



Optimization of physical education classes using artificial intelligence for students of SMG

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Abstract

Objective of the study was to exploration of the potential for employing artificial intelligence to tailor physical education lessons for students in a specialized medical group, and the evaluation of the impact of this approach on the educational experience within the university.

Methods and structure of the study. The research work was conducted in two distinct phases. In the initial phase, which commenced in early 2023, an AI-based model was created. This model was employed to evaluate physical abilities and create personalized physical education plans for students in a special medical group at the Tomsk State University. The model is based on a multimodal neural network, specifically Generative Pretrained Transformer 4o.

Results and conclusions. The potential of AI in tailoring physical education lessons for students with specific medical conditions has been explored, and the success of its implementation in the university's curriculum has been evaluated. The use of AI has been shown to be highly effective in personalizing lessons for students with special medical needs. By considering the unique characteristics of each student's illness and physical abilities, AI has helped to enhance physical performance, reduce the frequency of disease flare-ups, and increase student satisfaction with their lessons.

Keywords: *students, special medical group, physical education, artificial intelligence.*

Introduction. Physical education occupies a central place in the comprehensive rehabilitation of students with health problems [1, 2]. An individual approach to physical education classes for this category of students is most important, as it allows taking into account the specifics of their diseases, limitations and physical capabilities [3, 6].

Recently, artificial intelligence (AI) systems have been widely introduced into all areas of human activity, including physical education [5]. AI systems allow analyzing students' physical data, such as heart rate, speed and endurance, and some others, in order to quickly and efficiently create personalized training programs adapted to their individual needs and goals. AI can continuously monitor students' progress by analyzing their performance indicators and providing feedback in real time. AI can be used to analyze stu-

dents' exercise technique and provide personalized instructions for their improvement [4].

Thus, the use of artificial intelligence has great potential for optimizing the process of individualization of physical education, including for students of a special medical group.

Objective of the study was to exploration of the potential for employing artificial intelligence to tailor physical education lessons for students in a specialized medical group, and the evaluation of the impact of this approach on the educational experience within the university.

Methods and structure of the study. The research was carried out in two main stages. At the first stage, in early 2023, a model for working with AI was developed, which was used to assess physical capabilities and draw up individual physical education les-



son plans for students of a special medical group at universities of the Big University of Tomsk.

The model was constructed based on the multi-modal neural network Generative Pre-trained Transformer 4o (GPT-4o, OpenAI, USA). The following information about the student served as the initial indicators for building the model: gender, age, body weight, height, resting heart rate, resting blood pressure (systolic/diastolic), existing diagnoses (indicating the severity/stage of the disease). The system was trained by loading sets of individualized exercise therapy programs for various diseases into it, as well as by loading reviews of the program options proposed by the neural network. The formulation of queries to the neural network was processed using the method of repeated queries indicating the required frequency and duration of classes. The working version was implemented as a virtual assistant (chat bot), which, upon request with the input parameters, offered a version of the program of classes. At the same time, the final decision on the use of the results in practical activities was made by specialists to exclude the possibility of harm to the health of students.

At the second stage, an experimental study was conducted with the participation of 60 students of a special medical group. The students were divided into two groups: the experimental group (40 students), for which individual physical education lesson plans were used, compiled using the author's model of working with AI, and the control group (20 students), which continued physical education classes according to the standard scheme for a particular university.

The results and effects of using the model were assessed by the following indicators:

- Improvement in physical performance (strength, flexibility, coordination) indicators were recorded using dynamometry and flexibility and coordination tests (tilt from a standing position on a bench, static balance);
- Reduction in the frequency of exacerbations of diseases (recording of symptoms and absences due to illness);
- Increasing student satisfaction with physical education classes (survey).

Statistical data processing was carried out using the GraphPad Prism 9.3.1 program (academic license No. 1531155, valid until December 16, 2024).

Results of the study and discussion.

Improvement of physical performance

According to the results of the study, the experimental group showed a significant improvement in physical performance for all measured indicators (Table 1). Thus, strength increased by 15,3%, flexibility by 17,6%, coordination by 14,2%. In the control group, the improvement in physical performance was insignificant and did not reach statistical significance.

Reduction in the frequency of exacerbations of diseases

In the experimental group, a decrease in the frequency of exacerbations of diseases was observed (Table 2). Thus, the number of exacerbations of diseases per year decreased by 30%. In the control group, the decrease in the frequency of exacerbations of diseases was less pronounced and did not reach statistically significant indicators.

Increasing student satisfaction with physical education classes

The results of the study showed that the students in the experimental group were more satisfied with physical education classes compared to the students in the control group. Thus, the level of satisfaction with classes increased by 16% in the experimental group and by 8% in the control group. The students in the experimental group left positive emotionally charged reviews in the questionnaires, which will be further studied using the content analysis method.

The results of the study demonstrate the effectiveness of using AI to implement an individual approach to physical education classes for students in a special medical group. The use of AI made it possible to take into account the specifics of diseases and physical capabilities of each student, which contributed to improving physical performance, reducing the frequency of exacerbations of diseases and increasing student satisfaction with classes.

In our opinion, the use of AI in physical education opens up a number of opportunities for optimizing the educational process:

Table 1. Change in physical performance

Indicators	Increase in experimental group, %	Increase in control group, %
Strength	15,3	7,1
Flexibility	17,6	8,3
Coordination	14.2	6,4



Table 2. Change in the frequency of exacerbations of diseases

Groups	Number of exacerbations before the study	Number of exacerbations after the study
Experimental	1,2 ± 0.4	0.8 ± 0,3*
Control	1.3 ± 0.5	1.1 ± 0.4

* – Significance of differences between groups, $p < 0,05$.

- Individualization of classes: AI will allow you to create personalized physical exercise programs adapted to the specific needs and limitations of each student.

- Taking into account the dynamics of health: AI models will allow you to track changes in students' health and make adjustments to physical education lesson plans.

- Progress monitoring: AI will help monitor students' progress and identify deviations from individual plans in a timely manner.

- Increased motivation: Personalized study programs and progress tracking can increase student motivation and make classes more interesting.

Conclusions. The use of artificial intelligence is a promising direction in the individualization of physical activities for students of a special medical group. The model of working with AI proposed in the study allows taking into account the specifics of diseases and physical capabilities of each student, which leads to improved physical performance, a decrease in the frequency of exacerbations of diseases and an increase in satisfaction with classes. The integration of AI into the educational process in physical education can significantly increase its effectiveness and become an important tool for maintaining the health and physical well-being of students with health problems.

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