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Effect of Age Determination and Athletic Training Factors on Heart Rate

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ABSTRACT. The decrease dynamics of the heart rate of judokas with an increase of age is discussed in the paper. The degree of influence of age and training factors on heart rate decrease is estimated. It was found that over a 10-year period (8 to 18 years of age) in untrained individual's heart rate decreases on the average by 18 units, which is due to age, while in persons training in judo this index decreases on the average by 23.97 units. In the given age range, for judokas data of heart rate decrease by additional 5.97 units compared with the untrained persons (23.97-18) is subjected to the effect of training factor.

Key words: *heart rate, age, athletic training.*

Method of evaluation of heart rate as a variable is widely used. It is regarded as one of the indicators of a body adaptive capacity – as the body adaptation to different environmental factors significantly depends on cardiovascular reactions and optimal performance of regulatory mechanisms [1].

Observation of heart rate is widely used in diagnostic tests of body functioning, determining the exercise difficulty and estimation of chronotropic impact. It is a relatively easily measured parameter and its use is especially important in sports practice.

Training factor affects the human body functional systems. In particular, training causes changes in cardiovascular system functional status. Trained human heart operates differently at rest compared with that of untrained one. The first noticeable change is increase in the volume of the heart.

According to morphological changes, the trained person's heart, unlike that of an untrained one, experiences functional changes as well and starts to work in a more economical mode. The number of its contractions (pulse rate) in athletes with high physical conditions, trained for endurance, may vary from 28 to 40 beats. This factor can be explained as the result of heart muscle hypertrophy and left ventricular systolic blood volume increase, caused by its strong contraction, which, instead of 50-80 ml (which can be found in untrained individuals) is equal to 100-150 ml [2, 3].

At rest the heart rate is variable. It mostly depends on the age and in most adult persons makes 70 on the average. Heart rate along with age is significantly

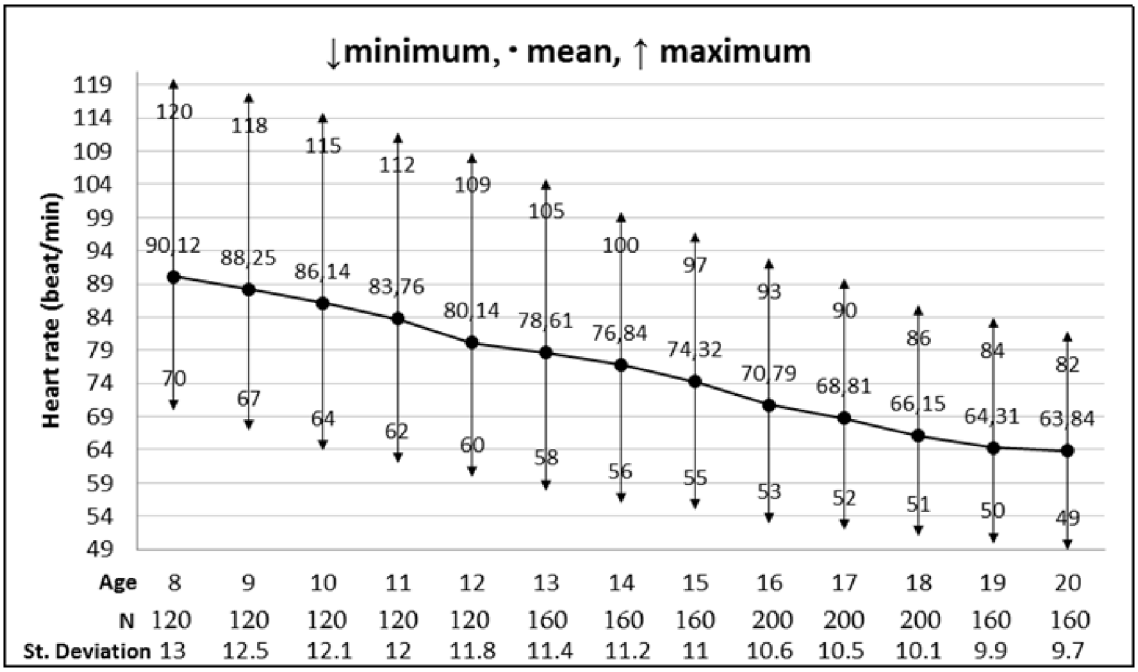

Fig. Descriptive data of heart rate at rest by age in judokas.

affected by the specificity of sports activity. In well trained wrestlers it can make 60-65 beats per minute. As for the teens, on the heart rate number there are still different opinions [4, 5], putting on the agenda the necessity of similar data determination.

Heart rate depends on age, sex, qualification, sports type, intensity of the load [6] and the time of the day [4]. For example, in the period between 2 am and 2 pm at rest it may increase by 13.8% (65 - to 74). Heart rate is also significantly affected by endurance exercise. In untrained persons, after each one-week endurance training the heart rate may reduce by 1 stroke and this process will continue for several weeks. The basic mechanism of this reduction has not yet been fully explored, but the exercise seems to cause parasympathetic system activation and sympathetic system inactivation due to which a relatively low heart rate is observed in trained individuals [4].

Research Aim. To examine the impact of judo training on the heart rate.

Objectives. 1. Studying of heart rate at rest in 8 to 20-year-old judokas.

2. Comparison of the frequency of heart rate of judokas to that of untrained persons at certain age levels.

Research Methods

Subjects. a research was conducted in 2009-2011 in Georgia, in the various specialized training sportsmen groups, from 8 to 20-year-old 2000 male judokas. Their distribution by age is presented in the Figure.

Measurements. heart rate at rest was measured by BP 3AX1 (Microlife), in standing position.

Statistical Data Processing. by the statistical method the data were processed in the computer program SPSS 19. The ANOVA test was used to determine the dependence of heart rate decrease on the age (8-20 years). Quantitative data are presented as mean, standard deviation, maximum and minimum values. The level of significance was set at $p<0.01$.

Research Results and Discussion.

The data obtained by the research are presented in the Figure.

Minimum and maximum values heart rate at rest quantitatively for each next age has the trend to de-

crease. With respect of data dispersion percentage the picture does not change and at the age of 8 it makes 71.4% (70 and 120), and at the age of 20- 67.3% (49 and 82).

The heart rate at rest, presented as mean values by ages, is the highest at the age of 8 years, and makes 90.12 beats per minute. This index drops by 26.28 units at the age of 20 and makes 63.84 beats per minute; meaning decrease in heart rate by 41.2%.

Our results of the heart rate at rest were compared to the data of [5] obtained in 8-18-years old untrained persons. It was found that at the age of 8, the heart rate frequency was identical to each other. The difference was in rates of decrease in next age groups.

According to the results of S. Fleming et al. [5] the heart rate from 8 to 18 years drops from 90 to 72 in average and reduces by 18 units, or 25%. According to our data, the obtained picture is different and the heart rate from 8 to 18 years reduces from 90.12 to 66.15 on average, implying the data reduction by 23.97 units, i.e. 36.2% on average. The data obtained show that the index of heart rate in judokas from 8 to 18 years reduces by 5.97 beats (23.97-18) more than in untrained persons.

Conclusion

From 8 to 18 year the index of heart rate decrease by 18 units on average is caused by age (untrained individuals). After this limit data reduction by 5.97 units is subjected to the training factor (judokas).

ადამიანის და ცხოველთა ფიზიოლოგია

გულისცემის სიხშირეზე ასაკობრივი დეტერმინაციისა და სპორტული წვრთნის ფაქტორების ზეგავლენა

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სტატიაში განხილულია ძიუდოში მოჭარჯიშე სპორტსმენთა გულისცემის სიხშირის კლების დინამიკა ასაკის მატებასთან დაკავშირებით. შეფასებულია ასაკისა და წვრთნის ფაქტორების ზეგავლენის ხარისხი გულისცემის სიხშირის კლებაზე. დადგენილია, რომ 10-წლიან პერიოდში (8-დან 18 წლამდე) უვარჯიშებელ პირებში გულისცემის სიხშირე საშუალოდ 18 ერთეულით მცირდება, რაც ასაკობრივად დეტერმინირებულია, ძიუდოისტებში კი ეს მონაცემი საშუალოდ 23.97 ერთეულით განიცდის კლებას. მოცემულ ასაკობრივ დიაპაზონში უვარჯიშებლებთან შედარებით ძიუდოისტთათვის გულისცემის სიხშირის დამატებით 5.97 ერთეულით კლების მაჩვენებელი (23.97-18) გაწვრთნილობის ფაქტორის გავლენას ექვემდებარება.

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