Original Article

Research health-keeping technologies in the system of physical education of students from special medical groups

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Abstract:
Objective. The aim of the study was theoretical foundation, development healthkeeping technologies and experimental verification of their effectiveness in physical education students of SMG (special medical groups) of universities. *Material and methods.* The study involved the first year students of the National University of Life and Environmental Sciences Ukraine (96 girls and 82 boys). The following methods of studies were used: anthropometry, dynamometry, methods of testing speed-strength fitness, statistical processing and computer modelling with Statistica 10 application program package, etc. *Results.* The first time the conception of physical education students of special medical groups using health keeping technologies has been substantiated in the thesis. The theoretically and experimentally are elaborated, checked up and proved structural and functional model of physical education students of special medical groups using health keeping technologies. The sex differences in the relationship of components of physical preparation and student's health of special medical groups based on stage of teaching in higher education establishment have been investigated. The structure of physical training young boys and girls considering the dynamics of their body and relationship factors that provide the foundation of forming physical performance of future specialists by means of physical education has been defined. *Conclusions.* The regularities of using health-keeping technologies that characterize biological age dependence of the volume of weekly physical activity of students of special medical group are defined. The mathematical and graphical model's health keeping technologies to simulate and predict biological age and level of care, depending on the physical development and physical preparation of students of special medical groups have been worked out.
Key words: physical education students, special medical group, health keeping technologies.

Introduction

Today, Ukraine is experiencing not only a deep economic, political and social crisis, but faced with demographic processes that threaten the existence of the Ukrainian nation in particular. In Ukraine continues to catastrophic decline in population. As of June 1, 2014, Ukraine's population is 42 million 995 thousand 500 persons.

Results of student clinic show that in 2013/2014 academic year for students of special medical groups of first, second and third-year National University of Life and Environmental Sciences of Ukraine found that the health of students every year more and more worse. Thus, if the health of a number of first-year students to special medical group students clinic was placed at the beginning of 2006/2007 school year 10,0 %, it is already the beginning of 2013/2014 – 13,5 %. Progressive disease therapeutic pathology of 13,6 % to 24,5 %; cardiovascular disease from 3,9 % to 10,7 %; gynecological diseases from 7,4 % to 20,3 %; central nervous system from 2.3% to 6.1%. Not isolated cases among students and cancer.

Our research during the 2013/2014 and studies R.T. Raevskogo with colleagues (2007) demonstrated that the total number of student life priorities among the vast majority of them give priority to health. In addition, the practical implementation of their daily lives this concept do not all.

Analysis of health student youth Ukraine shows that almost 90% of them are variations in health status, 50% - poor physical fitness (the National University of Life and Environmental Sciences of Ukraine, more than 60%). Only in recent years almost 40% increase in the number of students, referred to as special medical care group (Amosov, 2002; Kidd, 1987).

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Somatic health and level of physical fitness of students of special medical groups is becoming increasingly public, scientific and practical significance.

Essential to assess the viability of the organism are not so much morbidity as a general biological, morbidity description of his condition, which is not based on the classification of the disease and the very concept of disease. This assessment is given by human biological age (Maughan, 1999; Muravov et al., 1997, 1998; Starosta, 2004).

Modern approaches in higher education for the conservation and promotion of health student youth are not sufficiently reflected in the educational process, which is largely due to the fragmented perceptions of healthkeeping of teaching staff as part of educational activities.

Despite the fact that a number of authors involved in this problem (Belsky, & Smirnova, 2010; Borisov, & Philip, 2009; Vardanyan, 2007; Vasenyn, 2012; Vishnevskyy, 2002; Hryban, 2011; Dubohay & Tsos, 2012; Efimova, 2003; etc.) Many theoretical and practical aspects are not covered, and mostly contradictory.

Scientists of the USA, Austria, Germany, France, England, Japan, Ukraine, Belarus, Russia and other countries of the world, carried out the problem of studying biological age for a long time. However, these studies are usually conducted among the people of the II period of Mature and elderly, usually patients, using different methods.

A number of authors have suggested various indicators for assessing the functional age of a person. Some indicators (systolic blood pressure) lead different authors, whereas other tests (tilt of torso) were used only in separate proceedings.
All available indicators inherent ease of identification and ability to quantify mark. The results of these studies had showed that the psychomotor tests are far from perfect O. Muravov, M. Alexandrova, Y. Bukov, M. Bulich, M. Kobza, & A. Taha (1997).

The Department of gerontology of the Academy of Sciences of Belarus were proposed to determine the biological age to use the indicators of the circulatory system, which make a significant contribution to the evaluation of BA integral animals. With this purpose were used the relative mass of the heart (CPA) and hydroxyproline in the myocardium (PSO).

In Russia in the 80th years of the twentieth century extensively conducted studies to determine the biological age among healthy different population groups and place of residence II people of middle and old age using anthropological data O. M. Pawlowski (1987).

A significant contribution to the development of the method of determining the biological age of children and adolescents was made V. M. Efimova (2003). The basis of his method the authors chose the concept N. Amosov (2002). The peculiarity of this principle was that each stage of development of each characteristic of biological age corresponds to a certain number of points. In particular, I.V. Belsky, & P.G. Smirnova (2010) to determine a biological age for a basis had taken dental maturity, sexual maturity, skeletal maturity of a person.

V.G. Arefiev. (1999) suggested assessment of biological age according to the scheme – if two of the three index (index geterogennost, the level of physical development and sexual form) correspond average values, biological age corresponds to the calendar.

Genetics of Kharkiv national University (G.L. Apanasenko, 2007) have proposed a fundamentally new method of determining the biological age of a person.

According to the research results was built the average distribution curve of the negative electrical charges of cells (from the mucous membranes of the inner surface of the cheek of man) by age – from birth to death. As evidenced by the results of studies in children under one year the rate is extremely low, sometimes electronegative core are absent. Then the figures rise to twenty years of age and are characterized by a small period of relative stability, which is observed from 12 to 16 years. And after 35 years begins a gradual decline to zero. The degree of deviation, the scientists propose to judge how the person is younger or older than your calendar age.

K.K. Kidd (1987), proposed a method for the determination of biological age in terms of the maximum oxygen consumption (MOC).

Scientists of the Kyiv Centre (2011) of health believe biological age can be calculated using this test for flexibility.

Normally the value of health is recognized at all levels of higher education, but as recognition health keeping pedagogical objectives as part of educational technology, educational activities as a result of extremely rare (Apanasenko, 2007; Hirtz, 1994; Kidd, 1987).

The aim of the study was theoretical foundation, development healthkeeping technologies and experimental verification of their effectiveness in physical education students of SMG (special medical groups) of universities. In accordance with the objectives of the study consistently following tasks:

1. Make a theoretical analysis of scientific and pedagogical sources of problems of physical education students of SMG using healthkeeping technology in general and special literature.

2. To study the general laws that affect the planning objective individual components healthkeeping technologies in various kinds of health occupations students of SMG.

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3. Develop healthkeeping technologies of education students of SMG system of physical education, experimentally test the effectiveness of their use and implement the learning process.

The theoretical prediction is to use to determine the probability of changing phenomena studied, especially healthkeeping technology, level of physical health and physical fitness of students of special medical groups more or less distant future. We used variants research and normative forecasting.

Materials and methods

The study involved the first year students of the National University of Life and Environmental Sciences Ukraine (96 girls and 82 boys). All students according to the students referred to special clinic's medical groups of (experimental and control groups) and students of basic medical groups. In the experimental group, the amount of weekly physical activity was 6-9 hours.

In order to exercise self-control by the results of independent studies and exercise, students of special medical department were required to keep a journal of physical self-student. In addition, they conducted with lectures and discussions on topics of importance health-training exercise, a healthy lifestyle, education psycho-emotional balance while studying in higher education and more.

In order to further determine the effectiveness of the experimental technique differences concerning common, we used the method of Professor G.L. Apanasenko (Apanasenko, & Naumenko, 1986; Apanasenko, 2007). This technique makes it possible to determine the level of health subjects. We used methodology on indicators of cardiovascular and respiratory systems and data anthropometry (height, weight, hand dynamometry main hand). The study involved students of 1st year special and primary care groups.

The following methods of studies were used: anthropometry, dynamometry, methods of testing speed-strength fitness, statistical processing and computer modelling with Statistica 10 application program package (Borovikov & Ivchenko, 2006), etc.

Results

As shown in Table 1 at the beginning of the level of physical health of girls special medical experimental group was very low relative to other groups of the study.

Table 1. Comparison of physical health of girls 1-year NULES of Ukraine during the 2009-2010 school year, % (N = 96)

Research Groups	Period of study	The level of physical health				
		Low	Below Average	Average	Above average	High
Experimental Special Medical Group	Begining school year	96,2	3,8	–	–	–
	End of school year	38,6	48,0	13,4	–	–
Control Special Medical Group	Begining school year	77,8	16,7	5,5	–	–
	End of school year	89,0	9,2	1,8	–	–
Basic Medical Group	Begining school year	78,3	18,1	3,6	–	–
	End of school year	83,7	12,7	3,6	–	–

At the end of the school year in the same experimental medical representatives of the percentage of students of with low levels of physical health declined 57,6 units, below the average percentage increased to 44,2, the average of the beginning of the school year there was no percent, at the end – 13,4%.

With regard to the control of special medical group and primary health care team, they have physical health indicators at the end of the school year is much worse than the beginning.

It is characteristic that the performance of basic medical group lower values than the control task medical force, It is not surprising. How this can be explained. In our view, if we consider the issue of physical health of students in general, despite medical group to which they are assigned student health clinic after a medical examination, their poor condition. Doctors at the medical examination medical team primarily determine:
• first, focusing on the student's answer to the question doctor "hurt - no pain";
• second, paying attention to the diagnosis, which is defined in the certificate of residence of the student.
Sometimes require students to undergo a full medical examination in specialized medical institutions.

There are many cases when a student present serious diseases of the cardiovascular system and deviations in other systems of the body and the first year he enrolled in special medical group and suddenly, at the beginning of the second year he gives the student a certificate for its transfer to the primary health care team. Even first-year students of medical educational institution known that this diagnosis should be treated seriously man for years, maybe for life.

There are cases and otherwise. For the diagnosis of scoliosis or flat feet I and II degree of doctor a certificate of complete exemption from student practical physical education classes. Therefore, the quality and accountability of health workers during medical examinations of students is much negative talk. Until this

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problem is resolved at the state level, will perish children not only in physical education classesbut also the lessons of mathematics, history, Ukrainian or foreign language, as already such occurrences.

With all the negative attitude of scientific and educational, teaching staff from other disciplines, parents, and society as a whole, it should be noted that only in the classroom for physical education teachers and teachers with an understanding relating to the student or the student, taking into account the state of his health take into account the level of physical fitness. It's unusual lesson, and recreation and recovery. There are many cases where scientific staff member uses all his skills and knowledge in the field of psychology and pedagogy to reduce stress state student after school on theoretical subjects prior to engage in physical education. For other teachers for subject-usually do not pay attention to the health of the student.

During classes in computer science, mathematics, anatomy or physiology students do not share a special and major medical groups. And the consequences, sometimes great stress condition occurs student is scientific staff member of the Department of Physical Education.

From his professional training, the ability to understand a student at this moment, use of physical education not only to address the objectives and purposes of discipline "Physical Education"but also reduce psychological stress in students after theoretical subjects.

Turning to the results of physical health students basic medical group, you can give a single answer - now students for health reasons attributed to this group there is little (table. 2). After all, according to statistics only about 10% of secondary school students classified as conditionally healthy, and others - to special medical group.

Table 2. Comparison of physical health of young men of 1-year NULES of Ukraine during the 2009-2010 school year, % (N = 82)

| Research Groups | Period of study | The level of physical health | | | | |
		Low	Below Average	Average	Above average	High
Experimental Special Medical Group	Begining school year	78,6	17,8	3,6	–	–
	End of school year	46,5	35,7	17,8	–	–
Control Special Medical Group	Begining school year	79,2	16,7	4,1	–	–
	End of school year	83,3	16,7	–	–	–
Basic Medical Group	Begining school year	59,1	34,4	6,5	–	–
	End of school year	68,8	24,7	6,5	–	–

Analyzing the data in table 2 can note the following. If at the beginning of the school year somatic level of health adolescent students of both special medical groups about equal as naturally, the representatives of major medical groups have much better results. Thus, if a low level of physical health observed in 78,6 % of the experimental group and special medical 79.2% in the control, the primary health care team only 59,1 % of students; levels are below average respectively 17,8 % and 16,7 % and 34,4 %. Also, larger percentage of primary care groups that are defined as the average level of physical health.

At the end of the school year there is a completely different situation. The representatives of Experimental Medical Group nearly doubled the percentage of low levels of physical health, twice the percent below average and almost five times the percent of average physical health.

The representatives of special medical control group to 4,1 % increase in the number of students with low levels of physical health and no one with middle level.

A similar situation is observed in the primary health care team representatives. 9.7% increase in the number of students with low levels of physical health and at the same percentage decrease in the number of students from lower-middle, middle-changes have occurred.

The use of experimental methods we have developed positive results at the end of the teaching experiment. The data confirm the fact that during physical education classes must not only decide improving physical fitness, but also provide theoretical knowledge and teaching skills. The student must consciously perform a particular exercise, it should represent the effect of each physical exercise not only on the muscular system and the bone machine, but most importantly, the effect of exercise on internal organs and systems. Only in this condition scientific staff member can achieve the desired results with the student. Of course, one cannot dismiss all other means of physical training.

In addition, we have conducted experimental studies of first-year students 2007/2008 academic year in order to detect the influence of experimental techniques to improve the performance of biological age and physical fitness among students basic training department. Training sessions on physical training that was conducted by the conventional method on special health department in which the learning process of physical education held in a special program and experimental techniques.

The experimental technique involved students in special medical department number 54 students (17 boys and 37 girls) and conventional method, students in basic training department number 68 students (34 boys and 34 girls) (table. 3, 4).

Table 3. The evolution of biological age and level of physical fitness Students 1 year NULES of Ukraine special medical group during the 2008/2009 school year (N = 54)

Sex	Period of study	Statistical indicators	Biological age, years	Run 100 m, s	6–m. run, m	Long jump from place, cm	Raising the body in the sit, number	Push-up, number	Run 4x9 m, s
Boys	Beginning school year	M	58,6	16,1	1045,2	201,1	24,2	27,5	10,1
		± m	1,43	0,36	28,3	3,42	0,98	1,43	0,12
	End of school year	M	55,0	15,4	1126,5	203,9	26,5	30,9	10,0
		± m	1,34	0,23	27,6	3,24	1,00	1,21	0,10
		p	**< 0,02**	**< 0,05**	**< 0,01**	> 0,5	**< 0,05**	**< 0,01**	> 0,5
	Dynamic		+ 3,6	+ 0,7	+ 81,3	+2,8	+ 2,3	+ 3,4	+ 0,1
Girls	Beginning school year	M	44,3	19,9	874,0	149,2	16,5	15,8	11,6
		± m	0,82	0,29	23,6	1,34	0,47	0,81	0,12
	End of school year	M	42,6	19,1	913,9	152,8	19,7	16,1	11,4
		± m	0,86	0,25	16,0	1,14	0,35	0,66	0,08
		p	**< 0,05**	**< 0,01**	**< 0,05**	**< 0,01**	**< 0,001**	> 0,5	**< 0,05**
	Dynamic		+ 1,7	+ 0,8	+ 39,9	+ 3,6	+ 3,2	+ 0,3	+ 0,2

Table 4. The evolution of biological age and level of physical fitness Students 1 year NULES of Ukraine basic medical group during the 2008/2009 school year (N = 68)

Sex	Period of study	Statistical indicators	Biological age, years	Run 100 m, s	6–m. run, m	Long jump from place, cm	Raising the body in the sit, number	Push-up, number	Run 4x9 m, s
Boys	Beginning school year	M	44,9	14,2	1275,0	231,2	30,1	37,8	9,2
		± m	0,97	0,16	29,1	3,57	0,77	1,43	0,07
	End of school year	M	52,7	14,1	1245,0	227,8	30,5	35,7	9,2
		± m	1,03	0,13	27,9	2,99	0,76	1,21	0,06
		p	< 0,001	> 0,5	> 0,5	> 0,5	> 0,5	< 0,02	
	Dynamic		+ 7,8	+ 0,1	+ 30,0	− 3,4	+ 0,4	− 2,1	0
Girls	Beginning school year	M	39,3	17,6	1120,0	178,0	24,6	19,2	10,2
		± m	0,63	0,24	27,3	2,41	0,59	0,98	0,09
	End of school year	M	41,7	17,5	107,0,0	171,2	24,9	16,5	10,7
		± m	0,69	0,25	36,5	2,45	0,49	1,02	0,09
		p	< 0,001	> 0,5	> 0,2	< 0,01	> 0,5	< 0,01	< 0,001
	Dynamic		+ 2,4	+ 0,1	+ 50,0	− 6,8	+ 0,3	− 2,7	+ 0,5

Below is given mathematical model in the form of multiple regression equation, which reflects dependence of biological age (BA) of young females of experimental groups (EG) on indices of their physical development:

$$y = 38,288 + 0,08x_1 + 0,138 x_2 + 0,307x_3 - 0,005x_4 - 0,126x_5 - 0,048x_6,$$

where: y – BA of young females, x_1 – body mass, kg, x_2 – VC/bm, x_3 – left hand strength, kg, x_4 – VC, ml, x_5 – strength index, x_6 – timed expiratory capacity, s., ($r = 0,643$, $p < 0,001$). The coefficient of determination (d) = 0,413, $p < 0,001$.

Among model parameters, the most influence upon BA is exerted by: VC/ml, x_3 – left hand strength, x_4 –VC, x_5 – strength index. Body mass and timed expiratory capacity effect BA to a lesser extent, although their ratio is of some importance for the final result of the model. The impact of this multiple regression model may be explained by alteration of 41,3 % of BA values in young females of EG by the end of the experiment.

Discussion
Modern approaches in higher education for the conservation and promotion of health student youth are not sufficiently reflected in the educational process. This is largely due to the fragmented understanding of the problems teachers save student health (Belsky & Smirnova 2010; Borisov & Philip 2009; Vardanyan 2007; Vasenyn 2012; Vishnevskyy 2002; Hryban 2011; Dubohay & Tsos 2012; Efimova 2003; etc.).

The studies show that students in special medical group in which the amount of weekly physical activity was at least 6-9 hours, rates decreased biological age, and level of physical fitness improved. While in the beginning of the school year in the first year of young men indicators of biological age was $58,6 \pm 1,43$, by the end of the school year - $55,0 \pm 1,43$ (-3,6 years), the degree of statistical significance was $< 0,02$; girls - respectively $44,3 \pm 0,82$, by the end of the school year - $42,6 \pm 0,86$ (-1,7 years), the degree of statistical significance was $< 0,05$ (Table. 3).

Indicators of 100 m run at students of special medical group improved by 0.7 pp in boys and 0.8 for girls, as evidenced by the statistical probability (respectively $< 0,05$ and $< 0,01$); 6-minute youths increased by 81,3 m ($< 0,01$), the girls at 39,9 m ($< 0,05$); a long jump from place result improved by 2,8 cm and 3,6 cm, but statistically significantly only in women ($< 0,01$); Sid lifting body in 30 s, respectively – 2,3 times ($< 0,05$) and 3,2 times ($< 0,001$); bending and unbending hands in emphasis from the floor for 30 seconds in the of young men results improved by 3,4 times, as evidenced by the statistical probability ($< 0,01$) and a tendency for girls to improve by 0,3 times, but not statistically significantly ($> 0,5$); with shuttle running 4 x 9 m of young men noticed a trend of improving results in 0,1 seconds, but incredibly statistically ($> 0,5$), the girls also result improved by 0,2 seconds, which is confirmed by the statistical probability ($< 0,05$).

Research results first-year students basic medical group are shown in table 4.

As can be seen from Table. 4 indicators of biological age of young men of the group at the beginning of the year amounted to $44,9 \pm 0,97$, and at the end of the school year - $52,7 \pm 1,03$ (+ 7,8 years), statistical probability was > 0.001; girls - by the beginning of the school year - $39,3 \pm 0,63$, and at the end - $41,7 \pm 0,86$ (+ 2,4 years), statistical probability was $> 0,001$.

As indicators of physical fitness, the dynamics of improving results at the end of the school year students in basic group is much worse than students of special medical group. The representatives of the main group only girls in the shuttle run 4 x 9 m revealed a high degree of statistical significance ($< 0,001$).

These results confirm the inefficiency of the educational process in physical education students basic training department and the advantage of experimental methods of health-training exercises special medical students of physical education.

Conclusion

1.Due to the change of the training activity ("pupil" - "student") and increased mental load in first year students body undergoes significant stress.

2. The reaction of the body first-year of young men worsening stress and susceptibility to stress more than girls (85,2 % versus 70,6 % and 47,5 % vs. 42,3 %). Due to the significant increase in mental stress, perception and comprehension of information is increasing over reactions of students deterioration stress and increase susceptibility to stress, resulting in performance in the second year girls are 82,3 %, a 11 ,7% increase compared to the freshman.

The body of young men on the contrary rather adapt to increased mental stress, as evidenced by the improvement of stress at 7,4 % and susceptibility to stress 11,8 % versus 11,7 %, respectively, and 36,1 % of girls.

3. One of the factors that performs "depreciation" action to reduce the impact of intense mental activity on the body of young men, specially organized a systematic and independent physical education and sports. Among of young men 77,5 % vs. 49,7 % of women who regularly engaged in various forms of sport.

4. Emotional stress makes moderate stress effect on the human body and has virtually no effect on physically trained students. The smallest effect of stress is found in those students whose weekly amount of motor activity is at least 6-8 hours.

5. The possibility of using the proposed means of correction stressful conditions and the effectiveness of their use depends on how the student consciously refers to preserve and strengthen their physical and mental health.

6. Based on the results of research more efficient and more to promote independent physical education and sport; greater use of the media, lectures and evident propaganda to create in students settings that healthy lifestyle, systematic physical education and sport for them is one of the highest priority values.

It is necessary to develop comprehensive targeted programs aimed at optimizing the socio-psychological climate, creating the right conditions for regular physical training and sports, including the formation of budgetary and extra-budgetary fund to stimulate students.

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