THE INDICATORS OF THE PHYSICAL HEALTH OF STUDENTS ON THE CHARACTERISTICS OF THE PHYSICAL FITNESS, AEROBIC AND ANAEROBIC PRODUCTIVITY OF THEIR BODY

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Annotation. *Purpose*: identification and assessment of physical health of students on physical performance characteristics, aerobic and anaerobic performance of their body. The objective of this study was to investigate the influence of cross-country training aerobic and anaerobic focus on physical performance, aerobic and anaerobic organism performance of students. *Material*: The study involved 413 students (boys) aged 21 - 23 years. Efficiency of impact studies using cross-country loads of aerobic and anaerobic focus on the physical health of students. *Results*: It was found that the level of physical health of students on a scale of G.L. Apanasenko steadily deteriorating. Decrease is observed to a safe level in 22 years and further still below the safe level for 23 years. Anaerobic performance level of students in the body 21, 22 and 23 do not differ significantly and is below the average. *Conclusions:* confirmed that aerobic and anaerobic capacity of the organism students do not meet the proper level and require correction. Found that such a correction would be the most effective subject to the development and implementation of health technologies. Technology based on the use of extracurricular activities running exercises.
Keywords: aerobic, performance, physical health, cross training, anaerobic.

Introduction

The key indicators of the physical health is physical capacity, aerobic and anaerobic (lactate) performance of the body. Given that there is enough controversial information on aerobic and anaerobic capacity of the body of a young person, studies that allow tracing the dynamics of the parameters that characterize the physical capability, aerobic and anaerobic (lactate) capacity of male students at the age of 21, 22 and 23 years.

To study the physical operability we have determined absolute and relative indicators PWC170. The study of aerobic capacity was carried out according to absolute and relative indicators of maximum oxygen consumption (VO2 max). The assessment of the aerobic capacity was done in accordance with the criteria suggested by Y.P. Pyarnata [14].

Purpose, tasks of the work, material and methods

Aim of the study - was to identify and assess the level of physical health of men at the age of 21-23 years.

Task of the study was to investigate the impact of aerobic and anaerobic jogging exercises on the physical capability, aerobic and anaerobic (lactate) capacity of the body of university students at the age of 21-23 years.

Methods of the study: we investigated the effect of classes using aerobic and anaerobic jogging loads on the physical health of male students at the age of 21 - 23 years. We have found methods and properties that are appropriate to use in the study of the physical condition of university students. Studying the dynamics level of aerobic capacity (RIOs) of the student's body at the age of 21-23 years has shown that according to the criteria, suggested, by Y.P. Pyarnata [14], 21-year old people develop a "mediocre level", with 22 and 23-year old students having the level below the mediocre one." We have discovered that the level of physical health according to the scale by G.L. Apanasenko [3], male students at the age of 21-23 years have a steadily deteriorating level, decreasing to a "safe"one at the age of 22 years, with that falling below the "safe" level at the age of 23 years. The level of the anaerobic capacity in male body at the age of 21, 22 and 23 years does not differ significantly and is below the average index, which according to A. Shögy, G. Cherebetin [21] is 38.1 kgm • min-1 • kg-1.

The experimental research work was carried out at DMZ "Lugansk Shevchenko National University." The study involved 413 male students at the age of 21 - 23 years and 17 sports teachers and doctors.

Results of the research

The key indicators of physical health is physical capability, aerobic and anaerobic (lactate) capacity of the body. Given that there is enough controversial information on aerobic and anaerobic capacity of the body of a young person, studies that allow tracing the dynamics of the parameters that characterize the physical capability, aerobic and anaerobic (lactate) capacity of male students at the age of 21, 22 and 23 years.

The comparative analysis of physical and aerobic capacity of the body gives enough reason to believe that both the absolute and relative indicators PWC170 and VO2 max at the age of 21-23 years do not undergo significant changes.

However, it should be noted that the dynamics of aerobic capacity, which is assessed according to the relative value of VO2 max, confirming its decline at the age of 22 years, compared to the average value of this index at the age of 21 years. So at the age of 21 RIOs corresponds to «mediocre ", and at the age of 22 years it is "below mediocre" , with the same level at the age of 23 years.

We have found out that all of the tested individuals in any age group showed "excellent" RIOs. Moreover, at the age of 21-23 years there is a less number of those whose RIOs corresponds to "good" and "mediocre", with an increased number of people with RIOs "below mediocre".

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The boundary of the transition from the healthy condition to the state of illness is the level that cannot compensate for the functional and biochemical changes in the body under the influence of negative factors.

"Safe" ("critical") level of health is determined by the relative index of VO2 max and is 42 ml • min^{-1} kg^{-1} for men. Taking into account this value, the results of our studies show that men at the age of 21 years have the level which is slightly higher than the "safe" one. And at the age of 22 years it corresponds to the "safe" level, and at the age of 23 years it is below that level.

Given the fact that the body's anaerobic capacity evaluation criteria are absent, we have carried out a comparative analysis of anaerobic (lactate) capacity of students at the age of 21, 22 and 23 years. In addition, anaerobic (lactate) capacity was analysed by comparing the value of MKZMR per 1 min of each testee with an average value, which according to A. Shögy, G. Cherebetin [21] corresponds to 38,1 kgm min^{-1} kg^{-1} for the persons of this age.

Analyzing the results of research, we have found the following: It is a common knowledge that one of the most important tasks of physical education in higher schools is to strengthen the health of students, as well as to further ensure an effective process of forming a sustained motivation of permanent employment by physical culture [6].

The youth, who enters higher educational establishment falls under the influence of unusual social factors related to the necessity of creative assimilation of a large ammount of information, due to the necessity of the formation of certain professional abilities and skills, as well as unusual conditions of the student's life. Junior students primarily feel certain discomfort. This phenomenon can be called " inadaptability" of young people to study at higher educational establishments" and is connected with the following reasons [15]: difference in methods and organization of studying in higher schools and a necessity in self-sufficiency for absorbing education information; the lack of well-established interpersonal relations, i.e. the group contact, which is typical of the new team at the stage of formation; the destruction of the old life patterns that prevailed during the years of study at school, and the formation of the new one, with new troubles while entering universities, connected with living in a hostel, separation from their parents, namely, independent budget, planning and organization of training and leisure time etc.

To overcome this discomfort a young person is required considerable of physical and mental forces. Classes in physical education are to compensate for the loss of these forces. They should become part of preparing students for future professional activity.

The necessity of enhancing the health of students is stressed by the fact that school leavers are physically and functionally ill-prepared to the requirements of physical education at higher schools[12]. While studying at the university there is also a trend towards the deterioration of the health of young people. We have found that 37% of the students have variations in the state of health, more than 20% of them are under clinical supervision [11], with a constantly growing number of special medical groups – from 5, 36% of freshmen to 14, and 46% of senior students [10].

According to the World Health Organization the concept of "health" is defined as a State of a complete comfort – physical, mental and social, not merely the absence of disease or physical defects. With the reference to the facts, mentioned above, physical health should be considered as a potential capacity that determines the direction of the change in the health, not only as a state of the body functions. Thus, one can perform not only qualitative, but also quantitative assessment of the health.

Given the fact that physical health caused by the level of aerobic and anaerobic capacity of the body, the research of the physical health was carried out by identifying indicators that characterize the aerobic and anaerobic (lactate) capacity of the body.

The main index of the aerobic capacity, as it is known, is the value of the maximum oxygen consumption ($VO_{2\ max}$). As we know, $VO_{2\ max}$ can be determined by using direct and indirect methods.

The main principle to determine $VO_{2\ max}$ directly is to perform the load of not less than two minutes long, with the intensity of an individual "critical power"(up to failure) Such load causes a maximum mobilizing system of the oxygen provision of the working muscles. A testee reaches a "critical power" usually during continuous operation or a series of discrete (discontinuous) loads of growing power. Physical exercises may be different: work on ergometer or on treadmill (tribal), climbing up a notch, specific physical exercises – running, swimming, rowing, etc. It is necessary to take into account that the value of VO2 max </b20 > depends on the volume of a muscle mass, which is involved when carrying out the research. So, if the work on ergometer is performed by hands, the value of $VO_{2\ max}$ will be slightly lower than that by feet, but when working on a treadmill it will be greater than when working on ergometer. This should be paid attention in case of dynamic observations for one and the same testees or when comparing the value of $VO_{2\ max}$ in different individuals. You can only compare values obtained using the same method.

One of the methodological problems in determining the $VO_{2\ max}$ is the reliability of achievement of an individual maximum level of oxygen consumption, which requires maximum mobilization of the functional capacity of the body. Therefore, an important factor in defining $VO_{2\ max}$ directly is a sufficient motivation of testees to muscular loads. Refusal from physical work is not always indicative of the workloads of "a critical capacity". Even in conditions of an appropriate motivation the phenomenon of "a critical capacity" in laboratory studies happens very rare. Athletes - of about 50% of cases, with ill-trained persons - seldom [4]. The absolute criterion for reaching the oxygen consumption at the level of $VO_{2\ max}$ is the phenomenon of "alignment" (leaving off), i.e. losses of the oxygen consumption dependence from the capacity of work. This phenomenon demonstrates the complete use of the reserves to mobilize the system of transporting and utilizing of oxygen that, in other words - about the maximum physical stress of the testee.

On the basis of the recommendations of leading experts, we have found out that the direct determination of $VO_{2\ max}$ provides continuous, graded growing power load on ergometer or on treadmill. The duration of each stage of power ranges from 2 to 5 min. You can also use a series of discrete loads. Then the duration of the work at each level of power should not be less than 5-6 min, rest intervals should be enough for recovery after the previous load. As we know, the procedure to determine $VO_{2\ max}$ is quite long and exhausting. In addition, local muscle fatigue occurs of lower limbs that makes sometimes stop working or reduce intensity.

Procedure of the direct determination of $VO_{2\ max}$ is dangerous to some extent. Analyzing the results of 170,000 tests, R. Rochmis and H. Blockburn [20] have discovered that the number of fatal accidents during testing can reach 0.01% of the studies.

So, despite high validity, direct methods of determination of $VO_{2\ max}$ also have some faults. One of them is that an accurate determining of the $VO_{2\ max}$ level greatly depends on the motivation of a tested to perform the work "up to failure". Not always a refusal from testing demonstrates exhausting of the body reserves, and in many cases it is connected with the local fatigue of the locomotive organs. The second disadvantage is the exhausting nature of the procedure. The third one is the absence of security guarantees for the health of a tested.

So, we have discovered that in case of the screening examination one should use indirect methods to determine $VO_{2\ max}$. They are based on the fact that there is a linear dependence between the value of the oxygen consumption and heart rate. Such connection allows us to find the dependence between them in the presence of the two points in the system of rectilinear coordinates, with the level of the oxygen consumption marked on the horizontal axis, and with the heart rate on the vertical axis. These points are to measure the heart rate on the two levels of physical activity after a "steady state". Therefore, the duration of the first and second loads should be not less than 5 min, with the heart rate measured at the end of work. $VO_{2\ max}$ is determined by linear extrapolation obtained between two points of a straight line to the value of the maximum pulse rate (heart rate $_{max}$), which is calculated by the formula: maximum heart rate $_{max}$ = 220 – T, where T is the age in years.

Another method of an indirect determination of $VO_{2\ max}$ is based on the presence of a close correlation between values of $VO_{2\ max}$ and physical capacity (PWC_{170}).

It is a common knowledge that the PWC_{170} is the power of the muscle in the heart rate, which corresponds to 170 beats min^{-1}. The heart rate of 170 beats min^{-1} describes the beginning of a zone of an optimal functioning of the cardio-respiratory system during physical activity. In addition, there is a linear dependence between power and the heart rate [8].

Thus, we can state that the heart rate of 170 beats min^{-1} is chosen to determine PWC_{170} on the basis of the fact that from the physiological point of view, it shows the beginning of an optimal zone of the cardio-respiratory system, and from the viewpoint of methodology – the beginning of a clear non-linear dependence on the capacity of muscle to work on the curve of a maximum heart rate.

The level of an aerobic capacity of the body depends on the age and gender. So, we have found out that one should evaluate an individual value of $VO_{2\ max}$ taking into account these factors. However, there is a close dependence of absolute indicators of $VO_{2\ max}$ from the body weight. In order to eliminate the influence of the body weight when evaluating an aerobic capacity, one usually uses not absolute, but relative indicators of $VO_{2\ max}$ in mL min^{-1} kg^{-1}. But there are no universally excepted assessment criteria of the aerobic capacity of the body according to a relative indicator of $VO_{2\ max}$. One of the reasons for the abovementioned discrepancies is the lack of standardization of methods to determine $VO_{2\ max.}$ It is connected with the examination of the heterogeneous population. We have found that the data suggested by different authors [11, 12, 16, 17] are somewhat different.

We have discovered that depending on the value of the given index scientists determine 4-6 levels of the maximum oxygen consumption and consider them to be the level of the aerobic capacity.

We have determined that the Y. P. Pyarnata's evaluation criteria of $VO_{2\ max}$ [14] similar to V. L. Karpmana's criteria [8], but they are applied to the younger groups at the age of10-11 years, so they should be used for research and assessment of the aerobic capacity of a young person.

Taking the above mentioned facts into consideration, on the basis of the comparative analysis we used Y.P. Pyarnata's criteria [14]to assess the aerobic capacity of the students at the age of 21-23 years according to the indicators of $VO_{2\ max\ rest.}$

We have discovered while studying at universities there is a necessity to correct the RFU and, in particular, the aerobic and anoxic (lactate) capacity of the body. We have determined that the results of some studies show the tendency to reduce the level of the latter along with an older age, especially of men, who are older than 19 years [7, 9].

The results of our studies also confirm the data suggested in the special literature as to the insufficient level of physical health of male students at the age of 21-23 years. So, the relative value of $VO_{2\ max}$, which quantitatively reflects the level of health of men at the age of 21 and 22 years is on the verge of "a safe level" of health, and at the age of 23 years it is below the safe level."

These facts indicate that higher educational establishments irrationally use all possibilities of physical education in solving the tasks of preparing students for employment. So, on the one hand, there exists a strong need to further develop and improve appropriate methods of organizing and conducting extracurricular classes in physical education. But on the other hand, there is a need for the scientific reasoning of new ways to improve the quality of physical education during class hours [2.18].

So, we have revealed that a weak point of the university studying is the methodical provision of physical education. The existing programs of physical training do not address the task of improving the physical health of students, as well as improving capacity to work in general [1, 5, 19]. It violates the basic principle of functioning of the system of physical education in higher schools, namely: the principle of health orientation. In our opinion, the deterioration of the health of students is connected with the fact that only junior students have classes in physical education in the majority of universities. Besides, one can observe a reduced number of academic hours in physical education. The results of our research indicate that there have been no significant changes of physical capability, aerobic and anaerobic (lactate) capacity of the body as well as the parameters of the motor skills of the students for 28 weeks of classes conducted on the basis of the programs being traditionally used in Ukrainian universities.

The above facts determine the necessity to apply and test the effectiveness of the developed programs (I-VII) of extracurricular classes in athletics, which are based on jogging loads with different modes of work of the body. In accordance with the scheme of study the programs are to become the core of the universal therapeutic technologies that one can use at any university provided one should meet certain requirements.

Conclusions.

Analysis of the results of the research involving students of universities allowed to make the following conclusions:

We have discovered methods and characteristics that are to be used in the process of studying the physical condition of university students (subsections 2.1 – 2.3). The research of the changes of the level of the aerobic capacity (RAC) of the body of students at the age of 21-23 years showed that according to the criteria suggested by Y. P. Pyârnata, male students at the age of 21year show "a mediocre level", with the level below it at the age of 22-23 years. We have found that the level of physical health according to the scale, suggested by G. L. Apanasenka, is reduced to a "safe" level at the age of 22 years reaching the level below the "safe" one at the age of 23 years. The level of the anaerobic capacity of men at the age of 21, 22 and 23 years is of no difference and is below an average one which according to A. Shögy, G. Cherebetin [21] is 38,1 kgm min^{-1} kg^{-1}.

Thus, we have confirmed that the aerobic and anaerobic capacity of young male students do not meet appropriate standards, therefore require correction. In the process of the research we have determined that such a correction will be the most effective in terms of development and implementation of health technologies, based on the use of jogging at extracurricular classes. Firstly, due to availability, simplicity and objectivity of dosage, jogging can serve as a universal remedy for effective impact on physical health. Secondly, the rational use of the jogging exercise can provide necessary influence both on the aerobic and anaerobic mechanisms.

On the basis of the experimental research and experience of the experts we have developed the programs for extracurricular classes (I-VII) with the use of jogging exercises that provide a substantial improvement in indicators of the physical health of students. According to the research scheme the basis of programs I, III, V is jogging exercises that develop the aerobic capacity and the basis of programs II, IV, VI, VII is exercises that mainly promote anaerobic and aerobic mechanisms. When we work out programs, we take into account the following factors: methodological principles of physical education, age and sexual features and health study, the functional readiness of the body to do physical exercises, the intensity of jogging loads, the mode of energy supply of jogging, the frequency and influence on the physical health. The peculiar features of the suggested programs for extracurricular classes are that the volume of physical activity was determined for each of the testee individually taking into account functional readiness of the body. Moreover, we have excluded a possibility of the overdose of physical work. We have found that the impact on the aerobic and anaerobic processes of the energy supply depends on the content of the classes, which is determined by the method of training as well as the intensity and volume of the work. The developed programs have become the basis to create the universal therapeutic technologies.

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