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THE IMPORTANCE OF THE MORPHOFUNCTIONAL AND PERSONAL QUALITIES OF HEALTHY YOUNG MEN IN PROVIDING PHYSICAL PERFORMANCE AT THE TREADMILL STAGE PERFORMANCE TEST

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Annotation. Modern methods of load testing can help identify and substantiate the most informative markers of success in the chosen sport. The aim of this study is to assess the indicators of the organism of young male students before and after the stage performance test on the treadmill to failure and to determine the importance of morphological, functional, biochemical and personal characteristics in ensuring performance. 30 young male students without health restrictions at the age of 20±2 years performed a stage test to failure on a treadmill. The initial speed of the stage test was 6 to 8 km/h, depending on the individual heart rate values set during the warm-up. The duration of running on each stage was 3 minutes. The increase in the speed of each subsequent stage was 1 km/h. Blood sampling from the finger to determine the concentration of glucose and lactate was performed during a 30-second pause between stages (and immediately after failure). Morphological indicators (body mass, Ketle index, percent of subcutaneous fat) significantly decreased under the influence of stepwise cyclic loads, however, biochemical indicators of capillary blood (concentration of lactate and glucose), as well as heart rate (HR) increased in male students in relation to the background. There were significant positive correlations between the Ketle index, hand strength, shoulder circumference in tension, lactate concentration in capillary blood, and significant negative correlations between the Pinier index, the level of stress resistance and the degree of negativity, on the one hand, and the total muscle work of young men, on the other hand. The results obtained indicate significant homeostatic changes in

healthy young men after intense physical activity, which requires determining the recovery mode. These data make possible to predict the amount of muscular work performed by young men, depending on their individual psychological and morphofunctional characteristics.

Introduction. Currently the issue of research of adaptation and functional reserves of an organism both in healthy people and in athletes remain relevant. Unfortunately, the development of sports medicine, implementation of innovations in diagnostic and testing hardware are not aimed at the reveal of the full information about the state of health of athletes, but often only identifying hidden pathology [5]. At the same time, the use of substantiated scientific-methodological approach to conduct and analyze results of the functional load test would allow to assess the level of health, functional state and adaptation reserves of an organism [1]. It also very important to identify candidates, who possess applicable potential capabilities, on the initial stage of sports selection. Though there are many criteria for selection [2, 6, 7], it is very important for both coaches and athletes to reveal and substantiate the most informative markers of the success of training sessions. Therefore, the aim of this study is to assess the indicators of the organism of young male students before and after the stage performance test on the treadmill to failure and to determine the importance of morphological, functional, biochemical and personal characteristics in ensuring performance.

Methods and organization. Thirty young male students of the full-time study without health restrictions at the age of 20±2 years participated in the research. Every participant signed a voluntary consent to participate in the experiment consisting of two parts, which were conducted on different days. The day before testing participants refrained from intense physical loads, alcohol intake and smoking 2 hours after a light breakfast. Before the beginning of testing every subject was given a task to achieve the maximum running speed, fatigue and inability to continue running were considered as a criterion to for refusing to continue. Before the beginning of testing a 5-minute low-intensity warm-up running on the treadmill was conducted, which did not cause an increase in pulse higher than 130 beats/min. The initial speed of the stage test was 6 to 8 km/h, depending on the individual heart rate values set during the warm-up. The duration of running on each stage was 3 minutes. The increase in the speed of each subsequent stage was 1 km/h. Blood sampling from the finger was performed during a 30-second pause between stages (and immediately after failure, when a subject stepped on the unmoving part of the treadmill after completing the next stage). Capillary blood analysis was conducted in order to determine the concentration of glucose and lactate on the Super GL Ambulance device (manufactured by Dr. Muller, Germany). The measurement

range for glucose was 0,6-50,0 mmol/l, for lactate – 0,5-30,0 mmol/l. To determine body mass and endogenous fat percentage the segmental analyzer of body composition ("Tanita BC-545N", Japan). Running was performed on the treadmill ("Spirit Fitness XT 685 AC", Hasttings, USA). The level of the ability to handle stress and diagnostics of the state of aggression were registered using the "Monitoring health of athletes" program [3]. The "STATISTICA 10" program for Windows was used to process and analyze data. In order to reveal significant differences between baseline indicators and indicators after loads the Student's t-criterion was used in case of parametric sampling and the non-parametric Wilcoxon-Mann-Whitney criterion in case of variables, which do not have a normal distribution. The differences were considered as significant if their significance level is ≥95% [4].

Results and discussion. Indicators of the organism of young male students before and after the stage test are presented in Table 1.

The table showed that body mass and % of subcutaneous fat decreased after testing. At the same time, a significant increase in HR, glucose and lactate concentration in capillary blood was registered, which indicates significant changes in the cardiovascular system and energy support of muscle activity in young men.

Table 1

Indicators of young men before and during the failure after performing loads on the treadmill (M ± σ)

Indicators	Baseline (n = 30)	Failure (n = 30)
Body mass, kg	74,13±11,42	73,43±11,20▲
Ketle index, kg/m^2	22,62±2,73	22,40±2,66▲
% of subcutaneous fat	17,56±6,41	15,82±6,56▲
HR, beat/min	70,53±11,33	193,20±11,78▲
Glucose concentration capillary blood, mmol/l	4,50±0,40	5,32±0,94▲
Lactate concentration in capillary blood, mmol/l	2,80±0,90	10,07±3,97▲

Note: ▲ – significant in relation to baseline indicators; M – mean arithmetic selection; σ – confidence interval (95%) for root mean square deviation.

On the next stage of analysis, a correlation group of indicators of morphofunctional and psychological testing depending on total muscle work performed by examined young men on the treadmill (Fig. 1).

On the second stage, the analysis of the obtained data on results of the multiple linear regression analysis (Table 2) was conducted. In order to build the model of multiple regression as a X_i factor, morphofunctional, biochemical and personal indicators were used. As a result, the equation of regression became $Y = -173,02B+0,44X_1-19,31X_2+2,47X_3+23,40X_4-0,36X_5+10,25X_6+4,27X_7-7,38X_8$, where Y is the volume of muscle work, and B is the intercept term.

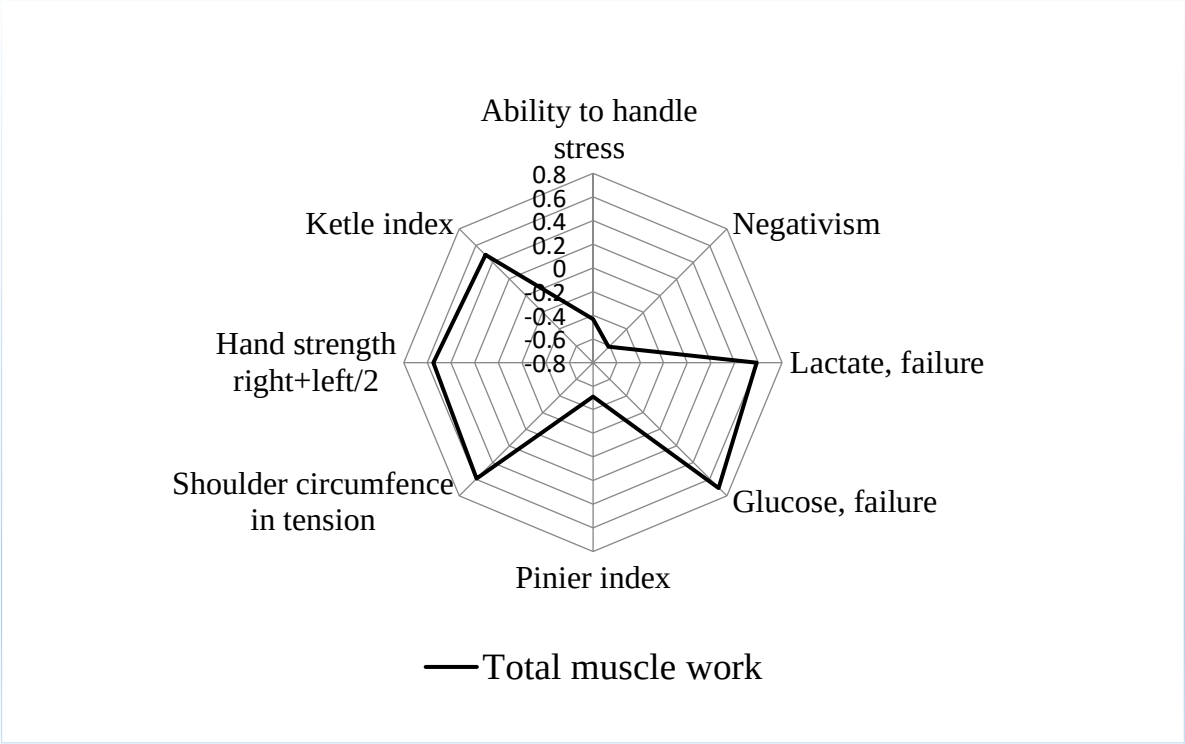

Fig. 1. Coefficients of the Spearman's rank correlation (r) between morphofunctional, biochemical, personal indicators and the total muscle work on the treadmill

Note: only significant correlations between indicators and the total muscle work are presented.

Table 2

Equation of multiple regression

Indicators(predictors)	B±m	R±m	P
Ability to handle stress (X_1)	0,03±0,13	0,44±1,80	-
*Negativism (X_2)	-0,33±0,14	-19,31±8,53	0,03
Lactate, failure (X_3)	0,11±0,15	2,47±3,46	-
Glucose, failure (X_4)	0,257±0,15	23,40±13,83	-
Pinier index (X_5)	-0,06±0,70	-0,36±4,13	-
Shoulder circumfence in tension (X_6)	0,36±0,24	10,25±6,98	-
*Hand strength of the left + right arm/2 (X_7)	0,36±0,13	4,27±1,57	0,01
Ketle index (X_8)	-0,24±0,73	-7,38±22,24	-

Note: * – significant factors in the equation of multiple regression; B – standardized beta coefficient (can allow to evaluate the role of every factor in Y's behavior); R – regression coefficient; P – level of significance.

With the standardized beta coefficient (B), the effect of each indicator on the total result can be evaluated. Indicators of negativism and hand strength play a role, which is almost equal in strength but the opposite in value. Using the regression coefficient, you can predict how much the result will increase or decrease depending on the value of the indicator. With an increase on the negativism scale by 1 point, the total muscle work will decrease in average by 19 kg/km. However, with the increase of the hand strength by one unit (kg), the total result will increase in average by 4 kg/km. The coefficient of multiple correlation shows a combination of examined indicators, which explain 89,7% of variability of the total muscle work. The revealed predictors have a significant effect on the performance during the stage test.

Conclusion. The significant changes in indicators of the organism of young male students after the stage performance test on the treadmill to failure. Morphological indicators, such as body mass, Ketle index and percentage of subcutaneous fat were significantly decreased under the influence of stage loads of cyclical manner, however, biochemical indicators of capillary blood (glucose and lactate concentration) and HR were increased in young men in relation to baseline indicators. According to results of the analysis projecting data, which effect the manifestation of the total muscle work during the stage test to failure, were revealed. Negativism affects the volume of total work, and the hand strength predetermines higher potential of performance in young male students. Implementation of simple and at the same time informative criteria when selecting candidate to cyclical sports would make the process of athletes' training more effective.

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