ORIGINAL ARTICLE

Interrelation of students' motor activity and physical state as a basis for determining individual health-improving motor regimen

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ABSTRACT

Aim: To investigate the interrelation between motor activity and the physical state of students.

Materials and Methods: The research, which was conducted in 2023-2024, involved 168 students (86 girls and 82 boys) aged 17-18. The following indicators were studied: motor activity indicator according to the Framingham method, body mass index, Rufier index, body balance index using the Romberg test, speed index, indicator of speed and strength abilities, agility indicator, strength indicator, strength endurance indicator, flexibility indicator, endurance indicator.

Results: The dependence of morphological and functional indicators and indicators of physical development of the student's body on the level of weekly motor activity, including the amount of time spent directly on physical exercises, has been established. It has been found that the Rufier index has the strongest correlation relationship with motor activity, and therefore can be considered an informative indicator of the physical state of young people.

Conclusions: The interrelation of a high level of students' motor activity with the level of physical state as well as morphological and functional indicators of their body development has been established. The identified correlation relationships can form the basis for planning the nature and direction of the content of motor loads in the process of students' physical exercises by gender.

KEY WORDS: motor activity, students, physical state, physical development, morphological and functional indicators

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INTRODUCTION

The level of health and motor activity of young people as components of their physical state are among the most important criteria for assessing the development potential of modern society and indicators of the cultural character formedness in the individual. Harmonious personality development is ensured by adequate motor activity, which is one of the main factors determining the level of health of the population. Insufficient motor activity reduces the possibility of maintaining health, is a factor in the emergence and development of somatic diseases, and causes a low level of students' motor abilities [1, 2]. The ineffective modern organization of physical education in higher educational institutions leads to a decrease in motivation to exercise and, as a result, a decrease in the motor activity of students. These problems are the object of constant attention of many scientists [3].

The analysis of scientific research in pedagogical and biomedical fields shows that most scientists focus on the general problems of motor activity of the population, its importance for the full physical development and health of children and youth, its quantitative age norms, and qualitative content [4]. According to the WHO, the weekly norm of motor activity for a person aged 17 to 64 should be at least 150 minutes of moderate-intensity aerobic physical loads, or at least 75 minutes of high-intensity aerobic physical loads, or an equivalent combination of moderate and high-intensity motor activities [5]. According to the scientists, a person should take an average of 10,000 steps per day [6]. However, these norms of motor activity are average and do not take into account the age and individual characteristics of those who exercise. Given that the norm of motor activity of modern youth is considered to be a value that fully satisfies the biological needs for movement and is adequate to the functional capabilities of the body, health status, and motor abilities of those who exercise, one of the prerequisites for determining an individual norm is to determine the interrelation between motor activity and the physical state of student youth.

AIM

The aim is to investigate the interrelation between motor activity and the physical state of students.

MATERIALS AND METHODS

Students aged 17-18 from Ukrainian State Dragomanov University, Drohobych Ivan Franko State Pedagogical University, and Berdyansk State Pedagogical University, totaling 168 people (86 girls and 82 boys) were involved in the research.

Research methods: theoretical analysis and generalization of literary sources, medical and biological methods, and correlation analysis. The theoretical analysis and generalization of literary sources were used to investigate the current state of the problem under study and to systematize and generalize the information obtained as a result of the research. 20 sources from the scientometric databases PubMed, Scopus, Web of Science Core Collection, and others were analyzed. Medical and biological methods were used to determine the morphological and functional as well as physical development indicators of students. The following indicators were studied: motor activity indicator according to the Framingham method (high level, hours per week); body mass index, which characterizes the features of a person's physique and allows to assess physical development (kg/m); Rufier index to assess the functional state of the cardiovascular system of students (points); body balance index using the Romberg test (s); speed index for overcoming a distance of 30 m (s); indicator of speed and strength abilities based on the results of a long jump from a standing position (cm), agility indicator by results of 4x9 m shuttle run (s), strength abilities indicator based on the following tests: for girls – push-ups (times), for boys – pull-ups (times), strength endurance indicator in lifting the torso to the sitting position for 1 min (times); flexibility indicator in tilting the torso forward from the sitting position (cm), endurance indicator based on the results of 12 min of distance swimming (m). Statistical methods made it possible to determine the interrelation between the level of motor activity and indicators of students' physical state. For this purpose, the linear Pearson correlation coefficient was used.

The process of conducting this research is based on the relevant ethical rules. First of all, this research complies with the provisions of the Declaration of Helsinki of the World Medical Association. In addition, our research received the consent of the Ethical Committees of the Ukrainian State Dragomanov University, Drohobych Ivan Franko State Pedagogical University, and Berdyansk State Pedagogical University. After that, the participants were informed about the aim and objectives of the research. They were also informed that participation in the research was voluntary, and they had the right to withdraw at any time.

RESULTS

To study the interrelation between the level of motor activity and indicators of the physical state of students' organism, a linear correlation analysis was conducted using the Pearson method, which established the existence of a dependence of the level of indicators of the physical state of students aged 17-18 on the level of their motor activity. At the same time, only the volume of its high level, i.e. the time directly spent on physical exercises, was considered as an indicator of motor activity.

During the correlation analysis in girls, a direct interrelation between motor activity and the following indicators of physical state was established: endurance indicator ($r = 0.60$ at $p \leq 0.05$), arm strength indicator ($r = 0.64$ at $p \leq 0.05$), strength endurance indicator ($r = 0.65$ at $p \leq 0.05$), speed and strength qualities ($r = 0.45$ at $p \leq 0.05$), and balance ($r = 0.52$ at $p \leq 0.05$). Also the inverse correlation coefficients between the level of motor activity and the Rufier index ($r = -0,79$ at $p \leq 0,05$) were established in girls (Fig. 1).

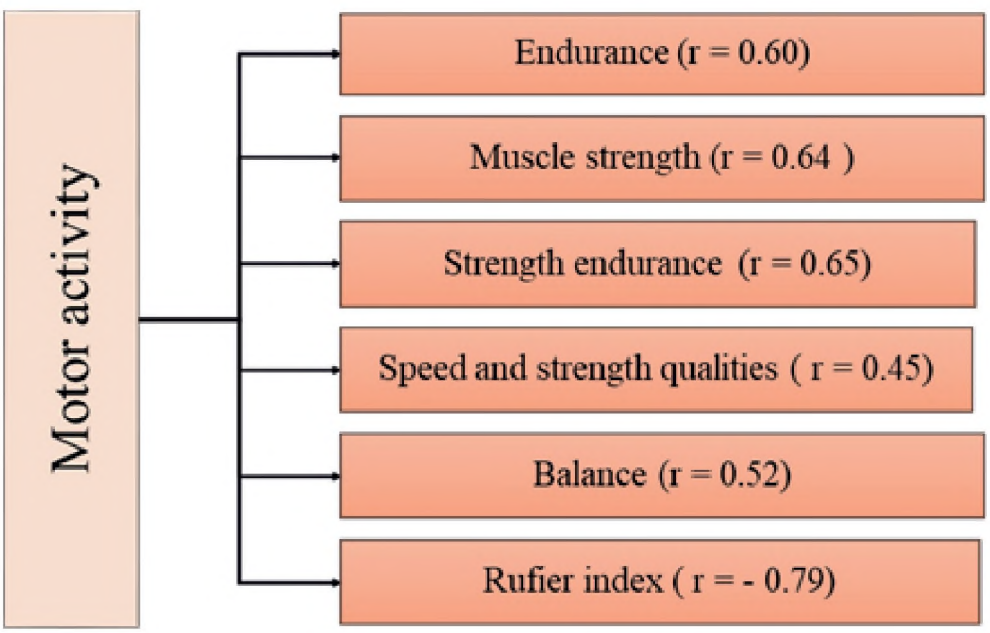

Fig. 1. Dependence of indicators of the physical state of 17-18-year-old female students on the amount of weekly motor activity.

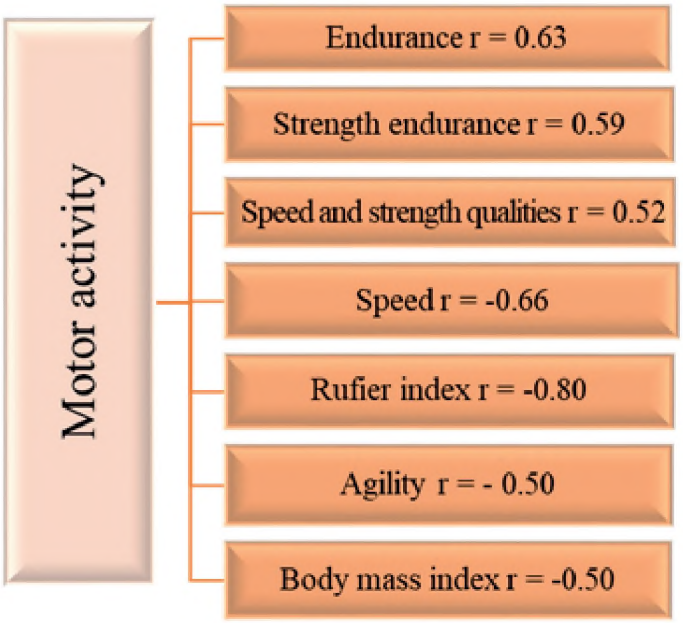

Fig. 2. Dependence of indicators of the physical state of 17-18-year-old male students on the amount of weekly motor activity.

At the same time, it was found out that the level of motor activity in boys has correlation relationships with indicators of endurance ($r = 0.63$ at $p \leq 0.05$), strength endurance ($r = 0.59$ at $p < 0.05$), speed and strength qualities ($r = 0.52$ at $p \leq 0.05$). The inverse correlation coefficients between motor activity and indicators of speed ($r = -0.66$ at $p \leq 0.05$), Rufier index ($r = -0.80$ at $p \leq 0.05$), agility ($r = -0.50$ at $p \leq 0.05$), and body mass index ($r = -0.50$ at $p \leq 0.05$) were established (Fig. 2).

The study found that the Rufier index, which characterizes the level of functional reserve of the heart and the body's adaptation to physical loads, has the strongest correlation relationship of all the parameters studied with the level of motor activity of students (girls and boys) aged 17-18. Given this, the level of Rufier index can be the basis for determining the individual level of students' weekly motor activity. Other correlation relationships between the level of motor activity and the physical state of students can form the basis for planning the nature and focus of the content of motor activity in the process of physical education by gender.

DISCUSSION

The analysis of scientific works [7] indicates that almost 60 % of the population lead a sedentary lifestyle and have a low level of motor activity under physiological norms. Recently, there has been a downward trend in the health indicators of student youth, which is due to the discrepancy between the amount of their motor activity and the biological needs of the body. This is one of the main reasons for the disruption of the musculoskeletal system, a decrease in the functional resources of the body, the emergence of somatic disorders, a slowdown in metabolic processes, and a deterioration in the psycho-emotional state. Analyzing the state of health of students, several authors emphasize the problem of deterioration of their physical state [8]. Scientists define physical state as the compliance of the body's vital signs with age and sex norms. One of the most important factors in improving the physical state of students is their dynamic motor activity, the volume and intensity of which corresponds to the individual capabilities of those who are engaged. Scientists [9] argue that the physical state of modern youth depends on the lifestyle and proper organization of motor activity by almost 50 %. After all, motor activity is an important component of everyone's life, which contributes to a healthy lifestyle and has a positive impact on the overall level of well-being, disease prevention, reducing the impact of bad habits on the body, the number of antisocial manifestations, and depression [7]. According to scientists [10], a decrease in the amount of motor activity of students negatively affects their physical development, physical fitness, and functional state, which makes it especially important to preserve and improve the health of student youth.

According to experts [11], a certain "dose" of motor activity is necessary for the normal functioning of the human body and the preservation of health. There is a certain optimal level of motor activity that has the most favorable effect. It is noted that the optimal load is individual. It should take into account the peculiarities of life-sustaining activity, physical state, and individual capabilities [12]. The norm of motor activity of students of higher educational institutions can be considered a value that fully satisfies the biological needs for movement, meets the functional capabilities of the body, and promotes its development, physical fitness, and health. In the scientific literature and physical education programs, the optimal amount of motor activity for students is 12-14 hours per week with sufficient physiological load [13]. At the same time, the analysis of scientific works [14] shows that the norm of motor activity of

students is up to 8-10 hours per week. Studies [15] indicate that only 18 % of students adhere to the recommended amount of motor activity. Scientists [16] note that 32.4 % of girls and 38.5 % of boys have a minimum amount of weekly motor activity among students. Studies [2] have found that 2 hours of weekly motor activity do not have an effective impact on the health and physical fitness of modern youth. To improve physical state, the optimal amount of motor activity is 6-10 hours per week.

The standards of motor fitness, the implementation of which is conditioned by the optimal and economical level of functioning of the main body systems (cardiovascular, respiratory, neuromuscular), as well as metabolic processes, correspond to a high level of physical state. To achieve this, it is necessary to develop an individual regimen of specially organized motor activity [17]. An optimal motor regimen is the most important condition for a healthy lifestyle. It is based on systematic physical exercises; their main tasks are to strengthen and preserve health, develop physical abilities, and motor skills of young people, and strengthen the prevention of adverse age-related changes [18].

An individually selected motor regimen that involves rational planning of the amount and intensity of physical loads can not only improve physical state indicators, but also effectively resist the endless flow of stress, anxiety, and depression that are characteristic of the present time. Exercise can act as a kind of protective barrier that reduces tension and stress in everyday life, and has a positive effect on improving mood and the overall physical and psychological state of a person [19]. The age aspect is important when determining a motor regimen aimed at improving physical state. Each age period has certain features: the nature of metabolism; the predominant type of autonomic nervous regulation; the speed of inclusion in the load and recovery after it; features of the immune system functioning; mental status; dominant needs and interests [20].

An individual motor regimen should be based on expediency and health benefits, so it is necessary to focus on the indicators that most closely correlate with the level of motor activity. It is important not only to know how much you need to move and perform locomotion during the week but also what kind of exercises to do and what level of physical state you need to achieve. This requires determining the focus of exercise and the parameters of physical loads.

CONCLUSIONS

In the course of the research, the dependence of the level of morphological and functional indicators and indicators of physical development of 17-18-year-old students on the amount of their motor activity has been established. It has been determined that the Rufier index, which characterizes the level of functional reserve of the heart and the body's adaptation to physical loads, has the strongest correlation relationship with the level of motor activity of girls and boys aged 17-18 years of all studied parameters. Given this, the level of the Rufier index can be the basis for determining the individual level of weekly motor activity of students. Other correlation relationships between the level of motor activity and motor performance of students can form the basis for planning the nature and focus of the content of motor activity in the process of physical education by gender.

Prospects for further research are in the development of a methodology for determining the individual motor regimen of students aged 17-18 in the process of their physical education.

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CONFLICT OF INTEREST
The Authors declare no conflict of interest

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