

# The influence of general and static endurance of highly qualified athletes on the effectiveness of competitive activities in sailing races on the YAL-6

UDC 797.14



PhD, Associate Professor **V.B. Paramzin**<sup>1</sup>

PhD, Associate Professor **I.Yu. Pugachev**<sup>2</sup>

PhD **S.V. Raznovskaya**<sup>3</sup>

<sup>1</sup>Krasnodar Higher Military School named after the general of the Army S.M. Shtemenko, Krasnodar

<sup>2</sup>Derzhavin Tambov State University, Tambov

<sup>3</sup>Petrozavodsk State University, Petrozavodsk

Corresponding author: sveta\_r3000@mail.ru

## Abstract

**Objective of the study** was to reveal the structure of the physical readiness factors of highly qualified athletes that affect the effectiveness of competitive activity, as well as to determine the most important general physical qualities of developing the ability to resist fatigue in sailing races on YaL-6.

**Methods and structure of the study.** The scientific work was attended by 16 members of the team of the Naval Institute of Radio Electronics. A.S. Popov (St. Petersburg), divided into two mixed (with a high and low level of endurance) crew. Endurance level (high, low) was determined by 1 km cross-country and Cooper's test. To determine the degree of influence of the most important general physical qualities (general and static endurance), during the control training, a comparative experiment was conducted using a blank method for self-assessment of the ability to resist fatigue.

**Results and conclusions.** Four generalized factors were identified with a total dispersion of indicators: the first - indicators of general and static endurance amounted to 33%, the second "professional sailing readiness" - 29%, the third "functional state and physical development" - 20%, the fourth - indicators of "speed" - 17%. According to the results of the blank method of self-assessment and heart rate, significant differences in the ability to resist fatigue were established. In athletes with a low level of fatigue, they appeared already by the second hour of the race, and in athletes with a high level, they were not observed until the end of the race. Significant indicators are: vital capacity, cross training, maximum oxygen consumption, static endurance. Thus, the level of endurance according to the result in running for 1 km should not be lower than 204 seconds, in the Cooper test - not lower than 3.3 km, which, in turn, will positively affect the stability of the psychophysiological functions of the body and performance during sailing races.

**Keywords:** high-class athletes, sailing races, factors, significant qualities.

**Introduction.** Today, sailing races on YAL-6 without using the rudder are characterized by the importance and value of the role of each crew member both in driving the boat, and in gaining and maintaining maximum speed throughout the race [2]. In scientific publications, there is no data on the state of athletes in the conditions of competitive struggle in sailing races on sea yawls [2]. In addition, the training process requires a clearer specification of the content of the types of training and their percentage component in different periods of training, especially at the stages of improvement and sportsmanship [1, 3, 4, 5], for more accurate and optimal summing up of an athlete for races of various durations and level.

**Objective of the study** was to reveal the structure of the physical readiness factors of highly qualified

athletes that affect the effectiveness of competitive activity, as well as to determine the most important general physical qualities of developing the ability to resist fatigue in sailing races on YaL-6.

**Methods and structure of the study.** The study was conducted with the participation of a team (16 people - the stage of sports improvement) of the Naval Institute of Radio Electronics named after A.S. Popov (St. Petersburg) in sailing on YAL-6. In the course of the study, based on the ranking of results in the 1 km cross-country, two mixed crews were formed, odd numbers one crew, even numbers the second. Endurance level (high, low) was determined by 1 km cross-country and Cooper's test. To determine the degree of influence of the most important general physical qualities (general and static endurance), during the control



training, a comparative experiment was conducted using a blank method for self-assessment of the ability to resist fatigue. According to the methodology, each crew member noted in the form of a point scale for self-assessment of mental and physical performance the figure that most accurately reflects his condition before, after and every hour of the race, and pulse (HR) was measured in parallel. The criterion for fatigue was considered to be a decrease in performance by 1.5 points. The material was processed on an electronic computer at the Military Institute of Physical Culture of the Ministry of Defense of the Russian Federation (St. Petersburg) according to the author's program of A.M. Meyerson and using a Hungarian-made MG-440 electromyograph with skin electrodes.

**Results of the study and their discussion.** Initially, important indicators of the professional readiness of athletes in the pre-competitive microcycle were identified, which affect the effectiveness of training and competitive activities:

- age and anthropometric characteristics: average age -  $20.2 \pm 0.7$  years; average standing height -  $176.4 \pm 1.9$  cm; sitting height -  $91.4 \pm 0.6$  cm; abdominal circumference -  $77.8 \pm 0.9$  cm; forearm circumference -  $27.5 \pm 0.3$  cm; shoulder circumference in a relaxed position -  $29.5 \pm 0.4$  cm; shoulder circumference in a tense position -  $32.7 \pm 0.5$  cm; thigh circumference -  $53.9 \pm 0.3$  cm; leg circumference -  $35.4 \pm 0.6$  cm; body weight -  $73.9 \pm 1.4$  kg; thickness of skin-fat folds of the back of the hand -  $2.9 \pm 0.08$  mm;

- functional indicators: lung capacity -  $4.95 \pm 0.25$  l; maximum oxygen consumption -  $48.1 \pm 1.4$  ml/min·kg; endurance coefficient -  $13.71 \pm 0.6$  c.u.; indicators of the functional reserves of the body: the index of tension of regulatory systems -  $123.8 \pm 12.1$  c.u.; reduced blood pressure -  $55.3 \pm 1.3$  mm Hg. Art.; speed of thought processes - the average time of one reaction according to the "Arithmetic calculations" method -  $1643.7 \pm 61.2$  ms.

- physical qualities: Cooper's test -  $2908.7 \pm 9.6$  m; cross for 1 km -  $221.1 \pm 2.9$  s; 100 m run -  $13.6 \pm 0.2$  s; 400 m run -  $73.0 \pm 1.3$  s; pull-ups on the crossbar -  $13.9 \pm 0.8$  times; static endurance: back muscles - backbone strength -  $152.1 \pm 2.9$  kg with retention for  $23.1 \pm 2.9 \pm 1.7$  s; abdominal muscles - holding the angle in emphasis on the uneven bars -  $12.3 \pm 1.6$  s; hands - hanging on bent arms -  $38.3 \pm 1.6$  s.

- practical (professional) skills: total training time spent with a sail on the water -  $306.7 \pm 6.9$  hours in navigation; the results of motor skills when driving the yawl, especially when turning -  $7.8 \pm 0.2$  arb. units (in a conditional 9-point expert scale); tests that characterize the stability and distribution of attention: the number of errors in the "Correction test" method -  $1.2 \pm 0.2$ ; the number of reactions of the technique "Red-black table" -  $41.3 \pm 0.9$ ; the search time for a motor

unit (MU) was  $36.7 \pm 1.9$  s; coefficient of regularity of work DE -  $79.6 \pm 2.4\%$ ; control accuracy coefficient MU -  $79.3 \pm 1.6\%$ . The potential duration (DP) of the MU of the hand muscles was  $9.24 \pm 0.06$  ms; DPMU of forearm muscles -  $10.1 \pm 0.06\%$ ; DPMU of the biceps of the shoulder -  $10.24 \pm 0.06\%$ ; DPMU of the triceps muscle of the shoulder -  $12.1 \pm 0.04\%$ . Potential amplitude (AP) of hand muscles MU -  $1494.1 \pm 25.3$   $\mu$ V; APMU of forearm muscles -  $794.1 \pm 6.3\%$ ; APMU of the biceps muscle of the shoulder -  $374.2 \pm 3.1\%$ ; APMU of the triceps muscle of the shoulder -  $929.2 \pm 11.3\%$ ; the speed of propagation of excitation along the radial nerve was  $59.4 \pm 1.6$  ms.

As a result of statistical analysis, in order to reduce the number of indicators, 4 groups of factors were identified. In the first group (the contribution of the factor to the total variance of indicators was 33%), indicators of vital capacity of the lungs, cross-country 1 km and the Cooper test, maximum oxygen consumption, static endurance of the muscles of the back, abdomen, arms, endurance coefficient had large factor weights. In this regard, the first group can be interpreted as a factor of "general and static endurance". In the second group of factors (the contribution to the total variance was 29%), the following had a significant weight: the total training time spent with a sail on the water; age, results of motor skills in steering the yawl, especially when turning; indicators of stability and distribution of attention. This group is interpreted as a factor of "professional sailing readiness". In the third group (the contribution to the total variance of indicators was 20%), significant factor weights had: a functional indicator characterizing the level of development of the body's functional reserves, the volume of motor activity, as well as weight and height. This made it possible to interpret this group as a factor of "functional state and physical development". In the fourth group (the contribution to the total variance was 17%), the highest factor loadings were in the 100m and 400m runs, as well as the speed of thought processes. This group is interpreted as a factor of "quickness". The use of factor analysis made it possible to identify the structure of indicators that most contribute to successful competitive activity.

To study the influence of endurance on the ability to resist general fatigue in the process of competitive activity, the method of identifying and comparing polar groups was applied, the results of the studies are presented in the table.

Declines in performance levels occurred in both groups of participants. In athletes with a higher level of endurance, fatigue occurred only by the third hour of the race, with a low level, a significant degree of fatigue (a decrease in the indicator by more than two or more points) was observed already by the second hour, and the dynamics persisted after the race. In the

*Comparative analysis of self-assessment and performance indicators of sportsmen-racers on YAL-6*

Endurance level	Test time				
	Before the start of the race (x±m)	1st hour (x±m)	2nd hour (x±m)	3rd hour (x±m)	After the race
High	0,17±0,02	0,37±0,04	0,82±0,05	1,73±0,11	1,78±0,12
Low	0,16±0,02	0,87±0,05	2,47±0,16	3,88±0,21	3,97±0,21
p	t=1,93; p > 0,05	t=7,8; p < 0,001	t=9,8; p < 0,001	t=9,0; p < 0,001	t=9,0; p < 0,001
Heart rate (high)	64,8±1,6	162,3±1,9	166,5±1,7	160,1±2,1	69,3±1,8
Heart rate (low)	63,6±1,5	168,4±2,0	172,9±2,1	168,0±2,2	70,1±1,8
p	t=0,54; p>0,05	t=2,2; p<0,05	t=2,4; p<0,05	t=2,6; p<0,05	t=0,31; p>0,05

course of the comparative analysis, a range of results in a 1 km run was identified, corresponding to athletes with a high and low level: before the race, the indicators of self-assessment of readiness were the same, after the first hour of the race, the analysis showed the initial stage of fatigue in athletes running a distance of 1 km for 230 s and slower, after the second hour - in 222 s, after the third hour - in 204 s.

**Conclusions.** For the successful competitive activity of athletes in sailing races on YAL-6, professionally significant indicators are: vital capacity of the lungs, maximum oxygen consumption, static endurance of the muscles of the back, abdomen, arms, cross-country results for 1 km and in the Cooper test, endurance coefficient. The data indicate the need to increase the level of endurance according to the result in running for 1 km not lower than 204 s, in the Cooper test - not lower than 3300 m, which, in turn, will positively affect the resistance of the psychophysiological functions of the body and working capacity in the process of sailing races.

### References

1. Mashchenko O.V., Paramzin V.B., Raznovskaya S.V., Yatsyk V.Z., Vasilchenko O.S. Povysheniye fizicheskoy rabotosposobnosti i vynoslivosti devushek v armeyskom girevom ryvke sredstvami krossovoy podgotovki [Improving the physical performance and endurance of girls in the army kettlebell snatch by means of cross-country training]. *Teoriya i praktika fizicheskoy kultury*. 2021. No. 5. pp. 45-47.
2. Pugachev I.Yu. Grebno-parusnoye mnogoborye kak effektivnoye sredstvo obespecheniya professionalnoy rabotosposobnosti spetsialistov morskikh inzhenerno-tekhnicheskikh vuzov RF [Rowing and sailing all-around as an effective means of ensuring the professional performance of specialists from marine engineering and technical universities of the Russian Federation]. *Vestnik Tambovskogo universiteta. Seriya: Gumanitarnyye nauki*. 2007. No. 6 (50). pp. 36-38.
3. Pugachev I.Yu. Nauchnyye predstavleniya o professionalnoy i fizicheskoy rabotosposobnosti spetsialista [Scientific ideas about the professional and physical performance of a specialist]. *Kant*. 2022. No. 3 (44). pp. 4-15.
4. Raznovskaya S.V., Paramzin V.B., Pugachev I.Yu., Yurchenko A.L. Napravlennost spetsialnoy fizicheskoy podgotovki spetsialistov upravleniya vozdushnym dvizheniyem s uchetom professional'no znachimyykh psikhofiziologicheskikh kachestv [Direction of special physical training of air traffic control specialists taking into account professionally significant psychophysiological qualities]. *Teoriya i praktika fizicheskoy kultury*. 2022. No. 11. pp. 81-83.
5. Yurchenko A.L., Kiselev A.O., Raznovskaya S.V., Pugachev I.Yu., Paramzin V.B. Modernizatsiya kontenta upravleniya sostoyaniyem sorevnovatelnoy gotovnosti kvalifitsirovannykh atletov na etape sportivnogo sovershenstvovaniya [Modernization of the content of management of the state of competitive readiness of qualified athletes at the stage of sports improvement]. *Uchenye zapiski universiteta im. P.F. Lesgafta*. 2022. No. 10 (212). pp. 514-519.