J HOPE Asia Network. Morning surge in blood pressure and blood pressure variability in Asia: Evidence and statement from the HOPE Asia Network. Clin Hypertens (Greenwich). 2019; 21(2): 324-334 (In Russ.).] doi: 10.1111/jch.13451.

11. Tereshchenko S, Kasparov E, Smolnikova M, Shubina M, Gorbacheva N, Moskalenko O. Internet Addiction and Sleep Problems among Russian Adolescents: A Field School-Based Study. Int J Environ Res Public Health. 2021; 18(19): 10397 (In Russ.).] doi: 10.3390/ijerph181910397.

12. Lissak G. Adverse physiological and psychological effects of screen time on children and adolescents: Literature review and case study. Environ Res. 2018; 164: 149-157. doi: 10.1016/j.envres.2018.01.015.

13. Lu DW, Wang JW, Huang AC. Differentiation of Internet addiction risk level based on autonomic nervous responses: the Internet-addiction hypothesis of autonomic activity. Cyberpsychol Behav Soc Netw. 2010; 13(4): 371-8. doi: 10.1089/cyber.2009.0254.

14. Poskotinova LV, Krivonogova OV, Zaborsky OS. Cardiovascular response to physical exercise and the risk of Internet addiction in 15-16-year-old adolescents. J Behav Addict. 2021; 10(2): 347-351. doi: 10.1556/2006.2021.00021

L.I. Konstantinova, E.D. Okhlopkova, L.D. Olesova

DOI 10.25789/YMJ.2024.87.09

UDC 796.612.2

ASSESSMENT OF THE BODY RESISTANCE OF ATHLETES FROM YAKUTIA TO HYPOXIA

The article reflects the assessment of the body resistance of students of the «North-Eastern Federal University named after M.K. Ammosov», living in the Far North, to hypoxic conditions. 146 people took part in the study – 119 boys and 27 girls. Of these, the study group consisted of 74 student – athletes (59 boys, 15 girls), the control group consisted of 72 students engaged in physical education according to the general program of the University (60 boys, 12 girls). The average age of the surveyed was 21± 2,5 years. To identify the assessment of the body's resistance to hypoxia in Yakutia athletes, the following functional tests were conducted: the Stange test (breath holding on inhalation) and the Genchi test (breath holding on exhalation). The obtained results of the study allowed us to see the prevailing excellent criterion (assessment "excellent") in athletes and the average criterion (assessment "good") in the control group, the results with an unsatisfactory criterion (assessment "unsatisfactory") were less. The conducted assessment shows a positive level of non-specific adaptive capabilities of the respiratory system in the studied students. The functional resistance of the respiratory system to hypoxia in young men was significantly higher than in girls.

Keywords: athletes of Yakutia, students, hypoxia, Stange's test, Genchi test

Introduction: The physiological state of the human body is determined by oxygen consumption. Oxygen is necessary for breathing, saturation of cells and tissues of the body with oxygen, oxidation of proteins, fats, carbohydrates, amino acids, as well as for many other biochemical processes. Oxygen enters the tissues and cells of the body through the respiratory and cardiovascular systems. If these body systems fail to function, hypoxia may develop. During diagnostics of the human respiratory system, the volume of the lungs, the rhythm of breathing, its depth are determined, and standard methods of functional tests are used to determine resistance and adaptation to hypoxia. Functional breath-holding tests, such as the Stange test (breath-holding on inhalation) and the Genchi test (breath-holding on exhalation), can reveal hidden disorders in the body's functioning that cannot always be determined by standard methods. These tests help assess the body's resistance to hypoxia and endurance. Such tests are easy to perform, so you can test yourself and assess whether there are any problems with the respiratory system.

In the works of a number of authors it has been noted that the longer the breath-holding time, the higher the adaptive capacity of the respiratory and cardiovascular systems to hypoxia and high functional capabilities of the body [1, 3, 7]. In case of dysfunction of the oxygen-transport system of the body, for example, in case of iron deficiency anemia, the duration of breath-holding is reduced [8, 9].

The aim of the study. To assess the resistance of the body of students of Yakutia to hypoxia depending on physical activity on the possibility of holding the breath on inhalation and exhalation.

Materials and methods of the study: 146 students of NEFU named after M.K. Ammosov were examined. Of these, the study group consisted of 74 athletes (59 boys, 15 girls), the control group consisted of 72 students involved in physical education according to the general program of the university (60 boys, 12 girls). The average age of the examined was 21±2.5 years.

The athletes were involved in the following sports: track and field - 20 people, mas-wrestling - 34 people, national jumping - 8 people, shooting - 5 people, freestyle wrestling - 7 people.

The following functional tests were used in the study to determine the body's sensitivity to oxygen deficiency:

Stange test. Method of performance: the subject inhales, then exhales, and again takes a deep breath and holds his breath for the maximum possible time. The time of breath holding is recorded. The norm for men = 50–60 sec; the norm for athletes = 65–75 sec and more; the norm for women = 35–45 sec; the norm for female athletes = 45–55 sec. Evaluation of results: “excellent” – for men from 60 sec, for women from 50 sec; “good” – for men from 50 to 59 sec, for women from 40 to 49 sec; “satisfactory” – for men from 35 to 49 sec, for women from 30 to 39 sec; “unsatisfactory” – for men less than 35 sec, for women less than 30 sec.

Genchi test. Method of execution: it is carried out similarly to the Stange test,

Yakut Science Center of Complex Medical Problems (YSC CMP), Yakutsk: **KONSTANTINOVA Lena Ivanovna** – PhD, research associate, laboratory of biochemical and immunological studies, department of epidemiology of chronic non-communicable diseases, YSC CMP, konstanta.l@mail.ru; **OKHLOPKOVA Elena Dmitrievna** – PhD, senior research associate, laboratory of biochemical and immunological studies, department of epidemiology of chronic non-communicable diseases, YSC CMP, elena_ohlopkova@mail.ru; **OLESOVA Lyubov Dygynovna** – PhD, leading research associate – head of the laboratory of biochemical and immunological studies, department of epidemiology of chronic non-communicable diseases, YSC CMP, oles@mail.ru

the only difference being that the breath is held after a deep exhalation. The average result is a breath-holding time of 30 seconds or longer. The norm for healthy people = 20–40 sec; the norm for athletes = 40–60 sec. Evaluation of results: “excellent” – for men from 50 sec, for women from 40 sec; “good” – for men from 40 to 49 sec, for women from 32 to 39 sec; “satisfactory” – for men from 30 to 39 sec, for women from 25 to 31 sec; “unsatisfactory” – for men less than 29 sec, for women less than 24 sec.

The obtained data were processed using the IBM SPSS Statistics 23 application package. Standard methods of variation statistics were used: calculation of the median and the 25th and 75th quartiles (Me [Q25; Q75]). To compare two independent groups, statistical analysis was performed using the nonparametric Mann-Whitney U-test. The relationship between variables was assessed using the Spearman method (for variables measured on a rank scale), where p is the significance of the result.

Results and discussion: The data we obtained on the Stange test (Table 1) showed that the functional capabilities of the athletes' body in terms of the ability to hold their breath on inhalation in young men and women corresponded to the grade "excellent". In the control group, when holding their breath on inhalation in young men and women, the indicators were significantly lower than in trained athletes, which corresponded to the grade "good".

The breath holding time according to the Genchi test (Table 2) in male and female athletes was equal to that of untrained individuals and corresponded to the assessment of "satisfactory". In the control group, the indicators of male and female athletes differed significantly from those of athletes and corresponded to the assessment of "unsatisfactory".

The functional state according to the Stange test (Fig. 1) in 77.7% of young athletes confirms “excellent” and “good” results in the ability to hold breath on inhalation for trained people, only 3,4% had hypoxia. In 80% of female athletes, an “excellent” assessment is confirmed in the ability to hold breath on inhalation for trained people, hypoxia was not noted. In the studied comparison groups, no statistically significant differences were found.

In the control group, the functional state of the body according to the Stange test is insignificantly lower than that of student athletes. In 63,3% of young men, the "excellent" and "good" assessment of the results is confirmed in the ability to hold the breath on inhalation, hypoxia

Table 1

Indicators of the functional state of the body according to the Stange test, sec

	Groups	N	Me (Q1; Q3)	P
1	Athletes young men	59	62.72 (51.33; 76.00)*	P_{1-3}=0.029
2	Athletes girls	15	57.89 (40.94; 62.27)**	P_{2-4}=0.013
3	Young men control	60	56.64 (43.43; 62.89)*	
4	Girl control	12	39.94 (28.81; 47.65)**	

Table 2

Indicators of the functional state of the body according to the Genchi test, sec

Groups		N	Me (Q1; Q3)	P
1	Athletes young men	59	30.72 (25.55; 40.59)*	P_{1-3}=0.0
2	Athletes girls	15	29.60 (22.59; 35.47)**	P_{2-4}=0.046
3	Young men control	60	28.43 (23.10; 38.29)*	
4	Girl control	12	23.37 (18.40; 29.72)**	

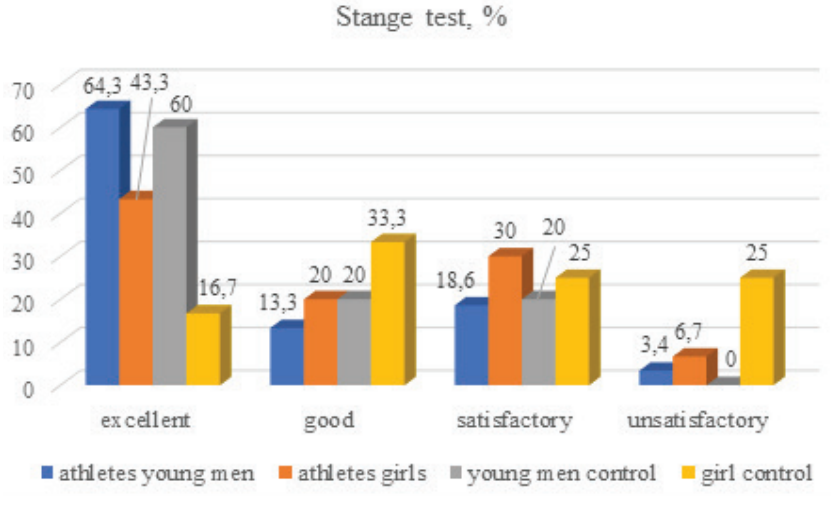

Рис. 1. Evaluation of functional state indicators according to the Stange test, %

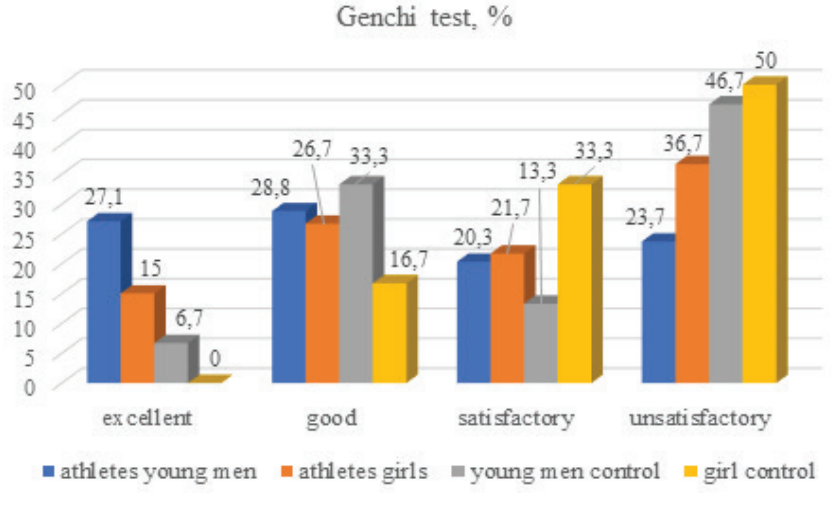

Рис. 2. Evaluation of functional state indicators according to the Genchi test, %

Table 3

Indicators of the functional state of the body according to the Stange test depending on the type of sport, sec

Sport	N	Me (Q1; Q3)
Athletics	20	68.47 (54.24; 84.34)
Mas wrestling	34	58.98 (48.87; 68.04)
National jumps	8	61.74 (44.67; 78.06)
Bullet shooting	5	55.06 (44.95; 69.09)
Freestyle wrestling	7	62.03 (42.76; 76.49)
Young men control	60	56.64 (43.43; 62.89)
Girl control	12	39.94 (28.81; 47.65)

Table 4

Indicators of the functional state of the body according to the Genchi test depending on the type of sport, sec

Sport	N	Me (Q1; Q3)
Athletics	20	28.32 (22.99; 37.64)
Mas wrestling	34	30.41 (25.34; 37.64)
National jumps	8	31.41 (21.02; 36.52)
Bullet shooting	5	37.12 (26.64; 44.91)
Freestyle wrestling	7	31.81 (29.00; 51.06)
Young men control	60	28.43 (23.10; 38.29)
Girl control	12	23.37 (18.40; 29.72)

was recorded in 6,7% of the subjects. In 16,7% of girls from the control group, the result is assessed as "excellent", and in 33.3%, the indicators are determined to be "good". Hypoxia was detected among 25% of girls in the control group.

The functional state according to the Genchi test (Fig. 2) in 55,9% of young male athletes confirms the assessment of “excellent” and “good” in terms of the ability to hold one’s breath on exhalation for trained people, hypoxia was detected in 23,7% of the athletes studied. In 6,7% of female athletes, the results of the study according to the Genchi test confirm the assessment of “excellent”, and in 33,3% the assessment of “good” in terms of the ability to hold one’s breath on exhalation for trained people, hypoxia was recorded in 46,7%.

In the control group, the functional state indicators according to the Genchi test are insignificantly lower than those of student athletes. 15% of young men showed excellent indicators and 26,7% showed good results in the ability to hold their breath on exhalation, hypoxia was observed in 36,7%. Among the girls in the control group, an excellent indicator was not recorded, an indicator with a "good" rating was noted in 16,7%. Hypoxia was noted among 50% of the girls in the control group.

Table 3 presents the functional state data according to the Stange test by sports. All athletes have average values within the range of “excellent” and “good”. The best value is noted among track and field athletes. This is probably due to the fact that this is the most popular sport, which includes various disciplines: race walking, running, running and cross-country, all-around, jumping, throwing, shot put. All these sports activities are characterized by high aerobic load. It is believed that physical activity consisting of aerobic exercises is the most beneficial for health [2, 4].

Table 4 presents the functional state data for the Genchi test by sports. All athletes have average breath-holding rates on exhalation that are below the norm, within the “satisfactory” rating. Of these, the best rate was observed in athletes involved in target shooting. The worst result was observed in track and field athletes, which reflects weak adaptation to hypoxia. This may be specific to these athletes, who are characterized by high aerobic loads, since overcoming a distance is accompanied by an increased frequency and depth of breathing [5].

During the work, significant differences in the main functional indicators of external respiration were identified in athletes and students who do not regularly engage in sports. In the work of a number of authors, it was noted that the external respiration system of freestyle wrestlers and boxers is 50,14% weaker than that of mas-wrestlers [6].

Conclusion. Comparative assessment of the functional state of breathing using the Stange and Genchi test in young men and women involved in sports revealed gender differences: young men had higher rates of breath holding on inhalation and exhalation than young women. The rates indicate oxygen supply and the general level of fitness of athletes.

A comparative assessment of the functional state of respiration using the Stange and Genchi test in athletes and the control group revealed that in athletes, breath holding on inhalation and exhalation is significantly higher than in the control group, which confirms that physical activity improves health, increases the body's resistance to hypoxia and demonstrates a high rate of non-specific adaptive capabilities of the respiratory system in athletes from Yakutia.

Although the results obtained clearly show differences in physiological parameters, it is necessary to analyze a larger sample to obtain more reliable data and confirm the results of the study.

References

1. Ali Muhammad A., Prokop'ev N.YA., Semizorov E.A. Proby SHtange i Genchi v ocenke funkcii vneshnego dyhaniya u yunoshej sbornoj komandy Sirii po shossejnym gonkam na predsorevnovatel'nom etape provedeniya trenirovochnogo processa [Stange and Gench tests in assessing the function of external respiration in young men of the Syrian national road racing team at the pre-competition stage of the training process. Sciences of Europe. 2022; 88 (2): 48-53 (In Russ.).]

2. Bekembetov R. A., Konakbaev B.M. Znachenie trenirovochnoj nagruzki maloj aerobnoj moshchnosti v edinoborstvah [The importance of low aerobic power training load in martial arts] Teoriya i metodika fizicheskoj kul'tury. 2022; 1(67): 166-173. DOI 10.48114/2306-5540_2022_1_166. – EDN XIVJHO.

3. Bakhtina TN, Osechkina TA, Lesheva NS, Plotnikova SS. Dinamika pokazatelej prob SHtange i Genchi studentov SPBGLTU imeni S.M. Kirova, zanimayushchihsya ozdorovitel'noj hod'boj [Dynamics of indicators of Stange and Genchi samples of students of St. Petersburg State Forestry University named after S.M. Kirov, engaged in recreational walking]. Kul'tura fizicheskaya i zdorov'e. 2023; 3(87); 12-16 (In Russ.).] DOI 10.47438/1999-3455_2023_3_12. – EDN UJPEEC.

4. Zaharina AN, Golubina OA. Vliyanie zanyatij legkoj atletikoj na organizm studenta [The influence of athletics on the student’s body]. Mezhdunarodnyj studencheskij nauchnyj vestnik. 2022. № 6. URL: https://eduherald.ru/ru/article/view?id=21071 (data obrashcheniya: 09.07.2024).

5. Kolomejchuk OV. Osobennosti ustojchivosti k gipoksii u predstavitelej razlichnyh vidov sporta [Features of resistance to hypoxia in representa-

tives of various sports]. Fizicheskaya kul'tura v obshchekul'turnoj i professional'noj podgotovke studenta: sbornik materialov vtoroj Vserossijskoj s mezhdunarodnym uchastiem nauchnoj konferencii, Rostov-na-Donu, 04–08 aprelya 2016 goda. Rostov-na-Donu: YUzhnyj federal'nyj universitet, 2016; 64-68.

6. Gavrilieva KS, Handy MV, Solovyova MI, Kuzmina SS. Osobennosti funkcional'nogo sostoyaniya i antioksidantnoj sistemy u yunyh sportsmenov, zanimayushchihsya mas-restlingom [Features of functional state and antioxidant system in young athletes engaged in mass wrestling]. Vestnik sportivnoj nauki. 2016; 1: 29-33. EDN WLBCPX.

7. SHvetskij FM, Potievskaya VI, Polonskaya AS, CHerenkova VA. Proba SHtange i Genchi – zabytye rutinnye pokazateli ustojchivosti nejronnyh setej k giperkapnii pri adaptacii k sportivnym trenirovkam [Stange and Genchi test - forgotten routine indicators of the resistance of neural networks to hypercapnia during adaptation to sports training]. Ekologo-fiziologicheskie problemy adaptacii: materialy XVII Vserossijskogo simpoziuma. Ryazan', 23-26 Maya [Ecological-physiological issues of adaptation: materials of the XVII All-Russian symposium. Ryazan. May 23-26. 2017; 246-247 (In Russ.).]

8. D'Alessandro A, et al. AltitudeOmics: Red Blood Cell Metabolic Adaptation to High Altitude Hypoxia. J Proteome Res. 2016. Oct 7; 15(10): 3883-3895. doi: 10.1021/acs.jproteome.6b00733. Epub 2016 Sep 27. PMID: 27646145; PMCID: PMC5512539.

9. Rogers RS, et al. Hypoxia extends lifespan and neurological function in a mouse model of aging. PLoS Biol. 2023 May 23; 21(5): e3002117. doi: 10.1371/journal.pbio.3002117. PMID: 37220109; PMCID: PMC10204955.

ORGANIZATION OF HEALTH, MEDICAL SCIENCE AND EDUCATION

T.K. Davydova, A.N. Romanova, O.V. Tatarinova, T.Ya. Nikolaeva

PROVISION OF SPECIALIZED MEDICAL CARE IN THE REPUBLIC OF SAKHA (YAKUTIA) TO PATIENTS WITH COGNITIVE DISORDERS

DOI 10.25789/YMJ.2024.87.10

UDC 616.711.8-006.2-089

The article presents an analysis of statistical data on dementia from official sources of state statistics, medical and scientific organizations, as well as the provision of specialized medical care in the Republic of Sakha (Yakutia) to patients with cognitive disorders.

Keywords: neurodegenerative diseases, healthcare organization, specialized medical care, Alzheimer's disease, dementia, cognitive disorder.

Relevance of the problem. In the Republic of Sakha (Yakutia) (further RS (Y)) one of the main medical and social problems is cognitive disorder (CI), including Alzheimer's disease (AD). Despite the obvious deficit in AD diagnostics, the situation, as in the world, is becoming extremely important [2]. AD is a disease of old age and increasing age is becoming one of the main reasons for the increase in the incidence and prevalence of AD in the world. In Russia, according to 2019 data, the mortality rate from AD was 0.13%, while out of 188,132 patient visits to a doctor with a diagnosis of dementia, 6,381 cases were due to AD [11].

In the United States, according to the AD Association, in 2021, 6.2 million Americans aged 65 and older suffer from dementia associated with Alzheimer's disease. This number may grow to 13.8 million by 2060. In the United States in 2019, mortality from AD was in 6th place, and among the elderly aged 65 and older in 5th place. Official death certificates recorded 121,499 deaths from AD, or an increase in deaths from AD by more than 145%. In 2020, mortality from AD increased against the backdrop of the COVID-19 pandemic. At the same time, mortality from acute cerebrovascular accidents, heart diseases and HIV decreased between 2000 and 2019 [5,9]

A study of mortality from AD and other dementias in China showed that the overall mortality rate from AD and other dementias increased from 3.7 per 100,000 to 6.2 per 100,000 population in 2011-2020. Studies have shown that there is an increasing trend in the overall mortality rate from AD and other dementias with a decreasing age-standardized mortality rate, indicating the further development of population aging and dementia mortality in the past and future decades [7].

In Brazil, from 2000-2019, 211,658 deaths from Alzheimer's disease were recorded among the elderly, with an increasing trend in mortality at the age of 60 to 80 years and older, which is also consistent with the global trend [8].

According to a retrospective multicenter study in Spain, BA is the cause of an increase in the proportion of hospitalizations and an increase in in-hospital mortality from BA, which leads to an increase in the cost of medical care and emphasizes the importance of early detection and optimization of care for patients with BA [3].

Given the increase in mortality rates and the number of patients with dementia in Russia, taking into account the global situation, there is currently a need to conduct epidemiological studies and develop methods for the early diagnosis and prevention of CI in the Russian Federation. The goal of these activities should be to improve diagnostics, extend the period of a person's full working life and active longevity among the elderly population.

According to Rosstat for the Republic of Sakha (Yakutia), from 2021 to 2023, the number of elderly people aged 60 years and above increased from 148.4 thousand people. up to 154.6 thousand people, respectively, and the average life expectancy was 72.7 in 2022, in 2023 al-

Yakut Science Centre of Complex Medical Problems: **DAVYDOVA Tatyana Kimovna** – PhD, visiting research fellow, head of the lab, tanya.davydova.56@inbox.ru; **ROMANOVA Anna Nikolaevna** – MD, Director; **TATARINOVA Olga Viktorovna** – MD, senior researcher; chief physician of the Republican Clinical Hospital No 3; **NIKOLAEVA Tatiana Yakovlevna** – MD, head of the Department of Medical Sciences of M.K. Ammosov North Eastern Federal University.