



Received: 2007.10.26
Accepted: 2007.11.02
Published: 2007.11.06

Authors' contributions:

A Study design
B Data collection
C Statistical analysis
D Data interpretation
E Literature search
F Manuscript preparation
G Funds collection

The experience of the scientific basing of the time resources for military service men training in hand-to-hand fighting

Sergey Ashkinazi

P. Lesgaft State Academy of Physical Education, St. Petersburg, Russia

The paper was presented at the 1st World Scientific Congress of Combat Sports and Martial Arts, 23-25.09.2006, Rzeszów, Poland

<p>Study aim:</p> <p>Material/methods:</p> <p>Results:</p> <p>Conclusions:</p> <p>Key words:</p>	<p>Summary</p> <p>The specially conducted complex of researches was aiming to give reply to two questions at the same time: about the time necessary for acquiring the skills in hand-to-hand fighting and about the methods of objective estimation of such skills.</p> <p>Hand to hand fighting readiness check was complex and included three varieties of hand to hand combats: 1) combat of an unarmed with a knife armed opponent; 2) combat of an unarmed with an opponent armed with a submachine gun with bayonet; 3) bayonet combat. The criteria of the estimate were developed on the basis of the probabilistic-statistic approach. The combats were held in protective equipment and with special weapon models. We have estimated the 4 year dynamic of skills and abilities forming of soldiers and cadets of the Military Institute of Physical Culture after 10, 20, 28, 76 and 148 hours of training. 25 soldiers and 30 cadets were picked for this research (who were not single combats), attended not less than 75% of training sessions.</p> <p>Extrapolation and interpolation were held according to the models and the training results forecast was conducted in dependence on time and conditions of training.</p> <p>1. Concentrated character of training, especially in initial period. 2. Realization of rules of dynamic, tactic, psychological and effective compliance in training with special models of weapon and protective equipment usage in combats. 3. Extreme atmosphere making when conducting combats in pairs. 4. It is necessary to plan 10-15% half-conditional combats from total training time on the initial period and not less then 20-25% when mastering.</p> <p>Hand-to-hand fighting • Military service men • Physical training with tactic preparation</p>
<p>Full-text PDF:</p> <p>Word count:</p> <p>Tables:</p> <p>Figures:</p> <p>References:</p> <p>Author's address:</p>	<p>http://www.archbudo.com/get_pdf.php?IDMAN=11473.pdf</p> <p>3856</p> <p>2</p> <p>4</p> <p>17</p> <p>Prof. Sergey Ashkinazi, P. Lesgaft State Academy of Physical Education, Dekabristov 35, 190121 St. Petersburg, Russia</p>

BACKGROUND

The problem of scientific basing of the time resources for effective military service men and policeman training in hand to hand fighting is quite important [2, 3, 5, 6, 7]. It has one of the leading places in the complex of problems of theory and practice of single combat and hand-to-hand fighting, and its solution is able to enrich theory of human motive education with new data.

There are not enough objective data for basing time factors when planning training and for learning programs at the present moment. The whole range of researches were held in Russia to estimate the average temporal inputs for mastering a separate grip of hand-to-hand fighting (from different ranges) to the level of “good” result [1, 2]. But there were quite few researches in the field of servicemen’ dynamics of skills and abilities forming and mastering depending on temporal inputs, on different terms of the educational process. It is important that skills of hand-to-hand fighting as “acquired by a human abilities of using special skills and knowledge in a purposeful and creative way in a process of his activity” [10], can be estimated only in hand-to-hand fighting in conditions close to battle conditions, which is the most objective.

The specially conducted complex of researches was aiming to give reply to two questions at the same time: about the time necessary for acquiring the skills in hand-to-hand fighting and about the methods of objective estimation of such skills.

MATERIAL & METHODS

We have estimated the long-term dynamic of skills and abilities forming of soldiers and cadets of the Military Institute of Physical Culture after 10, 20, 28, 76 and 148 hours of training. 25 soldiers and 30 cadets were picked for this research (who were not single combats), attended not less than 75% of training sessions. Hand to hand fighting readiness check was complex and included three varieties of hand to hand combats: 1) combat of an unarmed with a knife armed opponent; 2) combat of an unarmed with an opponent armed with a submachine gun with bayonet; 3) bayonet combat. Consecution of checking in every variety of hand-to-hand fighting was the same each time. We will consider in on the example of the combats of the first variety.

1. In the beginning the level of grip skill forming was tested – painful grip with knife stab – the unarming grip. The 4 point scale was used (“2” – “non

satisfactory”; “3” – “satisfactory”; “4” – “good”; “5” – “excellent”) and the average from three attempts was taken. Terms of testing: attack at the comment of the test conductor, the blow was performed to a protected opponent’s shank.

2. Then every probationer took part in 10 free-style combats with an opponent armed with a model of knife in the conditions close to battle (opponents wore protective equipment, rubber knife was used, technical actions of an opponent were not limited). According to results of these fights, the skill of an opponent’s disarmament was estimated as well as number of other indices of results and effect in combats, which will be described lower.

The criteria of the estimate were developed on the basis of the probabilistic-statistic approach [1]. We considered the experience of hand-to-hand fighting contests in the Armed Forces of the USSR and Russia, and some of index’s of tactics and technical readiness, developed for combat sports [11, 13].

The following results were fixed as overall results:

a_1 - «winning», if a probationer: a) performed any disarmament hold; b) stroke off the knife stab and performed a blow to a pain zone; c) performed an effective counter attack and performed a preventive leg kick;

a_1^1 - m «defence», if a probationer kicked off the knife stab without a blow to a pain zone and kept the distance away from the opponent;

a_1^2 - «mutual defeat», if the probationer missed the knife stab as a result of weak defence in a counter or mutual attack, but managed to perform an effective kick to an opponent’s pain zone;

a_1^3 - «defeat», if the probationer appeared to be defeated and an opponent remained unharmed.

Then the results of combats were summed up and we had:

$$A_1 = \sum a_1 - \text{total number of “winning”};$$

$$A_1^1 = \sum a_1^1 - \text{total number of “defence”};$$

$$A_1^2 = \sum a_1^2 - \text{total number of “mutual defeat”};$$

$$A_1^3 = \sum a_1^3 - \text{total number of “defeat”}.$$

Further these index’s were transformed into four probability and statistical criteria:



Table 1. Generalized indices of effectiveness of response defence actions of military men in hand to hand combats.

Defense and response actions	Number of training hours				
	10	20	28	76	148
Estimation of actions in standard conditions, (5 marks scale)	-	-	3,74 ±0,09	4,21 ±0,07	4,65 ±0,05
Training level of the forward (B 9 marks scale): q	3,7 ±0,19	4,7 ±0,17	5,5 ±0,16	7,3 ±0,15	8,3 ±0,07
Probability of effective disarmament action P₁ (%), Q₁ (1000 marks scale)	5,8 ±0,4 68,7 ±7,9	6,5 ±0,3 87,5 ±8,4	6,8 ±0,1 102,1 ±4,9	8,0 ±1,3 141,4 ±9,5	8,5 ±0,9 162,9 ±7,4
Integral index: P₂ (%), Q₂ (1000 marks scale)	13,8 ±1,5 98 ±8,2	14,1 ±1,4 128 ±10,1	14,2 ±1,3 142,6 ±7,3	22,5 ±2,2 247,3 ±16	28,3 ±3,12 326,6 ±26
Activeness of defence and response P₃ (%), Q₃ (1000 marks scale)	13,8 ±1,4 101 ±7,8	14,3 ±1,1 127 ±9,3	14,6 ±1,6 144 ±6,6	19,3 ±1,8 223,9 ±13	21,2 ±2,2 267,6 ±18
Effectiveness of defence and response actions: P₄ (%), Q₄ (1000 marks scale)	42 202,4	43,6 261,9	46,6 321,3	41,5 386	40,1 425,8

(1) **P₁** – probability of disarmament (defence act); **P₁** = **A₁** · **10%**

(2) **P₂** – an integral index of the probability of successful actions in hand to hand combat (according to the total number of attempts, when the probationer was not defeated **A₂**); **P₂** = (**A₁** + **A₁¹**) · **10%** = **A₂** · **10%**

(3) **P₃** – activeness of defence and response actions (according to the total number of attempts when the probationer defeated the opponent **A₃**); **P₃** = (**A₁** + **A₁²**) · **10%** = **A₃** · **10%**

(4) **P₄** – effectiveness of defence and response actions (in relation of the number of attempts, where the probationer was a winner to a total number of attempts, when he made blows to the opponent **A₄**);

$$P_4 = \frac{A_1}{A_3} \cdot 100\% = A_4 \cdot 100\%$$

(5) Generalized look of the formula for calculation indices is

$$P_i = A_i \cdot \frac{100\%}{n}$$

where: *i* = 1, 2, 3; *n* – total number of fights

Besides, the level of the forward's training was determined according to the method of expert scores of 9 marks scale: (**q**) taking into consideration the following criteria: initiative, determination, aggressiveness (psychological component), speed of attacking actions, presence and quality of deceit actions, variety of technical actions (tactic and technical component), ability to choose start of an attack and distance (tactical moment itself).

Further for conditions checking equalization all the indices (**P_i**) were recounted in 100 points scale (**Q_i**), taking into consideration the level of training (**q**) according to formula:

$$(6) \quad Q_i = q \cdot 10 + P_i \cdot q + 10$$

where: *i* = 1, 2, 3, 4

The level of skills and abilities forming of opponent's unarming was tested in the same way (for an opponent attacking with submachine gun with bayonet and response defence actions with submachine gun to an opponent's actions armed with submachine gun). On the whole, to estimate the quality of these skills 600 conditional fights and over 1200 free-style combats were conducted. They were held to estimate the level of skills, every military serviceman was a probationer in 12 conditional fights and 30 free-style combats and in the same number of fights and combats as an opponent.

RESULTS AND DISCUSSION

The generalized results are given in the table 1, figures 1, 2 and are interpreted in the table 2. As it can be seen from the table 1 and from figures, dynamics of the indexes has logarithmic character, except the first case (fig. 1), where curve is close to modified exponent. It does not quite coincide with numerous researches of moving and verbal skills forming [4, 12, p. 91-92, 149; 15, 17]. Reasons for this phenomenon will be viewed later.

During the period of research (148 hours) skills of disarmament (response defensive acts) were not transformed into abilities of the highest level (tab. 1). This is proved by a such index as probability of response defensive acts conducting, and also by results received

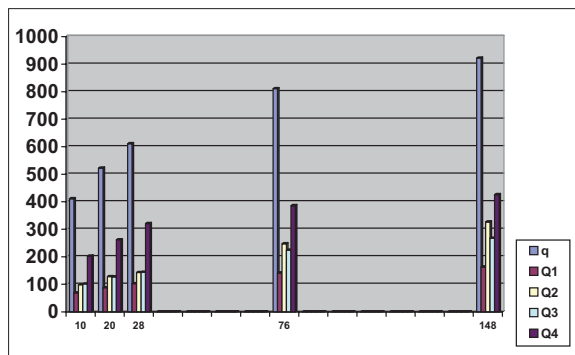


Figure 1. Dynamic of hand-to hand fighting skills and abilities depending on training time input (abscissa /X/ – time for training in hours, ordinate /Y/ – points).

in following data handling. We used the method of three stage double ranging for interpreting the results [9], where 7-9 points stand for the high level of opponent’s readiness, 4-6 points for midlevel, 1-3 points for low level.

On the basis of formula (6) we rated such a probability for combats with opponents of different levels of readiness. It appeared that only 1 person out of 10 after 148 hours of training was able to perform response defensive acts (disarmament) against a well trained opponent, 2 out of 10 – against averagely trained opponent and 3-5 against low trained (tab. 2).

Defence acts skills are easier than response defensive skills or disarmament skills, and finally good ability is formed, which is characterized by good results: 30 ±5% against highly qualified; 55 ±12% against averagely qualified and not less then 95% against low qualified opponent. Level of opponent defeating skill forming in a quantitative

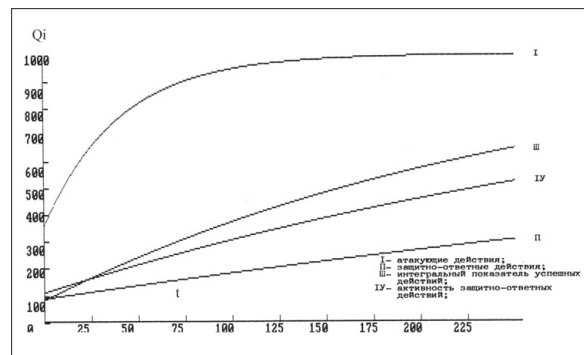


Figure 2. Comparative dynamics of different hand-to-hand fighting skills (abscissa /X/ – time for training, ordinate /Y/ – points) I – attacking actions; II – response defensive actions; III – integral index of successful actions; IV – effectiveness of response defensive actions.

sense has the place between the skills considered above. Let us note one detail. From the total number of cases when military men tried to defeat an opponent (by the leg kick, by hand blow, or by weapon if he was armed), they were not defeated only in 40-50% of cases. In other words, every second attempt ended in a mutual defeat. The mistakes were various: weak defence, being not able to distinguish a deceitful attack from a real one, absence of defensive acts, etc. These pedagogical facts are also characterizing a low level of response defensive skills forming. The problem of further mastering of methods of hand-to-hand fighting training is clearly opened.

Modelling and forecasting of some aspects of hand-to-hand fighting training process

To receive full characteristics of current hand-to-hand fighting military service men training process and to

Table 2. Probable result of hand-to-hand fighting with opponents of different levels of training when performing disarmament or attack repulsing.

Hand-to-hand fighting practice [hours]	Probable result of fighting in case of attack [%]	Opponent's qualification		
		High level 7-9 points	Middle level 4-6 points	Low level 1-3 points
28 hours	Perform defence response action	2 ±1	9 ±4	29 ±8
	Will be able to defend themselves	7 ±2	17 ±5	44 ±10
	Will be able to defeat an opponent	7 ±2	18 ±5	46 ±11
76 hours	Perform defence response action	7 ±2	18 ±6	45 ±11
	Will be able to defend themselves	20 ±4	34 ±5	Not less then 69%
	Will be able to defeat an opponent	18 ±4	35 ±9	77 ±17
148 hours	Perform defence response action	10 ±3	22 ±6	44 ±13
	Will be able to defend themselves	30 ±5	55 ±12	Not less then 95%
	Will be able to defeat an opponent	23 ±5	43 ±10	Not less then 75%



specify the time needed for necessary skills forming, we have conducted modelling and discovered analytical equations of dynamic of different skills of hand-to-hand fighting forming, depending on: t – number of hours for training; t_1 – time for actions training in conditions close to battle conditions; N – number of free-style combats, non-conditional fights, fights with counteraction (two last facts were received while sessions timekeeping).

The whole range of mathematic methods of human teaching process models is described in literature. The stochastic model by R. Bush and F. Mosteller [4] is the most famous, adapted by V.M. Zazhiorisky with co-authors [17], V.A. Plahtienko and V.V. Safronov [14] to some situations usual for physical education and sports. But this model has a binary alternative of the result and fixation of each attempt result is supposed, thus it cannot be used in our research. Another model is worth considering, too. This model, suggested by V.F. Prisnyakov [15] is based on the theory of information interpreting by human memory. This model has good results when describing the processes of prick skill forming in fencing and when training a person to reduce time for reaction. And though the curve character is close to our case, our attempt to use this model required the whole range of amendments.

There are two significant reasons for that: we did not deal with skills, but abilities of highest level, and these abilities appear in a combat with active opponent. In connection with that and also taking into consideration the recommendations from works of V.I Balandin, U.M. Bludov, V.A. Plahtienko [see 16], we have taken a model described by modified exponent equation as a “grey box”.

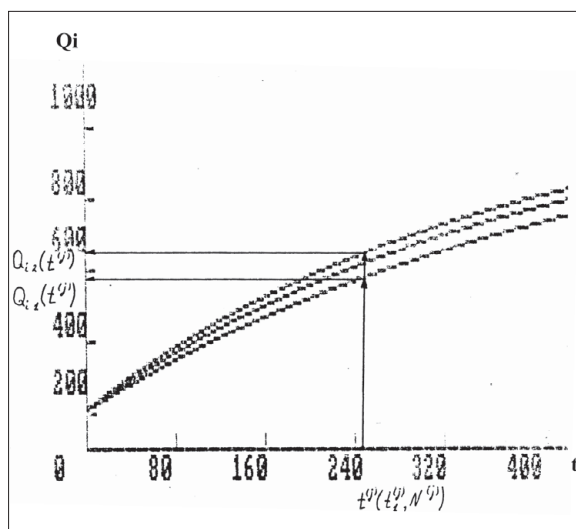


Figure 3. Algorithm of direct forecast.

$$(7) \quad q = 9 - e^{(C_0 - C_1 \cdot t)}$$

$$(8) \quad Q_i = 1000 - e^{(d_{0i} - d_{1i} \cdot t)}$$

where: C_0, C_1, d_{0i}, d_{1i} unknown constants; $i = 1, 2, 3$; t – time for hand-to-hand fighting training; $t \in [0, t_{max}]$, t_{max} maximum really possible inputs for training. Any above mentioned argument can be used as an argument for the formula.

Identification of suggested model was made by least squares method. In such a way the analytical dependence of skill forming dynamics was calculated. They allow: 1) to forecast (extra- and interpolate) the result of hand-to-hand fighting education and training depending on time input; 2) to define necessary time input to achieve a certain level of training. Let's take a closer look to this.

Algorithm of direct and inverse forecast is shown on fig. 3 and 4. when making the direct forecast the corresponding argument values are inserted in received analytical dependence of upper and lower limit: t – time for hand-to-hand fighting training (hours); t – time for free-style fights (minutes); N – number of free-style fights. As the result we receive an area of probable results of training. For example, after 150 hours of training we can expect very effective attacking actions: $8,86 \pm 0,02$ points. Result equal to $8,4 \pm 0,06$ points will be achieved after 800 non-conditional fights and free-style fights.

For reverse forecast (to define necessary input for receiving a certain result) it is necessary to use the following formula:

a) for upper level of forecast:

$$(9) \quad t^{(i1)} = \frac{1}{d^{(1)}} (d_{0i}^{(1)} - \ln(Q_i^{(e)} - 1000))$$

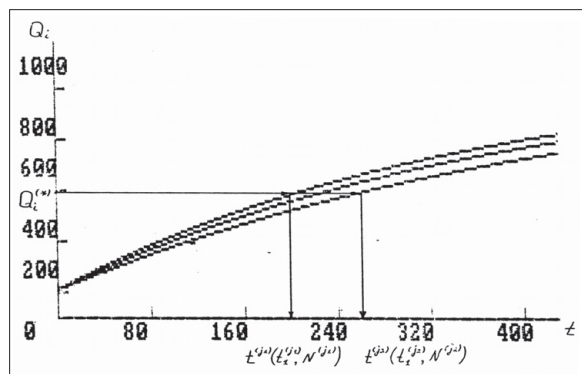


Figure 4. Algorithm of reverse forecast.

b) for lower level of forecast:

$$(10) \quad t^{(2)} = \frac{1}{d^{(2)}} (d_{0i}^{(2)} - \ln(Q_i^{(*)}) - 1000)$$

where: $d_{0i}^{(1)}$, $d_{1i}^{(1)}$ coefficients of equality

$$Q_i = 1000 - e^{-(d_{0i} + d_{1i} \cdot t)}$$

For , $d_{0i}^{(2)}$, $d_{1i}^{(2)}$ – same equality coefficients for lower limit; $i = 1, 2, 3$.

Let us take a look to several variants of this task solution.

1. Direct forecast: If we take 35 hours as pure time for training and will insert this in the formulas (7) and (8) we will have the following results: tactic and technical level of attacking actions (9 points scale) $q = 6,5 \pm 0,1$; probability of response defensive action conducting (1000 points scale) $Q_1 = 121 \pm 7$; integral index of successful action probability (1000 points scale) $Q_2 = 196 \pm 12$; activeness of response defence actions (1000 points scale) $Q_3 = 184 \pm 10$.
2. Reverse forecast probability of response defensive action conducting $Q_1 = 200$ points correspond to: a) $14 \pm 3\%$ against high level trained opponent; b) $30 \pm 8\%$ against well trained opponent; c) $70 \pm 15\%$ against low level trained opponent. According to formulas (9) and (10) this training level will be achieved after 120 ± 10 hours of sessions or after 1080 ± 100 fights (non-conditional fights, free style combats).
3. Integral index $Q_2 = 400$ correspond to: a) $40 \pm 6\%$ against high level trained opponent; b) $71 \pm 16\%$ against well trained opponent; c) not less than 98% against low level trained opponent. This training level will be achieved after 113 ± 13 hours of sessions or after 1000 ± 130 fights.
4. Possibility to traumatize an armed opponent $Q_3 = 300$ points correspond to: a) $27 \pm 4\%$ against high level trained opponent; b) $50 \pm 12\%$ against well trained opponent; c) not less than 87% against low level trained opponent. This training level will be achieved after 100 ± 13 hours of sessions or after 830 ± 65 fights.

To make a conclusion, we may notice that these dependences show the probable training results, when traditional method of hand-to-hand fighting is applied in currently provided conditions, which does not allow to conduct the fights in real velocity and with full contact. Work with this models revealed, that real conditions

of combat training do not allow to solve problems of mastering the military service men training level in extensive way – by increasing time input. That is why one of the main ways to intensify hand-to-hand training process is to increase time input within the time limit devoted to this section or in other formats (corresponding forms of tactic preparation, complex lessons, sports work). Besides, it is necessary to find new intensive methods of training and to give prove to conditions of their realization to achieve a high level of military service men training in the field of hand-to-hand fighting and to develop psychological resistance to factors to close combat.

As it often happens, this problem solution revealed a new complex of scientific and methodical tasks. Further we conducted several series of experiments to research the following: effectiveness of imitation exercises when teaching and mastering hand-to-hand fighting techniques; sport specialization and sport qualification level influence to a successful hand-to-hand fighting training; working out a new class of weapon dummies and protective equipment to conduct hand-to-hand training; working out a “contact” method of training and effectiveness estimation, specification of mathematic model, describing the process of hand-to-hand fighting according to so-called “contact” method; dynamics of hand-to-hand fighting skills “fading” when stop training and grounding of necessary repeating of training; estimation of reliability and informative of traditional system of hand-to-hand fighting control and estimation and developing a more informative system; base techniques of hand-to-hand fighting (“linear” and “rotation-circular”) and mastering and classification grounding of hand-to-hand fighting techniques.

CONCLUSIONS

As the results of these experiments, it was proved that the main factors influencing the level of hand-to-hand fighting training are the following: (a) developing content and method of training on the basis of unified basic techniques and basic algorithms of close combat conditions; (b) concentration of training on initial stages; (c) it is necessary to devote 10-15% of whole training time for half-conditional fights on the initial stage and not less then 20-25% for half-conditional fights and free-style fights when mastering; (d) realization in training dynamic, tactic and effective correspondence with weapon dummies usage; (e) extreme atmosphere creation when conducting fights in pairs; (f) providing systematic character of hand-to-hand fighting training by rational combining different forms of *physical training with tactic preparation*.



REFERENCES:

1. Ashkinazi S.M. (1989) Veroyatnostno-statisticheskiy podhod k ozenke podgotovlennosti voennosluzhazhich k rukopashnomu boyu. In: *Tesisy dokladov konferentsii ad'junktov Instituta sa 1988 god. WIFK, Leningrad*, 97-98.
2. Ashkinazi S.M. (2001) *Voprosy teoryi i praktiki rukopashnogo boya v Wooruzhonnnykh Silakh Rossyjsko Federacii. Monografija. WI FK, St. Peterburg.*
3. Ashkinazi S., Jagiello W., Kalina R.M., Novikov S., Stupnicki R. (2005) The importance of hand-to-hand fights for determining psychomotor competence of antiterrorists. *Archives of Budo. Vol 1: 8-12.* <http://www.archbudo.com>
4. Bush R., Mosteller F. (1982) *Stohasticheskie modeli obuchaemosti. Moskwa.*
5. Bashun E.A., Lodyaev N.F. (1977) O rezultatah oputnoj proverki eksperimentalnuh program kompleksov rukopashnogo boia proekta NFP v vojskovuh uslovijah. *VDKIFK, Leningrad*, 34-36.
6. Carzyński M., Kalina R.M., Kaluźny R., Mikłusiak G. (2000) Próba wstępnego zweryfikowania trafności testów służących ocenie wytrenowania żołnierzy w zakresie walki wręcz. W: Litwiniuk S., Bujak Z., Litwiniuk A. (red.) *Optymalizacja struktury treningu i współzawodnictwa w sportach walki. Zamiejscowy Wydział Wychowania Fizycznego, Biała Podlaska*, 23-31.
7. Kalina R.M., Dadelo S., V. Podlužnas (2005) Aspects of physical fitness in guards. *Visuomenės Sveikata/PublicHealth. 2 (29), 70-76.*
8. Kalina R.M., Chodała A., Dadelo S., Jagiello W., Nastula P., Niedomagala W. (2005) Empirical basis for predicting success in combat sports and self-defence. *Journal of Kinesiology. 37, 1: 64-73.*
9. Marizhuk V.L. (1977) *Pedagogicheskie osnovu izuchenija lichnosti voennosluzhazhix, problemu profotbora i proforientazii. VDKIFK. Leningrad.*
10. Marizhuk V.L. (1988) *Voprosu moralno-psihologicheskoy podgotovki lichnogo sostava SA i VMF. VDKIFK. Leningrad.*
11. Nikiforov J.B. (1987) *Effektivnost trenirovki bokserov. FiS. Moskwa.*
12. Norman D. (1985) *Pamyat i nauchenie. Mir, Moskwa.*
13. Novikov A.A., Akopyan A.O. (1985) *Osnovnye principu planirovanija podgotovki sbornuh komand SSSR v sportivnoj borbe. Nauchno-sportivnuj vestnic. 6: 14-17.*
14. Plahtienko V.A., Safronov V.V. (1973) *O matematicheskom modelirovanii prozessa formirovanija dvigatelnuh navukovnuh. VDKFFKiS pri GDOIFK, Leningrad*, 187-180.
15. Prisnyakov V.F. (1988) *Modelirovanie trenirovochnogo processa. Teorija i praktika fizicheskoy kultury, 4: 39-41.*
16. Shustin B.N. (1995) *Modelnue harakteristiki sorevnovatelnoj dejatelnosti. SSM, Moskwa*, 50-72.
17. Zazhiorsky V.M. (1969) *Kibernetika, matematika, sport. FiS, Moskwa.*