will allow finding the best combination of the supportless and supporting phases of the stroke, and on the other hand, will create conditions for the most efficient stroke structure.

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FUNCTIONAL AND PHYSICAL FITNESS OF HIGHLY QUALIFIED SWIMMERS IN TERMS OF THE ANNUAL VOLUME OF TRAINING LOADS

The article presents the results of the research, on the basis of which there has been revealed a correlation between the main indicators reflecting the functional and physical fitness of highly qualified swimmers with the amount of training work performed in different intensity zones. The obtained data can contribute to the timely correction of the volume and intensity of training loads and, as a result, to the rational management of the process of sports training of highly qualified swimmers.

Currently, the study of improving the level of physical and functional fitness of athletes as well as the search for effective ratios of the volume and intensity of training loads do not lose their relevance. At the same time, further rationalization and improvement of the sports training system is required, with the help of which it is possible to ensure the growth of sports results.

Experts note that effective management of the process of sports training can be carried out only if there is feedback from the controlled object, due to the study of various aspects of the athlete's fitness (physical, functional, technical and others), which will make it possible to make timely corrections in the training plan [1].

The level of athletic performance in many sports can be determined by the capacity of aerobic and anaerobic sources of energy supply for muscle activity, which characterize the energy capabilities of a person. When performing physical exercises, three main energy systems are involved: oxidative, glycolytic, and alactate, while the contribution of the above sources in performing various cyclic exercises is not the same [2; 3].

For dosing training work throughout the entire macrocycle, specialists [4; 5] have divided the training loads of swimmers into 5 intensity zones that have certain physiological boundaries and pedagogical criteria and affect a particular energy system of the body. The practical experience of our activity shows that often, a number of factors can lead to disruption of adaptive mechanisms, deterioration of the functional state and, as a result, a decrease in athletic performance, including the lack of control and consideration of training work in different intensity zones, as well as the desire to increase the volume and intensity of training loads that do not correspond to the current the state of the athlete's body [6].

It should be noted that improving the effectiveness of managing the process of sports training can be due to taking into account those indicators that are most susceptible to changes as a result of performing training work of various directions. Based on this, an important role in the rational management of the sports training process will be assigned to the search and determination of relationships between the volume of work performed in various energy supply zones, functional indicators and results of pedagogical testing, the dynamics of which may reflect the success of the athlete's body's adaptation to the training loads presented [7].

The purpose of the study was to determine the relationship between the volume of training work of swimmers performed in various intensity zones with physical fitness and the main indicators reflecting the functional state of the external respiration system and gas exchange of athletes.

Research methods and organization.

15 highly qualified swimmers (8 men and 7 women) with the titles of "Master of Sports" and "Master of Sports of international class" took part in an experiment conducted on the basis of the research laboratory of Olympic Sports of the Faculty of Physical Culture of the Higher Educational Institution "Francisk Skorina Gomel State University".

To assess functional fitness, we used a test with a stepwise increasing load on an ergometer with registration of the main parameters of gas exchange and external respiration using a portable ergospyrometer "Cortex MetaMax 3B". We recorded the following parameters: heart rate at the anaerobic metabolic threshold (HR (AT), bpm), oxygen consumption at the anaerobic metabolic threshold (VO_2 (AT), ml/kg/min), maximum oxygen consumption (VO_2 max, ml/kg/min), maximum carbon dioxide release (VCO_2 max, ml/kg/min), maximum lactate concentration (La max, mmol/l) and maximum heart rate (HR max, bpm).

The amount of training work performed by athletes in different intensity zones was determined based on the analysis of training plans and diaries of athletes.

To study the special physical fitness of swimmers we used a number of pedagogical tests that allow us to assess the fitness of athletes in different intensity zones: 2000 m, 10x100 m, 4x50 m, 25 m.

The relationship between the volume and intensity of training loads and the functional and physical fitness of highly qualified swimmers was determined based on the calculation of the Bravais-Pearson correlation coefficient. In order to identify the tightness of the relationship between the studied indicators, we used the following generally accepted ranges of values: strong statistical relationship (r=0,7–0,99), average statistical relationship (r=0,5–0,69), weak statistical relationship (r=0,2–0,49), very weak statistical relationship (r=0,19–0,09). At the same time, the "+" or "–" sign reflects the direction of the relationship, when, respectively, there is a direct (positive) relationship

(when an increase in one indicator causes an improvement in another) or an inverse (negative) relationship (when an increase in one indicator is associated with a decrease in another) [8].

Research results and discussion.

Our study made it possible to establish the close relationship of indicators reflecting the functional and physical fitness of swimmers with the amount of load performed in different intensity zones (table 1).

Table 1 – Correlation of the volume and intensity of training loads with indicators reflecting the functional and physical fitness of highly qualified swimmers

	1 zone	**2 zone**	**3 zone**	**4 zone**	**5 zone**
HR (AT)	0,507	0,875	0,489	0,257	0,158
VO_2 (AT)	0,209	0,429	0,633	0,163	0,118
VO_2 max	-0,092	0,285	0,612	0,416	0,251
VCO_2 max	-0,166	0,103	0,377	0,817	0,463
La max	-0,199	-0,176	0,186	0,797	0,654
HR max	0,242	0,563	0,346	0,765	0,649
2000 m	-0,355	-0,758	-0,417	-0,396	-0,151
10x100 m	-0,197	-0,366	-0,625	-0,324	-0,254
4x50 m	-0,142	-0,379	-0,363	-0,688	-0,423
25 m	-0,112	-0,426	-0,411	-0,427	-0,513

Intensity zone 1 (aerobic recovery zone or aerobic threshold) is characterized by a low speed and longtime of work due to the complete utilization of lactate by slow muscle fibers (blood concentration of 2 mmol/l). Loads in this intensity zone are applied to a large extent during the preparation period, while at other stages of preparation their volume decreases, and they are used mainly as a means of recovery.

Our correlation analysis of the studied indicators with the amount of work performed in 1 intensity zone showed that there was no reliable statistical relationship between all the studied indicators, with the exception of the HR (AT) indicator, where an average relationship was noted (r=0,507). This may indicate that working in this zone can be used to increase the threshold of anaerobic metabolism mainly in athletes with a low level of aerobic capabilities and low qualifications, which is confirmed by the results of studies by other authors [9].

A weak positive statistical relationship of swimming volume in zone 1 was recorded with the indicators VO_2 (AT) and HR max (r=0,209 and r=0,242, respectively), while a very weak negative relationship was noted with the rest of the studied indicators: VO_2 max (r=-0,092), VCO_2 max (r=-0,166), La max (r=-0,199).

At the same time, the correlation analysis of the results of pedagogical testing with the volume of work performed in 1 intensity zone showed a weak negative relationship in the 2000 m test (r=-0,355), as well as a very weak negative relationship in the 10x100 m (r=-0,197), 4x50 m (r=-0,142) and 25 m (r=-0,112).

Based on the obtained data, it can be stated that the performance of training tasks in this intensity zone in the practical aspect should be regarded more as recovery work, during which the lactate concentration will not exceed 2 mmol/l, while significant changes in the indicators reflecting the functional state of the athletes' body will not be observed.

The aerobic development zone, or anaerobic threshold zone (zone 2), which is widely used to increase the aerobic performance of the cardiovascular system of the athlete's body, is mainly used for the development of general endurance (lactate concentration up to 4 mmol/l).

As can be seen from the data presented in the table, the volume of aerobic-developmental loads performed has a strong correlation with the HR (AT) indicator (r=0,875), as well as an average

relationship with the HR max indicator (r=0,563). The revealed closeness of the relationship between the volume of work in the 2 intensity zone and the index of the maximum heart rate can be explained by the fact that, as a rule, with a decrease in HR (AT), a decrease in HR max can occur, and vice versa, which is confirmed by the high statistical relationship of the indicators under consideration with each other (r=0,747) [10].

At the same time, we noted a weak and very weak correlation between the volume of work in zone 2 with the indicators VO_2 (AT) (r=0,429), VO_2 max (r=0,285) and VCO_2 max (r=0,103); in addition, a very weak negative relationship was noted with the indicator La max (r=-0,176).

Analysis of the results of pedagogical testing and the amount of work performed in the 2nd intensity zone showed a strong negative correlation in the 2000 m test (r=-0,758), as well as a weak negative relationship with the rest of the tests: 10x100 m (r=-0,366), 4x50 m (r=-0,379), 25 m (r=-0,426). The revealed strong correlation between the time to cover the distance of 2000 m and the amount of work of the aerobic-developmental orientation may indicate the possibility of using this test to assess endurance at the level of the threshold of anaerobic metabolism, reflecting the development of aerobic capacity of athletes.

Working in the zone of mixed aerobic-anaerobic exposure (3 zone of intensity) causes an increase in the concentration of lactate in the blood from 4 to 8 mmol/l as a result of activation of anaerobic glycolysis.

Our correlation analysis showed that the VO_2 (AT) and VO_2 max indicators have an average close relationship with the amount of work performed in the zone of mixed aerobic-anaerobic exposure (r=0,633 and r=0,612, respectively). A weak correlation was found with HR (AT) (r=0,489), VCO_2 max (r=0,377), and HR max (r=0,346), while a very weak correlation was found with La max (r=0,186).

Analysis of the results of pedagogical testing with the volume of work in the 3rd intensity zone showed a weak negative correlation in the tests of 2000 m (r=-0,417), 4x50 m (r=-0,363) and 25 m (r=-0,417). At the same time, we found an average negative statistical relationship between the result of performing the 10x100 m test and the amount of work in the 3rd intensity zone (r=-0,625), which may indicate the possibility of using this test to assess aerobic power or endurance in a mixed aerobic-anaerobic energy supply zone.

It is worth noting that the revealed average statistical relationship between the volume of work performed in the 3rd intensity zone and the indicators of oxygen consumption at the level of the threshold of anaerobic metabolism and maximum oxygen consumption is confirmed in other studies, and it is proposed to divide this zone into separate zones [4]. At the same time, the practical experience of our work indicates that the development of the VO_2 (AT) indicator is carried out to a greater extent when performing work from 4 to 6 mmol/l, while the increase in VO_2 max is more due to training work in the intensity zone from 6 to 8 mmol/l.

In the anaerobic-glycolytic or 4 intensity zone, when performing exercise, there is a significant increase in the concentration of lactate in the blood (up to 8-12 mmol/l and above). In the process of performing training tasks in this zone, the development of special and strength endurance, as well as anaerobic glycolytic capabilities is stimulated.

The volume of work performed in the anaerobic-glycolytic energy supply zone has a strong correlation with the indicators VCO_2 max (r=0,817), La max (r=0,797) and HR max (r=0,765), which confirms the orientation of the intensity zone under consideration to increase the glycolytic capacity and body power of athletes.

At the same time, a weak correlation was found with the VO_2 max (r=0,416) and HR (AT) (r=0,257) indicators, and a very weak correlation was found with the VO_2 (AT) indicator (r=0,163). The obtained data confirm our previous studies, where it was found that with an increase in the number of anaerobic-lactate and alactate exercises during a one-year macrocycle, there may be a decrease in indicators reflecting aerobic capacity and power [11].

At the same time, the analysis of the results of the pedagogical testing conducted with the volume of work in the 4 intensity zone showed an average negative statistical relationship only with the 4x50 m test (r=-0,688) (on the basis of which it is possible to assess the anaerobic glycolytic

capabilities of the swimmers ' body using this test). We observed a weak negative correlation with the results in other tests: 2000 m (r=-0,396), 10x100 m (r=-0,324), 25 m (r=-0,427).

When working with anaerobic alactate orientation (5 intensity zone), the lactate concentration does not have time to reach high values due to the short duration of exercise. Therefore, it is considered that the upper limit of this zone is the maximum speed (power) of movement, and the main task of its application is to develop or maintain high-speed and speed-power abilities.

In the course of the correlation analysis, the average statistical relationship between the volume of training work in the 5th intensity zone and the La max (r=0,654) and HR max (r=0,649) indicators was revealed, which confirms the possibility of using training tasks performed in this energy supply zone for the development of speed and speed-strength capabilities of swimmers.

At the same time, a weak tightness in the relationship between the volume of work performed in the intensity zone under consideration was recorded with the indicators VO_2 max (r=0,251) and VCO_2 max (r=0,463). A very weak correlation was also found with HR (AT) (r=0,158) and VO_2 (AT) (r=0,118).

A study of the relationship between the results of pedagogical testing and the volume of work in the 5 intensity zone established an average negative statistical relationship in the 25 m test (r=-0,513), a weak negative relationship in the 4x50 m (r=-0,423) and 10x100 m (r=-0,254) tests, and a very weak negative relationship in the 2000 m test (r=-0,151). Based on the obtained data, we can conclude that it is possible to use the test with swimming the control distance of 25 m to control the development of speed capabilities of swimmers, including training in the 5th intensity zone.

Conclusion. In the course of the study, we identified a statistically significant relationship between the volume and intensity of training loads used by highly qualified swimmers and indicators that characterize the functional and physical fitness of athletes.

It is established that the volume of work performed in the 1st intensity zone has practically no significant relationships with most of the considered indicators, with the exception of HR (AT) (r=0,507). The load volume in the 2nd intensity zone has a strong correlation with the HR (AT) indicator (r=0,875), as well as the results of the 2000 m test (r=-0,758). The volume of work in the 3rd intensity zone has an average correlation with the VO_2 (AT) and VO_2 max indicators (r=0,633 and r=0,612, respectively) and the results in the 10x100 m test (r=-0,625). A strong correlation between VCO_2 (r=0.817), La max (r=0.797) and HR max (r=0.765), as well as the average correlation between the results of the 4x50 m test (r=-0,688) was found with the amount of work performed in the 4 intensity zone. At the same time, the volume of work in the intensity zone 5 had an average tightness of correlation with the La max (r=0,654) and HR max (r=0,649) indicators, as well as the results of the 25 m test (r=-0,513).

It can be stated that the analysis of the dynamics of functional indicators and physical fitness, reflecting the effectiveness of the training work performed in a particular intensity zone will contribute to a more rational management of the sports training process. At the same time, the coach will have the opportunity to make operational adjustments to the training program, as well as select the optimal amounts of loads, the implementation of which will contribute to improving the functional and physical fitness of athletes, and, as a result, to the growth of their sports skills.

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THE CURRENT STATE OF THE DEVELOPMENT OF ICE HOCKEY IN CHINA

The article is devoted to the current situation with the development of ice hockey in China, after the successful holding of the 2022 Winter Olympic Games in Beijing. The subsequent period became a matter of concern in terms of popularization and improvement of winter sports, as well as the formation of their sustainable development. The problems that exist in the country in the development of ice hockey are reflected.

Introduction It is widely known that the successful bid for the 2022 Beijing Winter Olympics has propelled the development of ice and snow sports in China to an unprecedented new height. The goal of "Driving 300 million people to participate in ice and snow sports", which is directed at youth education, is a Chinese contribution that has changed the world map of ice and snow sports and opened up new horizons for the Olympics. The subsequent post-Winter Olympics period has become an issue of concern for the popularity and improvement of snow and ice sports, and the formation of a state of sustainable development.

Therefore, in this paper, we reviewed all the literature in the past ten years by using "ice hockey" as a keyword. After sorting and summarizing, we found that there were 133 studies on ice hockey from 2013 to 2023. Among them, 90% were from the northeastern region of China. Among these literatures, there are 62 articles on the topic of the current status of hockey development; only 11 articles on the topic of improving hockey training methods. And in these articles that studied the current status of hockey development, no practical improvement measures were proposed, so the goal of this paper is to pave the way for subsequent writings on training tools and methods to promote women's hockey, and to provide actionable training methods for the Chinese hockey training system.