EVALUATION RATE OF AGING PERSON BASED ON DETERMINATION OF BIOLOGICAL AGE

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Abstract

The article considers the value of biological and passport age of student youth. In experiment participated 140 students aged 17-19 years. Calculated their biological age. Reviewed pace of aging of the body of students. Detected indexes that have the strongest relationship with indicators of biological age. The results compared with researchers of other regions of Ukraine.

Keywords: chronological (passport) age, biological age, appropriate biological age, pulse blood pressure, rate of aging, static balancing, self-reported level of health.

Introduction. The problem of premature aging of the body is relevant not only biological but also economic consequences because early aging has a significant impact on the duration of labor and creative activity of people in Ukraine and is an average of about 30 years (age range from 20 - 25 to 50 - 55 years), while even in the poorer countries of the duration of 45 - 50 years [11].

Analysis of the length and quality of life for residents of Ukrainian and CIS shows that the last decade marked a sharp deterioration in the health status of people of all ages, including all the authors draw attention to the premature "wear" aging organism [3, 7, 14]. The degree of "wear" can be estimated biological age and calculated by him measure the rate of aging. It is known that the average Ukrainian biological age is much higher than their European peers, and almost the same as in Africa [7]. Compared with the same Europe, we also much more likely to develop young people [11].

If chronologically analyze national literature, the interest in the problem of premature aging and combating started O. Bohomolets', I. Sarkyzov-Serazini, M. Amosov etc.

In modern sources the problem of value the biological and passport age in young students devoted a number of works of authors M. Ahaladze, V. Voytenko, S. Prysiazhnyuk, S. Kalinkina, T. Loshytska, S. Sorokina etc. [2, 3, 6, 7, 11-14].

In the works of these authors indicate that the biological age of the young students an average of 40 to 46 years. The discrepancy between biological and passport age from 10 to 40 years, whereas 15-20 years ago, the difference between calendar and biological age was 4 - 5 years [7].

In scientific studies also indicate that it is essential to biological age and heart coincide with the passport man's age. If the biological age of the heart is much greater

than the passport, in this case there is the risk of cardio-vascular system and premature aging heart [11].

With medical sources also aware that every human body is aging heterochrony - and in different periods of life, and people from different countries and continents rate of aging - different [11]. As for Ukrainian, it does not indicate which age "layer" Ukrainian has the highest rate of aging. It is also unknown whether the same age men and women of Ukraine.

Biological age (BA) is integral index, defined as the matching of individual morpho-functional level some average rate of this population and reflects the uneven development, maturity and aging of various physiological systems and the rate of age-related changes of adaptation of the organism [1]. The analysis of the literature shows that the attempts to assess the level of care according to the criteria of BA as an indicator of "deterioration" of functional and morphological structures in the body per unit of biological time there and there by many researchers [3, 7, 10, 14]. There are many definitions of BA. According to D.F. Chebotarev, A.V. Korkushko, V.B. Shatylo, A.J. Mintz [8] BA reflects the functionality of the body, its efficiency, sustainability. According V.P. Voytenko and his co-authors [6, 7] BA is a measure of system disintegration of the body during aging.

The most complete, in our view, the history of this issue highlighted in the works of L.M. Belozyorova. Author definites BA as a measure, expressed in units of time measured by the ratio values of individual biomarkers with standard for population curve changes of these biomarkers of calendar age [4, 5]. The criteria for evaluation of BV can be morphological, functional, biochemical, immunological, cytochemical indicators, the value of which in determining the degree of maturation of body vary depending on the stages of postnatal ontogenesis. Chronological age is growing all the same. Using indicators BV individual can objectively assess the effectiveness of interventions aimed at reducing the manifestations of aging, its pace. Activation studies of this issue in recent years is due to a decrease in indicators of health of different age groups, including premature aging organism [11].

Problems of premature aging body devoted a considerable amount of work, but the reasons for this phenomenon in relation to the body of young people of college age, in our opinion, insufficiently studied and need to be updated.

Relationship of academic programs, themes. The investigation was conducted as planned research "Methodological problems of formation and preservation of individual level health of the body by the action of natural and preformed medical factors Drohobych region" Department of Anatomy, Physiology and Valeology Ivan Franko Drohobych State Pedagogical University.

The aim is to study the characteristics of the rate of aging based biological age in students I-II courses.

Material and methods research. There are 140 female students of the first and second courses of Ivan Franko Drohobych State Pedagogical University were involved in an experimental study. Based on the results of biomedical research identifies BA (by V.P. Voytenko [7, 15]).

To calculate the BA we used the following formula:

$$BA_{fem.} = -1{,}463 + 0{,}415 \bullet BPp - 0{,}141 \bullet SB + 0{,}248 \bullet W + 0{,}694 \bullet POPs.$$

Blood pressure systolic (BPs) and diastolic (BPd) is measured by the standard technique for the right hand, in sitting, three times at intervals of 5 minutes. Take into account the results of measurement in which the blood pressure is the lowest magnitude. Pulse pressure (BPp) – the difference between the PBs and BPd.

Static balance (SB) is determined by the investigational standing on the left foot, without shoes, eyes closed, hands dropped along the trunk without prior training. The best result are allowanced (maximum duration of standing on one leg) three attempts at intervals between 5 minutes.

The index of self-care (POPs) were determined by questionnaire, containing 29 questions.

In order to determine the extent to which the degree of aging is related to calendar age (PA) of patients, individual BA compared with proper biological age (PBA). Value PBA determined by the formula:

$$PBA_{female.} = 0.581 \cdot PA + 17.24.$$

The evaluation of aging inspected contingent included the following steps: calculating the true value of BA for each individual; calculate the proper value of BA (PBA) for calendar age; comparison of actual BA and calendar age. The difference between the indices BA and PBA characterized the rate of aging.

For the statistical analysis used the software package "Microsoft Excel 2007" and "Statistika 6".

Results and discussion. Based on results of the calculations (Table 1), we divided BA on conditional age groups. Table 2 presents the distribution of students on conventional age group by indicators of BA with the corresponding medium statistics PA, PBA.

Distribution BA on conditional age groups and statistical analysis revealed that with increasing BA is the strain regulator mechanisms and reducing the reserve capacity of the organism, which provide the foundation of health. Performance BA in subjects students was 33.13 ± 0.35, and compared to the average data of other authors [3, 9, 11, 16] were not significantly different.

Table 1. Anthropometric and hemodynamic performance of female students of the first and second courses

|	M	m	σ
Pasport age, years	17,11	0,05	0,59
Weight, kg	54,17	0,58	6,92
Height, cm	163,92	0,42	5,03
Blood pressure systolic, mm Hg	114,62	0,95	11,3
Blood pressure diastolic, mm Hg	71,24	0,82	9,75
Blood pressure pulse, mm Hg	43,37	0,52	6,16
Heart rate, beats/min	78,55	1,13	13,3
Index of self-care, points	5,98	0,24	2,84
Static balance, sec	7,02	0,77	9,11

Table 2. Distribution of students on conventional age group by indicators of BA with the corresponding medium statistics PA, PBA (Mean±SE)

BA intervals, years	BA, years	PA, years	PBA, years
<25 (n=3)	24,55±0,45	17,0 ±0,57	27,11±0,33
25÷30 (n=33)	28,68±0,21	17,09±0,11	27,17±0,06
30÷35 (n=58)	32,37±0,19	17,17±0,08	27,22±0,05
35÷40 (n=39)	37,04±0,22	17,02±0,07	27,13±0,04
>40 (n=7)	42,36±1,08	17,14±0,14	27,2±0,08

For developing organism significant advance or lag of biological age in relation to the calendar one can be interpreted as a sign of decline in human health [1, 2]. It is believed that at physiological aging of its chronological and biological age should coincide. During various studies have found that discrepancy between passport and biological age is observed in all age groups, and the biological age of women is less than that of men in all age groups. Worsens the indicator of biological age the increased body weight, decreased physical activity index, smoking. Some authors [11, 13] believe that the person whose BA significantly higher than population-based reference, constitute one of the largest groups on attitude to risk of disease, disability and death.

On the basis of this rate of aging of the body as dramatically slow (the difference in years between BA and PBA from -15 to - 9 years); slow (from -8.9 to - 3 years); BA = PBA (from -2.9 to 2.9 g); accelerated (from 3 to 8.9 g); accelerated sharply (from +9 to +15 c), we grouped the subject contingent on these indicators. Sharply slow and slow pace of aging is not found in any of the students, in 25.7% (36 students) biological age coincides with the passport. In 72 (51.4%) female students observed accelerated rate of aging; sharply accelerated the pace recorded in 22.8% (32 female students) (see Fig. 1).

Fig. 1. The ratio of BA & PBA and assessment of rates of aging
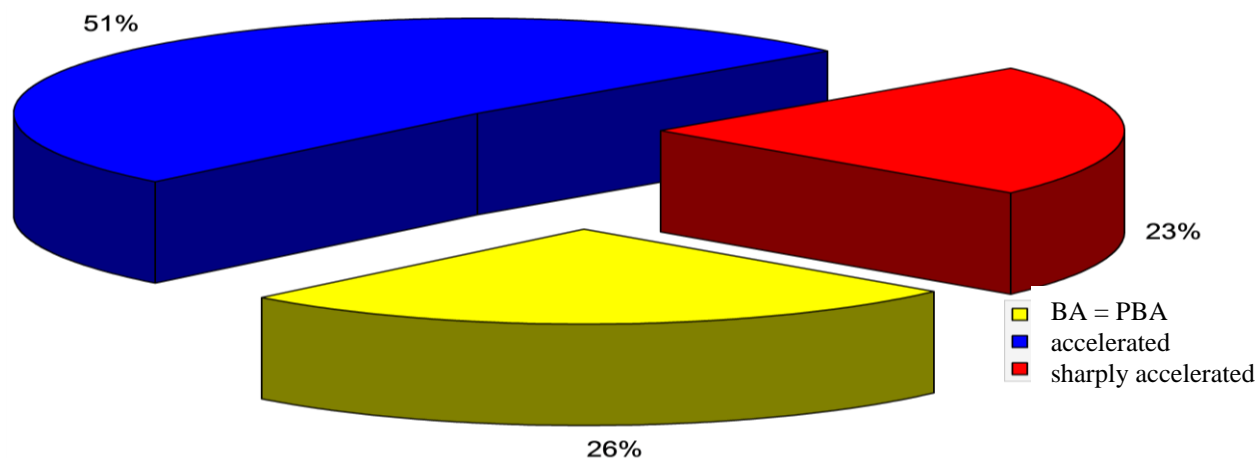
Dynamics of average indicators used to determine the BA and PBA has enabled us to judge the limiting level that affect the rate of aging young students [9].

The method of pair correlation defined coefficients relationship. The indicators included in the formula for determining the BA girls, correlates with: self-reported health (r = 0,60), pulse pressure (r = 0,67), static balance (r = -0,21), weight (r = 0,55), that consistent with results of other authors [9, 11, 16]. Self-care was defined subjectively – using questionnaires. Analysis of our data obtained in the study showed that students POPs characterized by symptoms that are characteristic for neurosis and consistent with objective data.

Battery markers of aging can not only calculate individual index BA by which to assess the alleged violations of health, but also to build a direct forecast possible number of diseases in the individual. In our opinion, the calculation BA is simple procedure that does not require special training or sophisticated equipment, but provides information on defenses, physical condition, flow adaptive processes, reserves the cardio-respiratory system, the stability of neural processes individually to each student and allows to select tools and teaching methods adequate biological development.

Conclusion. The biological age is a fundamental characteristic of the individual rate of development. It corresponds to the morphological and functional maturation of the organism and population standard. By this criterion, the individual can meet the population norm of its chronological (passport) age, ahead of its varying degrees, or, on the contrary, behind.

Distribution of biological age on conventional age groups and statistical analysis revealed that with the increase of biological age is strain regulation mechanisms and reducing reserve capacity of the organism, which provide the foundation of human health. Indicators of biological age in surveyed female students was 33.13 ± 0.35, and compared to the average data of other authors did not significantly differ.

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