CORRECTION OF PHYSICAL EDUCATION PROGRAM FOR TECHNICAL HIGHER EDUCATIONAL ESTABLISHMENT GIRL-STUDENTS ON THE BASE OF THEIR HEALTH INDICATORS

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Abstract. *Purpose:* to illustrate opportunities of physical education in health strengthening of technical HEE girl-students through correction of their biological age components. *Material:* 127 girl-students participated in the research. *Results*: the authors' program of biological age correction permitted to increase breathing pauses, hand strength, time of static balance and reduce blood pressure. Knowledge of biological age and mechanisms of too early ageing facilitates practicing healthy life style and formation of body-motor conditions. We offered trainings of biological age correction' methodic, oriented on prophylaxis of organism's ageing, reduction of biological age and prolongation girl-students' active life. *Conclusions:* specially determined biological age of an individual can be used as integral characteristic of his/her health condition.
Key words: physical, education, biological, age, health, girl-students.

Introduction

The problem of health protection and strengthening is one of main tasks of our society. Modern conditions of education in higher educational establishments set high requirements to students' health. Absence of healthy life style and low motor activity condition sharply accelerated ageing, characteristic for all age groups. It reflects general tendency to worsening life quality, health and physical fitness. Besides it determines the demand in prophylaxis of too early ageing and working out health related technologies.

To day actually every forth patient and fifth citizen of workable age have diseases of cardio-vascular system, [22, 41, 50]. Vegetovascular dystonia is one of the most frequent cardio-vascular diseases among young persons. With it among women it is 2-3 times more frequent than among men [1, 25, 43, 46].

Recent scientific researches witness that in health rehabilitation and strengthening active role is played by complexes of rehabilitation measures. Such complexes are directed at treatment of existing pathological; syndromes and improvement of students' health. Physical education means engage important place in these complexes that is proved by scientific works [10, 18, 26, 53]. Systemic physical exercises' practicing facilitates significant strengthening of students' organism's resistance and physical fitness [34, 42, 47, 51]. With it harmony of he whole organism is achieved.

Compliance of students' individual morphological functional level with mean statistic standard of this population reflects non-uniformity of development, maturity and ageing of different physiological systems. The temp of organism's adaptation potentials' age changes determines such model conception as biological age [11, 32, 44, 48]. Biological age is an indicator of wear out of structure and organism's definite structural element or group of elements and organism in the whole, expressed in units of time. It is found by correlating the measured individual bio-markers with reference mean population curves of these bio-markers' dependences on calendar age [5, 8, 11, 17].

It is known that mean biological age of Ukrainians is much higher than in their European peers. This age is nearly equal to Africans' age [6, 30, 37, 38]. Comparing with Europe, in Ukraine youth more frequent has diseases [4, 9, 35].

The problem of too early ageing is relevant due to its biological and economic consequences. It is known that early ageing significantly influences on period of working and creative activity. In Ukraine this indicator is 30 years (in the range of age from 20-25 – to 50-55 years). In poorer countries it lasts 45-50 years [2, 12, 31, 36].

If to analyze literature sources chronologically it is seen that interest to too early ageing was manifested by many authors. In modern literature the problem of students' biological and passport age correlation is regarded in the works of many authors [3, 13, 20, 23]. In these works it is pointed that students' biological age is, in average,

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from 40 to 46 years, Discrepancy between biological and passport age is from 10 to 40 years. Approximately 15-20 years ago this difference was 4-5 years [14, 27, 39, 45].

In scientific works significance of biological and passport age coincidence is noted. If biological age of heart is much higher than passport age there appears a risk of cardio-vascular system's disease and too early heart's ageing [16, 24, 40, 52].

From medical sources it is known that every person's organism ages hetero-chronically. In different life periods, ageing of people from different countries and continents is different [19, 29, 33, 49]. In respect to Ukrainians, there is no mentioning of "age strata" with higher ageing temps. Also it is unknown, if ageing temps are equal for men and women in Ukraine. In scientific journals there are very few works, devoted to biological ageing and its correction by physical education means, especially in respect to students.

Hypothesis: it was assumed that partial individualization of girl-students' physical education on the base of data about their health would permit to raise the level of their physical fitness.

The purpose of the research: is to illustrate opportunities of physical education in health strengthening of technical HEE girl-students through correction of their biological age components.

Material and methods

Participants: in the research 127 1-st – 2nd year girl-students of 17-21 years' age, from Kiev national university of technology and design participated. All girl students were practically healthy (I.e. did not have any health problems). The girl-students were divided into experimental and control groups.

Organization of the research: the research was conducted in 2015-2016. At the beginning of 2015 we registered girl-students' biological age, detected weak organism' systems, worked out individual program of physical education. At the end of 2016 we again registered biological age of the same girl-students. The experiment implied working out means for biological age correction and implementation of the authors' program and methodic in educational process.

For determination of personal biological age we used some modified methods [25]. For biological age assessment we used indicators of separate organism systems' maturity. The assessment was fulfilled by comparing girl-students' appropriate indicators with standards, characteristic for this age group. For correct assessment of biological age it is desirable to use several indicators in heir combination. However, in practice, when doing mass examinations, one has to consider separate indicators, which reflect human state rather satisfactory. Biological age assessment shall reflect clear age changes, which can be measured or described. The method of such changes' assessment shall not be harmful for the health and shall not cause unpleasant feelings. It shall be suitable for screening of great number of girl-students. We used abbreviated method of biological age determination [25]: determination of obesity degree (weight-height indicator); hand power (hand dynamometry); testing of cardio-vascular system (heart beats rate –HBR after 20 squats); state of nervous system (Romberg's test); state of respiratory system (vital capacity of lungs – VCL); determination of blood vessels' elasticity (blood pressure); functional state of respiratory and blood circulation systems (Genchi's test).

Statistical analysis:

For processing of the research's results we used mathematical statistic methods. For every indicator we calculated mean values and mean square deviation. Confidence of results was assessed with Student's t-criterion at 1% and 5% significance levels.

In conduct of complex pedagogic and biologic testing of girl-students we observed health protection laws of Ukraine and Helsinki declaration 2000; directive №86/609 of European community on human participation in medical-biological researches.

Results

Results of preliminary research (2015) showed that girl-students' average biological age (27.9 years) does not correspond to passport age (18.6 years) exceeding it. Accelerated temps of ageing are observed in 99% girl-students. Distribution by biological age is not uniform and the rage of variations is 27.0 years. In 17% girl-students biological age is within from 23 to 26 years; in 10% from 27 to 30 years; in 31% - from 31 to 34 years; in 21% - from 35 to 38 years; in 14% it is from 39 to 50 years; 4% have biological age from 51 to 60 years; 1% - from 61

to 70 years. Thus, biological age of most of girl-students is in the range form 30 to 40 years. The quantity of girl –students with low biological age (18-20 and 20-22) is insignificant and is not obligate (1% and 1% accordingly).

By results of preliminary testing in 83 girl-students we registered low health level; in 29 – below average and in 15 girl-students – average level. Thus, the girl-students' health can not be assessed as above average. Therefore, no one of them is in "safe zone". It is connected with deficiency of physical functioning and absence of systemic sports practicing.

Other mean-statistic data of our research are given in table 1.

The youngest biological age was 19.7 years. It exceeds passport age by 1.7 years. It should be noted that it is the best indicator. In all other cases biological age indicators are much worse.

The methodic of biological age assessment did not envisage study of volume and content of motor functioning. That is why we could not analyze influence of the latter on biological age.

Pedagogic experiment implied initial testing of control and experimental groups' girl-students. During academic year experimental group was trained by the authors' program of biological age correction. After finishing pedagogic experiment we received results of finalizing testing of these groups' biological age (see table 1).

Table 1. Girls-students' biological age indicators before and after application the authors' program

№№	Indicators	Before experiment	After experiment	Confidence
1	Weight-height indicator, conv.un.	21.9	22.2	P≥0.05
2	Static balance (Romberg's test), sec.	51.4	45.6	P≤0.05
3	Blood pressure, mm.merc.col.	34.9	29.2	P≤0.05
4	Breath pause (Genchi's test), sec.	33.5	30.3	P≤0.05
5	Hand dynamometry, kg	38.5	31.7	P≤0.05
6	VCL, liters	18.1	18.2	P≥0.05
7	HBR restoration after 20 squats, beats per sec.	17.8	18.2	P≥0.05
8	Mean passport age, years	17.6	18.6	P≥0.05
9	Mean biological age, years	27.9	23.3	P≤0.05

It is undoubted that influence of physical education means on student's organism is extremely necessary. However, to influence on biological age it is required to determine the most significant indicators. With Pearson's method of pair correlation we determined correlation coefficients. The highest rating belonged to indicator of pause after exhale (r=0.91); the second place is taken by static balancing on one leg with closed eyes (r=0.59); third place belonged to blood pressure (r=0.43). All these were considered in selection of the authors' program means.

The worked out authors' program included theoretical part. This part is a cycle of lectures targeted to open main principles and sense of the studies conceptions. The second part included content of practical, methodic and independent trainings. In the process of trainings we practically familiarized girl-students with complex of targeted means, oriented on human biological age correction and on application of the received knowledge in practice. As a result of this part's realization girl-students mastered therapeutic physical culture exercises, vestibular and fine motor exercises, breathing methodic, psycho-correction techniques. Besides, the girl-students knew methods of determination of human biological age and learnt to independently find it by calculations.

Independent trainings by the authors' methodic were directed at better mastering of material. Practical classes were conducted in the process of compulsory academic hours on discipline "Physical education". In our opinion group practical classes shall be conducted with application of individual approach to girl-students. It will permit for them to self-influence by correction and prophylaxis exercises. Means for biological age correction can include: therapeutic physical exercises, breathing exercises and exercises for psycho-correction relaxation [15, 16, 19].

The repeated testing of biological age showed that in 21% girl-students it is within from 23 to 26 years; in 16.0% - from 27 to 30 years; in 32.0% - from 31 to 34 years; in 17.0% - from 35 to 38 years; in 10.0% - from 39 to 50 years and in 1.0% -from 51 to 60 years. The quantity of girl=student with low biological age (18-20 and 20-22) remained insignificant (1% and 2% accordingly). The main is: period of breath pause, hand strength and period

of static balance increases as well as blood pressure reduced (see table 1). With it the following indicators nearly did not change: weight-height indicator, VCL, HBR after 20 squats (restoration of pulse).

As it follows from the received data the authors' program of girl-students' biological age correction and its realization methodic showed their confident effectiveness by most of the tested indicators.

Discussion

The results of presented here work can be called deplorable: they witness about significant passport age exceeding by biological age. In the future this gap can only increase owing to accelerated ageing. If now biological age is about 28 years, then in the nearest 5 years it can raise up to 40 years. It is necessary to think about control over this process and improvement girl-students' health.

It should also be noted that ageing is a multi-factor process of biologically conditioned objective and subjective factors' influence, which depend on a person [19, 26, 33]. It can be assumed that correction of a number of physical defects is possible with the help of specially selected physical exercises. On the base of the present work we can conclude that one training a week is not enough for health strengthening and improvement. It is necessary to think about independent trainings (for example in sport circles). With it individual condition of girl-students shall be considered [15, 37, 40].

As a result of the authors' program application we registered that girl-students' heaviest problems appear in respiratory system. By Genchi's test 55.6% have low health level, 18.5% - health below average. For cardio vascular and respiratory systems aerobic kinds of sports can be proposed. For example: run or power walking, swimming bicycle racing, dances, skating (roller skating) or skiing, outdoor games with ball (basketball, football, volleyball and etc.) [15, 21, 28].

Besides, Romberg's test showed the presence of problems with nervous system in girls. Indeed, balancing, as one of coordination qualities, directly influences on professional qualities of technologists and designers [26, 40].

We compared the received data with the data of other authors, who studied this problem earlier. Results of biological age study in the whole coincide with the data of other authors, living in Ukraine.

Conclusions

1. Specially determined girl-students' biological age can be used as an integral characteristic of their health.

2. As far as human biological age is conditioned by physiological, functional and adaptation organism's potentials, physical education means can be considered to be the most rational mean for ensuring longevity and prevention from too early ageing. They permit to mobilize adaptation mechanisms of young people, who are bent to pathologies of different organism's organs and systems.

3. Knowledge of biological age essence and mechanisms of too early ageing can facilitate the tasks of girl-students' self-perfection, healthy life style and formation of body-motor conditions; self-correction of organism's systems and functions.

4. Within the frames of "Physical education" discipline in university it is purposeful to realize the course by choice. This course is based on mastering biological age correction methodic; reduction of biological age and prolongation of girl-students' active life.

5. It is purposeful to introduce lectures, methodic and practical classes in the process of physical education in university. Such classes will be mainly directed at future technologists (designers, engineers) preparation for ageing prophylaxis through biological age reduction and active life prolongation.

The prospects of future studies imply development and implementation of too early ageing prophylaxis program for students.

Conflict of interests

The authors declare that there is no conflict of interests.

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