-monitoring of the psychophysical state; an increase in the number of students taking part in mandatory and additional physical education classes, which reduced the time spent in social networks (65% -20%); an increase by 65% in the number of bachelors who are able to manage their psychoemotional mood using self-regulation methods, successfully communicate in society. There was a marked increase in the functional capabilities of the body in the N1 group, compared with the N2 group, using MS FIT: the results of endurance, as resistance to physical fatigue in the process of muscle activity, improved in the N1 group (5.85-8.13 points), in the N2 group (5.88-6.90). There was an improvement in the work of the cervical, thoracic, lumbar and sacral spine of bachelor N1 (5.43-9.25 points); significant differences in control exercises were recorded in group N1, compared with group N2. Conclusions: the implementation model of physical education of students of SMG contributed to the creation of the University athletic-educational space, which led to in-depth mastery of special knowledge, increase adaptive capacity and improvement of physical qualities, formation of competences in the field of health promotion, the successful social integration of the bachelors in communication and learning environment of the University.

**Keywords:** physical education model, equal opportunities, cross-communicative space.

### Introduction.

Analysis of the socio-economic development of Russian society has established the demand for the modern labor market in competent workers with professional health (L. B. Andryushchenko, 2019; G. B. Glazkova, 2019; E. F. Zeer, 2005; I. V. Manzhelei, 2014). However, scientists and practitioners are concerned about the systematic increase in the number of bachelors with non-communicable diseases: more than 50% of students are identified for health reasons in SMG for physical education, up to 20% of students are exempt from practical training, 5% have disabilities and limited health opportunities (N. V. Balysheva, 2010; O. G. Rumba, 2011; A. S. Gracheva, 2013; L. A. Parfenova, 2019; and others).

This category of youth, while studying at the University, accompanied by high demands on the level of training, information overload, psychoemotional tension, low physical activity, leading to the development of various diseases, deterioration of mental and physical health, social disadaptation of students, to the failure of the social order for training of future specialist, having a sufficient level of psychophysical condition.

The problem of improving the health of SMG bachelors directs specialists to develop innovative methods of physical education for the active involvement of students in physical activity, improving psychophysical conditions and successful social integration into the cross-communicative space of the University (I. N. Timoshina, 2008; V. L. Kondakov, 2013; E. A. Ponyrko, 2013; T. E. Veselkina, 2014; M. A. Ovsyannikova, 2015; P. V. Borodin, 2017; S. N. Chernyakova, 2016; and others).

Despite the government's ratification of legislative orders and regulations aimed at increasing the proportion of students who lead a healthy lifestyle and regularly engage in physical culture, certain regulatory and methodological documents prohibit SMG students from participating in competitions at various levels, which determines this category of students in a separate group and negatively affects their social adaptation. At the same time, practice shows the unjustified release by doctors of a large number of students with disabilities from mandatory physical exercises, the lack of a holistic approach to physical education of SMG bachelors, the shift of the target areas of physical education (the formation of physical culture of the individual) to narrowly focused tasks (S. B. Bondar, 1984; N. V. Balysheva, 2010; A. S. Gracheva, 2013; L. V. Salaznikova, 2000; E. I. Sheenko, 2019).

The analysis of special literature in the field of modeling the organization of physical activity and attracting young people with various nosologies, disabilities and disabled people to motor activity in the UK, USA, Germany and France and other countries has revealed the following effective practices and social aspects of involving this category of students in physical education classes (D. Ortenbyrger, A. Zorio-Ferrerres, A Karaca, S. Markian):

- application of new attractive types of physical activity of students (cheer dance, climbing, aerobics, tourism, shaping, dance movements, sailing, aqua fitness, etc.) to increase resistance to psychophysical stress and develop professional and applied skills;
- formation of a comprehensive approach to improving physical education of students with disabilities in health;
- local sports federations in cooperation with the parks and recreation departments offer a variety of free training programs in various sports (football, tennis, golf);
- holding annual sports games in which the local population takes part, regardless of age restrictions and health level;
- the "Sport after school" program offers the practice of conducting free sports sections in the afternoon;
- promotion and development of special programs and projects to increase the participation of young people with various nosologies in physical activity;
- creation of special websites with methodological materials and effective practices in the field of adaptive physical culture;
- attracting people to adaptive sports classes from the grassroots to professional athletes with any health disorders;
- a comprehensive approach to the development of sports and physical opportunities for people with disabilities to rest throughout the country.

The analysis of domestic and foreign experience of involving students in physical activity allowed us to determine the purpose of the study: to develop and experimentally justify the effectiveness of the pedagogical model of physical education of students with various nosologies to strengthen their health, successful social adaptation and integration in the educational environment of an economic University.

**Materials and methods.**

The research was conducted on the basis of the Plekhanov Russian University of Economics (Moscow, Russia). Participants: first-year students with various deviations in health status, classified for health reasons to a special medical group for physical exercise, were divided into 2 identical groups: students N1 (n=20) were trained in physical culture according to the experimental program, bachelors N2 (n=20) – according to the traditional curriculum for SMG students. The development of a pedagogical model of physical education of SMG students determined the ascertaining experiment: research and analysis of the mental and physiological capabilities of modern youth, their value and need orientations in the field of physical culture and motivation for physical activity. The functional and psychological capabilities of the experiment participants were measured using an electronic body composition analyzer MS WELLNESS-OXi (MS FIT): physical development indicators (height, weight, waist and hip size) and blood pressure, were included in the MS FIT program for individual scanning of the study participants to analyze the physical condition of students and develop recommendations for physical activity.

Thus, in a study with an assessment of skin-galvanic reaction, the stress level of students was determined (figure 1).

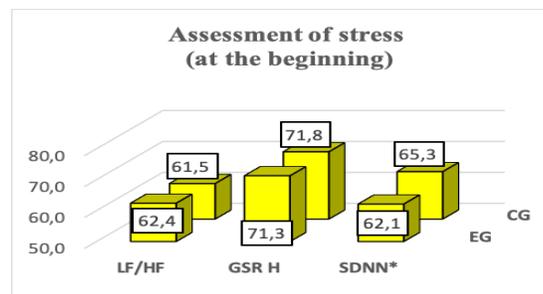


Figure 1. - Stress assessment of first-year SMG students

The results showed that LF/HF is the ratio of high frequency to low frequency HRV, GSR h is the galvanic reaction of the skin on the hands, and SDNN\* is the standard deviation of NN intervals in bachelors N1 and N2 above the norm (satisfactorily). Therefore, in physical education at the University, methods of psychoemotional unloading, exercises to increase the stress resistance of students are necessary.

In the study of the state of spine of students N1 and N2 indicators from 59 to 71 points (satisfactory) were recorded, which confirms the need to increase physical activity during the school day to unload the spine, strengthen the muscle corset and form the correct posture of first-year students (figures 2,3).

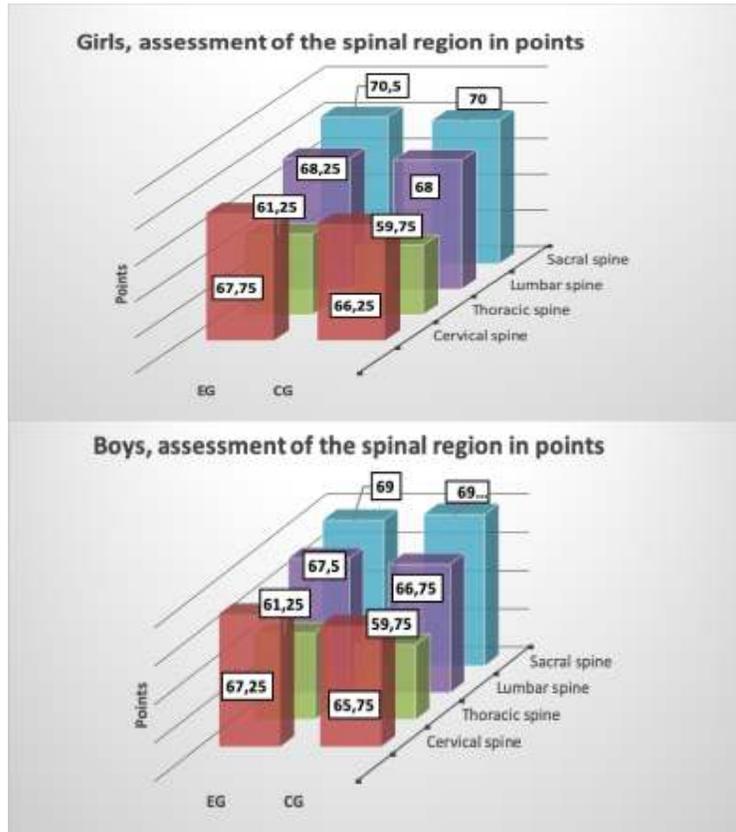


Figure 2. - Spine assessment

Figure 3. - Spine assessment

To determine the interests and values in the field of physical culture, an online survey was conducted among 1st-year SMG students (n=318). The analysis showed that 30% of students consider it necessary to adhere to a healthy lifestyle (HL), 65% of students believe that observing HL is not the main thing in life, 5% are not interested in this issue. The majority of respondents (48,1%) indicated that lack of will prevents them from maintaining healthy lifestyle, while 67,9% of bachelors noted lack of time. At the same time, students find opportunities for entertainment and social networking (figure 4).

**How much time do You spend on computer and other gadgets daily?**

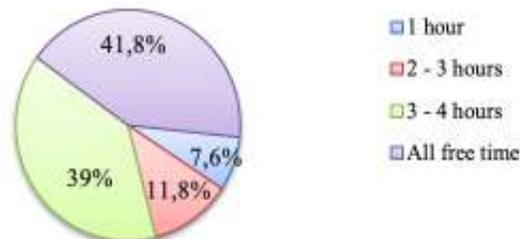


Figure 4. - Time spent by students on PCs and other gadgets

At the same time, 76.1% of respondents do not have a fitness bracelet that helps monitor their health (sleep, nutrition, physical activity), and 23.9% do not use it fully (figure 5).

**Do you have a fitness bracelet?**

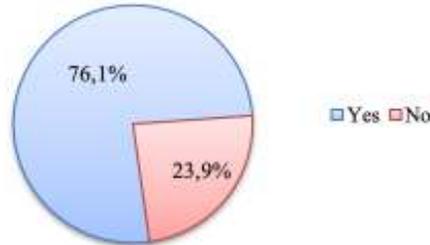


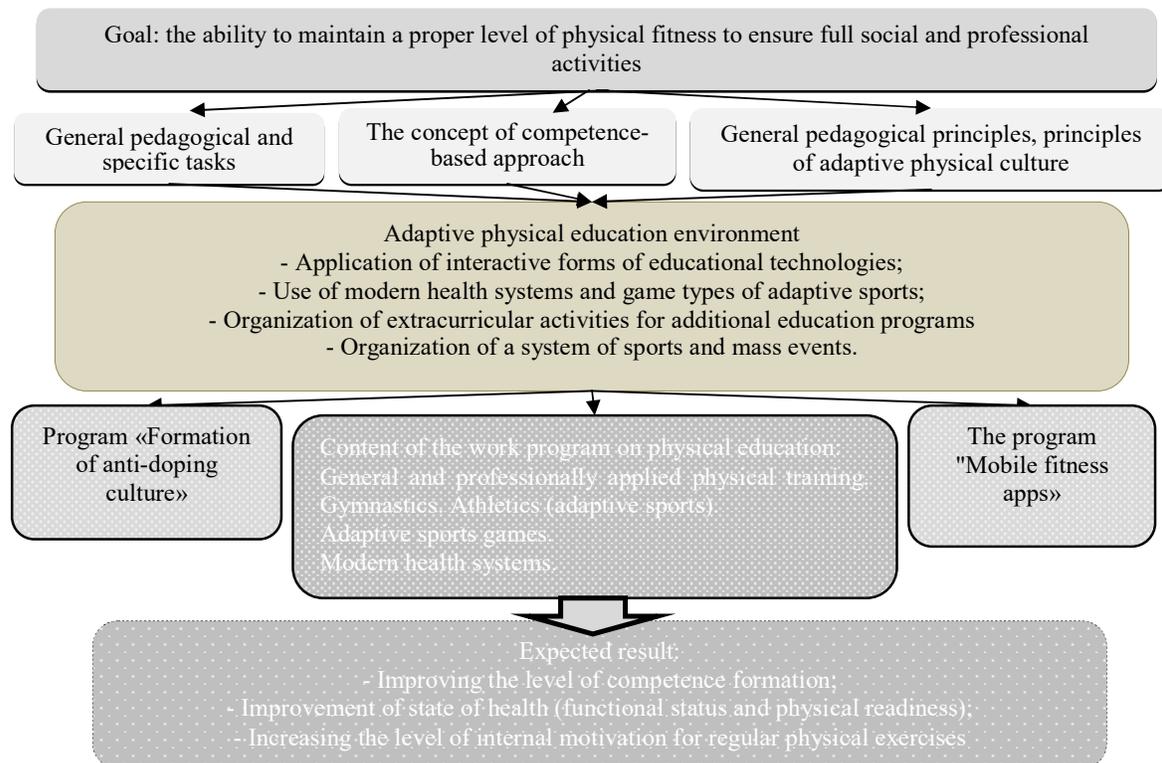
Figure 4. - Availability of fitness bracelets for students

A generalized analysis of the online survey allowed us to draw conclusions:

- majority of respondents do not consider it a priority to lead a healthy lifestyle;
- bachelors do not have a need to engage in physical activity, they prefer to spend their free time with gadgets;
- students are interested in the following information: nutrition, posture prevention, psychophysical readiness for professional activity, individual fitness programs;
- lack of information about the use of fitness apps and fitness bracelets for strengthening and maintaining health.

The results of the ascertaining study determined the goal of the experimental work: to develop and experimentally test the effectiveness of the model of physical education of SMG bachelors taking into account health, interests and needs, using modern ICT and digital technologies.

At the first stage, a mental and conceptual model of physical education of SMG students was constructed. At the second stage, the structural units of the system, model characteristics, finding a set of connections between the model elements, creating a visual image of physical education of students were determined (scheme 1).



Scheme 1. - Model of physical education of SMG students

Next, an adaptive physical education environment (organizational and pedagogical conditions) was modeled in order to develop physical self-education in students N1, which will allow to consolidate the processes of physical development, mastering special theoretical knowledge, improving physical qualities and gaining experience in sports and wellness activities.

The study used the technology of mixed learning, which includes both distance and independent learning using ICT, as well as classroom theoretical and practical classes.

Statistical data processing was carried out according to generally accepted methods of variation statistics with calculation of average value, standard deviation and verification of research results on the significance of differences (Student's t-test). Mathematical processing was implemented using the MSExcel 2010 table processor and the StatPlus2009 program.

**Results.**

The obtained data indicate that students N1 compared with N2 significantly improved indicators of functional health (table 1). The study was performed on an electronic analyzer MS WELLNESS-OXi (MS FIT) in points for the following indicators: stress, fatigue, endurance, performance, arterial stiffness, blood pressure, microcirculation, body fluid, body composition, spine.

The measurement of all indicators was determined on a scale from 0 to 60 points-bad, from 60-80 points-satisfactorily, from 80-100 points-good. Each indicator consisted of three indicators with a score from 0 to 10 points, where the sum of points determined the overall functional state of the student.

Table 1. Results of a functional state of health of SMG students

Indicators	Groups	Before the research (M±m)	After the research (M±m)	Growth%	t-kr of Student
Stress index (score)	N1, n=20	5,13±1,11	9,18±1,01	79,024	<b>2,694</b>
	N2, n=20	5,20±1,38	6,62±1,29	27,403	0,752
Fatigue (score)	N1, n=20	5,25±1,24	9,25±0,95	76,191	<b>2,562</b>
	N2, n=20	5,23±0,95	6,60±1,26	26,315	0,871
Endurance (score)	N1, n=20	5,85±1,44	8,13±1,49	38,889	1,097
	N2, n=20	5,88±1,06	6,57±0,93	11,440	0,479
Performance (score)	N1, n=20	6,50±0,75	9,65±1,69	48,462	1,705
	N2, n=20	6,55±0,88	7,63±1,21	16,412	0,718
Arterial stiffness (score)	N1, n=20	6,30±0,94	8,70±0,93	38,095	<b>1,807</b>
	N2, n=20	6,33±1,14	7,25±1,28	14,624	0,540
Blood pressure (point)	N1, n=20	6,68±0,92	9,13±0,97	36,704	1,840
	N2, n=20	6,65±0,86	7,35±1,00	10,526	0,529
Microcirculation (score)	N1, n=20	5,53±1,06	9,05±1,06	63,801	<b>2,348</b>
	N2, n=20	5,60±1,34	6,82±0,87	21,875	0,767
Body fluid (score)	N1, n=20	6,58±0,71	8,53±0,82	29,658	<b>1,800</b>
	N2, n=20	6,48±1,43	7,08±1,04	9,266	0,338
Body composition (score)	N1, n=20	5,53±1,11	9,03±0,86	63,348	<b>2,492</b>
	N2, n=20	5,58±1,13	6,55±1,26	17,488	0,576
Spine (score)	N1, n=20	5,43±1,39	9,25±1,28	70,507	<b>2,024</b>
	N2, n=20	5,45±1,11	6,87±1,34	26,147	0,812
Total score	N1, n=20	58,33±3,49	90,03±3,57	54,351	<b>6,351</b>
	N2, n=20	58,95±3,71	67,30±3,24	14,165	1,697

Note: \* - significant increase (p<0.05)

The stress index indicators improved. Before the study, stress in N1 and N2 was in the range of 5.13 to 5.20 points higher than normal, this was confirmed by a lack of motor activity. After the experiment, in N1, the indicators increased to 9,18 points (an increase of 79%), in N2, the indicators changed by only 27%.

Fatigue indicators in N1 and N2 have changed. Before the experiment, the indicators ranged from 61,8 to 66,2 points. After the experiment, the values of N1 students returned to normal from 5,25 to 9,25 points, the increase was 76,2%, in N2 the indicators increased not significantly by 26,3%.

A noticeable improvement was found in the following indicators: endurance in N1 increased by 38%, in N2 by 11%; performance in N1 by 48%, in N2 by 16%; blood pressure in N1 by 36% and N2 by 10%; arterial stiffness in N1 by 38,1%, in N2 by 14,6%; fluid in N1 by 29,7%, in N2 by 9,3%. Microcirculation and body composition in N1 improved by an increase of 63%.

The vertebral column at the beginning of the experiment was at a satisfactory level (from 59 to 71 points), by the end of the study in N1 there was an increase of 70.5 %. All improvements indicate the use of new techniques: "dance plastics", stretching, relaxation, "isoton", "intelligent body", "mental fitness". The overall score in the EG revealed high reliability (p<0.001), which confirms the effectiveness of the practical implementation of the pedagogical model.

Comparative analysis of physical fitness (table.2), at the beginning of the experiment did not show significant differences, which confirmed the uniformity of N1 and N2. When comparing the inter-group differences, the reliability (p<0.05) was found in boys and girls N1.

Table 2. Comparative results of physical fitness of SMG students

Indicators	Groups	Girls				Boys			
		The beginning (M±m)	The end (M±m)	Growth, %	t-kr Student	The beginning (M±m)	The end (M±m)	Growth, %	t-kr Student
6-minute running alternating with walking (m)	N1, n=20	664±7,4	755±16,0	13,78	<b>5,20</b>	666±2,3	759±16,4	13,83	<b>5,56</b>
	N2, n=20	663±7,7	679±3,2	2,38	<b>1,89</b>	667±2,4	683±6,8	2,47	<b>2,30</b>
Romberg test, sec	N1, n=20	10,8±0,4	18,0±1,8	66,89	<b>4,00</b>	10,8±0,4	19,5±1,1	80,00	<b>7,70</b>
	N2, n=20	10,9±0,3	11,6±0,7	7,24	0,95	10,7±0,5	12,2±0,8	14,06	1,64
Bending and unbending of the arms at the front leaning rest position lying on the floor (at the front leaning rest position on your knees), times	N1, n=20	16,8±0,8	20,8±0,9	23,83	<b>3,17</b>	19,5±0,6	25,67±0,5	31,62	<b>8,19</b>
	N2, n=20	16,7±0,7	17,4±0,5	3,85	0,73	19,5±0,6	19,83±0,4	1,71	0,49
Alternate lifting of a dissimilar arm and leg, from a lying position on the stomach, times	N1, n=20	21,9±0,3	27,7±0,6	26,38	<b>8,67</b>	17,3±0,5	25,2±0,8	45,19	<b>8,58</b>
	N2, n=20	21,9±0,4	22,9±0,7	4,90	1,31	17,2±0,4	17,8±0,4	3,88	1,15
Bending forward from a standing position with straight legs, cm	N1, n=20	8,9±0,7	15,1±0,7	68,80	<b>5,95</b>	4,8±0,8	8,5±1,1	75,86	<b>2,84</b>
	N2, n=20	8,6±0,9	10,5±0,5	22,50	<b>1,80</b>	5,0±0,9	6,5±0,6	30,00	1,43

Note: reliable at p<0.05

The use of new techniques has had a positive impact on the development of flexibility and improvement of the work of the vestibular apparatus of students. Results has improved in N1 for girls by 68,80%, in N2 by 22,50%, in boys in N1 by 75,86%, in N2 by 30,00%. There is a noticeable increase in N1 in the Romberg sample in girls by 66,89%, in N2 by 7,24%, in boys N1 by 80,00% and N2 by 14,06%.

Results has improved in N1 in the test for 6-minute running alternating with walking, in girls N1 by 13,78% and in boys by 13,83%. At the end of the experiment, in the test for bending and extension of the arms in the front leaning rest position, girls N1 increased by 23,83%, N2 by 3,85%, boys N1 by 31,62%, N2 by 1,71%.

The test for back strength "alternate lifting of a dissimilar arm and leg" from a lying position on the stomach, showed the best result in girls in N1 by 26,38%, in N2 by 4,90%, in boys in N1 by 45,19%, in N2 by 3,88%. Results in N1 are reliable p<0.05. Measurement of flexibility in the test of bending forward from a standing position with straight legs, has revealed a positive trend. Thus, in girls N1, the increase was 68,80%, in N2 by 22,50%, in boys N1 by 75,86%, in N2 by 30,00%. These tests are caused by the use of physical exercises of a corrective and restorative orientation. It should be taken into account that there were unreliable minor differences between boys and girls N2.

Thus, the implementation of the developed model with new methods allowed to improve the results on all indicators of physical fitness of students N1, which confirms the effectiveness of physical education of SMG students.

### Discussion.

The analysis of special literature and research works (PhD and doctoral dissertations) allowed us to identify the development of scientific problems and existing directions of domestic physical education of students with disabilities in health:

- orientation of physical education to a specific disease (M. D. Bogoeva, 2011; E. A. Ponyrko, 2013; O. G. Rumba, 2015);
- application of certain health-improving systems of physical exercises (S. V. Titov, 2013; E. I. Sheenko, 2019; A. I. Zagrevskaya, 2014);
- use of information and educational environment (P. V. Borodin, 2017; A.D. Lifanov, 2017; N. V. Stetsenko, 2019);
- development of adaptive physical education (S. P. Evseev, 2016; I. N. Timoshina, 2008; T. E. Simina, 2019; E. N. Chekanushkina, 2016);
- increasing the level of special knowledge in the field of health-improving physical culture (S. N. Chernyakova, 2016; L. A. Bartnovskaya, 2015);

- implementing of health-saving technologies (E. V. Yegorycheva, 2014; V. L. Kondakov, 2013; L. I. Lubysheva, 2019; K.E. Stolyar, 2019);
- education of motivation for physical exercises (T. S. Vlasova, R. I. Sungatullin, N. M. Zakirova, 2015; L. A. Parfenova, 2018);
- formation of physical culture of the individual (L. B. Andryushchenko, S. I. Filimonova, O. M. Aksenov, V. N. Pushkina, 2019; E. V. Bodukov, 2015).

Based on the analysis conducted in the field of physical education of SMG students, the adaptive physical culture and recreation environment (AFOS) was modeled taking into account the health and physical motivation of the experiment participants.

In order to master students' special knowledge in the field of healthy lifestyle, AFOS introduced online programs of additional education: "Formation of an anti-doping culture" (formation of an understanding among bachelors of intolerance to the use of prohibited substances) and "Mobile fitness apps" (training students to correctly use fitness bracelets and mobile apps to improve their health). The distance education format allowed students to study at an individual pace and operate with a large amount of special information to improve and manage their health.

The content of physical education of SMG bachelors includes the following blocks: mandatory program (invariant and variable); additional educational programs ("correction of posture disorders by means of AFC", "Mental fitness 2", "Dance plastic 2", "Sports games (adaptive types)", "Athletic gymnastics").

The variable block included methodological and practical seminars and practical classes on the developed innovative health-improving methods. Methodological and practical seminar: lecture hall (theoretical material) and workshop (master class on General adaptive physical training, health systems, industrial gymnastics, dance directions and methodological and practical analysis of the studied motor activity).

The content of practical classes was developed taking into account the FSES HE 3<sup>++</sup>, the needs and health of students. Practical classes are distributed in modules in the target areas:

- correction and prevention of physical development and somatic disorders (preventive and health-improving gymnastics);
- correction and development of physical abilities (sports games (adaptive forms and types): bocce, Golf, goal ball, bowling, sitting volleyball);
- physical improvement (wellness systems ("Isoton". "Intelligent body", "Dance plastic", "Mental fitness»);
- professional and applied training (industrial gymnastics, morning gymnastics, physical training and physical training periods).

### **Conclusions.**

The analysis of the best domestic and foreign practices in the field of physical education of students with disabilities in the state of health revealed the organizational and pedagogical conditions of the physical education process of SMG students:

- the use of interactive forms of educational technologies (master classes on modern health systems, dance directions, professional and applied training; interactive lectures and practical classes with ICT, video and audio material and the use of digital devices; instructor-methodical seminars, discussions, projects and portfolios taking into account the interests of students);
- use of means of modern health systems and game types of adaptive sports (mastering the exercises of health systems, dance plastics, mental fitness; elements of game types of adaptive sports);
- organization of sports and recreation events and competitions in game types of adaptive sports according to simplified rules for beginners (bocce, golf, table tennis, darts, billiards, etc.);
- organization of extracurricular activities on programs of additional education of a health-improving orientation for use in independent classes on physical improvement.

Adaptive physical culture, health, environment (organizational-pedagogical conditions) helped to consolidate effective methods in a unified and holistic model of physical education of this category of students, including health status, interests in physical activity and needs for successful social adaptation among peers. The final results of the pedagogical experiment recorded significant improvements in the functional capabilities and physical fitness of students N1 compared to N2, which proves the effectiveness of the implementation of the pedagogical model in the physical education of students with disabilities in health.

Thus, the implementation of the developed model in the physical education of students with various nosologies allowed:

- to provide equal opportunities to access sports and educational services to strengthen and preserve their health;
- to increase the involvement of bachelors with disabilities in mass sports events and adaptive sports;
- to improve social integration into the cross-communication space of the University and create prerequisites for their further competitiveness in the modern labor market.

### **Conflict of interest**

The authors state that there is no conflict of interest.

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