



ORIGINAL SCIENTIFIC ARTICLE

FEATURES OF THE CANOEISTS' SPECIAL PHYSICAL FITNESS AT THE DISTANCE OF 1000 m

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Abstract

The aim of the study. To better understanding of the indicators of functional support for special endurance and physiological demands in canoeists at a distance of 1000 m.

Material and methods: 20 athletes (19-23 years) in canoeing from Shandong and Jiangxi provinces.

Results. According to the results of the analysis, the following typological groups of athletes-canoeists, specializing in the distance of 1000 m, with pronounced differences in the implementation of anaerobic energy supply. Typological groups of athletes had no significant differences in aerobic energy capacity ($p > 0.05$).

The first typological group ($La_{max} 90\text{ s} < 10.08\text{ mmol}\cdot\text{l}^{-1}$, $p < 0.05$) is characterized by: power indicators $4.96 \pm 2.35\text{ mmol}\cdot\text{l}^{-1}$ and anaerobic energy supply capacity $6.93 \pm 3.16\text{ mmol}\cdot\text{l}^{-1}$, which were the lowest among other groups of athletes. Athletes showed significantly low performance in 10-s, 30-s and 90-s tests, and performed less work in the step test, with varying degrees of severity of fatigue compensation mechanisms.

The second typological group ($La_{max} 90\text{ s} - 10.08-16.64\text{ mmol}\cdot\text{l}^{-1}$, $p < 0.05$), is characterized by high power $7.4 \pm 1.68\text{ mmol}\cdot\text{l}^{-1}$ and low capacity anaerobic energy supply $13.32 \pm 1.52\text{ mmol}\cdot\text{l}^{-1}$. Athletes performed a sufficient amount of work in the step test (3-4 steps), but performance in the 90-s test was reduced, there were reduced characteristics of the ability to compensate for fatigue.

The third typological group ($La_{max} 90\text{ s} > 16.64\text{ mmol}\cdot\text{l}^{-1}$, $p < 0.05$) is characterized by: power indicators $8.20 \pm 2.36\text{ mmol}\cdot\text{l}^{-1}$ and anaerobic energy supply capacity $17.85 \pm 1.05\text{ mmol}\cdot\text{l}^{-1}$, which were the highest among other groups of athletes and significantly ($p < 0.05$) higher performance in 30 s, 90 s tests, and the level of power at which the maximum oxygen consumption in the step test is reached.

Conclusion. The results of the studies indicate differences in the level of functional support for special endurance for paddlers of uniform groups for canoeists that specialize in a distance of 1000 m.

Keywords: canoeing, aerobic energy supply, anaerobic energy supply, special performance.

Introduction

Canoeing and Kayaking are classified as event requiring mixed anaerobic lactic energy production, as well as great aerobic capacity and endurance; such reactions of energy production prevail in 1000 m event (Bishop, 2004; van Someren & Howatson 2008, Nekrišius et al., 2018). The typical individual performance times for men and women have

been approximately 210 s for the 1000-m, respectively. At Rio 2016, medals won within 211.447 to 213.363 s, respectively, for 1,000 m.

During races, energy is supplied via the anaerobic and aerobic pathways (Garcia-Pallares, Sanchez-Medina et al. 2009), with aerobic metabolism contributing – $82 \pm 5.0\%$ for the 1000-m event (Lim et al., 1997).

Slow twitch, enduring muscle fibers with their inner intense aerobic processes are active participants in muscle work. In 1000 m event, good sport results are being achieved by athletes possessing relative maximal oxygen uptake $70\text{ ml}\cdot\text{min}^{-1}\cdot\text{kg}^{-1}$ (Nekrišius, 2018; Diachenko et al., 2020; Dy-

achenko, 2004) due to this fact, the significance and time allocation to aerobic capacity development for paddlers preparing for this event becomes obvious. Therefore, the training undertaken to prepare for such arduous activity is expected to develop several components of fitness, including maximum oxygen uptake ($\dot{V}O_{2\max}$). The $\dot{V}O_{2\max}$ is a common indicator for aerobic fitness and higher levels allow athletes to maintain higher power outputs and speed during racing. For example, investigations with athletes from national to elite international level have presented large-to-very large inverse correlations between $\dot{V}O_{2\max}$ and performance over 1000-m on-water performance (Fry & Morton, 1991; Bishop, 2004; Bishop et al., 2002).

When overcoming the competitive distance of the 1000th, athletes row at 102% of the power of $\dot{V}O_{2\max}$ (Zamparo et al., 1999). A study by individual authors (Tesch, 1983; Fry and Mortin, 1991; Bishop, 2004) demonstrated a high correlation between distance and $\dot{V}O_{2\max}$, and power at the anaerobic threshold. Anaerobic power recorded during 30-second and 2-minute ergometer tests was also associated with kayak distance in kayakers (van Someren & Howatson, 2008).

Despite the fact that a number of studies have shown that the characteristics of the functional support of special performance have a wide range of individual differences, the issue of selection the typological features of the functional support of special performance of athletes who specialize in the distance of 1000 m in canoeing, were not the subject of special analysis. This leads to the selection of the problem issue that needs to be studied and analyzed.

The purpose of the study – identify differences and substantiate the typological features of the functional support of special performance of athletes who specialize in the distance of 1000 m in canoeing.

Materials and methods

Subject

Depending on the purpose of the research phase, the theoretical and experimental parts of the research were conducted at different training periods at the national aquatic sports training centers in Beihai, Zhizhao (PRC). The research involved 20 athletes (19-23 years) in canoeing from Shandong and Jiangxi provinces (PRC).

Research protocol

Physical Characteristics, Gas exchange, HR, and blood lactate measurements.

Minute ventilation ($\dot{V}E$), oxygen consumption ($\dot{V}O_2$), CO_2 production ($\dot{V}CO_2$), were determined on a breath-by-breath basis using an Oxycon mobile (Jaeger) metabolimeter. The metabolic unit was calibrated a gas of known composition (16.00% O_2 , 4.00% CO_2), respectively.

HR was recorded every 5 s with an HR monitor (S610 Polar Electro, Kempele, Finland).

The blood lactate concentration ([La]b) was determined using a portable lactate analyzer (Biosen S. line lab +) on a blood sample obtained from the ear lobe at the end of the test.

A modified canoe-ergometer (Dansprint PRO, Denmark) was used. Ergometric power (EP) of work were recorded.

All the sportsmens performed an incremental exercise test on separate days, with at least 24 hours and no longer than 3 days between.

The testing program is built in the form of test battery, each test solving a task to assess certain component of anaerobic abilities of athletes and cardiorespiratory system response. Test tasks were performed in a strictly determined sequence. It was important to preserve the parameters of the ergometric power of work which provided for the energy release in anaerobic alactate and anaerobic lactate (glycolytic) way, as well as the length of the rest intervals. The rest interval between 10 and 30 s work was one minute, between 30 s and step test- seven minutes, between step test and 90 s – one minutes, after 90 s work – five minutes.

The composition of test tasks included the formed conditions of realization of structure of energy supply of rowers according to structure of special working capacity of rowers on competitive distance of 1000 m:

- “test 10 s” – the load forms the conditions for the realization of the start, taking into account the mobilization of power and capacity of anaerobic lactate energy supply. Indicator W 10 s, W is analyzed.
- “test 30 s” – the load forms the conditions for the realization of the capacity and capacity of anaerobic alactate and lactate (glycolytic) energy supply in accordance with the initial part of the competitive distance of 1000 m. Indicators W 30 s, W, La max 30 s, $mmol \cdot l^{-1}$ are analyzed.
- step-increasing load (step test): the first step is the ergometric power of work in accordance with the coefficient determined for men – canoe, at the level of 1.6 (coefficient $\times$ body weight). The increase in ergometric power on each step of work is 20 W, the duration of work on the step is 2 minutes. The work is performed to failure (inability to maintain ergometric power of work on the step). Features of functional training of qualified and especially highly qualified rowers for the kinetics of the cardiorespiratory system and aerobic energy supply. The load forms the conditions for the realization of body functions in terms of modeling the intensity of competitive activity. The period of reaching a steady state (Plateau) of consumption of O_2 , W $\dot{V}O_2$ max, VE/CO_2 , VE/CO_2 , $\dot{V}O_2$ max c.u. are analyzed;
- critical power operation: acceleration for 90 s – “test 90 s”. It is used to model the conditions of realization of power and capacity of anaerobic energy supply according to the second half of the distance of 1000 m against the background of increasing fatigue (performed one minute after performing the step-increasing test performed according to the $\dot{V}O_2$ max registration protocol). Indicators W 90 s, W, La max 90 s, $mmol \cdot l^{-1}$, VE/CO_2 90 s, c.u. are analyzed.

The research related to human use has complied with all the relevant national regulations and institutional policies; has followed the tenets of the Helsinki Declaration, and has been approved by the authors' institutional review board or al equivalent committee. Informed consent has been obtained from all individuals included in this study.

Statistical Analysis

The following methods of mathematical statistics were applied: descriptive statistics, selective method, Shapiro-

Wilk's normality test, non-parametric Mann-Whitney test. Methods of descriptive analysis were used, including tabular presentation of separate variables, calculation of mean arithmetic value (M), standard deviation (SD), coefficient of variation (CV, %). The sample data for normality were tested with the normal distribution formula and the Shapiro-Wilks test. The level of $p \leq 0.05$ (the probability of error) was assumed statistically significant.

Results

In the process of analyzing the experimental data, it was noted that the high value of the coefficient of variation of the anaerobic energy supply characteristics of the canoeists registered during the performance of the 30-second maximum test. Permissible limits exceeded the coefficient of variation (CV (%)) > 10-15 %, $p < 0.05$) recorded values of blood lactate concentration at the third minute of the recovery period and the maximum blood lactate concentration after performing a 30-second maximum test, were 26.05% and 26.27%, respectively for athletes in canoe.

The analysis also noted high values of the coefficient of variation of anaerobic energy supply characteristics of rowers registered during the 90-second maximum test, which

simulated the conditions of realization of power and capacity of anaerobic energy supply according to the second half of the distance of 1000 m against increasing fatigue. Thus, the largest range of variation of 24.57% and the highest power of anaerobic energy reactions in canoeists were recorded during the 90-second maximum test, which simulated the conditions of increasing fatigue according to the second half of the distance of 1000 m. $13.36 \pm 3.28 \text{ mmol}\cdot\text{l}^{-1}$ and the range of differences of indicators – minimum and maximum $3.28\text{-}18.99 \text{ mmol}\cdot\text{l}^{-1}$.

It should be noted the high range of variation of indicators that characterize the degree of compensation for fatigue (ratio of indicators $\text{VE}/\text{CO}_2 \text{ VO}_2 \text{ max}$, c.u. and $\text{VE}/\text{CO}_2 \text{ 90s}$, c.u.) In the period, performance of the step test and against the background of growing fatigue, in the 90-second test, and canoeists, which reached values of 76.39 %.

These differences indicate the possibility of distinguishing typological groups of canoeists with pronounced differences in terms of implementation of anaerobic energy supply at $\text{La max 90s} < 10.08$, $\text{La max 90s} - 10.08\text{-}16.64 \text{ mmol}\cdot\text{l}^{-1}$, $\text{La max 90 s} - > 16.64 \text{ mmol}\cdot\text{l}^{-1}$. According to the results of the analysis, selected the following typological groups of athletes – canoeists, who specialize in the distance of 1000 m (table 1).

Table 1. Indicators of functional support of special working capacity of qualified canoeists who specialize in the distance of 1000 m ($n=20$), $p<0,05$

Indicators, values of indicators (M $\pm$ SD)	The first typological group La max 90 s <10.08 mmol·l ⁻¹ n = 2	The second typological group La max 90 s – 10.08-16.64 mmol·l ⁻¹ n = 15	The third typological group La max 90 s – >16.64 mmol·l ⁻¹ n = 3
Performance indicators			
W10s, W	190.5 $\pm$ 30.41*	263.07 $\pm$ 54.14	270.67 $\pm$ 12.58
W30s, W	204.5 $\pm$ 13.44*	256.47 $\pm$ 28.58	275.33 $\pm$ 25.15*
The amount of work in the step test, steps	1-2	3-4	2-4
W VO ₂ max, W	121.5 $\pm$ 14.85	141.0 $\pm$ 15.67	156.33 $\pm$ 13.58*
W 90 s, W	139.00 $\pm$ 11.31	157.60 $\pm$ 16.54	184.33 $\pm$ 29.26*
Indicators of power and capacity of anaerobic energy supply			
La 3min 30 s, mmol·l ⁻¹	4.96 $\pm$ 2.35	6.62 $\pm$ 1.41	8.03 $\pm$ 2.5
La 7min 30 s, mmol·l ⁻¹	4.59 $\pm$ 2.12	7.30 $\pm$ 1.7	8.17 $\pm$ 2.32
La max 30 s, mmol·l ⁻¹	4.96 $\pm$ 2.35	7.4 $\pm$ 1.68*	8.20 $\pm$ 2.36*
Δ La 30 s, mmol·l ⁻¹	-0.37 $\pm$ 0.23	0.68 $\pm$ 0.77	0.15 $\pm$ 0.19
La 3 min 90 s, mmol·l ⁻¹	6.93 $\pm$ 5.16	12.76 $\pm$ 1.38	17.27 $\pm$ 1.72
La 5 min 90 s, mmol·l ⁻¹	6.45 $\pm$ 5.42	13.03 $\pm$ 1.73	17.61 $\pm$ 0.67
La max 90 s, mmol·l ⁻¹	6.93 $\pm$ 3.16	13.32 $\pm$ 1.52*	17.85 $\pm$ 1.05*
Indicators of aerobic energy supply capacity			
VO ₂ max, ml·min ⁻¹ ·kg ⁻¹	53.11 $\pm$ 2.20	51.83 $\pm$ 5.44	55.73 $\pm$ 7.46
Indicators, characterize the ability to compensate for fatigue			
VE/CO ₂ VO ₂ max*, c.u. .	28.5 $\pm$ 0.71	31.13 $\pm$ 5.57	31.33 $\pm$ 5.69
VE/CO ₂ 90s **, c.u.	33.5 $\pm$ 4.95	34.27 $\pm$ 5.09	35.67 $\pm$ 8.74

Notes: *-1 – indicators, registered at the starting point of achievement VO₂ max in “step test” (averages of 30 seconds); ** -2 – indicators, registered in “test 90 s”

The first typological group characterized: significantly ($p < 0.05$) lower indicators of ergometric power in the conditions of increasing fatigue 139.00 ± 11.31 W (W90s, W), in the conditions of model of the starting segment of the distance 204.5 W (W30s, W), the indicators of ergometric power to achieve the level of maximum oxygen consumption in the conditions of step-increasing load were at the level of 121.5 ± 14.85 W (W VO_2 max, W), which were not significantly different from those of athletes in other typological groups ($p > 0.05$). Indicators of anaerobic energy supply capacity 6.93 ± 3.16 mmol·l⁻¹ (La max 90 s) were the lowest among other groups of athletes. Differences in indicators are significant at $p < 0.05$. This group of athletes has an indicator of lactate concentration La max was registered at 3 minutes of the recovery period and by the seventh minute decreased by $1-0.04$ mmol·l⁻¹. Indicators lactate kinetics has negative values. This group of athletes is characterized by different degrees of severity of fatigue compensation mechanisms.

The second typological group characterized: During the 90-second maximum test period, under the conditions of increased fatigue and difference in fatigue compensation, the aerobic energy supply index decreased, in some athletes VE/CO_2 VO_2 max c.u. exceeded VE/CO_2 90 s, c.u. Indicators of aerobic energy supply did not differ significantly from those of athletes of other typological groups ($p > 0.05$). Indicators of power and capacity of anaerobic energy supply 7.4 ± 1.68 mmol·l⁻¹ (La max 30 s) and 13.32 ± 1.52 mmol·l⁻¹ (La max 90 s) ($p < 0.05$) significantly exceeded the indicators of the first typological group.

The third typological group "Anaerobic" characterized: significantly higher indicators of ergometric power in conditions of increasing fatigue 184.33 ± 29.26 W (W90s, W), in the conditions of modeling of a starting segment of distance 275.33 ± 25.15 W (W30s, W), achieving the level of maximum oxygen consumption in the conditions of step-increasing load 156.33 ± 13.58 W (W VO_2 max, W), which were within the model range of high-class athletes ($p < 0.05$). This was taken into account that volume of step-increasing load, which was at the level of 2 to 4 steps. Indicators power 8.20 ± 2.36 mmol·l⁻¹ (La max 30 s) and anaerobic energy supply capacity 17.85 ± 1.05 mmol·l⁻¹ (La max 90 s) were the highest among other groups of athletes. Differences in indicators are significant at $p < 0.05$. Indicators power aerobic energy supply did not differ significantly from the performance of athletes of other typological groups ($p > 0.05$).

Discussion

Coaches and sport scientists must use valid and accurate instruments with equally valid and reliable protocols to detect training adaptations that could influence performance. Ergometers simulate the movement patterns of a sport, allowing access to the physiological responses in a controlled laboratory environment (van Someren, Phillips, & Palmer, 2000). The comparison of ergometer with on-water kayaking performance has concluded that kayak ergometers accurately simulate the physiological demands of short-term high-intensity kayaking (van Someren et al., 2000; van Someren & Palmer, 2002). The use of ergometers offers advantages in the evaluation of athletes performance in a laboratory context (Gomes et al., 2012), bringing advantages of methodological rigor in the control of athletes in the laboratory context.

The study (Coelho, et al., 2021). In conclusion, we found that $\text{V}\cdot\text{O}_2$ max, stroke distance and stroke rate during the a maximal graded exercise test (GXT) were not different from the corresponding variables ($\text{V}\cdot\text{O}_2$ peak, stroke distance and stroke rate) observed during the time-trial performance (TT), and that MAP and the corresponding stroke rate were strong predictors of 1,000 m TT performance. The results confirmed that $\text{V}\cdot\text{O}_2$ max, chronological age, the speed at VT_1 and VT_2 , stroke rate and power output are significantly correlated with the performance in a 1,000 m time-trial. This study demonstrated that in well-trained young kayakers, cardiorespiratory fitness could be assessed during a time-trial test that mimics the actual performance attained in flat water.

The lactate concentration values found in this study highlights the contribution of the anaerobic energy pathway to kayak TT performance and reinforces the role of the significant contribution of anaerobic energy sources in sprint kayak performance (Gomes et al., 2012).

Previous research did not report the verified correlation of the velocity at VT_1 and VT_2 intensities with that of 1,000 m. These results support the importance of the aerobic-fitness variables as a valuable and useful marker for monitoring longitudinal athlete development and. They could also reinforce that better submaximal (velocity) performance influences the all-out time-trial performance. The relative intensity of VT_1 and VT_2 found in study Coelho et al. (2021).

The findings López-Plaza et al. (2017, 2018), Alacid and Carrasco (2004) confirm the importance of maturity status in sprint kayaking and canoeing since the more mature paddlers were also those who revealed largest body size, physical fitness level and best paddling performance. Additionally, the most important variables predicting performance times in kayaking and canoeing were maturity status and chronological age, respectively. Negative and significant correlations ($p < 0.01$) were detected between performance times, chronological age and anthropometry (body mass, height, sitting height and maturity status), overhead medicine ball throw and sit and reach for all distances.

In the beginning of the preparation for the season 2011 was carried out testing with incrementally increasing power loads capacity (4×3 min, with 1-minute interval) on the ergometer "Dansprint" with the kayakers of national team of the Republic of Belarus ($n = 27$). On the last step was measured the work and was calculated the amount of ATP which is necessary for it accomplishment. Based on the data of kinetics of lactate concentration in the blood before the beginning of rowing on the last step and during the recovery period was revealed the rate constant of disappearance and appearance of lactate in the blood. It allowed to calculate the maximum lactate concentration in the compartment within the absorption of one-compartment pharmino-kinetics' model. Taking into account its volume, were determined the number of the formed lactate and ATP resynthesizing as a results of anaerobic glycolysis (1.03 (0.90-1.19) mol – men, 0.48 (0.39-0.61) mol – women) and the contribution of latter in the energy supply of exercise – 31 (26-34)% and 22 (22-25)% (Moroz et al., 2016; Kong Xianglin et al., 2019, 2020).

Therefore, coaches can use these variables ($\text{V}\cdot\text{O}_2$ max, chronological age, the speed at VT_1 and VT_2 , stroke rate and power output) as performance markers when monitor-

ing their athletes with regards to predictive factors of sport-specific performance. Programming training to improve these variables may therefore also improve 1,000-m kayaking performance.

Conclusions

According to the results of experimental research, substantiated the differences and typological features of the functional support of the special performance of athletes who specialize in the distance of 1000 m in canoeing.

According to the results of the analysis, the following typological groups of athletes-canoeists, specializing in the distance of 1000 m, with pronounced differences in the implementation of anaerobic energy supply.

The first typological group (La max 90s < 10.08 mmol·l⁻¹, p < 0.05) is characterized by: power indicators (La max 30 s) 4.96 ± 2.35 mmol·l⁻¹ and anaerobic energy supply capacity (La max 90 s) 6.93 ± 3.16 mmol·l⁻¹, which were the lowest among other groups of athletes. Athletes showed significantly low performance in 10-s, 30-s and 90-s tests, and performed less work in the step test, with varying degrees of severity of fatigue compensation mechanisms.

The second typological group (La max 90s – 10.08–16.64 mmol·l⁻¹, p < 0.05), is characterized by high power (La max 30 s) 7.4 ± 1.68 mmol·l⁻¹ and low capacity anaerobic energy supply (La max 90 s) 13.32 ± 1.52 mmol·l⁻¹. Athletes performed a sufficient amount of work in the step test (3–4 steps), but performance in the 90-s test was reduced, there were reduced characteristics of the ability to compensate for fatigue.

The third typological group (La max 90s > 16.64 mmol·l⁻¹, p < 0.05) is characterized by: power indicators (La max 30 s) 8.20 ± 2.36 mmol·l⁻¹ and anaerobic energy supply capacity (La max 90 s) 17.85 ± 1.05 mmol·l⁻¹, which were the highest among other groups of athletes and significantly (p < 0.05) higher performance in 30-s, 90-s tests, and the level of power at which the maximum oxygen consumption in the step test is reached.

Typological groups of athletes had no significant differences in aerobic energy capacity (p > 0.05). Thus, these data form the basis for a specialized focus of the training process of athletes of different typological groups.

Prospects for further research consist in the implementation of the developed theoretical provisions to the management system of training and competitive loads of athletes in canoeing.

Conflict of Interest

The authors declare no conflict of interest.

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ОСОБЛИВОСТІ ФУНКЦІОНАЛЬНОГО ЗАБЕЗПЕЧЕННЯ СПЕЦІАЛЬНОЇ ПРАЦЕЗДАТНОСТІ КАНОЇСТІВ, ЯКІ СПЕЦІАЛІЗУЮТЬСЯ НА ДИСТАНЦІЇ 1000 м

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Реферат. Стаття: 5 с., 1 таб., 22 джерела.

Мета дослідження. Визначити відмінності функціонального забезпечення спеціальної працездатності каноїстів, які спеціалізуються на дистанції 1000 м.

Матеріал і методи: 20 спортсменів (19-23 роки) з веслування на каное з провінції Шаньдун і Дзянсі.

Результати. За результатами аналізу виділяють наступні типологічні групи спортсменів-каноїстів, що спеціалізуються на дистанції 1000 м, із вираженими відмінностями у здійсненні анаеробного енергозабезпечення. Типологічні групи спортсменів не мали достовірних відмінностей за показниками потужності аеробного енергозабезпечення ($p > 0,05$).

Перша типологічна група ($La_{max} 90\text{ с} < 10,08 \text{ ммоль}\cdot\text{л}^{-1}$, $p < 0,05$) характеризується: показниками потужності $4,96 \pm 2,35 \text{ ммоль}\cdot\text{л}^{-1}$ та ємності анаеробного енергозабезпечення $6,93 \pm 3,16 \text{ ммоль}\cdot\text{л}^{-1}$, які були найнижчими серед інших груп спортсменів. Спортсмени показали достовірно низькі результати в 10 с, 30 с і 90 с тестах, а також виконували менше роботи в степ-тесті з різним ступенем вираженості механізмів компенсації втоми.

Друга типологічна група ($La_{max} 90\text{ с} - 10,08-16,64 \text{ ммоль}\cdot\text{л}^{-1}$, $p < 0,05$), характеризується високою потуж-

ністю $7,4 \pm 1,68 \text{ ммоль}\cdot\text{л}^{-1}$ та зниженими показниками ємності анаеробного енергозабезпечення $13,32 \pm 1,52 \text{ ммоль}\cdot\text{л}^{-1}$. Спортсмени виконали достатній обсяг роботи в степ-тесті (3-4 кроки), але показники в тесті 90 с знизилися, знизилися характеристики здатності компенсувати втому.

Третя типологічна група ($La_{max} 90\text{ с} - > 16,64 \text{ ммоль}\cdot\text{л}^{-1}$, $p < 0,05$) характеризується: показниками потужності $8,20 \pm 2,36 \text{ ммоль}\cdot\text{л}^{-1}$ та ємністю анаеробного енергозабезпечення $17,85 \pm 1,05 \text{ ммоль}\cdot\text{л}^{-1}$, які були найвищими серед інших груп спортсменів, та достовірно більш високими показниками потужності роботи у 30 с, 90 с тестах, та рівнем потужності роботи, при якому досягнуто максимальне споживання кисню у степ-тесті ($p < 0,05$).

Висновок. Результати досліджень свідчать про відмінності в рівні функціонального забезпечення спеціальної витривалості у веслярів однорідних груп каноїстів, які спеціалізуються на дистанції 1000 м.

Ключові слова: веслування на каное, аеробне енергозабезпечення, анаеробне енергопостачання, спеціальна продуктивність.

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