Influence of regular swimming learning on the parameters of the respiratory system

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Abstract

Objective of the study was to identify the level of development of the respiratory system in experienced swimmers.
Methods and structure of the study. The scientific work involved 37 young men who have been swimming every day for the last 2 years: during the day they swam for 1 hour - 12 people; swam for 40 minutes a day - 14 young men; swam for 30 minutes a day - 11 people. The assembled control group consisted of 17 young men who had never been involved in sports. The state of the respiratory system was taken into account and the results were statistically processed.
Results and conclusions. In the case of regular swimming lessons, an increase in the volume and speed indicators of the respiratory system was revealed. Their greatest severity was in athletes who train for an hour a day. Apparently, swimming lessons, as training lengthens, increase the degree of development of the muscles of the upper shoulder girdle and chest while expanding the bronchi and increasing the available physical capabilities. As a result of learning to swim in the youthful body, the development of the pulmonary system and muscles, which provide the breathing process, is enhanced. This increases as the daily swimming sessions lengthen.

Keywords: *swimming, exercise, respiratory system, lungs.*

Introduction. The development of the pulmonary system is of great importance for effective training in any sport, as it ensures the overall performance of the muscular system, and hence physical capabilities [3]. It is clear that in order to achieve high efficiency of any sports activities, a significant development of all elements of the respiratory system is required [5]. A very high physiological significance is the large lumen of the airways, the diameter of the alveoli and the fitness of the muscles involved in the process of external respiration [1]. Of great interest is the influence of swimming training on the dynamics of the parameters of the pulmonary system. For this reason, in sports science, there is still a high interest in the development of the respiratory system in swimmers, depending on the level of regular exercise.

Objective of the study was to identify the level of development of the respiratory system in experienced swimmers.

Methods and structure of the study. In the work, 37 young athletes (17-21 years old) were observed, who daily for the last two years were swimming in the pool for 1 hour a day - 12 people, 40 minutes a day - 14 people, 30 minutes a day - 11 people. A control group was also recruited, consisting of 17 young men (17-21 years old), who had not previously been associated with sports activities and had daily low muscle activity. All young men included in the study, included in all observed groups, were clinically healthy.

The biological characteristics of the respiratory system in the course of the study were determined during the use of the apparatus “Spiro-Spectrum”, produced by the NeuroSoft enterprise (Russia). During the use of this device, the volumetric and velocity parameters of the lungs were determined. Mathematical processing of the registered results was carried out during the calculation of the Student’s criterion.

Results of the study and their discussion. Achieving a pronounced sports result is possible with sufficient development of the vital capacity of the lungs (VC). This parameter reflects the area of the entire

respiratory surface of the alveoli of the lungs. As this characteristic increases, there is an increase in the process of gas exchange between the blood and alveolar air, which means that an increase in metabolism is achieved in all internal organs. In physically developed people, the value of VC can fluctuate widely and depends on the severity of regular physical activity [9]. There is a clear relationship between the value of this indicator and the level of sports results in any sport.

In the control, VC was low (table 1). In observed swimmers, this value was higher in all cases. This indicator was the lowest in young swimmers who trained for 30 minutes a day - 5.29 ± 0.17 l, this indicator was found to be higher in swimmers who swim 40 minutes a day - 5.49 ± 0.15 l, and even higher it was found in swimmers. daily for 1 hour - 5.92 ± 0.19 liters.

The same regularity in the ratio of parameters between groups took place for the magnitude of the forced vital capacity of the lungs (FVC). In the comparison group, the FVC value was 3.72±0.32 liters. In the observed swimmers, this parameter was greater and amounted to those who swam daily for 1 hour a day -5.99 ± 0.20 liters.

The inner diameter of the bronchi is very significant in terms of the implementation of respiratory acts. As it increases, the resistance of the bronchi to the air stream coming from the atmosphere decreases, and the more air can be inhaled during active inspiration under load. With an increase in the lumen of the bronchi, ventilation of the lungs is intensified. One might think that the high patency of the bronchi provides a sufficient level of energy received in the cells of the body, which is especially important for athletes.

The amount of air released under conditions of forced expiration during the first half second and during the first second (FEV0.5 and FEV1) was maximal in persons swimming during the day for 1 hour (3.72 ± 0.12 l and 5.30 ±0.18 l).

Swimmers who train for 1 hour a day, have the ability to release during one exhalation the maximum volume of air in the first half second and the first second of the act of exhalation. In swimmers during the day for 40 minutes and 30 minutes, these parameters were lower, but exceeded the control level. In persons included in the control, the FEV1 value was 2.81 ± 0.28 l, and the FEV value of 0.5 was 1.80 ± 0.14 l.

Table 1. *Characteristics of the respiratory system in the examined*

Respiratory characteristics	Swim for 30 minutes a day n=11(1)	Swim for 40 minutes a day n=14(2)	Swim for 60 minutes a day n=12(3)	Control, n=17	p1-2	p2-3	p1-3
FVC, l	5,33±0,28 p<0,01	5,66±0,22 p<0,01	5,99±0,20 p<0,01	3,72±0,32			<0,05
VC, l	5,29±0,17 p<0,01	5,49±0,15 p<0,01	5,92±0,19 p<0,01	4,15±0,27			<0,05
FEV1, l	4,64±0,20 p<0,01	4,92±0,26 p<0,01	5,30±0,18 p<0,01	2,81±0,28			<0,05
FEV 0.5, l	3,30±0,15 p<0,01	3,55±0,18 p<0,01	3,72±0,12 p<0,01	1,80±0,14			<0,05
Tpve, s	0,08±0,02 p<0,01	0,07±0,02 p<0,05	0,06±0,01 p<0,01	0,12±0,05	<0,05	<0,05	<0,01
Texh, s	1,91±0,14 p<0,05	1,77±0,17 p<0,05	1,61±0,16 p<0,01	2,31±0,13			<0,05
MVV25, l/s	8,19±0,22 p<0,01	8,47±0,37 p<0,01	8,79±0,26 p<0,01	6,39±0,25			
MVV50, l/s	6,12±0,33 p<0,01	6,35±0,34 p<0,01	6,71±0,30 p<0,01	4,32±0,23			
MVV75, /s	3,11±0,41 p<0,01	3,29±0,30 p<0,01	3,49±0,28 p<0,01	2,35±0,18			<0,05
AVV25-75, l/s	5,22±0,23 p<0,01	5,48±0,34 p<0,01	5,79±0,23 p<0,01	4,22±0,21			<0,05

Note: p - the significance of the differences in the indicators taken into account in the young men included in the groups of athletes and in the control group.

In the most trained swimmers, it was possible to note the highest values of the instantaneous expiratory volumetric velocity and the average volumetric velocity during the implementation of FVC (AVV25-75).

Volumetric instantaneous velocity during expiration at 25% of the FVC volume in young men swimming daily for 1 hour reached 8.79±0.26 l/s, at 50% of the FVC value - 6.71±0.30 l/s , in the conditions of the implementation of the act of exhalation by 75% of the FVC value of 3.49±0.28 l/s. In the course of taking into account the value of FVC in the range from 25% to 75%, the average volumetric velocity reached 5.79±0.23 l/s in swimmers swimming an hour a day. This face was somewhat inferior to athletes who swim a day for 30 minutes or 40 minutes. However, the indicators of the examined swimmers turned out to be higher than the control value, which indicated a very significant level of training in athletes of the respiratory muscles and the development of tracheobronchial structures in comparison with persons leading a physically inactive lifestyle.

In the observed young men, the duration of expiration of FVC (Texh) and the time required to exhale during the rapid implementation of exhalation (Tpve) were evaluated. The latter indicator turned out to be the lowest among swimmers who swim for 1 hour a day (0.06±0.01 s) in comparison with other surveyed.

Evaluating the results found in the work, it was clear in the observed swimmers that regular muscle loads stimulate the work of vital organs [2]. The greatest development of the indicators taken into account was observed in those who floated one hour a day. Those who swim during the day for 30 minutes and 40 minutes were slightly inferior to them in terms of the parameters taken into account due to the impact on their body of a slightly lower physical load. At the same time, the pulmonary system of all swimmers was functionally more developed than that of untrained individuals. This proved a great biological benefit from systematic physical training, which was confirmed by the observations available in the literature on representatives of other sports [4].

Conclusions. The formation of a large reserve potential of the respiratory system provides its great functionality, which is especially necessary in terms of swimming. During these trainings, significant volumetric and speed characteristics of the pulmonary system are formed. These changes can be considered a consequence of regular swimming lessons with training of the muscles that implement the act of breathing, as well as leading to the expansion of the lumen of the trachea and bronchi. In the case of an increase in daily swimming activities, there is an increase in the functional capabilities of the respiratory system, which reach a very high level in swimmers who train for at least 60 minutes daily.

References

1. Karpov V.Yu., Zavalishina S.Yu., Dorontsev A.V., Voronova N.N., Shulgin A.M., Sharagin V.I., Koz'yakov R.V. Influence of Regular Feasible Physical Activity on the Platelet's Functional Activity of the Second Mature Age People. Systematic Reviews in Pharmacy. 2020. Vol.11. No. 8. pp. 439-445.
2. Karpov V.Yu., Zavalishina S.Yu., Gusev A.V., Sharagin V.I., Petina E.S. Physical Rehabilitation of Girls with Neurocirculatory Dystonia. Indian Journal of Public Health Research & Development. 2019. Vol.10, No10.pp.2045-2050.
3. Kachenkova E.S., Grishan M.A., ZavalishinaS. Yu., ZbruevaYu.V. Funkcional'nye vozmozhnosti dyhatel'noj systemy yunyh legkoatletov [Functional capabilities of the respiratory system in young athletes].Teoriya i praktika fiz. kultury. 2022. No. 12, pp. 39-41.
4. Makurina O.N., Mal G.S., Makhova A.V., Vorobyeva N.V., Fayzullina I.I., Khvastunov A.A. The Effectiveness of Pharmacological Effects on Weakened Animals Kept in the Conditions of Central Russia. Lecture Notes in Networks and Systems. 2022. Vol. 354 LNNS. pp. 609-615.
5. Karpov V.Yu., Zavalishina S.Yu., Romanova A.V., Voevodina T.M. Physiological Mechanisms of Rehabilitation in Vegetative Vascular Dystonia. Indian Journal of Public Health Research & Development. 2019. Vol. 10, No. 10. pp. 1261-1265.
6. Kachenkova E.S., Kulkova I.V., Zavalishina S.Yu., Tkacheva E.S. Fizkul'turno-ozdorovitel'naya trenirovka muzhchin 50-60 let kak sredstvo profilaktiki zabolevanij serdechno-sosudistoj sistemy [Health-improving training of 50-60 year-old males in prevention of cardiovascular diseases]. Teoriya i praktika fiz. kultury. 2020. No. 9. pp. 62-64.
7. Zavalishina S.Yu., Karpov V.Yu., Eremin M.V., Pryanikova N.G., Tatarova S., Kozjakov R.V. The

functional state of the body of older men experiencing regular recreational stress. International Journal of Pharmaceutical Research. 2020. Vol. 13(1). pp. 292-298.
8. Grishan M.A., ZavalishinaS.Yu., Tokareva S.V., SkripinaA.Yu. Funkcional'nye osobennosti serdca plovcov [Functional features of the heart of swimmers].Teoriya i praktika fiz. kultury. 2022. No. 12. pp. 50-51.
9. Zavalishina, S.Yu., Kachenkova, E.S. Fiziologicheskie izmeneniya v serdechno-sosudistoj sisteme pri vestibulyarnom razdrazhenii u predstavitelej igrovyh vidov sporta [Physiological changes in cardiovascular system with vestibular irritation among representatives of team sports]. Teoriya i praktika fiz. kultury. 2021. No. 8. pp. 24-26.
10. Latushkina E.N., Zavalishina S.Y., Rysakova O.G., Kazakov D.A. Funkcional'noe razvitie kardiorespiratornoj sistemy yunoshej, vypolnivshih normy na zolotoj znak VFSK GTO [Functional development of the cardiorespiratory system of young men who passed standards for the gold badge of vesk GTO]. Teoriya i praktika fiz. kultury. 2022. No. 12. p. 18.