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Typological Features of the Morphofunctional Status and Temperature Homeostasis of Highly Skilled Players

N. N. Zakharyeva
Russian State Medical University, Moscow, Russia

In the article, the age features of the morphofunctional status of highly skilled football players are reflected. The dynamics of the average skin temperature of athletes during the performance of the PWC170 load test and the temperature of the skin of the chest in a football match outdoors at T-8 °C and 80% humidity is described. Individual temperature analysis of the "plastic" type of reaction was carried out with the best result of PWC170.

Keywords: football players, physical working capacity, weighted average body temperature, morphofunctional status

Relevance

The intensive development of professional football promotes the emergence of athletes of high qualification in different age periods, including youth and mature. Each of the age stages is characterized by a change in the functional state, by restructuring the physiological mechanisms of the regulation of the basic systems (Balsevich, 2008; Tambovtseva, 2015; Kharitonova, 2015; Shakhanova, 2008; 2010) and the quality of intra- and intersystem interaction (Zakharyeva, 2012; 2017). The decisive role in the age-related changes in the functional level of the organism is played by factors of adaptation of the human body to physical stress, including to loads in unusual climatic conditions (Kotenko, 2013). In this regard, for the category of highly skilled athletes, the study of the age factor of adaptation determining the physiological features of adaptive mechanisms in ontogenesis acquires particular relevance, which are associated with different quality of response of the main body systems to environmental influences.

The Purpose of the Research

The purpose of the research was to establish the features of the morphofunctional characteristics and temperature balance of highly skilled players aged 17-21 years.

In addition, our task was to establish the characteristics of the temperature balance of football players of the national team RGUFKST with the maximum values of physical performance in the test PWC170.

Methods and Organization of the Research

The following methods were used in the work: canetting; anthropometric method (body length, body weight, chest circumference, excursion, body mass index, caliperometry); dynamometric method (force of the

N. N. Zakharyeva, Doctor of Medicine, professor, Russian State Medical University, Moscow, Russia.
Correspondence concerning this article should be addressed to N. N. Zakharyeva, 4 Sirenevii boulevard, Moscow 105132, Russian.

hand muscles, power index); spirometric method (vital capacity of lungs, reserve volume of inspiration, reserve volume of exhalation, respiratory volume, vital index, maximal pulmonary ventilation), echocardiographic method: minute volume of blood, stroke volume of blood, stroke index, cardiac index, total peripheral resistance, size of the athlete's left ventricle according to ultrasound data with doppler; electrocardiography at rest, before the start; functional measurements and samples (heart rate, blood pressure, PWC170, maximum oxygen consumption, relative maximum oxygen consumption/kg); Thermal assessment—Thermo temperature sensor (CorTemp®)—registration of skin temperature at five points. The obtained digital material was processed on a personal computer using the programs STATISTICA 10.0 and "OriginPro 8.5.1".

Organization of the Study

Data for this study were collected by 15 sportsmen-football players participated in the study (the national team of the RGUFKSMiT); sports category not less than one adult, male, the average age is 19.4 ± 0.32 years. There were two age groups: 1gr—17-19-year-old—9 people; 2gr—20-21 yr—first maturity—6 people. The survey was conducted in two stages. The first stage is physiological testing at rest in the SIC of Sports Medicine, including the PWC170 sample with thermometric control of skin temperature at five points. The second stage-measurement of this study was carried out during a football match in Khimki on March 28, 2018. Parameters of physiological status: heart rate, blood pressure, skin temperature one point-chest before the start; during the game; when recovered after each period of five minutes every minute (Bragin, 2017).

Results of the Study

The analysis of average values of physical status parameters of highly qualified football players of different age groups is carried out. The index of the vital index (the ratio of the vital capacity of the lungs to the mass of the body) should be included among the integral indicators of physical development characterizing the reserve capabilities of oxygen transportation systems. Reliable differences in the indices of the vital index in age groups were revealed. The increase in the vital index in the period of one maturity indicates the expansion of the functional reserves of the respiratory system. The indicators of physical working capacity and aerobic abilities of highly skilled male players of different ages (s ± Sx) are analyzed.

Identified significant differences in PWC170 in the group of young men were in comparison with the group's first maturity. Correlation analysis was carried out, which was allowed to determine the influence of morphometric parameters on integral indicators of the functional capabilities of oxygen transport systems. The players of the first group showed significant interrelationships between the body mass index and maximum pulmonary ventilation with chest chest circumference ($r = -0.49$ and $r = 0.92$, respectively). It should be noted that an increase in body weight can limit the level of oxygen consumption in football players. At this stage of the survey, we found no age-specific features of changes in the temperature of the skin of athletes-players during load testing in the laboratory and in the field conditions of the football match in Khimki at an ambient temperature of -8 °C and a humidity of 80%. The temperature of the human skin was chosen for the analysis. At the first stage, the average human skin temperature (SVTK) is the calculated skin temperature at five points of the body: on the forehead, on the arm, on the chest, on the back, and on the leg. At the second stage—match-field conditions—the temperature of the skin is one point-chest.

The analysis of average values of the average skin temperature of athletes during the performance of the stress test PWC 170 was carried out. The dynamics of mean values of cutaneous temperature of SVTK was as

follows. There was a smooth growth during the first load at 0.64 °C, then the temperature between the loads and at one minute of the second load was equal to 32.7 °C. Further growth was 0.3 °C, which is more than half the growth during the first load. The obtained data testify to the adaptive increase in SVTC at the first load and the active inclusion of such a heat transfer mechanism as a result of the vaporization—on the second.

The analysis of SVTK data from football players with different indicators of PWC170 was carried out.

From the array of surveyed, two types of players were chosen with the maximum and minimum index of the test values of the PWC170 test. The analysis allowed us to distinguish two types of changes in SVTK in football players—inert and plastic.

In the case of a plastic type of SVTK changes, a decrease in SVTC was observed after a pause before two loads from 33.4 °C to 32.5 °C, which is lower than the resting temperature of 32.7 °C. This change in the temperature status of players indicates a high level of adaptability of athletes to the load by reducing SVTK through steaming—a "plastic" type of response. As shown by scientific literary studies, the "plastic" type of athletes is more adapted for intensive physical exertion, with flight desynchronization of biological rhythms and physical exertion in a hot and cold, humid climate.

Inactive players (most surveyed) showed a smooth growth during the first load, then the temperature between the loads and at one minute of the second load was equal to and was 32.7 °C. Further growth was half the growth during the first load. The revealed changes in the temperature balance made it possible to attribute this group of players to the inert type.

Conclusion

In sports physiology, changes in physical status are often discussed in terms of age development and sports development of athletes.

The results of the study show that adults of highly skilled sportsmen, during long sports activities, changes in morphometric and functional parameters of physical status can also occur, caused by both age-related changes and cumulative effects of training, which must be taken into account when assessing the functional capabilities of players.

We studied the dynamics of the average skin temperature of athletes during the performance of the PWC170 load test and the temperature of the skin of the breast in a football match outdoors at T-8°C and 80% humidity. Also, the individual temperature dynamics of the "plastic" type of reaction was analyzed with the best result of the PWC170. Due to the prognostic significance of skin temperature as one of the indicators of the thermal state, further study is required to continue the study with the definition of the rectal temperature, the level of thermal sensations, and the integral indicator of the thermal state of football players of different ages.

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