Physical performance and lipid composition of students’ blood in conditions of the Kola North

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Abstract. The effect of the experimental physical education program (twice a week) on the maximum oxygen consumption (MOC), blood lipid composition and motor tests of technical university students have been studied. The research was carried out four times during the academic year (in September, December, February and May). It was established that MOC significantly increased at all stages of the experiment, reaching its maximum in the spring term. The concentration of high density lipoproteins (HDL) statistically significantly increased in the fall and spring terms. The level of low density lipoproteins (LDL) decreased significantly throughout the research period. The level of total cholesterol (TC) decreased significantly in the spring term (by 9%). It can be concluded that training twice a week is effective for the development of aerobic performance and changing the lipid composition of the blood.

1. Introduction
As far as is known, the intellectual and psycho physiological load experienced by Northern students in the process of educational activity can be accompanied by tension, overstrain, and in some cases a breakdown of adaptation mechanisms [3], [5], [7]. Formal physical education classes are often ineffective. A program is needed where an optimal effect can be achieved with minimal time. It was found that aerobic exercise programs increase the MOC value relatively quickly [1], [2]. At the same time, to further increase it, it is necessary to increase constantly the frequency, duration, or intensity of training. In many cases, combined physical education training programs are more effective [1]. Such programs, as a rule, correct the lipid composition of blood, increasing the concentration of HDL, in some cases, the concentration of LDL and TC decreases [4], [6]. All positive changes in total reduce the risk of coronary heart disease.

2. Research purpose
The purpose of the research is to study the influence of a special program of students' physical education on aerobic performance, blood lipid composition and physical fitness.

3. Research methods and organization
The experiment involved 18 male students aged 18-19 years. The study was carried out four times during the school year: in September, December, February and May, according to a specially developed program based on the implementation of relatively short-term running programs. In September - October, the students were engaged in outdoor recreational running from aerobic mode to mixed and combined modes, in November - December, they were engaged in additional sports games and strength exercises. In April - May, classes were mainly held outdoors - jogging in combination with sports games.
To determine the MOC, the work was performed on the bicycle ergometer; the work was increased in power every 3 minutes by 50 watts to a maximum, with final 1-minute acceleration. Exhaled air samples were collected over the last 30 seconds at the end of each load, as well as during the final spurt. Venous blood samples were taken on an empty stomach. Physical fitness testing was conducted at the beginning and end of the academic year. The following tests were used to determine physical fitness: 1) long jump from a place, 2) bending of the body for 2 minutes, 3) pulling up on the bar, 4) Cooper test.

4. The results of the study and their discussion
During the fall and spring terms, the MOC increased significantly (by 13%), and, accordingly, (by 11%) during the examination session (ES) and vacations. From blood biochemical parameters, HDL concentration increased significantly in the fall and spring terms (p <0.05) and decreased insignificantly during ES and holidays. A significant decrease in LDL was observed throughout the experiment, reaching its maximum in May. The concentration of TC during the academic year was within the normal range and decreased insignificantly during ES and holidays. A significant decrease in TC was noted in May (by 10%) (table 1).

It is known from the literature that training of a predominantly aerobic nature leads to positive changes in the lipid composition of the blood [2]. This study noted an increase in HDL, a decrease in LDL, TC, and an increase in MOC. This dynamics of the above indicators is a criterion for preventing the development of cardiovascular diseases [6]. The results of students' physical fitness are presented in table 2. As can be seen from the table, statistically reliable results were noted only in the test “bending the torso”.

5. Conclusion
Our proposed methods for conducting physical education classes were effective in terms of increasing MOC and positive dynamics of the lipid composition of the blood during the academic year. An increase in the level of HDL, a decrease in LDL TC, throughout the entire period of the experiment, is a criterion for a reduced risk of coronary atherosclerosis.

Table 1. Aerobic performance and blood lipid composition of students at the stages of the experiment (X±m, n=18)

| Indicator          | September   | December   | February  | May     |
|--------------------|-------------|------------|-----------|---------|
| Age, years         | 18,5±0,2    |            |           |         |
| Height, sm         | 174,1±0,7   |            |           |         |
| Weight, kg         | 67,5±0,8    | 66±0,4     | 67,4±0,3  | 68,4±0,7|
| MOC, ml/min/kg     | 44,4±0,9    | 49,2±1,0** | 47,7±1,2* | 50,2±1,1**|
| Cholesterol, mmol/l| 4,65±0,09   | 4,63±0,11  | 4,62±0,09 | 4,17±0,09*|
| HDL, mmol/l        | 1,39±0,04   | 1,55±0,05** | 1,38±0,02 | 1,44±0,07*|
| LDL, mmol/l        | 2,70±0,05   | 2,30±0,05* | 2,20±0,03* | 2,10±0,02**|
| P<0,05*, P<0,01*   |             |            |           |         |

Table 2. Indicators of physical fitness of students at the research stages (X±m, n=18)

| Indicator                              | September   | May       |
|----------------------------------------|-------------|-----------|
| Standing long jump, m                  | 1,84±0,03   | 1,86±0,02 |
| Bending the torso within 2 min, number | 43,5±1,4    | 48,5±0,04*|
| of times                               |             |           |
Pull-up, number of times

|                | Value 1 | Value 2 |
|----------------|---------|---------|
| Cooper test    | 2330±32.3 | 2340±30.2 |
| P<0.01*        |         |         |

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