

PECULIARITIES OF PSYCHOPHYSIOLOGICAL STATUS OF BIOLOGICAL AND MEDICAL SECOND-YEAR STUDENTS

Gorkavaya A. Yu., Sidorova O.N., Kuznetsova I.A.

The paper deals with psychophysiological features of biological and medical second-year students. Parameters of physical development and cardiovascular system were measured in 88 medical students (52 men and 36 women) and 89 biological students (36 men and 53 women). Peculiarities of psychoemotional status of the women, studying both in biological and medical universities, have been examined with the help of the standard methods. Underweight was detected in 1/3 men studying in medical university and in 1/4 men studying in biological university, in 1/5 women studying in both universities. In more than a half of cases, reduction of lung capacity and muscle strength of the hand was found in biological and medical students of both sexes. Cardiohemodynamic markers in all participants met the normative standards. Balanced state of intro-extroversion attitude, medium level of neuroticism and personal anxiety, hyperthymic type of character accentuation were revealed in most cases in women. At the same time, elevated levels of reactive anxiety and high risk of coronary-prone behavior was higher in women studying in medical university as compared to biological students. The paper discusses possible causes of mentioned specific differences and degree of physiological adequateness of the psychoemotional pattern in women studying in medical university.

Keywords: *students; physical development; cardiohemodynamic indices; intro-extraversion; neuroticism; anxiety; coronary-prone behavior.*

First years in any university is a period of acute adaptation to adverse changes accompanying transition from family and school environment to student living [1–3]. Requirement for digestion of ever-increasing scope of information, assimilation of knowledge and skills

in a compressed time frame and amid psychoemotional tension has negative impact on debilitated (more often even before the university) state of body and mind. In first years the scope of academic load, a significant part of which is an independent work during extracurricular hours, is great. This is the most pressing for medical students whose academic load is 1,5–2 times higher than for other students [4–6]. Despite this fact, adaptive reserves of young people is rather high, and initial adaptation phase shows mainly psychoemotional troubles which may result in asthenization, and then in a disease only in case of unfavorable course of the adaptive process. Women are considered to be more adaptive to ever-changing environmental conditions, but there are data stating that adaptation to student living requires more significant psychoemotional tension in women than in men, it makes them more vulnerable in terms of development of functional and neural disorders when exposed to contributing traumatic factors [7–9].

Object

Find out peculiarities of physical development of second-year students learning at the Pacific State Medical University (PSMU) and at biological departments of the Far Eastern Federal University (FEFU). Carry out comparative study of psychoemotional status of women studying in both universities.

Material and methods

177 second-year students took part in the study, among them 88 PSMU students (52 men and 36 women) and 89 FEFU students (36 men and 53 women). Age of the test people was between 18 and 21. All of them belonged to the group of apparently healthy people and took part in the study on the basis of voluntary informed consent. In order to characterize physical development, a height standing (P, cm), a height sitting (T, cm) and a body weight (bwt, kg) of the examined people were measured. On the basis of obtained data a body weight index (I_{bw} , kg/m²) was calculated. By using a dry handy spirometer SSP,

actual vital capacity was determined in all test persons (AVC, ml). The procedures was repeated 3 times, but a maximum result was selected from all results. For assessment of this indicator, reference vital capacity (RVC, ml) was calculated, then a percentage of the actually obtained value to the reference one was obtained. The greatest result was selected from 3-time dynamometry of the right and left hand (A, kg) measured by using a hand dynamometer DK 140, and a relative value of force of the hand (%) was calculated. When studying a functional state of the cardiovascular system in test persons in prone position after a ten-minute rest, a heart rate (HR, beats/min), systolic and diastolic arterial pressure according to Korotkov (SAP, DAP, mmHg) were determined. The following cardiohemodynamic indicators were found based on calculations: true pulse pressure (TPP, mmHg), mean arterial pressure (AP_m , mmHg), stroke volume (SV, ml), circulation minute volume (CMV, L/min), total peripheral vascular resistance (TPVR, $\text{dyne} \times \text{sec} \times \text{cm}^{-5}$). In order to characterize a psychoemotional status of test persons the following test methods were used: Eysenck's methods (determination of neuroticism and intro-extraversion levels) [10], Leonhard's method (reveal of character accentuation) [11], Spielberger's method (study of personal and reactive anxiety) and Jenkins's method (reveal of coronary-prone behavior risk) [12]. For obtaining a subjective evaluation of living standard, the students were proposed to complete an anonymous questionnaire prepared by the author, which contained the questions aimed at the study of social and hygienic aspects of students' life, living conditions and labor. Statistic assurance of differences of the signs value's distribution was calculated by using χ^2 -criterion. Results were processed by using the program Statistica for Windows, release 7.0.

Results

In most cases there was underweight: in PSMU a body weight index was below the norm in 1/3 men and 1/5 women, in FEFU – in 1/4 men and 1/5 women. There was a recorded reduction of the relative

value of force of the right hand in 67% of female students of both universities, and left hand in 94% of PSMU female students and 92% of FEFU female students. For men such indicators were more lower: force of the right hand in 81% cases was below the norm and only in 19% it complied with the norm in men studying in PSMU, and 85% and 15% in men studying in FEFU. Force of the left hand in students of both universities was below the norm in 100% cases. Students' actual vital capacity differed from the calculated reference vital capacity towards to decrease in women in 67% (PSMU) and in 55% (FEFU) cases, in men in 87% and 82% respectively. At that, statistically reliable differences between the groups in respect to above indicators were not revealed.

It is testified that PSMU and FEFU men and women do not differ as to value of cardiohemodynamic indicators – HR, SAP, DAP, SV and CMV. Cardiohemodynamic indicators complied with adopted physiological norms (table 1).

Table 1.

Basic cardiohemodynamic indicators of PSMU and FEFU studnets

Indicator	Sex	PSMU	FEFU
HR, beats/min	men	71±2,1	72±2,8
	women	74±1,6	75±2,3
SAP, mmHg.	men	124±1,31	118±1,35
	women	120±1,27	112±1,32
DAP, mmHg	men	74±1,2	72±1,2
	women	73±1,1	70±1,4
SV, ml	men	68±0,74	69±0,65
	women	68±0,62	67±0,71
SMV, L/min	men	5,3±0,16	5,2±0,14
	women	5,4±0,11	4,8±0,18
TPVR, dyne×sec×cm ⁻⁵	men	1464±31	1428±28
	women	1512±26	1496±43

Study of a psychoemotional status was performed in female students of both universities. While analyzing the intro-extraversive relations according to Eysenck's methods it was established that their

balance state was demonstrated by 73% PSMU and 69% FEFU female students. Frequency of evident introversion and extraversion among PSMU female students was equal to 16 and 11% respectively, among FEFU female students – 8 and 23%. In most cases, a neuroticism level was defined as a moderate (PSMU –72, FEFU – 61%), number of persons with high and low values of this indicator among PSMU female students was 22 and 6%, among FEFU female students – 31 and 8% respectively. Study of character accentuations using Leonhard's test in female students of both universities pointed out that a share of women with a hyperthymic type was two thirds of the total number of the examined women. Essential differences in distribution of indicators of these two tests in female students of both universities were not found out.

Based on findings of Spielberger's test, basic part of female students of both universities was characterized by a moderate personal anxiety level (table 2). In contrast the greatest values of reactive anxiety in students of comparable universities are different: in PSMU they fall on a high and moderate level, while in FEFU – on a low level.

Table 2.

**Comparative frequency of personal and reactive anxiety in Spielberger's test
in PSMU and FEFU female students**

Anxiety level	PSMU female students, %	FEFU female students, %
Personal anxiety		
High	16,7±9,11	8,3±7,83
Moderate	72,2±8,73 *	83,4±10,84 *
Low	11,1±7,88	8,3±7,83
Reactive anxiety		
High	44,4±10,79 *	0,0
Moderate	38,9±11,82 *	15,4±9,90
Low	16,7±9,11	84,6±9,90 *

* – $P_x^2 \leq 0,05$

Along with the reactive anxiety there are differences in a risk of coronary-prone behavior diagnosed by Jenkins's method: in PSMU the group AB (moderate risk of coronary behavior) is 1/3, and group

A (high risk of coronary-prone behavior) – 2/3 cases, while in FEFU the frequency of both groups is equally distributed (table 3).

Table 3.

Comparative frequency of a risk of coronary-prone behavior in Jenkins test in PSMU and FEFU female students

Risk level of coronary-prone behavior	PSMU female students, %	FEFU female students, %
A	66,7±11,3 *	53,8±13,84 *
AB	33,3±11,3 *	46,2±13,84 *
B	0,0	0,6

* – $P_{\chi^2} \leq 0,05$

This poses the question, to what extent the frequency of a high level of reactive anxiety and high risk of coronary-prone behavior can be correlated with the total academic load (in particular, with an amount of academic hours and a scope of independent work performed out of the university). It is found that in PSMU 1/3 students spend in university from 4 to 5 hours, and 2/3 – more than 5 hours. In FEFU 1/3 students spend in university from 4 to 5 hours too, but 2/3 – from 2 to 4 hours (table 4).

Table 4.

Comparative frequency of time spent by PSMU and FEFU female students

Hours	PSMU female students, %	FEFU female students, %
Time spent in university		
2-4	0,0	60±15,49 *
4-5	31,3±11,56 *	30±15,49 *
>5	68,7±11,56 *	10±9,48
Time spent for self-training		
1-2	12,5±8,12	44,4±16,5 *
2-4	50,0±12,5 *	55,6±16,5 *
>4	37,5±12,0 *	0,0

* – $P_{\chi^2} \leq 0,05$

Significant differences are revealed in respect to the duration of self-training. In both situations a half of students devotes for self-train-

ing from 2 to 4 hours daily, but from among the students remained in PSMU the most students work over 4 hours, and in FEFU – from 1 to 2 hours only.

Discussion

The obtained results confirm the literary, including our data in respect to the widespread occurrence of a gracilization phenomenon among the Russian young people [13, 14], at that the students of both universities have similar quotients of physical development. Parameters of the functional state of students cardiovascular system are within age norms. Any essential differences in temper and character of female students of two universities. The women have sufficient emotional stability, which is confirmed by a moderate neuroticism level recorded in most of them. Such individuals, as a rule, are able to properly perceive reality and safely get out of difficult real-life situations [15]. Hyperthymic type of character accentuation of most women manifesting as a high activity, sociality and high spirit speaks for successful adaptation to a modern business lifestyle, however, such behavior model is not always consistent with adequate facilities of the body [16, 17]. A high anxiety level is a base for occurrence of psychoemotional tension, can contribute to the reduction of mental capacity and resistance to stress in the teaching and learning process [18–20]. Women had a moderate personal anxiety level – a feature which is determined by the type of human higher nervous activity, his temper, nature and education. However, medical female students, rather than FEFU, demonstrated a high reactive anxiety as a behavioral reaction to current problems and worries. Also they more frequently displayed a high risk of coronary behavior which is associated with a danger of development of ischemic heart disease [21]. Probably this is explained by great academic load on PSMU students, characterized both by the time spent in lessons in the university and by the time spent for individual work. It is not easy for young people to get used to new teaching methods, a necessity to independently plan work and adjust an evenness of

load make additional difficulties for them and can result in mental and psychoemotional stress.

References

1. Agadzhanyan N.A., Degtyarev V.P., Rusanov E.I., Ermakova N.V., Ponomoreva V.V., Radysh I.V., Vilenskiy M.Ya., Grinina O.V., Kislit-syn Yu.L., Neverova N.P. *Zdorov'ye studentov* [Students' health]. Moscow, RUDN Publ., 1999. 200 p.
2. Gulin A.V., Zasyad'ko K.I., Zaytseva S.D., Krasichkov D.V. Psikhofiziologicheskie i fiziologicheskie aspekty dinamiki adaptatsii uchasheysya molodezhi k uchebnomu protsessu [Psychophysiological and physiological aspects of study the students' adaptation to educational process' dynamics]. *Sistemnyy analiz i upravlenie v biomeditsinskikh sistemakh* [System analysis and management in biomedical systems], 2008, vol. 7, no. 4, pp. 992–997.
3. Gorter R., Freeman R., Hammen S. Psychological stress and health in undergraduate dental students: fifth year outcomes compared with first year baseline results from five European dental schools. *Eur. J. Dent. Educ.*, 2008, vol. 12, no. 2, pp. 61–68.
4. Agadzhanyan N.A., Minnibaev T.Sh., Severin A.E., Ermakova N.V., Kuznetsova L.Yu., Silaev A.A. Izuchenie obraza zhizni, sostoyaniya zdorov'ya i uspevaemosti studentov pri intensivatsii obrazovatel'no-go protsessa [Study of way of life, health state and progress of students in intensified educational process]. *Gigiena i sanitariya* [Hygiene and sanitation], 2005, no. 3, pp. 48–52.
5. Dregalo A.A., Ul'yanovskiy V.I. Studenty-mediki: sotsial'nyy portret [Medical students: social portrait]. *Ekologiya cheloveka* [Human Ecology], 2007, no. 3, pp. 53–58.
6. Hojat M., Zuckerman M. Personality and specialty interest in medical students. *Med. Teach.*, 2008., vol. 30, no. 4, pp. 400–406.
7. Pavlenkovich S.S., Tokaeva L.K., Bupalova T.A. Psikhofiziologicheskie osobennosti uchebnoy adaptatsii studentov-pervokursnikov fizkul'turnogo vuza v gendernom aspekte [Psychophysiological features

- of academic adaptation of first-year students of sports universities from a gender perspective]. *Sovremennyye problemy nauki i obrazovaniya: elektronnyy zhurnal* [Modern problems of science and education], 2015, no. 5. URL: <http://science-education.ru/ru/article/view?id=22738>
8. Sidtikov F.G., Shaykhelislamova M.V., Valeev I.R. Vliyaniye uchebnoy nagruzki i usloviy proizvodstva na funktsional'noe sostoyaniye simpatoadrenalovoy sistemy i pokazateli regulyatsii serdechnogo ritma u devushek 17–18-letnego vozrasta [The effect of academic load and work conditions on the sympathoadrenal function and the indices of heart rhythm regulation in 17-to 18-year-old girls]. *Fiziologiya cheloveka* [Human physiology], 2001, vol. 27, no. 5, pp. 60–67.
 9. Gorkavaya A.Yu., Kirillov O.I. Osobennosti psikhooemotsional'nogo statusa studentov Dal'nevostochnogo federal'nogo universiteta [Peculiarities of psychoemotional status of Far Eastern Federal University students]. *Ekologiya cheloveka* [Human Ecology], 2011, no. 12, pp. 29–32.
 10. Eysenck H. J. Assessment of personality. *Br. Med. Bull.*, 1949, vol. 6, no. 1-2, pp. 16–20.
 11. Leongard K. *Aktsentuirovannyye lichnosti* [Accentuated personalities] per. s nem. Rostov n/D, Feniks Publ., 2000. 544 p.
 12. Jenkins C.D. Clinical recognition of the coronary-prone behavior pattern. *J. S. C. Med. Assoc.*, 1979, vol. 75, no. 11, pp. 548–554.
 13. Yampolskaya Yu.A. Formirovaniye v shkol'nye gody fizicheskogo razvitiya i reproduktivnogo zdorov'ya zhenshchiny [School-year formation of female physical development and reproductive health]. *Gigiena i sanitariya* [Hygiene and sanitation], 2006, no. 1, pp. 3–6.
 14. Gorkavaya A.Yu., Trigorlyy S.N., Kirillov O.I. Pokazateli fizicheskogo razvitiya i adaptatsii serdechno-sosudistoy sistemy studentov meditsinskogo universiteta vo Vladivostoke [The indices of physical development and cardiovascular system adaptation in Vladivostok medical university students]. *Gigiena i sanitariya* [Hygiene and sanitation], 2009, no. 1, pp. 58–60.
 15. Markina L.D., Markin V.V. Prognozirovaniye razvitiya dezadaptatsionnykh sostoyaniy i algoritm ikh effektivnoy korrektsii [Forecasting of

- the development of dysadaptable conditions and algorithm of their effective correction]. *Tikhookeanskiy meditsinskiy zhurnal* [Pacific medical journal], 2008, no. 3, pp. 30–36.
16. Ushakov I.B., Sokolova N.V. Sovremennye problemy kachestva zhizni studentov [Modern problems of quality of students' life]. *Gigiena i sanitariya* [Hygiene and sanitation], 2007, no. 2, pp. 56–58.
 17. Donika A.D. Psikhooemotsional'noe sostoyanie studentov v usloviyakh krupnogo promyshlennogo goroda Nizhnego Povolzh'ya [Psychoemotional state of students in conditions of industrial city in Lower Volga region]. *Ekologiya cheloveka* [Human Ecology], 2006, no. 12, pp. 42–47.
 18. Tokaeva L.K., Pavlenkovich S.S. Adaptivnye reaksii na uchebnyy protsess studentov-sportsmenov s raznym urovnem trevozhnosti [Adaptive response to the learning process of students-athletes with different levels of anxiety]. *Fundamental'nye issledovaniya* [Fundamental research], 2011, no. 9, pp. 309–313.
 19. Hazlett-Stevens H., Craske M.G., Mayer E.A. Prevalence of irritable bowel syndrome among university students: the roles of worry, neuroticism, anxiety sensitivity and visceral anxiety. *J. Psychosom. Res.*, 2003, vol. 55, no. 6, pp. 501–505.
 20. Gorkavaya A. Yu., Slutsкая T.N., Kirillov O.I. Effect of cucumaria japonica extract on cognitive performance in young adults. *In the World of Scientific Discoveries, Series A*, 2013, vol. 1, no. 1, pp. 35–45.
 21. Lobel T. E. Personality correlates of type A coronary-prone behavior. *J. Pers. Assess.*, 1988, vol. 52, no. 3, pp. 434–440.

DATA ABOUT THE AUTHORS

Gorkavaya Anna Yurevna, Docent of the Department of Normal and Pathological Physiology, Ph.D. in Medical Science
Pacific State Medical University
2d, Ostryakova Avenue, Vladivostok, 690002, Russian Federation
angorka2002@mail.ru
SPIN-code: 4015-2430

Sidorova Olga Nikolaevna, Docent of the Department of Normal and Pathological Physiology, Ph.D. in Medical Science, Associate Professor

Pacific State Medical University

2d, Ostryakova Avenue, Vladivostok, 690002, Russian Federation

Kuznetsova Irina Aleksandrovna, Assistant of the Department of Normal and Pathological Physiology

Pacific State Medical University

2d, Ostryakova Avenue, Vladivostok, 690002, Russian Federation