FACTOR STRUCTURE OF PHYSICAL STATE OF FEMALE STUDENTS OF HIGHER EDUCATION INSTITUTION

Gurieieva A.M., Klopov R.V.
Zaporozhia National University

Annotation. *Purpose:* to describe the factor structure of physical state of female students at the beginning of the academic year and to outline the rational balance of methods of developing physical skills, which are required for drawing up the recreational aerobics program of female students of higher education institutions. *Material:* 157 freshmen female students of Zaporizhzhya National University, aged 18-20 years took part in the experiment. *Results:* the factorization of the ascertaining experiment data give the opportunity to highlight nine factors outlining the physical condition of female students, which made it possible to define physical skills developing methods ratio to further implement in the recreational aerobics program. *Conclusions:* as a result of the analysis, the authors managed to define the most significant factors, that impact female freshmen's heath condition. The factor analysis made it possible to state the ratio of methods used in recreational aerobics program, that are meant for developing physical skills in active leisure.

Key words: *physical, education, factor, structure, female, students, physical, skills, active, leisure.*

Introduction

Health of nation is the most important condition of its welfare. Healthy person has higher workability, efficiency of labor, thus, facilitating increasing of society's economic resources [1]. In opinion of N.N. Amosov, G.A. Apanasenko, I.A. Arshavskiy, et al. absence of effective measures in health related physical culture, many years' trend to worsening of health and physical condition of rising generation will result in further worsening of health of all age groups and then influence on quality of labor resources and biological grounds of future generations [2].

Reducing of health of higher educational establishments' students has acquired steady character recent decade. Great scope of work to be fulfilled in conditions of time deficit against the background of functional reserves' weakening creates additional straining of adaption mechanisms that result in progressing of health's worsening [3]. In Ukraine, in this connection, especially acute is a problem of health and physical condition improvement of students.

The problem of students' health was dealt with by D.M. Anikeyev, D.V. Boyko, L.K. Kozhevnikova, R.T. Rayevskiy, N.V. Tretyakova, Yu.N. Yurov et al. Analysis of scientific methodic literature witnesses about increasing of quantity of girl-students, having serious deviations in health [4-9, 17-26].

Basing on the above said, we should pay attention to problem of development and scientific foundation of rational means of girl students' motion functioning organization in process of physical education as part of active leisure.

The work has been fulfilled in the frames of scientific research topic: "Theoretical and methodic principles of healthy life style forming in different strata of Ukrainian population with the help of physical culture and tourism means" (state registration No. 01111U007743) of combine plan of SRW of Ministry education and science of Ukraine for 2011-2014.

Purpose, tasks of the work material and methods

The purpose of the research is to determine factorial structure of girl-students' physical condition at beginning of academic year and specify rational correlation of means for working out of program of health related aerobics of higher educational establishments' girl students.

The purpose of the research is to find the most important factors, which influence on HEEs girl-students' physical condition in process of physical education for working out of experimental program of organized motion functioning as part of active leisure.

The methods and organization of the research: we used analysis and generalization of special scientific-methodic literature data, we conducted factorial analysis of 1st year girl students' physical condition, motion functioning and life style, we used methods of mathematical statistics of data processing. In the research 157 1st year girl students of Zaporozhye national university participated. The age of the tested was 18-20 years.

Results of the research

For working out of health related aerobics' training program as part of active leisure for higher educational establishments' girl-students, considering above listed factors, which negatively influence on physical condition and educational progress, it was necessary to determine the structure of girl students' physical condition. Specificity of analyzed data is evident, that is why we fulfilled mathematical processing of stating experiment's data, which permitted to find the most important factors in structure of physical condition. The obtained data permitted to most rationally construct program of health related aerobic as part of active leisure for higher educational establishments' girl-students in order to smooth negative after effects of intellectual functioning and increasing of organism's reserve potentials up to proper values.

doi: 10.6084/m9.figshare.1015378

Analysis of literature, devoted to rational correlation of means and orientation in health related physical education showed contradiction of opinions. Many authors defend 100% usage of means for general endurance in health related programs [10, 11].

V,M. Zatsiorskiy, in his works, writes about purposefulness of three groups of exercises in health related trainings: for endurance, strength and flexibility and for development of largest body muscles in power exercises [12].

More detail and less presented in literature researches stress the following correlation of means for motion skills: 40-50% – for development of general endurance, 24-40% – for quickness and speed-power endurance, 20-30% – for flexibility and quickness.

Researches, conducted by Ye.A. Pirogova, L.Ya. Ivaschenko et al [10, 11, 13, 14], proved need in differentiated approach to choosing of exercises' orientation depending on age and level of physical condition.

Contrariety and deficit of information required carrying out of mathematical analysis of experimental data.

Factoring of stating experiment's data with the help of Varimax rotation method and Kaizer's normalization permitted to specify 9 factors, describing the structure of girl students' physical condition. The specified factors describe 69% of data dispersion (see table 1).

Table 1

Factorial structure of physical condition of ZNU girl students (total weight 69 % of dispersion)

№ Of factor	Variables, included in factor	% of variable's dispersion	Factor's weight, %
1	Power endurance of girdle muscles (dynamic endurance)	2.78	11.55
	Dynamic strength	2.22	
	Power endurance of girdle muscles (static endurance)	3.05	
	Motion age	3.50	
2	Heart beats rate (HBR)	2.30	11.01
	Restoration of HBR after 20 squatting	1.90	
	Maximal oxygen consumption (MOC) by V.L. Karpman	3.40	
	Maximal oxygen consumption (MOC) by Von Dobeln	3.41	
3	Mass of body	2.29	10.03
	Length of body	2.49	
	Vital capacity of lungs (VCL)	3.01	
	Dynamometry	2.24	
4	Quantity of catarrhs in year	2.68	8.58
	Quantity of chronic diseases	3.02	
	Subjective evaluation of health (by V.P. Voytenko)	2.88	
5	Period of physical culture's practicing	2.88	8.26
	Attitude to healthy life style by A. Yassenger	2.04	
	Speed power endurance of abdomen muscles	1.64	
	Flexibility	1.70	
6	Systolic BP	3.32	6.53
	Diastolic BP	3.21	
7	Age	2.44	5.36
	Static balance	2.92	
8	Quickness	2.35	4.62
	Index of physical activity (IPA)	2.27	
9	Theoretical knowledge	3.06	3.06

Factorial analysis of stating pedagogic experiment's results showed that the most significant in structure of ZNU girl students' physical condition was factor, described by group of variables, which characterize level of main motion abilities (11,55% of data dispersion).

The most important variable in first factor is indicator of motion age (by Yu.N. Vavilov) [15], which describes 3.5% of data. This fact is rather logical because motion age includes indicators of testing of all motion abilities. Then practically equal by "weight" variables, describing static and dynamic power endurance– 3.05% and 278% of data dispersion follow. Variable, characterizing dynamic strength, describes 2.22% of data dispersion.

The presence in the most significant factor of variables, which describe motion skills' level permits to rationally distribute means, oriented on development of motion skills, when working out experimental program of organized motion functioning as active leisure for girl students of higher educational establishments.

The second by significance factor – 11.05% of data's dispersion is characterized by variables, which describe heart beats rate and aerobic endurance (see table 1). In second factor variables, describing maximal oxygen consumption (aerobic endurance) – 3.41% and 3.40% of data dispersion dominate and it permits for us to make

conclusion about significant share of HBR and MOC indicators in structure of physical condition. Validity of this conclusion is proved by results of earlier researches [16].

The third factor 10.03% (off data dispersion) is characterized by variables, which describe anthropometrical indicators of body mass – 2.29%, body length – 2.49%, vital capacity of lungs – 3.01%, dynamometry – 2,24% that permit to state high significance of physical condition indicators in structure of girl students' physical conditions.

The forth by significance factor (8.58% of data dispersion) combined variables, describing acute and chronic morbidity as well as subjective evaluation of health (by V.P. Voytenko). The presence in forth factor of variables, describing morbidity (acute and chronic) and subject6ive evaluation of health witnesses about high significance in structure of physical condition of organism's ageing and efficiency of immune system.

The fifth by significance factor (8.26% of data dispersion) is presented by variables, describing period of physical culture's practicing, attitude to healthy life style and motion skills: flexibility and speed-power endurance of abdomen muscles. The most significant variable in fifth factor is period of physical exercises' practicing that again proves need in regular trainings for maintaining of physical condition on proper level.

The rest four factors are described by variables, which characterize BP, age, quickness, index of motion activity and theoretical knowledge. Marking out of theoretical knowledge in separate factor permits to make conclusion about significance of this indicator for girl students' physical condition and proves that it is necessary to pay special attention to realization of theoretical and methodic parts of basic program on physical education of students of higher educational establishments.

The conducted factoring of data permits to determine rational correlation of means for development of motion skills, in process of development of training programs for health related aerobics as part of active leisure of higher educational establishments' girl students.

In compliance with relative dispersion weight of every factor, exercises of different orientation were distributed in total volume of health related means by formula [11]:

$$d_i = \frac{D_i}{\sum_{i=1}^{7} D_i} * 100$$

if sum is:

$\sum_{i=1}^{7} d_i = 100$,

Where: d_i – specific weight of exercises of certain orientation;

D_i – dispersion of factor;

$\sum_{i=1}^{7} D_i$ – sum of all factors.

In table 2 we presented rational correlation of means for development of motion skills, which should be considered in process of working out of health related programs on aerobics for girl students of higher educational establishments.

Table 2

Rational correlation of means for development of motion skills of higher educational establishments' girl students (%)

Motion skills	Correlation of means (%)
Power endurance of girdle muscles	16.21
Dynamic strength	12.94
Static endurance of girdle muscles	17.78
Aerobic endurance	19.88
Speed power endurance of abdomen muscles	9.56
Flexibility	9.91
Quickness	13.70

For example, for development of endurance of girdle muscles it is required 16.21% from scope of all means, dynamic strength – 12.94%, static endurance of girdle muscles 17.78%, aerobic endurance – 19.88%, speed-power endurance of abdomen muscles – 9.56%, flexibility – 9.91% and quickness – 13.7%.

Conclusions:

1. The fulfilled factoring of stating experiment's data with the help of rotation method Varimax and Kaiser's normalization permitted to mark out 9 factors, describing structure of girl students' physical condition, who started physical education trainings.
2. The most significant in physical structure of ZNU girl students' physical condition is the factor, which is described by group of variables, characterizing degree of development of main motion abilities (motion age,

static endurance of girdle muscles, dynamic power endurance of girdle muscles, dynamic strength – 11.55% of data dispersion).

3. The second by significance factor is characterized by variables, which describe heart beats rate and aerobic endurance– 11.01% of data dispersion.
4. The fulfilled factoring of data permitted to determine rational correlation of means for development of motion skills in program of health related aerobics' training as part of active leisure for higher educational establishments' girl students.

Further researches will be oriented on development and testing of health related aerobics' programs as part of active leisure of ZNU girl students. The basis of these researches will be composed by received data of factorial analysis and degree of their influence on physical condition.

References:

1. Romanchenko S.A. *Korrekciia sostoianiia zdorov'ia studentov v processe zaniatij fizicheskoj kul'turoj* [Correction of the state of health of students during physical training], Cand. Diss., Sankt Petersburg, 2006, 177 p.
2. Puzyr' Iu.P. *Upravlenie fizicheskim vospitaniem v obrazovatel'nykh uchrezhdeniiakh na osnove monitoringa fizicheskogo sostoianiia* [Management of physical education in educational institutions on the basis of monitoring the physical state], Cand. Diss., Moscow, 2006, 193 p.
3. Dorovskikh I.G. *Formirovanie gotovnosti studentov pedagogicheskogo vuza k ispol'zovaniiu sredstv adaptivnoj fizicheskoj kul'tury* [Formation of readiness of students of pedagogical high school to use funds adaptive physical education], Cand. Diss., Chelyabinsk, 2005, 188 p.
4. Anikeev D.M. *Fiziceskoe vospitanie studentov* [Physical Education of Students], 2010, vol.5, pp. 3-7.
5. Boyko D.V. *Pedagogika, psihologia ta mediko-biologicni problemi fizicnogo vihovanna i sportu* [Pedagogics, psychology, medical-biological problems of physical training and sports], 2012, vol.1, pp. 22-25.
6. Kozhevnikova L.K. *Fiziceskoe vospitanie studentov* [Physical Education of Students], 2010, vol.3, pp. 34-38.
7. Raevskij R.T., Kanishevskij S.M., Popichko A.F., Lapko V.G. Zdorov'e studencheskoj molodezhi i puti ego formirovaniia v sisteme obrazovaniia [Health of students and the way of its formation in the education system] *Zdorov'ia i osvita: problemi ta perspektivi* [Health and education: problems and prospects], Donetsk, 2004, pp. 351-357.
8. Tret'iakova N.V. *Osnovy zdorov'esberezheniia* [Basics of health saving], Yekaterinburg, 2011, 138 p.
9. Iurov Iu.N. *Klasterno-modul'nyj podkhod v fizicheskom vospitanii studentov s oslablennym zdorov'em* [Cluster-modular approach in physical education of students with poor health], Tambov, 2008, 66 p.
10. Pirogova E.A. *Sovershenstvovanie fizicheskogo sostoianiia cheloveka* [Improving the physical state], Kiev, Health, 1989, 167 p.
11. Pirogova E.A., Ivashchenko L.Ia., Strapko N.P. *Vliianie fizicheskikh uprazhnenij na rabotosposobnost' i zdorov'e cheloveka* [Effect of exercise on performance and health], Kiev, Health, 1986, 150 p.
12. Zaciorskij V.M. *Fizicheskie kachestva sportsmen* [Physical quality athlete], Moscow, Physical Culture and Sport, 1966, 200 p.
13. Ivashchenko L.Ia., Strapko N.P. *Samostoiatel'nye zaniatiia fizicheskimi uprazhneniiami* [Independent physical exercise], Kiev, Health, 1988, 155 p.
14. Ivashchenko L.Ia. *Nauchno-prikladnye osnovy bazovoj fizicheskoj kul'tury muzhchin 20-59 let s malopodvizhnym obrazom zhizni* [Applied scientific basis underlying physical culture of men aged 20-59 years old with a sedentary lifestyle], Dokt. Diss., Moscow, 1988, 32 p.
15. Vavilov Iu.N., Iarysh E.A., Kakorina E.P. *Teoriia i praktika fizicheskoj kul'tury* [Theory and practice of physical culture], 1997, vol.9, pp. 58-63.
16. Klopov R.V. *Korrekciia urovnia fizicheskogo sostoianiia rabotnikov AES sredstvami fizicheskoj kul'tury* [Adjust the level of the physical condition of NPP workers by means of physical culture], Cand. Diss., Kiev, 2002, 215 p.
17. Anye E.T., Gallien T.L., Bian H., Moulton M. The Relationship Between Spiritual Well-Being and Health-Related Quality of Life in College Students. *Journal of American College Health*. 2013, vol. 61(7), pp. 414-421. doi:10.1080/07448481.2013.824454.
18. Buultjens M., Robinson P. Enhancing aspects of the higher education student experience. *Journal of Higher Education Policy and Management*. 2011, vol. 33(4), pp. 337-346. doi:10.1080/1360080X.2011.585708.
19. Edward T. Howley, Don Franks B. Health Fitness: Instructor's Handbook. *Human Kinetics Books*, 1998, 368 p.
20. Enright E., O'Sullivan M. Physical Education "in All Sorts of Corners": Student Activists Transgressing Formal Physical Education Curricular Boundaries. *Research Quarterly for Exercise and Sport*. 2012, vol. 83(2), pp. 255-267. doi:10.1080/02701367.2012.10599856.
21. Hemphill S.A., Plenty S.M., Herrenkohl T.I., Toumbourou J.W., Catalano R.F. Student and school factors associated with school suspension: A multilevel analysis of students in Victoria, Australia and Washington State, United States. *Children and Youth Services Review*. 2014, vol.36, pp. 187-194. doi:10.1016/j.childyouth.2013.11.022.
22. Kalaja S.P., Jaakkola T.T., Liukkonen J.O., Digelidis N. Development of junior high school students' fundamental movement skills and physical activity in a naturalistic physical education setting. *Physical Education & Sport Pedagogy*. 2012, vol. 17(4), pp. 411-428. doi:10.1080/17408989.2011.603124.

23. Macleod G., Cebula K.R. Experiences of disabled students in initial teacher education. *Cambridge Journal of Education*. 2009, vol. 39(4), pp. 457-472. doi:10.1080/03057640903352465.
24. Williams B. Supporting Middle School Students Whose Parents Are Deployed: Challenges and Strategies for Schools. *The Clearing House: A Journal of Educational Strategies, Issues and Ideas*. 2013, vol. 86(4), pp. 128-135. doi:10.1080/00098655.2013.782849.
25. Wu H-Y., Wu H-S., Chen I-S., Chen H-C. Exploring the critical influential factors of creativity for college students: A multiple criteria decision-making approach. *Thinking Skills and Creativity*. 2014, vol.11, pp. 1-21. doi:10.1016/j.tsc.2013.09.004.
26. Zepke N., Butler P., Leach L. Institutional research and improving the quality of student engagement. *Quality in Higher Education*. 2012, vol. 18(3), pp. 329-347. doi:10.1080/13538322.2012.730338.

Information about the authors:

Gurieieva A.M.: ORCID: 0000-0003-3214-4829; gureev@i.ua; Zaporozhia National University; Zhukovskogo str. 66, Zaporozhia, 69000, Ukraine.

Klopov R.V.: ORCID: 0000-0001-9036-4331; clopov-r@ukr.net; Zaporozhia National University; Zhukovskogo str. 66, Zaporozhia, 69000, Ukraine.

Cite this article as: Gurieieva A.M., Klopov R.V. Factor structure of physical state of female students of higher education institution. *Pedagogics, psychology, medical-biological problems of physical training and sports,* 2014, vol.7, pp. 7-11. doi:10.6084/m9.figshare.1015378

The electronic version of this article is the complete one and can be found online at: http://www.sportpedagogy.org.ua/html/arhive-e.html

Received: 13.03.2014
Published: 28.03.2014