

ANTI-AGING BY MEANS OF PHYSICAL EDUCATION (ON EXAMPLE OF SWIMMING)

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Abstract. *Purpose:* to work out complex anti-aging program to find its influence on biological age and temp of elderly persons' ageing. *Material:* in experiment 78 persons (44 men and 34 women with accelerated organism's ageing) participated. Two groups were formed. In both groups trainings were conducted three times a week. Each training took 55-80 minutes. Realization of the program was in three stages: preparatory-adaptive, training and supporting. Testing of the author's program took ten months. For determination of biological (functional) age and temp of organism's ageing we used methodic by V.P. Voytenko. *Results:* we expanded ideas about slowing of involution changes in human organism without medication means. The main means of the program were special blocks of swimming. We determined the demand in formation of person's desire for further physical development, for accumulation knowledge and skills in correct selection and fulfillment of physical exercises; for independent controlling own physical fitness. *Conclusions:* In preparatory part we recommend to use the following blocks: warming up, breathing, theoretical block. In main part the following blocks were used: exercises with objects, imitation exercises, facilitating mastering swimming; jumps and exercises on ground; distant swimming; hypoxic exercises. In final part game and breathing exercises were used. It is recommended to use principle of variability, which envisages planning of training process in compliance with age-gender specificities.

Key words: ageing of person, biological age, anti-ageing, swimming, physical activity.

Introduction

In conditions of population's ageing especially important has become the problem of workability and health preservation of people, who work; provision them with work in compliance with profession, age and functional potentials [2, 15]. Recent decades sharp worsening of health of all Ukrainian population strata has been happening. Researchers [6, 9, and 13] attract attention to too early "wear out", ageing of organism [12]. The degree of this "wear out" can be assessed by biological age and calculated organism's ageing temp with the help of the received indicators [11].

In 90-s years of 20th century new sector of medical science appeared and started to quickly develop. It was anti-ageing – anti-age medicine [6, 7, 8]. It was proved that physical education means can substantially influence on quickness of ageing (organism's wear out) by inhibition of involution changes [11]. Modern science tries to struggle with many symptoms of ageing (skeletal muscles' atrophy; reduction of joints' mobility; partial loss of functional reserves of organism's physiological systems and bio-energetic potential; weakening of organism's potential for physiological re-generation). It permits to keep mental and physical workability at proper level.

The back up of workability is closely connected with functioning level of different human organism's systems. It is possible at the account of correctly chosen strategy of successful ageing [26, 28]; physical exercises' practicing [19, 20]; level of physical activity [21]; sound eating [22]; proper condition of cardio-vascular system [23] and composition of body [25].

In opinion of authors [7, 8] swimming facilitate successful ageing. Swimming practicing is recommended to use as non-medical mean for too early ageing prophylaxis [15]. Domination of biological markers of cardio-vascular and respiratory systems in determination of human organism's ageing has been proved [16]. Other authors found that swimming facilitates improvement of external breathing functional indicators [27] as well as renders health related effect [24]. Thus, differently directed health related measures can strengthen human workability and ensure successful; ageing.

The purpose of the research is to work out complex anti-aging program to find its influence on biological age and temp of elderly persons' ageing.

Material and methods

Participants: medical workers of 50-60 years' age, characterized by accelerated temp of ageing.

Organization of the research: the tested were divided into control and anti-ageing groups. Control group included people, who, by their interests, practiced aerobic, cyclic exercises (run, skating, bicycle racing, walking and so on). In group of anti-ageing influence we applied the author's program, which included: morning exercises, stretching, swimming and independent trainings. In both groups trainings were conducted three times a week; each training took 55-80 minutes, depending on stage of program. Realization of anti-ageing program was conducted in three stages: preparatory-adaptive, training and supporting. Testing of the program took ten months. For determination of biological (functional) age we used methodic by V.P. Voytenko [12].

For determination of biological age we used the following formulas:

BA (biological age) men:

$$BA = 26.985 + 0.215 \times BPS - 0.149 \times BP + 0.723 \times SAH - 0.151 \times SB$$

BA women:

$$BA = -1.463 + 0.415 \times PBP + 0.248 \times BM + 0.694 \times SAH - 0.14 \times SB$$

Where: BPS – blood pressure (systolic), mm. merc.col.

PBP – pulse blood pressure, mm. merc.col.

BP - breathing pause after deep inhale, sec.

SB – static balancing, sec.

BM – body mass, kg.

SAH – subjective assessment of health (to be determined with the help of questionnaire, containing 29 questions).

For determination of human ageing temp we compared individual BA with PBA (proper biological age), which characterizes population standard of age "wear out". Correlation BA/PBA points at difference between BA of the tested person and his/her peers.

PBA was calculated by the following formulas:

PBA (proper biological age) – men:

$$PBA = 0.629 \times CA + 18.56$$

PBA women:

$$PBA = 0.581 \times CA + 17.24$$

Where CA – calendar age

Statistical analysis was fulfilled with the help of Excel 2010 program.

Results of the research

The program is characterized by orientation on realization principle of variability, which envisages planning of academic material in compliance with age-gender characteristics.

Working out anti-ageing program we followed a number of requirements:

- Load's adequacy to age and sex, strict dozing and regulation of physical load;
- Systemic application of physical loads;
- Gradual expansion of means for complex ensuring influence on different muscular groups, joints and visceral organs;
- Selection of general, special, preparing and imitation exercises according to physical and technical fitness;
- Selection and application of exercises for cardio-respiratory physiological reserves;
- Organization of special motor regime;
- Improvement of psychological state.

Main mean of anti-ageing program was swimming in the form of special blocks. These blocks facilitated complex influence on organism. The blocks included gymnastic and breathing exercises as well as stretching. Application of these means was realized in organized trainings and as independent trainings. All these were registered in individual diary.

Realization of anti-ageing program was fulfilled in three stages: preparatory-adaptive, training and supporting.

Preparatory-adaptive period takes two months and implied application of threshold and moderate intensity physical loads. Its main tasks were: overcoming water-phobia and mastering or perfection main swimming techniques; adaptation of cardio-vascular and respiratory systems to physical loads; weakening of psychological tension and creation of optimistic mood; training of physical qualities and organism's hardening.

Second stage, training, took five months. It was characterized by average and peak intensity of physical loads. The tasks of this stage were: improvement of organism's physiological systems' functioning; perfection of organism's adaptation potentials; improvement of cardio-vascular and respiratory systems' state; improvement of elasticity of skeletal-muscular apparatus soft tissues and joints' mobility; backbone unloading and increase of its segments' mobility; further development of physical qualities;

Third stage, supporting, lasted three months and involved physical loads of moderate intensity.

The tasks of this stage were: further increasing of motor functioning and preservation of the achieved physical condition; increase of muscular and cardio-respiratory endurance; correction of psycho-emotional state; formation of healthy life style skills.

The structure of the program

Morning exercises (ME): are to be fulfilled every day, during 15-20 minutes before breakfast. Both control and experimental groups fulfilled complexes for all muscular groups. Beforehand, complexes of these exercises were distributed in the groups in text form.

Swimming: the structure of swimming trainings envisages specialized blocks, which permit to selectively influence on different physiological system and fitness sides.

In preparatory part the following block were used: warming up, breathing exercises, theoretical block. The main part of such trainings included exercises with objects, imitation exercises for training swimming abilities; jumps and exercises on ground; distant swimming; hypoxic exercises.

The recommended by regulations optimal dozing of health related swimming is purely oriented and can be less or higher. It depends on person's individual potentials. For more precise control of loads by indicators of maximal, peak and threshold heart beats rate (HBR) we used the following formulas:

$$\text{HBRmax} = 220 - \text{age (in years)};$$

$$\text{HBR bottom border} = (220 - \text{age (in years)}) \times 0.6;$$

$$\text{HBR top border} = (220 - \text{age (in years)}) \times 0.75.$$

Stretching: the purpose of stretching was to achieve its physiological effect – myostatic reflex, with which in relaxed muscle there happens increase of muscular fibers' contraction. As a result, metabolism increases in muscles and high tonus is ensured owing to perfection of conjunctive tissues' carcass of skeletal muscles.

Independent trainings were directed at formation of further physical self-perfection, accumulation of knowledge and skills to correctly select and fulfill physical exercises, to independently control own physical fitness.

Reduction of experimental group women's biological age after 7 months' trainings by anti-ageing program was 7.19% ($p < 0.05$), and after 10 months – 10.41% ($p < 0.05$).

Table 1. Dynamic of biological age (BA), proper biological age (PBA) and ageing temps of men and women changes after application anti-ageing program ($M \pm m$)

Stages	Control group			Experimental group		
	Biological age	Proper biological age	Ageing temp (BA-PBA)	Biological age	Proper biological age	Ageing temp (BA-PBA)
Men n=23				Men n=21		

Before	58.5±0,5	52.9±0,5	5.6	58.7±0.5	53.3±0.4	5.5
After 2 months	58.3±0,5	52.9±0,5	5.4	58.2±0.4	53.3±0.4	4.9
After 7 months	58.3±0,5	52.9±0,5	5.4	57.0±0.4***	53.3±0.4	3.7
After 10 months	58.2±0,5	52.9±0,5	5.4	56.8±0.5***	53.3±0.4	3.5
<i>Women n=15</i>				<i>Women n=19</i>		
Before	52.3±0.4	48.9±0.	3.4	52.8±0.4	49.4±1.6	3.4
After 2 months	52.0±0.4	48.9±0.4	3.1	51.8±0.4	49.4±1.6	2.4
After 7 months	52.0±0.4	48.9±0.4	3.1	49.0±0.6*** ••	49.4±1.6	0.4
After 10 months	51.3±0.5	48.9±0.4	2.3	47.3±0.5*** ••	49.4±1.6	-2.1

Notes: *** – (p<0.05) indicator is confident, comparing with initial data; •• – (p<0.05) indicator is confident, comparing with control group.

The received by us results witness about effectiveness of motor functioning in resisting to natural processes of age involution. Application of the authors' anti-ageing program facilitated confident reduction of biological age of the tested (50-60 years' age). This anti-ageing program can be used in recreational-rehabilitation centers, sanatoriums as well as at working places and places of residence as a mean for prevention organism's too early ageing.

Discussion

Accelerated ageing of any age person has been remaining a relevant problem of medicine (1, 3, 6, 12, 18] and physical education [13, 14]. The problem of longevity prolongation and activity of elderly people is still important in medical, social, economic and pedagogic spheres, in the aspect of physical education. It is purposeful to use application of physical education means for biological age correction [4]. Results of our research prove the data of other authors [26] about importance of searching individual means for ensuring longevity and life quality. Immobile way of life accelerates people's ageing [21] that witness about correctness of our research. However, the proofs that physical exercises can radically change body ageing are rather doubted [28]. Results of our research illustrate that physical exercises (to be more exact- swimming) can significantly strengthen resistance to ageing.

The data about implementation of the received results in physical education science are the novelty. For the first time we worked out anti-ageing program, oriented on inhibition negative biological changes of organism of 50-60 years' age persons with accelerated ageing. Theoretical substantiation of stretching, morning exercises; swimming and independent trainings' introduction in the program was conducted. For the first time we proved effectiveness of the authors' program for biological age and organism's ageing temp correction. It permits to recommend it for application as gero- protection mean for people of older age groups.

Conclusions

Application of authors' anti-ageing program permitted to substantially influence on biological age of 50-60 years' age.

Confident reduction of biological age witnesses about purposefulness of motor functioning in old age for negative biological changes' inhibition.

On examples of control and experimental groups we showed effectiveness of motor functioning independent on age, in which a person starts it.

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