

Influence of regular hand fighting on the functional capabilities of the cardiovascular system

UDC 796/799



PhD, Associate Professor **A.V. Dorontsev**¹

Dr. Biol., Professor **S.Yu. Zavalishina**²

PhD, Associate Professor **A.S. Boldov**³

PhD **N.V. Vorobieva**⁴

¹Astrakhan State Medical University, Astrakhan

²Russian State Social University, Moscow

³Moscow State University of Psychology & Education, Moscow

⁴Southwest State University, Kursk

Corresponding author: doroncev@rambler.ru

Abstract

Objective of the study was to find out the consequences of vestibular irritation on the cardiovascular system of experienced hand-to-hand fighters.

Methods and structure of the study. 46 young hand-to-hand fighters (19.2 ± 0.9 years) were observed, who systematically went in for sports 2-3 times a week during: 1 year - 15 persons, 2 years - 14 persons, 3 years - 17 persons. The control group consisted of 16 clinically healthy adolescents (20.0 ± 0.5 years) who were not previously involved in sports. The physiological characteristics of the system of the heart and blood vessels were monitored under conditions of vestibular stimulation during a rotational test. Student's t-test was applied.

Results and conclusions. The performance of sports movements, especially in hand-to-hand combat, makes it necessary for the athlete to develop the vestibular apparatus, which helps to maintain the optimum position of the body in space. An increase in the experience of hand-to-hand training is accompanied by an optimization of the parameters of the cardiovascular system and an increase in the functional characteristics of the vestibular apparatus. The maximum stability of the pulse value was observed in hand-to-hand fighters who had three years of experience in performing specific movements at different angles. We can assume that hand-to-hand combat trains the system of the heart and blood vessels and helps to increase its level of adaptation to vestibular irritation.

Keywords: *hand-to-hand combat, vestibular activation, sports, physical activity, heart, blood vessels.*

Introduction. The presence of systematic muscle loads provides a pronounced stimulation of the main parameters of the human body [1, 2]. An increase in regular physical activity enhances the activity of all internal organs [3]. During the implementation of any movements, the vestibular apparatus is always involved [4], which contributes to maintaining the optimum posture of the body, its position in space and the coordinated work of the muscular system [5]. The high efficiency of the vestibular mechanism, coordinated with the work of the main life support organs, creates a reliable basis for rational motor activity [6]. The state of the vestibular apparatus and the degree of its influence on the functioning of the heart and vascular system are of great importance for maintaining

an optimum somatic status and obtaining a good level of fitness in any sport [7, 8].

Objective of the study was to find out the consequences of vestibular irritation on the cardiovascular system of experienced hand-to-hand fighters.

Methods and structure of the study. The work was carried out on people of youthful age (19.2 ± 0.9 years) in the amount of 46 people who regularly engaged in hand-to-hand combat 2-3 times during the week. Of the observed hand-to-hand fighters, 15 people regularly trained for one year, 14 people for two years, and 17 people for three years. The available control group consisted of 16 clinically healthy adolescents (20.0 ± 0.5 years) who had never been associated with sports. In those under observation, the

parameters of the heart and blood vessels were recorded in the event of exposure to a rotational load on the body according to the methods of V.I. Voyachek. Changes in the pulse level and blood pressure were monitored initially and after the standard rotational test (5 rotations were performed during 10 s) and in the case of a modification of the test, which consisted in the presence of a tilt of the head to the left and right (in the case of a frequency of 5 rotations during 10 s). To increase the influence of rotation on the state of the vestibular apparatus, the duration of the standard rotational test was doubled (10 rotations were made during 20 s). The results of observations were processed using Student's criterion.

Results of the study and their discussion.

The heart rate of hand-to-hand fighters with different duration of previous hand-to-hand combat training was optimal and reached 65.4 ± 0.42 , 63.4 ± 0.46 and 61.5 ± 0.43 beats/min, respectively. In persons included in the control group, the value of this indicator was higher, but it was also considered quite normal (73.6 ± 0.65 beats/min).

The heart rate during vestibular activation in hand-to-hand combatants and in physically untrained individuals underwent an increase. During the implementation of the Voyachek test according to the standard scheme, there was an increase in the heart rate of hand-to-hand fighters with 1 year hand-to-hand combat experience by 3.6 ± 0.65 beats / min, with 2 years of hand-to-hand combat experience by 3.3 ± 0.45 beats / minute, having experience in hand-to-hand

combat for 3 years by 2.4 ± 0.34 beats/min. In those who made up the control sample, this indicator increased by 5.5 ± 0.45 beats/min (see table).

It was found that in the case of rotation of the body with a tilted head in different directions, the response of the heart had obvious differences. The pulse value in the case of head tilt to the right was less than in case of left head tilt.

The found differences in the magnitude of the dynamics of the pulse in hand-to-hand fighters with different training experience were small, but statistically significant. Obviously, this is due to the need for regular changes in the position of the head in relation to the body when practicing hand-to-hand combat, adaptation to which increases with the growth of sports experience. Hand-to-hand fighters training for at least three years had the least response of their pulse to the influence of body rotation with the right head tilt (2.6 ± 0.19 beats/min). In the case of a long sports experience, the heart is best adapted to various movements with a rotational element [9].

Hand-to-hand fighters with different levels of sports experience had different dynamics of the pulse value with a change in the time of rotational exposure. This dependence in hand-to-hand fighters of all groups turned out to be inverse: the weaker the reaction to five rotations, the stronger it manifested itself in the case of 10 rotations.

In hand-to-hand fighters who trained for 1 year, under the conditions of a standard test, the pulse level increased by 3.6 ± 0.65 beats / min, and during the

Dynamics of pulse values in hand-to-hand fighters during different variants of vestibular stimulation

Groups of surveyed	Increase in pulse rate, M \pm m			
	Standard exposure option	5 spins in 10 seconds tilted to the left	5 rotations in 10 seconds with head tilted to the right	10 rotations in 20 seconds with the vertical position of the head
Control group (n=16), bpm	5,5 \pm 0,45	7,0 \pm 0,48	5,8 \pm 0,42	9,9 \pm 0,59 $p_2 < 0,01$
Hand-to-hand fighters with one year of experience (n=15), bpm	3,6 \pm 0,65 $p < 0,01$ $p_1 < 0,01$	4,7 \pm 0,32 $p < 0,01$ $p_1 < 0,01$	3,9 \pm 0,26 $p < 0,01$ $p_1 < 0,01$ $p_2 < 0,01$	6,2 \pm 0,33 $p < 0,01$ $p_1 < 0,01$
Hand-to-hand fighters with two years of experience (n=14), bpm	3,3 \pm 0,45 $p < 0,01$ $p_1 < 0,01$	4,4 \pm 0,32 $p < 0,01$ $p_1 < 0,05$	3,2 \pm 0,29 $p < 0,01$ $p_1 < 0,01$ $p_2 < 0,01$	5,6 \pm 0,35 $p < 0,01$ $p_1 < 0,01$
Hand-to-hand fighters with three years of experience (n=17), bpm	2,4 \pm 0,34 $p < 0,01$	3,5 \pm 0,27 $p < 0,01$	2,6 \pm 0,19 $p < 0,01$ $p_2 < 0,01$	4,7 \pm 0,24 $p < 0,01$

Note: p - the significance of differences between hand-to-hand fighters and control, p_1 - the significance of differences between hand-to-hand fighters with 3 years of sports experience and athletes with one and two years of experience, p_2 - the significance of differences in the recorded parameters in case of different head positions.



test under conditions of 10 revolutions, this parameter was 6.2 ± 0.33 beats / min. For hand-to-hand fighters with two years of training experience, these values were 3.3 ± 0.45 beats/min and 5.6 ± 0.35 beats/min, respectively. In hand-to-hand fighters with three years of training experience, these indicators were 2.4 ± 0.34 beats/min and 4.7 ± 0.24 beats/min. Apparently, the reaction of the activity of the heart in hand-to-hand fighters who have been training for three years is the most physiological. There are reasons to think that it sufficiently intensifies the blood flow in the organs of athletes, as the movements they perform become more complicated [10].

The values of systolic pressure in hand-to-hand fighters training for different periods were normal. With a sports experience of one year, its value was 116.9 ± 0.55 mm Hg. Art., for those who had two years of sports experience - 115.0 ± 0.52 mm Hg. Art. and for those who have been engaged in hand-to-hand combat for three years - 112.5 ± 0.29 mm Hg. Art. This indicator was slightly higher in the control group - 128.0 ± 1.32 mm Hg. Art., also entering the boundaries of the norm.

In the case of a test with a doubling of the rotation time in hand-to-hand fighters with different sports experience, the pressure value increased by 23.6% higher than during the standard test. The increase in systolic pressure with a doubling of the time of the test with rotation in the control group was 65.1%, exceeding similar levels in all groups of athletes.

Diastolic pressure did not differ between different groups of athletes and averaged 67.8 ± 1.15 mm Hg. (in the control group it was 84.2 ± 0.56 mm Hg). At the same time, the value of diastolic pressure in all groups of hand-to-hand fighters under conditions of all types of rotations increased slightly.

Conclusions. Regular hand-to-hand combat training strengthens the vestibular apparatus and develops the heart muscle. In the case of an increase in the length of hand-to-hand training, the reaction of the heart to vestibular irritations weakens.

References

1. Medvedev I.N., Kachenkova E.S. Funkcionalnye osobennosti serdca u legkoatletov [Functional properties of the Athlete's heart]. *Teoriya i praktika fiz. kultury*. 2021. No. 8. pp. 20-21.
2. Medvedev I.N., Latushkina E.N., Mikhailov A.A., Eremin M.V. Funkcionalnye pokazateli serdca u rukopashnikov [Heart functional indicators in hand workers]. *Teoriya i praktika fiz. kultury*. 2022. No. 8. pp. 40-42.
3. Bikbulatova A.A., Andreeva E.G., Medvedev I.N. Platelets' Functional Peculiarities in Persons of the Second Mature Age with Spinal Column Osteochondrosis of the Second Degree. *Annual Research & Review in Biology*. 2017. Vol. 21(1). pp.1-9. doi: 10.9734/ARRB/2017/37795.
4. Karpov V.Yu., Medvedev I.N., Boldov A.S., Sibgatulina F.R., Fedorova T.Y. Physiological Basis for the Use of Physical Activity in Conditions of Disorders of Carbohydrate and Lipid Metabolism. *Indian Journal of Public Health Research & Development*. 2019. Vol.10. No. 8. pp. 1899-1903.
5. Karpov V.Yu., Medvedev I.N., Kazakov D.A., Sibgatulina F.R., Shulgin A.M., Krasnov R.B. Physiological Basis of Rehabilitation for Ulnar Neuritis. *Biomedical & Pharmacology Journal*. 2020. Vol. 13 (2). pp. 585-590. <http://dx.doi.org/10.13005/bpj/1921>.
6. Karpov V.Yu., Medvedev I.N., Komarov M.N., Lapina N.M., Sharagin V.I. Physical Rehabilitation of Adolescents with Bronchial Asthma. *Indian Journal of Public Health Research & Development*. 2019. Vol.10. No. 8. pp.1910-1914.
7. Medvedev I.N., Gusev A.V., Malyshev A.V., Mikhailova O.D., Garina E.V., Petina E.Sh., Tagirova N.Dz. Influence of the Experience of Health-Improving Jogging on the Level of Functional Activity of Platelets in Men of the Second Mature Age. *Systematic Reviews in Pharmacy*. 2020. No. 11(8). pp. 432-438.
8. Medvedev I.N. Place and Possibilities of the Robotic System Lokomat in the Rehabilitation of Patients after Ischemic Stroke. *Biomedical & Pharmacology Journal*. 2019. Vol.12(1). pp.131-140. <http://dx.doi.org/10.13005/bpj/1621>.
9. Medvedev I.N., Karpov V.Yu., Makurina O.N., Eremin M.V., Dorontsev A.V., Sibgatulina F.R., Ivanov D.A. Functional reaction of the cardiovascular system to irritation of vestibular receptors in students engaged in different types of martial arts. *International journal of biology and biomedical engineering*. 2022. No. 16. pp. 96-104.
10. Medvedev I.N., Kachenkova E.S., Ovchinnikova M.A., Zbrueva Y.V., Kulkova I.V. Functional Characteristics of Young Men Who Regularly Experience Feasible Physical Activity. *Biomedical and Pharmacology Journal*. 2022. Vol. 15(1). pp. 49-57.