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MUSCLES OF RESPIRATION IN PROFESSIONAL HOCKEY

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Annotation. *Most sportsmen direct their efforts to different groups of muscles development and don't pay much attention to muscles of respiration. In this case muscles of respiration become limitative factor for further results improvement. Nowadays many specialists in sport pay attention to muscles of respiration training. It is conditioned by the phenomenon, which was called "metaboreflex of respiration muscles". Its essence is in the fact that muscles of respiration in the state of tiredness cause oxygen decrease in an extremity, brain and heart.* ***Material****. Experimental check of an additional inhalation resistance methodology application at the training process of highly-qualified hockey players.* ***Research methods****: scientific literature analysis and summarizing, experiment, testing, methods of mathematical statistics.* ***Results.*** *The methodology of respiration muscles purposeful training is created and experimentally checked. The article considers the notion "metaboreflex", describes the importance of respiration muscles for sports activity and gives the results of their purposeful training.* ***Conclusion.*** *The experiment clearly proves a positive influence of purposeful training loads on strength, power and volume of sportsmen's inhalation.*
Keywords: *function of breathing, training, functional state, hockey.*

Introduction

Nowadays many specialists in sport pay attention to muscles of respiration training. It is conditioned by the phenomenon, which was called "metaboreflex of respiration muscles" [18]. Its essence is in the fact that muscles of respiration in the state of tiredness cause oxygen decrease in an extremity, brain and heart [4, 5]. According to the research works of Mishchenko V.S. and Andersson P. with other authors, there is some inverse relation between respiratory lungs capacity and the volume of oxygen delivery into functioning muscles [3, 9]. It means that unsufficiently trained respiration muscles can be a stimulating factor for muscles blood supply and as a result make working capacity worse [5].

The mass of breathing muscles is on the average 10-12% from a sportsman's weight and it is a considerable index [4]. At the same time, the research works of McConnell A.K. and Sheel W. together with other authors, during physical load of maximum intensity, revealed oxygen consumption by inspiratory breathing muscles at the level of 16% from the general available volume of oxygen [16,18]. It shows metabolic cost of an organism concerning breathing muscles functioning.

Taking into consideration the information we have, we can suppose that purposeful muscles of respiration training will help to prevent blood supply decrease of working muscles, substratum removal slowing-down will help to decrease the speed of lactic acid accumulation and increase working capacity of a person.

Validity of such kind of hypothesis is proved by several scientific research works in sport.

Great amount of experimental material concerning additional inhalation resistance was accumulated by native [1, 3, 6, 8] and foreign specialists [10, 11, 13, 14, 19].

McConnell A.K. and Kurashvili V.A. showed that muscles of respiration training leads to their functioning effectiveness increase and as a result, helps to increase working time with a standard power to more than 30% [2, 15].

Romer L.M. and Volianitis S. together with other authors stated the increase of sports working capacity among high-class rowers [20] and cyclists [17] to 4.6% owing to systematic inspiratory muscles training.

In the experimental research with the control group of highly-qualified sportsmen McConnell A.K. showed similar effect of everyday 5-minute training of respiration muscles during 5 weeks and an interval training, directed at aerobic endurance development, which was fulfilled also during 5 weeks [16].

Shamardin A.A. stated valid increase of physical readiness and functional abilities of football players (15-16 years-old) from the experimental group to 12,5% in comparison with the control group, where respiratory training wasn't used [7]. More impressive results were received by Suslina I.V. with the group of 13-14-year-old football players,

where the increase of inspiratory muscles power to 28,2% was stated, maximum oxygen consumption (MOC) to 10,5% and the results of Cooper's test to 15,9%, in comparison with the results in the control group of sportsmen, where there were no additional respiratory loads [5].

Taking into consideration all mentioned above, it is obvious that a purposeful strength, power and endurance of respiration muscles development in hockey is prospective as a reserve of sportsmen's working capacity increase [11-13].

The aim of the research: experimental check of an additional inhalation resistance methodology application at the training process of highly-qualified hockey players.

Research methods and research organization

The research works were held since January, 7, 2017 till February, 20, 2017 on the basis of hockey club KHL "Barys" Astana (6 weeks). 29 highly-qualified hockey players took part in the experiment. 17 players had the position of a forward, 9 players had the position of a defender and 3 players had the position of a goalkeeper.

Training lessons were held every day (except 6 rest days) with the help of individual training simulators Power Breathe Fitness Plus Medium. The training effect was achieved by means of inhalation resistance progressive increase. A training simulator helps to vary the load within the range of 23-186 $cmH_2O \cdot l \cdot sec.^{-1}$, which corresponds to 11 levels of difficulty (table 1.1):

Table 1.1 – Comparative table of the load level

	Inhalation resistance, $cmH_2O \cdot l \cdot sec.^{-1}$									
Level 0	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Level 9	Level 10
23	39	55	72	88	104	121	137	153	170	186

During the experiment three tests of respiration muscles were held: 7.01.2017, 20.01.2017 and 20.02.2017. The control was fulfilled with the help of special respiratory equipment Power Breathe K5. The essence of test was in one maximum powerful and at the same time maximum deep inhalation. The apparatus stated the following indices: index of strength, power (l/sec.), volume of inhalation (l).

Since January, 1 till January, 20 11 training lessons were held, which were directed at respiration muscles development (table 1.2):

Table 1.2 – Training lessons since January, 1, 2017 till January, 20, 2017

Date	07.01	08.01	09.01	10.01	11.01	12.01
Inhalations	10	10	10	10	10	10
Series	1	2	2	2	3	3
Load	0	0	0	0	0	0
Date	13.01	14.01	15.01	16.01	17.01	18.01
Inhalations	15		15	30	30	30
Series	2	Rest day	2	1	1	1
Load	0	0	0	0	0	0

Rest day – January, 19, 2017.

Since January, 20 till February, 20 27 training lessons were held, which were directed at muscles of respiration development (table 1.3):

Table 1.3 – Training lessons since January, 20, 2017 till February, 20, 2017

Date	20.01	21.01	22.01	23.01	24.01	25.01	26.01	27.01
Inhalations	10	10	10	10	15	15	15	15
Series	1	2	2	2	2	2	2	2
Load	1	1	1	1	1	1	1	1
Date	28.01	29.01	30.01	31.01	1.02	2.02	3.02	4.02
Inhalations	15	30	30	30	10	10	10	10
Series	2	1	1	1	1	1	2	2
Load	1	1	1	2	2	2	2	2
Date	5.02	6.02	7.02	8.02	9.02	10.02	11.02	12.02
Inhalations	10			15	15		15	30
Series	2	Rest day	Rest day	2	2	Rest day	2	1
Load	2			2	2		2	2
Date	13.02	14.02	15.02	16.02	17.02	18.02	19.02	
Inhalations	30	30	20	20	20	10		
Series	1	1	2	2	2	1	Rest day	
Load	2	2	2	2	2	3		

Research results

The following results were received during the test among KHL hockey players (table 1.4):

Table 1.4 – Results of tests

Indices	7.01.2017	20.01.2017	20.02.2017
Index of strength	129,59 (± 28,59)	147,93 (± 26,09)	153,62 (± 30,25)
Power (l/sec.)	7,15 (± 1,40)	8,04 (± 1,28)	8,21 (± 1,51)
Volume (l)	4,10 (± 0,78)	4,29 (± 0,57)	4,30 (± 0,59)

The results in table 1.4 show the effectiveness of the created program of respiration muscles training. Purposeful training during 2 weeks with two rest days at the load 0 level helped to achieve on the average 13,84% of progress in the index of strength, 11,73% in power and 6,03% in the volume of inhalation. Further 27 trainings during a month with three rest days provided increase of strength index on the average to 10,35%, power to 9,31%, volume of inhalation to 1,28%.

According to the theory of adaptation an intensive increase of indices was after the first two weeks. Then the results progress became slower, however, during 6 weeks of the training lessons a positive dynamics of indices preserves.

Direction of further research works

Positive influence of purposeful training loads on strength, power and volume of inhalation is shown by the described above experiment. Further it is interesting to study the influence of respiration muscles on hockey players' working capacity and on the speed of an urgent and delayed rehabilitation.

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PEDAGOGICAL AND MEDICAL-BIOLOGICAL METHODS OF HEALTH CORRECTION AMONG STUDENTS IN TERMS OF COMPLEX INFLUENCE OF MENTAL AND PHYSICAL LOADS

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Annotation. *Students are considered a population resource, which is not only the factor of well-being, but also the factor of country and its regions safety. In terms of ecological situation worsening, when the principles of healthy life style are not followed, the reserves of nervous, endocrine, immune systems are exhausted there is sickness rate (with temporary disability) increase among students of higher educational establishments. Considerable difference between the information about students' health state and their sickness rate is the result, why there are no integrated unified approaches to the received information gathering, analysis and interpretation. Taking into account the peculiarities of studying at physical culture higher educational establishment, the influence of complex mental and physical loads and also the fact, that students are not only professional sportsmen, but also people, who don't go in for sport and physical culture and even young disabled people, it is necessary to create a special health monitoring program, which is based on a system approach to the following characteristics estimation: educational environment conditions, students' life style and social status, individual morphofunctional characteristics of students' organism development, typological peculiarities of nervous system, mental working capacity, physical qualities and it gives an opportunity to realize in practice individual approach to educational process and students' behavior organization.* ***Material.*** *Students' sickness rate study (with temporary disability) at Ural State University of Physical Culture during the following period: 2014-2016 and pedagogical and medical-biological health-improving- correctional programs creation.* ***Research methods:*** *Sickness rate indices with temporary disability (TD) study, severity of diseases, the structure and main reasons of diseases study among students of the leading higher educational establishments in Chelyabinsk according to the rate of medical aid appealability during 2014-2016 on the basis of the state statistical observation form №12, an official form of account №16ВН; comparative analysis of sickness rate among the students of three leading higher educational establishments of Chelyabinsk during three years, their dynamics and structure; different methods of correctional programs*

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CONTENT