

Research Article

Effect of crossfit-trainings on the heart rate of adolescent judokas

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Abstract

Background: One of the types of the complex control system is medico-biological, which includes a set of methods and measures aimed at assessing the health, and functional state of the athlete's body, taking into account the reaction of his systems to various loads. CrossFit is a constantly varied and high-intensity functional training program in which with increasing the training load, the pulse rate increases.

The context and purpose of the study: The research was aimed to find out the frequency of heart rate of adolescent judokas in the presence of CrossFit-trainings in the process of physical fitness, for which a pedagogical scientific experiment was held at the youth sports and cultural training center after V. Zakaryan (Hrazdan city). From the groups of 10-12-year-olds practicing judo at the sports school, one experimental and control group was formed, each with 10 athletes. During CrossFit-trainings "Tabata", "AMRAP", "21-15-9" and "WOD" methods were mainly used. Athletes' pulse rate was measured manually at the wrist before training, during training, and immediately after training in order to control the athletes' feelings toward the training load.

Results: In the September-June period, with the implementation of the CrossFit-training program, the heart rate of athletes before training was on average 102,2 bpm, during training 158,3 bpm and immediately after training – 157,8 bpm.

Conclusion: The indicators obtained as a result of the research correspond to the norms suggested in literature sources.

More Information

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Introduction

The main characteristic of sports training is the training load. The training load is the general, total effect on the athlete's body of the exercises performed, and the rest between them, and various means (massage, pharmacological preparations, etc.) that speed up the recovery process [1]. On the one hand, the indicators of the load during the performance of physical exercises are the values that characterize the work performed in its externally expressed dimensions, on the other hand, the values of the functional and related shifts in the body caused by the exercise [2].

Competitive judo demands high-intensity intermittent actions, in which optimal physical attributes are necessary in order to achieve technical-tactical development and success in combat [3,4]. Actually, high training loads, which require successful and coordinated actions, are applied to judokas in order to achieve high sports performance.

CrossFit is a constantly varied and high-intensity functional training program, which consists of a combination

of different exercise elements: cardiovascular, gymnastic, and weightlifting exercises [5].

CrossFit programs attempt to develop competence in 10 fitness domains, including accuracy, agility, balance, coordination, cardiovascular and respiratory endurance, flexibility, power, speed, stamina, and strength [6].

One of the most informative and relatively easily recorded physiological indicators is the heart rate (HR), which adequately reflects the impact of various physical activities on the body [1]. Determination of heart rate in schoolchildren by the method of pulsometer can be carried out by palpation, by counting the number of pulse waves. Since, with a significant increase in the pulse, its determination on the radial artery is difficult, and for greater reliability and convenience, it is recommended to count the pulse on the carotid artery using a well-known method [7].

It is known that with increasing the training load, the pulse rate increases, and with a decrease, it decreases [1]. On the basis of this provision, a more accurate method for determining

the intensity of training exercises — pulsometer, has recently become widespread in sports practice. Pulsometer has a significant advantage over other methods of determining the intensity. In particular, pulse intensity indicators more closely correspond to the true state of the body at the time of training. In addition, it becomes possible to compare intensity indicators when performing various exercises.

We hypothesize that correctly programmed CrossFit-trainings will not negatively affect the normal work of the organ systems of adolescent judokas, in particular, the change in the frequency of their heart contractions.

The aim of the research is to find out the changes in the frequency of heart rate of adolescent judokas in the presence of CrossFit-trainings in the process of physical fitness.

Materials and methods

To achieve the goal of the research, the methods of research and analysis of literature sources, pedagogical scientific experiments, and mathematical statistics were used.

In order to find out the effect of CrossFit-trainings on the process of physical training of adolescent judokas, the pedagogical scientific experiment was held at the youth sports and cultural training center after V. Zakaryan (Hrazdan city). From the groups of 10 - 12-year-olds practicing judo at the sports school, one experimental and test group was formed, each with 10 athletes. September 2021 to June 2022 CrossFit-trainings were applied to the physical fitness process of the experimental group's judokas, twice a week, lasting 10-20 minutes, during which mainly "Tabata", "AMRAP", "21-15-9" and "WOD" methods were used (mostly using pull-ups, push-ups, burpees, sit-ups, squats, speed ladder, running exercises, etc.) and during the third training session of the week, coaches felt free to choose any method and mean for developing physical fitness (approximately 15 minutes, mainly using sports games). In the control group, the traditional methods and means of physical fitness provided by the training program continued to be used (e.g. 100 repetitions of push-ups or 50 repetitions of pull-ups in 10-20 minutes, etc.). In both groups yearly volume of physical fitness (September-June) was 31,2 hours.

Tabata training has been considered one of the high-intensity 'interval or intermittent training (HIIT) methods, which have varied considerably in terms of the characteristics of the training exercise, i.e., the exercise mode, intensity, and durations of exercise and rest [8]. Tabata training has evolved to include a variety of modes and exercises performed in the classic 20-10 pattern (i.e., 20 seconds of all-out effort followed by 10 seconds of rest) [9]. We have used the Tabata method for improving the motor skills of athletes.

Today, the AMRAP (As many reps or rounds as possible) method is a commonly used method [10]. In this method, the

aim is to perform required movement routines as much as possible for a length of time [11].

CrossFit training is usually performed with high-intensity, functional movements called "workout of the day" (WOD) [12]. In these training sessions, high-intensity exercises are executed quickly, repetitively, and with little or no recovery time between sets [13].

In order to control the athletes' feelings towards the training load, their pulse rate was measured manually at the wrist before training, during training, and immediately after training. Athletes pressed the index and middle fingers of one hand on the opposite wrist counting the number of beats in 15 s and multiplying that number by four [14].

All digital information obtained during the study was processed according to well-known statistical methods with the calculation of arithmetic mean values (M) using Excel software.

Results

We have collected and analyzed the changes in the heart rate of athletes in the presence of CrossFit-trainings during the whole experiment (September-June). The variations of the average heart rate data of athletes from September to June are presented in Chart 1.

Chart 1 presented the average heart rate of athletes before training, during training, and immediately after training by months. As we can see in Chart 1, the highest indicator of heart rate during training in the September-January period was in November (170 beats per minute (bpm)). It is related to the mostly application of the "AMRAP" training in which the rest intervals were as short as possible. And the lowest indicators during training in that period are observed in September (128 bpm) and October (123 bpm).

According to V. P. Filin and N. A. Fomin [15], the heart rate of teenage athletes at moderate training load is 130 bpm - 140 bpm, at heavy training load is 150 bpm - 160 bpm and of near-limit and limit training load - 180 ± 10 bpm. Authors also note that those indicators can reach and even exceed 200.

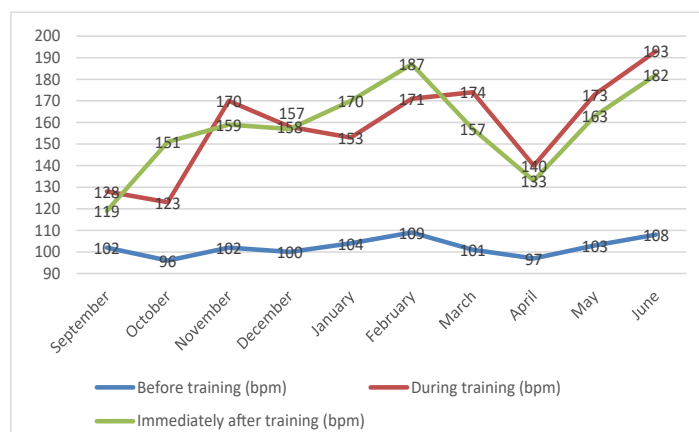


Chart 1: The variations of average heart rate data of athletes of the experimental group.

As can be seen from Chart 1, every month, the average heart rate of athletes during training and immediately after training is consistent with the indicators according to the literature sources [15-17].

As many authors note, the complex control system includes many types of control [6,18-20] one of which is medico-biological. It includes a set of methods and measures aimed at assessing the health, and functional state of the athlete's body, taking into account the reaction of his systems to various loads.

The average indicators of the heart rate of athletes during the February-June period are also presented in Chart 1. As can be seen from Chart 1, except for April, in all other cases, the average heart rate of the athletes during training and immediately after training was more than 150 bpm. During those months, we also added some running exercises, during which, as we know, heart rate rises quite a bit.

The highest indicators during training and immediately after training are shown in June (193 bpm and 182 bpm respectively). During this month, the "Tabata" method was applied every Tuesday, and the "AMRAP" method was used every Thursday. In the second case, the rest intervals during training have been reduced, and in some cases, even excluded.

So, in the September-June period, the heart rate of athletes before training was on average 102,2 bpm, during training 158,3 bpm and immediately after training – 157,8 bpm (Chart 2).

Discussion

Thus, comparing the data obtained as a result of our research with the literature sources, we can conclude that despite the fact that CrossFit-trainings, usually conducted by the High-Intensity Interval Training method (HIIT), during which an increase of the heart rate is often observed, as a result of the application of proposed training program in the process of physical fitness of adolescent judokas, similar cases were rare, the heart rate of athletes meets the norm and mostly corresponded to the indicators recorded during the training load of adolescent athletes, which are also recommended by a number of specialists.

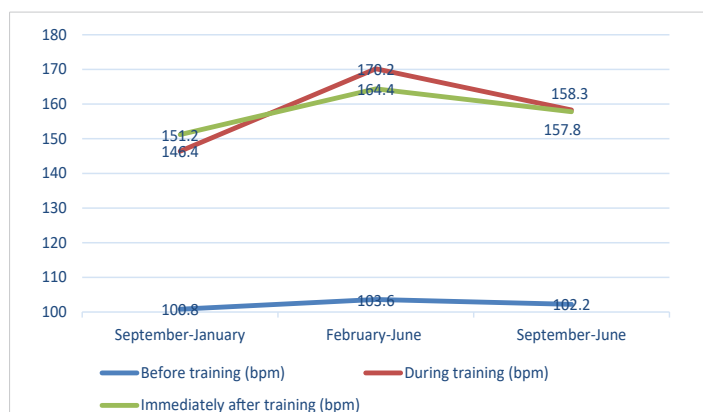


Chart 2: The average heart rate data of athletes of the experimental group.

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