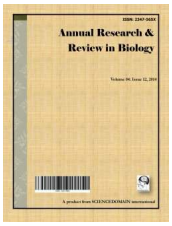

Annual Research & Review in Biology

15(2): 1-6, 2017; Article no.ARRB.35048
ISSN: 2347-565X, NLM ID: 101632869

The Impact of Durable and Regular Training in Hand-to-hand Fighting Section on Aggregative Platelet Activity of Persons at the First Mature Age

I. N. Medvedev[1*]

[1]Kursk Institute of Social Education (Branch of the Institute RSSU [Russian State Social University]), Kursk, Russia.

Author's contribution

The sole author designed, analyzed and interpreted and prepared the manuscript.

Article Information

DOI: 10.9734/ARRB/2017/35048
Editor(s):
(1) Asya Dragoeva, Department of Biology, Faculty of Natural Sciences, University of Shumen, Bulgaria.
(2) George Perry, Dean and Professor of Biology, University of Texas at San Antonio, USA.
Reviewers:
(1) Moacir Marocolo Júnior, Federal University of Juiz de For a, Brazil.
(2) Oguz Ozcelik, Firat University, Turkey.
(3) Nuray Oztasan, Afyonkarahisar Kocatepe University, Turkey.
Complete Peer review History: http://www.sciencedomain.org/review-history/20270

Original Research Article

Received 25th June 2017
Accepted 26th July 2017
Published 29th July 2017

ABSTRACT

Platelets, as one of the main elements of a body's homeostasis, support it on the whole and especially blood system. Through the modulation of their activity in response to different impacts they can influence the microcirculation and the level of tissue metabolism. The aim of our research is to determine platelet aggregative activity of healthy people of the first mature age which have long regular physical training in the section of hand-to-hand fighting. We took 112 healthy people of the first mature age, who had trained since childhood in hand-to-hand fighting section, into our experimental group. The control group was composed of 97 healthy people of the first mature age who had avoided any exercises during their lifetime. We applied biochemical, hematological and statistical methods of investigation. Physically trained people during the first mature age had stable low lipids' peroxidation in platelets. This experimental group also had stable low platelet aggregation. The constancy of platelet aggregative response to strong and weak inductors of hand-to-hand fighters was provided by stable low activity of platelet receptors and intraplatelet mechanisms of their aggregation. Basing on the mentioned information, we could state that regular

**Corresponding author: E-mail: ilmedv1@yandex.ru;*

physical training in hand-to-hand fighting section since childhood provided the fighters of the first mature age with stable low platelet activity. It also helped to create better conditions for microcirculation and hemostasis. In people, who had avoided exercises, there was increase of platelet aggregation at the first mature age though they could have no complaints on their health.

Keywords: Hand-to-hand fighting; physical activity; the first mature age; platelets; aggregation.

1. INTRODUCTION

Intense muscle activity promotes active development of adaptation processes of all the organs and their systems to it [1,2]. It increases body's stability on the whole towards factors of the environment [3,4]. Significant role in adaptation to the impact of physical activity is played, to great extent, by blood system as it limits the evidence of oxygen provision of the working organs [5].

As an important element of a body's homeostasis support on the whole and blood system in particular, platelets can influence microcirculation and the level of tissue metabolism [6]. They do it through modulation of their aggregation in response to different impacts. It is very interesting to study platelet aggregation (AP) in order to estimate the influence of natural for a body impact – physical activity - as a natural stimulator of many life processes [7].

In available scientific literature there is rather little information about the impact of physical training on functioning of platelets. Most such works are devoted to the dynamics of platelet activity during the treatment of developing and formed cardio-vascular pathology. It is considered to be the source of the risk of fatal thrombosis attacks [8]. Collected data about the impact of long and regular physical training on platelet functions of healthy people are poor enough [9,10]. And one field is not yet studied. This is the impact of regular long physical training (we mean different single combats in rather popular at present sections of hand-to-hand fighting) on aggregative ability of blood platelets and mechanisms of its realization in 22-35-year old people. There were made no comparisons between their state and the same one of healthy people of the first mature age who had had no significant regular physical activity during their lifetime.

The aim of the research is to determine platelet aggregative activity of healthy people of the first mature age who have long regular physical training in the section of hand-to-hand fighting.

2. MATERIALS AND METHODS

2.1 Materials

The study was approved by the Ethics Committee of Kursk Institute of Social Education (a branch of Russian State Social University) (record №5 from 12.05.2014). The research was conducted on the base of sport complex of the Russian State Social University in town Kursk, Russia. All the participants gave written consent to take part in the study. The experimental group was composed of 112 healthy people of the first mature age who had trained in the section of hand-to-hand fighting since 7-8 years of age 3 times a week for 1.5 hours a day (31persons – 22-years old, 26 persons – 26-27-years old, 28 persons – 30-31-years old, 27 persons – 34-35-years old). Control group was composed of 97 healthy people of the first mature age who had avoided physical activity during their lifetime (30 persons – 22-years old, 23 persons – 26-27-years old, 22 persons – 30-31-years old, 22 persons – 34-35-years old).

2.2 Methods

The achievement of the goal of the study was accomplished through the implementation of three research tasks. The first task was implemented in the following way: the level of platelet lipids' peroxidation (POL) of persons from the experimental group was determined according to the concentration of malon dialdehyde (MDA) in the reaction of thiobarbituric acid reduction and to the level of acylhydroperoxides (AHP) [11]. We calculated platelets' quantity in capillary blood in Gorjaev's box. The second task was implemented as follows: we estimated plasma level of the products of platelet phospholipids' labilization (these phospholipids were the activators of coagulation (F_3 - platelets)) by calculating the index of platelet activity (IPA) [12]. The third task was implemented in the following way: the duration of platelet aggregation (AP) was determined with the help of visual micromethod [13] using ADP (0. 5 × 10^{-4} M), collagen (dilution

1:2 of the main suspension), ristomicin (0. 8 mg/ml) and adrenaline (5×10^{-6} M) as inductors. Statistical processing of the results was made by Student's t-criterion. Statistical processing of received data was carried out with the usage of a program package "Statistics for Windows v. 6.0", "Microsoft Excel". Differences in data were considered to be reliable in case of ($p<0.05$).

3. RESULTS AND DISCUSSION

In the course of performing the first task of the study, the following data were obtained. The concentration of initial POL-AHP-products in platelets of 22-year old persons, who had no physical training, was at the level of 2.24±0.07 $D_{233/10}{}^{9}$ platelets, gradually increasing to 34-35 years up to the level of 2.65±0.16 $D_{233}/10^{9}$ platelets. At the same time, the level of MDA in platelets – the final POL product of 22-year-olds of the given category from the experimental group – was 0.69±0.019 nmol/10^{9} platelets, increasing to 34-35 years up to the level of 0.84±0.017 nmol/10^{9} platelets. AHP concentration in platelets of 22-year-old persons who trained in the section of hand-to-hand fighting, turned out to be lower than in control group ($p < 0.05$) and was equal to 1.95±0.14 $D_{233}/10^{9}$ platelets. It didn't change for certain to 34-35 years (2.07±0.25 $D_{233}/10^{9}$ platelets) (Fig. 1). At the same time, MDA content in platelets of those people who trained in hand-to-hand section, also stayed stable between 22 years (0.48±0.18 nmol/10^{9} platelets) and 34-35 years (0.51±0.24 nmol/10^{9} platelets), reliably yielding to the rates of persons who avoided physical activity ($p<0.01$) (Fig. 2).

In the course of performing the second task of the study, the following data were obtained. IPA index of people, who avoided physical activity, was equal to 23.7±0.11% at 22 years increasing together with their lifetime till 25.0±0.10% at 34-35 years. This fact pointed at gradual labilization of aggravation of platelet phospholipids – activators of blood coagulation of examined persons. IPA level of those people who trained in hand-to-hand section, reached at 22 years 20.8±0.16% and stayed at the given level in case of elder examined persons. So, 34-35-year old people who regularly trained physically, had the level of the given index 21.8±0.20% for sure yielding to the same rate ($p<0.01$) of the same age people who had no physical training (Fig. 3).

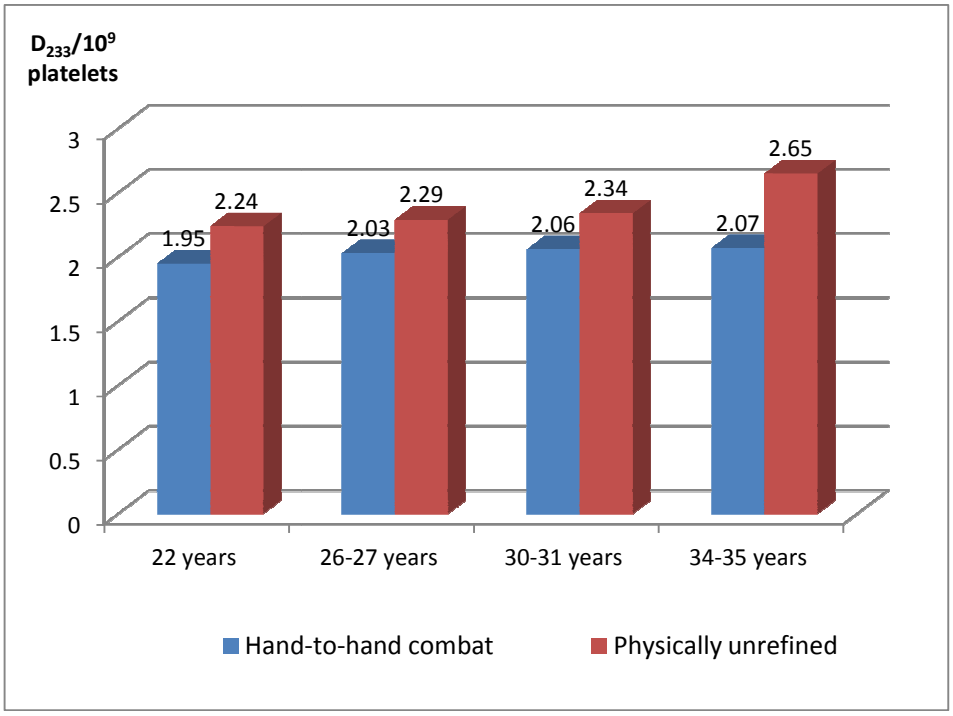

Fig. 1. Age dynamics of the level of acyl hydroperoxides in platelets in people taken in the study

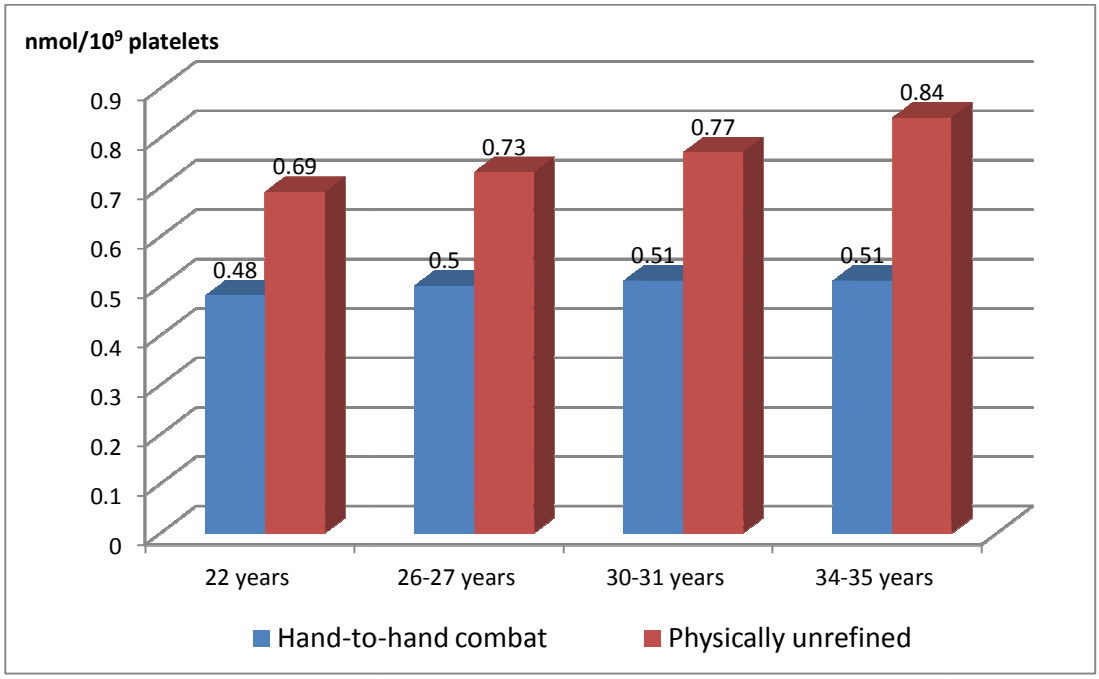

Fig. 2. Age dynamics of malondialdehyde's level in platelets in people taken in the study

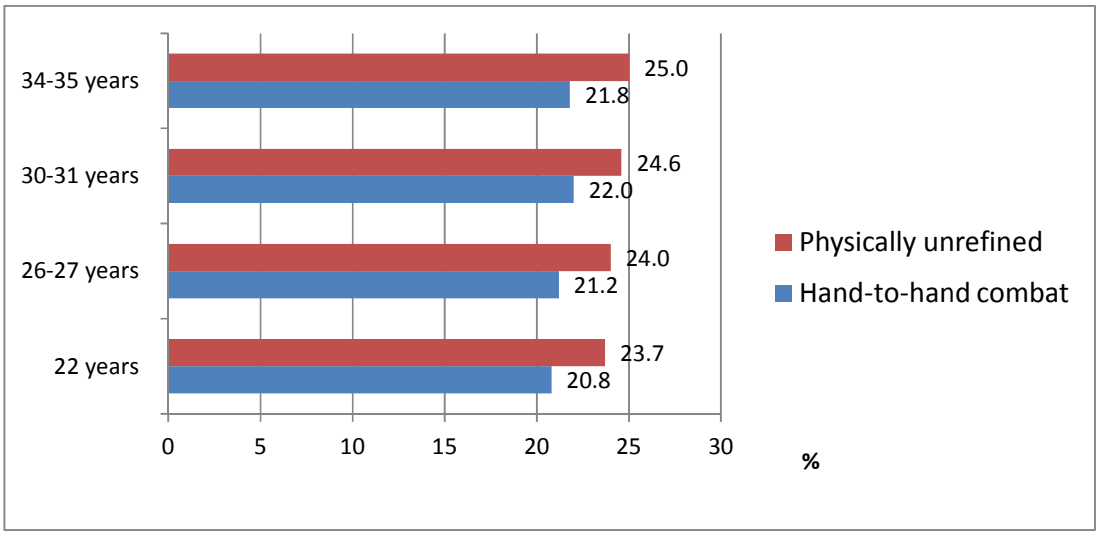

Fig. 3. Age dynamics of the platelet activity index in people taken into the study

In the course of performing the third task of the study, the following data were obtained. People, who had avoided exercises, had at 22 years the least AP development period under collagen influence which gradually curtailed with aging of examined persons (Table 1). Analogical AP regularity was also noted for people, who avoided exercises, under the influence of the rest inductors: ADP (to 39.0±0.05s), ristomicin (to 40.2±0.08s) and adrenaline (to 86.1±0.07s). AP of 22-year old hand-to-hand fighters came in response to collagen in 35.8±0.12s for sure having no difference with AP rate of elder examined persons, and exceeding the same period ($p<0.01$) of persons, who had no exercises. Low AP activity of trained persons at the first mature age was also noted under the influence of the rest inductors: ADP, ristomicin and adrenaline, for sure ($p<0.01$) differing from control rates.

Table 1. Platelet aggregation of the surveyed persons of the first mature age

Options	Age surveyed			
	22 years	26-27 years	30-31 years	34-35 years
Do not exercise physically, n=112, M±m				
number of examinees	**n=31**	**n=26**	**n=28**	**n=27**
AP with ADP, s	44.8±0.15	42.3±0.07	41.0±0.09 p<0.05	39.0±0.05 p<0.05
AP with collagen, s	33.4±0.04	32.4±0.06	30.0±0.12 p<0.05	28.6±0.11 p<0.05
AP with ristomicin, s	48.1±0.15	47.0±0.11	43.9±0.14 p<0.05	40.2±0.08 p<0.05
AP with adrenaline, s	98.8±0.11	96.2±0.06	92.0±0.12 p<0.05	86.1±0.07 p<0.05
Durably and regularly trained in unarmed combat section, n=97, M±m				
number of examinees	**n=30**	**n=23**	**n=22**	**n=22**
AP with ADP, s	46.3±0.17	46.2±0.12	45.9±0.24	45.7±0.16
AP with collagen, s	35.8±0.12	35.6±0.14	35.5±0.17	35.3±0.28
AP with ristomicin, s	49.8±0.14	49.6±0.20	49.7±0.12	49.5±0.16
AP with adrenaline, s	104.8±0.16	104.2±0.23	103.8±0.16	103.6±0.14

Note: p – the significance of differences in platelet aggregation period as compared to its value of 22-year-olds;
M – average value
m – the standard error of the mean

Morpho-physiological status of a human body is mainly provided by adequate hemostasis state and blood rheology which are influenced by different environmental factors, including regular physical activity. In its turn, blood platelets' activity is mostly the basis of functional hemostasis activity and seriously influences microcirculation state and metabolism in tissues of a body [14].

In this research it was determined that people with long regular physical training in section of hand-to-hand fighting at the first mature age had stable low POL. Given biochemical peculiarity of hand-to-hand fighters can be estimated as one of the factors promoting long preservation of low platelets' activity. So, persons who had regular physical training at the first mature age were noted to have stable low AP in response to all the used inductors. It might be mainly connected with the preservation of the constant level of their receptors' sensitivity to exogenous influence (aggregation inductors' concentration in blood and von Willebrand Factor – cofactor of platelet adherence) against the background of physical activity. Constancy of AP activity under the influence of strong aggregation inductors was mainly provided by long activity invariability of platelet phospholipase C in fighters. It led to functioning stability of phospho-inositol way, protein phosphorylation of contractile system, level of Ca^{2+} output from internal platelet repository and contractive ability of actomyosin [15]. Stable low reaction of their platelets on weak aggregation inductors pointed at physiological level of fibrinogenic receptors' (GPIIв-IIIa) expression on platelet surface and low activity of phospholipase A_2 in them which regulated output of arachidonic acid out of phospholipids' membranes. It was used for the formation of an aggregate thromboxane A_2.

4. CONCLUSION

Persons who had had long regular training in section of hand-to-hand fighting at the first mature age had stable low platelet activity which provided them with better conditions for microcirculation and hemostasis.

COMPETING INTERESTS

Author has declared that no competing interests exist.

REFERENCES

1. Makhov AS, Stepanova ON, Shmeleva SV, Petrova EA, Dubrovinskaya EI. Planning and organization of sports competitions for disabled people: Russian experience. Biosciences Biotechnology Research Asia. 2015;12(1):34-44.
2. Mikhaylova IV, Shmeleva SV, Makhov AS. Adaptive chess educational technology for disabled children. Theory and Practice of Physical Culture. 2015;7:12.

3. Mikhaylova IV, Shmeleva SV, Makhov AS. Information communication teaching aids in long-term training of chess players. Theory and Practice of Physical Culture. 2015;5:31.
4. Glagoleva TI, Zavalishina SYu. Aggregative activity of basic regular blood elements and vascular disaggregating control over it in calves of milk-vegetable nutrition. Annual Research & Review in Biology. 2017;12(6):1-7.
DOI: 10.9734/ARRB/2017/33767
5. Zavalishina SYu. Physiological features of hemostasis in newborn calves receiving ferroglukin, fosprenil and hamavit, for iron deficiency. Annual Research & Review in Biology. 2017;14(2):1-8.
DOI: 10.9734/ARRB/2017/33617
6. Sizov AA, Zavalishina SJ. Russian criminal legislation in prevention of sexually transmitted diseases in the territory of the Russian federation. Biology and Medicine (Aligarh). 2015;7(5):BM-142-15.
7. Zavalishina SYu, Vatnikov YuA, Makurina ON, Kulikov EV, Sotnikova ED, Parshina VI, Rystsova EO, Kochneva MV, Sturov NV. Diagnostical appreciation of physiological reaction of intravascular thrombocytes activity of two-years-old mice to regular physical loads. Biomedical & Pharmacology Journal. 2017;10(1):129-136.
Available:http://dx.doi.org/10.13005/bpj/1090
8. Zavalishina SYu. Physiological dynamics of spontaneous erythrocytes' aggregation of rats at last ontogenesis. Annual Research & Review in Biology. 2017; 13(1):1-7.
DOI: 10.9734/ARRB/2017/33616
9. Lapshina MV. The role of red blood cells and platelets in the blood coagulation and fibrinolysis reactions during exercise. Saransk. 2014;102.
10. Marysheva EF. Platelet hemostasis during exercise. Chelyabinsk. 2003;204.
11. Gavrilov VB, Mishkorudnaja MI. Spectrophotometric determination of plasma levels of lipid hydroperoxides. Laboratory Work.1983;3:33-36.
12. Barkagan ZS, Momot AP. Diagnosis and therapy controlled hemostasis disorders. Moscow. 2008;292.
13. Skoryatina IA, Zavalishina SYu. Impact of experimental development of arterial hypertension and dyslipidemia on intravascular activity of rats' platelets. Annual Research & Review in Biology. 2017;14(5):1-9.
DOI: 10.9734/ARRB/2017/33758
14. Zavalishina SYu, Kutafina NV, Vatnikov YuA, Makurina ON, Kulikov EV, et al. Platelet-activity dependence on the age of rats with experimental dyslipidemia. Biol Med (Aligarh). 2016; 8:326.
DOI: 10.4172/0974-8369.1000326
15. Zavalishina SY. Restoration of physiological activity of platelets in new-born calves with iron deficiency. Biomed Pharmacol J. 2017;10(2).
DOI: http://dx.doi.org/10.13005/bpj/1160

Peer-review history:
The peer review history for this paper can be accessed here:
http://sciencedomain.org/review-history/20270