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Results of bioimpedansometric researches of athletes on athletics and academic rowing

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Abstract

In sports medicine, different multistage complex calculation methods are used to analyze athlete's health condition. One of the modern informative, operational, non-invasive and reliable methods for determining body composition of athletes is bio-impedance analysis.

Keywords: medicine, sport, body composition, non-invasive method, bioimpedance analysis.

INTRODUCTION

In sports medicine, along with the methods of anthropometry, caliperometry, underwater weighing, hydrostatic densitometry, double X-ray absorptiometry, and nuclear-magnetic resonance are traditionally used to evaluate body composition, and bioelectric methods have been developed. One of the most common is bioimpedance analysis (BIA). Bioimpedance analysis, as an operational, non-invasive and reliable method for determining body composition, is utilized in clinical conditions [1].

Electrical impedancemetry, as a non-invasive technique allows us to receive information without explaining changes or the complication risks into the body. The method is relatively simple to implement, inexpensive and has advantages over traditional methods of non-invasive monitoring of the state of the body. It allows us to assess a wide range of morphological and physiological indicators of the body of athletes. The method is based on the laws that connect the level of electrical impedance with the parameters of the component composition of the body, and consists in estimating the amount of fluid that determines the active component of the impedance. The results obtained using the bioimpedansometric method allow calculating fatty, lean, cellular and musculoskeletal body mass [2,3].

Effective management of the training process onthe current stage of development of the theory and methodology of training athletes requires methodologically correct organization of complex control of functional statusorganism, development of motor qualities under the influence of prolonged physical activity [3, 4]. The problem of complex control of the physical condition of runners for shortand middle distances, including the assessment of individual components: the fitness and condition of the cardiovascular system of athletes is relevant; however,there are few studies in this area.

The aim of the study is to analyze bioimpedance of the main anthropometric indicators of elite athletes.

MATERIALS AND METHODS

The control studies were performedover 11 athletes of the national team of Uzbekistan in athletics and 11 elite athletes in rowing.

In Uzbekistan, bio-impedance analysis among athletes is carried out for the first time. The distribution of the components (muscles, fat, fluid, and body parts — arms, legs) was studied and the degree of obesity (body mass

indices) was evaluated. Measurements of the studied parameters were carried out on the TanitaMC-780MA-N Body Composition Analyzer (Japan) using the method of reactive resistance of body tissues (bioimpedansometry) [2].

Statistical research methods were donebased on standard clinical guidelines. Quantitative data are presented as arithmetic mean (M) ± standard deviation (SD) in the case of a normal distribution and as median (Md) and quartiles (Q) or (SD) for other distributions. For statistically significant changes, the confidence level P< 0.05 was taken.

The results of the clinical examination were processed on a Pentium-IV personal computer using the Statplus 9.0 office applications with the calculation of the arithmetic mean of the studied indicator (M), its standard error (m), reliability indicators (P) and Student's criterion. In this case, methods, existing guidelines for statistical data processing in clinical and laboratory studies were taken into account [4].

RESULTS AND DISCUSSION

The studies were carried out with the involvement of 11 athletes of the National team of Uzbekistan in athletics and 11 elite athletes in rowing at the age of 16 to 27 years. The mean age of athletes in athletics was 20.00±1.02, athletes in rowing 21.0±0.91 years.

Analysis of conducted research results revealed that athletes of the athletics team had an average body weight of 64.96±2.24 kg with average growths of 177.36±2.19 cm. Fat mass was 7.74±0.87 kg (12.6±0.9%), and lean body mass 55.5±1.7 kg, skeletal muscle mass 54.35±1.66 kg (83.0±0.9%), the amount of water 39,80±1.15 kg, body muscle mass of 29.89±0.76 kg. The development of the muscles of the right hand is 2.89 ± 0.16 kg, the development of the muscles of the left hand is 2.87 ± 0.2 kg. The parameters of the lower extremities were as follows: the muscle development of the right and left legs was set at the same level of 8.8 ± 0.4 kg. The main metabolism corresponded to 1666.8±46.7 kcal, the values of the body mass index - 20.65±0.55 kg/m^2.

The research results allowed to determine the individual ranges of parameter values related to the functional readiness of the athlete. So, athletes were characterized by their individual optimal weight, taking into account height (64.96±2.24 kg and 177.36±2.19 cm, respectively) and body type. All athletes had optimal weight values without reducing the number of calories consumed and overtraining, which significantly affects running performance and recovery. It isevidence that bone and muscle mass during the preparation and competitions for athletes practically do not change. Indicators of body length, trunk, limbs and feet, body weight, the ratio of muscle and fat tissue, composition, determine the angular characteristics of the joints and determine aerobic and anaerobic capabilities, affect the biomechanical parameters of athletes running.

Analysis of the results of electrical impedancemetry showed that athletes in rowing had an average body weight of 83.12±3.01 kg with average growth of 185.918±2.31 cm. Fat mass was 11.69±1.38 kg (13.88±1,31%), and lean body mass 71.43±2.397 kg, skeletal muscle mass 67.89±2.28 kg (81.86±1.25%), the amount of water 47.53±1.23 kg, muscle body weight 35.85±0.96 kg. The development of the muscles of the right hand is 4.05±0.17 kg; the development of the muscles of the left hand is 4.07±0.19 kg. The parameters of the lower extremities were: the development of the muscles of the right leg - 11.97±0.48 kg and the left leg 11.95±0.50 kg. The average values of the basal metabolic rate corresponded to 2137.82±79.38 kcal, the body mass index was 24.06±0.69 kg / m2.

A comparative analysis of the research results showed that all the studied indicators in elite athletes in rowing are almost 1-2 times higher than in athletes, which is associated with the specifics of this sport.

CONCLUSION

The results of studies of the main anthropometric characteristics of elite athletes using the bioimpedanceometric method make it possible to assess the functional readiness of athletes for the training process. The data obtained will allow sports doctors and coaches to adjust the training process in order to achieve the best results for each individual athlete.

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