Enhancing athletic gymnastics training through the use of artificial intelli-gence

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Abstract

Objective of the study was to assess the efficacy of AI-powered programs in amateur athletic gymnastics training.

Methods and structure of the study. The research was conducted at the FIFTY GIM fitness center in Moscow. The participants were a woman and a man in their middle age, who regularly engaged in physical exercises. To evaluate the performance of AI-based programs, we proposed the following metrics: body weight and muscle mass were measured using the Omron BF-508 body composi-tion monitor; heart rate and blood pressure were assessed using the Omron auto-matic tonometer; emotional state was evaluated using the SAN method.

Results and conclusions. During the research, as part of the training with a coach, the indicators of muscle mass increased gradually, unlike when training with AI. The indicator of total body weight also changed in a similar manner. The changes in men's indicators were not as rapid. We can say that no significant changes were observed during the study. However, in his opinion, he preferred classes with AI.

Despite the sophistication of the software, human expertise remains crucial when designing physical education classes in sports. Perhaps a combination of both approaches would be the ideal solution. An experienced professional coach could use AI to clarify certain aspects.

Keywords: *physical education, athletic gymnastics, artificial intelligence, training process, trainer, optimization.*

Introduction. Artificial intelligence (AI) is one of the most innovative and promising technologies that finds application in various spheres of life. Physical education and sports are no exception [3, 4].

In recent years, people have become more interested in their health, physical fitness and functional training, as well as ways to regulate them. With the development of artificial intelligence technologies, these areas of physical education and health activities have received a new impetus. Modern technologies based on artificial intelligence make it possible to use accumulated volumes of data and, based on them, issue training program options, as well as methods and ways to achieve the necessary goals [2, 6].

Some modern athletes and coaches are focused on using AI to optimize training loads and achieve maximum results [5, 7].

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Results of the study and discussion. AI has the ability to process and analyze large amounts of data. In physical education and sports, this can be used to

analyze statistical data, biometric measurements, and other parameters related to training and the condition of the athlete. Machine learning algorithms can identify patterns and trends in this data, which can help coaches optimize training programs and strategies.

Thanks to AI, training programs can become more personalized. Analysis of data about the athlete, his physical condition, preferences, problems, and needs makes it possible to develop an optimal training program. This allows for an individual and balanced load that takes into account the level of preparation and the set final goals.

AI can also be used to model and simulate game situations in sports. Athletes can train in virtual reality or augmented reality. To improve their skills, make quick decisions, and respond to a changing game environment, various game situations can be modeled and repeated if necessary. AI can greatly improve the ability of coaches and analysts to make informed decisions. Algorithms analyze a large amount of data about matches, training sessions, and opponents.

Professional coaches know how to motivate and support athletes throughout the training session. They provide feedback and help create a positive emotional environment, which can increase motivation and determination in those involved.

When considering AI, you can ask a question to any of the currently popular GPT chats. Any request would have been answered, but it was decided to use a more professional approach and choose a specialized application.

A number of sports apps were considered. Fitbod was the preferred one. This program uses machine learning algorithms to create customized workouts in the gym. It specifies goals, preferences, and level of physical fitness. As a result, the application creates an optimal training plan that takes into account all of the above. The subjects were a man who had been training with a professional trainer at a fitness club for over a year, and a woman who had been training with a personal trainer for a year and a half. They were asked to adjust their training program over two months. The first month was devoted to a training program using Fitbod, and the second month - with a trainer. The content of the training sessions was compiled in both cases based on the approaches of L.S. Dvorkin [1]. The difference was in the ability of the AI to take into account various indicators of the physical condition of the trainees. Throughout the study, the necessary measurements (body weight and muscle mass, heart rate (HR) and blood pressure (BP), emotional state (ES)) were recorded. Training sessions were held twice a week. The training program for the participants in the experiment, compiled with the help of AI, assumed the improvement of functional abilities, increased endurance, strength and flexibility. This direction is characteristic of functional training, which indicates the similarity of approaches with the methodology proposed by L.S. Dvorkin. The results obtained after two months of training are presented in Table 1.

Analyzing the woman's results, we can conclude that training with a trainer is more effective. Muscle mass growth is noted, but judging by the heart rate, it is more intense and energy-consuming.

The man's results indicate the opposite pattern. Preference was given to the program with AI. Muscle mass growth and a decrease in the overall body mass index were noted.

In general, we can conclude that if we take into account the opinion of amateurs, it is contradictory. As a result of the study, the man gave preference to training with AI. He noted that the training was more varied and less intense. The woman, on the contrary, made her choice to train with an individual trainer. She noted the need for eye contact and the importance of the communicative component for understanding the correctness of the exercises, as well as a positive emotional mood.

For a more detailed examination of the changes in the studied indicators, the results were noted for each

Table 1. Dynamics of the studied indicators

Those involved		Weight, kg	Muscle mass, %	BP, mm Hg		Heart rate, beats/min	ES, conl. units.
				Syst.	Diast.		
Woman	1 month	50,5±1,2	46,1±0,8	112±0,4	73±1,1	76±0,8	4,1±0,6
	2 months	49,4±0,5	43,5±0,9	120±0,6	75±1,3	81±1,1	5±0,4
Man	1 month	73,8±2,1	54,1±1,1	117±0,7	83±1,9	74±0,9	4,6±0,4
	2 months	74,5±1,8	52,5±0,8	120±0,9	79±2,1	72±0,8	4,5±0,5

Table 2. Changes in body weight of subjects during the study

Training	Woman				Man			
	Weight, kg		Muscle mass, %		Weight, kg		Muscle mass, %	
	1 month	2 months	1 month	2 months	1 month	2 months	1 month	2 months
1	50	48,5	47	43	74	75,6	54	50
2	50	48,9	47	43	74,3	75	54	53
3	51,2	50	46	40	73	75,1	54	53
4	51,2	49,5	46,5	40	73,6	74,9	54	53
5	51	49,5	46,5	43	74	74	54	53
6	51	49	46	45	74	74,2	54	53
7	50	50	45	47	74	74	54	53
8	49,8	50	45	47	74	74	54	54

training session. The results obtained are presented in Table 2.

Table 2 clearly shows that during the study, muscle mass indicators gradually increase in the context of training with a trainer, in contrast to training with AI. The total body mass indicator changes in a similar way. The indicators for the man do not change as quickly. And it can be said that significant changes cannot be noted during the study. Although, taking into account his opinion, he preferred training with AI.

Conclusions. The conducted research demonstrates that the final decision on whether to use a professional trainer or artificial intelligence depends on the personal preferences of the person involved, the availability of resources and goals. Despite the perfection of software, human qualities remain a priority when organizing physical education classes in sports. Perhaps the only and correct option will be a symbiosis of both approaches. When an experienced professional trainer will use artificial intelligence to clarify some issues.

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