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DYNAMICS OF INTEGRAL TRAINING OF YOUNG COMBAT ATHLETES IN THE PROCESS OF TRAINING SESSIONS (USING THE EXAMPLE OF KURASH AND FENCING)

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ABOUT ARTICLE

Key words: muscle performance, tone and strength of different muscle groups, training process.

Abstract: This article focuses on muscle performance in terms of strength and tone during the training process in kurash and fencing.

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Introduction. The study of muscle performance in young athletes acquires special significance in republics with hot climates, as the latter is a factor that complicates the physiological processes occurring in the athlete's body. Therefore, in the problem of training young athletes in republics with hot climates, the study of performance dynamics should be widely developed.

An important task of the integral training of young athletes is achieving their physical perfection. A huge role here is played by modern methods of sports training with an emphasis on the performance of the muscular system in terms of strength training indicators of various muscle groups, adequate to the data of tension tone and relaxation of the upper and lower extremities of young athletes.

The results of studying muscle performance, including in young athletes, are presented in a significant number of works (V.P. Filin, M.Ya. Nabatnikova, A.V. Korobkov, Yu.M. Uflyand, A.B. Gandelsman, A.N. Bernstein, V.I. Lyakh, Z.I. Biryukova, A.A. Markosyan, F.A. Kerimov, R.M. Matkarimov, T.S. Usmankhodzhaev, N.A. Chorshamiev, and others).

Research on muscle performance of young athletes in republics with hot climates has been conducted very sparingly by D.N. Levitsky, D.D. Sharipova, Sh.Kh. Khonkeldiev, Yu.M. Yunusova, A.I. Yarotsky, D.D. Dzhalolova, N.A. Koshbakhtiev.

The present study is devoted to studying the influence of sports training in kurash and fencing on the functional state of the muscular system – the strength and tone of various muscle groups, as well as their thermoregulatory functions – in the conditions of the hot climate of Uzbekistan.

National kurash and fencing in the republic are sports in which there are high and certain indicators and achievements (Sh.S. Mirzanov, M. Isomiddinov, Sh. Juraev). In fencing, Z.K. Daybekova – International Master of Sports in fencing, G. Perdibaeva – International Master of Sports among adults. Significant attention is paid to these sports when training athletes; meteorological conditions (air temperature and humidity) were taken into account during the research.

It could be assumed that faster recovery of muscle performance after physical work would be achieved through the influence of mechanical and temperature factors on skin reception.

As factors reflexively stimulating increased performance of fatigued muscles, we selected segmental massage according to O. Glaser and A.V. Dalikho, as well as a warm shower.

The study set out to investigate the following in hot climate conditions:

1. The state of certain body functions (muscle strength, muscle tone, skin temperature) in beginners and young athletes at rest.
2. The influence of muscular work on the functional state of the muscular system: after a training session and after prolonged training sessions.
3. The effects of massage and warm shower on the functional state of the muscular system of young kurash wrestlers and fencers.

Methodology. The participants were young athletes engaged in fencing and kurash. All subjects were aged 11–17 years and were students of the Olympic Colleges in Tashkent and Chirchik. By age groups, young athletes were distributed as follows: 11–12 years (10–12 years), 13–14 years (12–14 years), 15–16 years (15–17 years). Total number of athletes: 40 people.

The majority of students (40%) had a sports rank, while the rest (30%) were beginners preparing to pass standards to obtain a rank.

The study was conducted during periods before a series of training sessions (at rest), immediately after training sessions lasting 1 hour 30 minutes, and one month after the start of regular kurash and fencing training at rest.

Analysis of the experimental data presented in this work allows us to characterize some features of the organism of trained young athletes under conditions of high ambient temperature, to assess the impact of single and long-term training sessions in kurash and fencing, to establish the resulting shifts in the body of young athletes in terms of indicators characterizing the neuromuscular system and thermoregulatory function, as well as to evaluate the influence of the aforementioned recovery factors.

It is known that a comprehensive study using a number of methods provides a fairly complete characterization of the functional state of the muscular system. We selected the following indicators and used the following methods:

1. Muscle strength – using the electrodynamometry method (according to A.V. Korobkov and G.I. Chernyaev).
2. Muscle tone – using electrodynamometry (according to Yu.M. Uflyand).
3. Skin temperature – using TEMP-60 electric thermometers.

All obtained quantitative data were processed statistically.

During the study, muscle strength was measured during flexion and extension movements of the forearm muscles (triceps), shoulder, thigh, and lower leg. Muscle tone was determined on the forearm muscles, biceps brachii; lower leg extensors – quadriceps femoris. Measurements were taken on the left and right limbs.

Skin temperature was determined at 17 body points, including closed and open areas, as well as symmetrical areas of the limbs.

Ergography was performed not only before and after training sessions but also repeatedly at 15–20 minutes of natural recovery. The work was performed with the index finger of the right hand in the form of lifting and lowering a load weighing 3500 g. Quantitative assessment of the obtained curves was carried out by differentiated accounting of ergogram amplitude: high and low waves. The final assessment was expressed as a percentage of manifestation of high amplitudes.

Using a number of massage techniques, as well as a shower with water temperature up to 40°C, we sought to assess their restorative effect on performance.

Results and discussion. Characteristics of indicators at rest. The initial task of assessing these indicators was to identify them at rest. These data were intended to characterize a specific age group, reflecting the state of fitness in the considered indicators.

Muscle strength.

Analysis of the obtained data showed that the muscle strength of extensors in all age groups exceeds the muscle strength of flexors. The exception is the muscle strength of the forearm, where in all age groups the muscle strength of flexors is almost twice as high as that of extensors.

In the group of young athletes aged 11–12 years, in 70% of individuals, the muscle strength indicator of shoulder extensors was within 18–22 kg, in 24% – 26–30 kg, and only in 6% – 10–14 kg. In the group of athletes aged 13–14 years, this indicator in 96% of observations ranged from 20 to 26 kg, while in the rest it was 16 kg. In the group of young athletes aged 15–16 years, this indicator in 91% of observations ranged from 20 to 48 kg, while in the rest it was significantly lower. The indicators of flexor muscle strength in the younger group of young athletes have a smaller range of fluctuations than extensors, which is not observed in young athletes of older age groups. The greatest difference in the range of fluctuations of extensors relates to the thigh and lower leg muscles. With age, this difference increases very significantly for extensors, and for flexors, although it is observed, it is less significant.

Analysis of static data on muscle strength indicators in young athletes of all three age groups at rest indicates that the age difference between the younger and middle groups manifests itself mainly in the muscles of the lower extremities, especially in the extensor group. A distinct difference is more noticeable in these same muscle groups in relation to the older group of young athletes. However, in the older group, the age difference between the muscle strength of flexors and extensors of the lower extremities is even greater.

Analysis of the distribution of muscle strength indicators across the age range confirmed that in older age groups, the percentage of indicators concentrated around the average value is higher than in the younger group. We are inclined to interpret this not only as an expression of age-related characteristics but also as a reflection of the level of fitness. The main dynamics of muscle strength indicators associated with the age characteristics of young combat athletes were expressed as follows: the greatest increase in muscle strength was observed for thigh extensors (from 75 in the younger age group to 91 kg in the middle age group and up to 120 kg in the older age group), followed by an increase in muscle strength of lower leg extensors, weakly expressed in the younger and middle age groups (57 and 58) and particularly noticeable

in the older age group (83 kg). The increase in muscle strength of upper limb extensors and flexors of all four limbs was not significantly expressed.

Muscle tone. The state of muscle tone in young athletes at rest is presented in Table 1.

Table 1. Dynamics of muscle tone indicators in different age groups of young combat athletes (in rheo units)

Indicators	Statistical indicators	11 years	11 years	13 - 14 years	13 - 14 years	15 - 17 years	15 - 17 years
		Relaxation	**Tension**	**Relaxation**	**Tension**	**Relaxation**	**Tension**
Biceps brachii (Right)	Number of observations Range of fluctuations M ± m, ±G	54 11-28 18.5±0.19±2.1	54 35-60 56± 0.40± 3.08	105 10-61 21.2± 0.60	-105 34-82 52.8± 0.62± 6.92	48 10-28 19.5± 0.42± 3.34	48 40-67 54.7± 0.50 ±3.56
Biceps brachii (Left)	Number of observations Range of fluctuations M ± m, ±d	54 10-30 17.2±0.48±3.3	54 32-57 4± 0.86± 9.20	105 10-60 23.2 ±0.86 ±9.20	105 32-90 50.8± 0.70± 7.60	48 10-25 17.0± 0.14± 1.0	48 39-71 54.0± 0.79 ±5.36
Triceps brachii (Right)	Number of observations Range of fluctuations M ± m, ±G	54 10-22 14.8±0.838±2.1	54 29-52 9± 0.23± 6.92	105 10-62 20.0 ±0.80 ±6.92	105 24-81 48.5± 0.80± 8.50	51 10-18 14.9± 0.24± 1.58	45 31-65 45.6± 0.90± 6.32
Triceps brachii (Left)	Number of observations Range of fluctuations M ± m, ±d	54 10 – 26 15,2 ± 0,28 ± 2,0	54 25 – 52 42,3 ± 0,54 ± 4,0	105 10 – 58 20,4 ± 0,69 ± 6,96	105 22 – 80 45,2 ± 0,96 ± 0,40	45 10 – 22 15,8 ± 0,30 ± 2,20	45 30 – 63 44,9 ± 0,70 ± 5,20
Quadriceps femoris (Right)	Number of observations Range of fluctuations M ± m, ±G	54 15 – 31 23,4±0,34 ± 2,52	54 34 – 57 44,8±0,44 ± 3,20	105 13 – 65 29,5 ± 0,76 ± 8,0	105 30 – 86 54,2 ± 0,72 ± 8,0	45 20 – 42 29,9±0,80 ± 5,60	45 42 – 78 62,8 ± 0,60 ± 4,0
Quadriceps femoris (Left)	Number of observations Range of fluctuations M ± m, ±d	54 17 – 40 27,2±0,38± 2,82	54 34 – 60 47,8±0,54 ± 4,0	105 12 – 64 32,4 ±0,76± 8,0	105 27 – 93 53,8±0,76 ± 8,0	45 20 – 43 31,8±0,75 ± 4,80	45 38 – 74 56,0±0,75 ± 4,80

From the table, it can be seen that the relaxation tone in all age groups is higher in the quadriceps femoris muscles. This indicates that relaxation in these muscles is less pronounced compared to other muscles. The relaxation tone is almost the same in both the right and left limbs. The tension tone of the upper limb muscles increases slightly with age; in the lower limbs, the increase was noticeable.

In the middle age group, the indicators of both muscle tension and relaxation tone are significantly lower than in the other two groups.

Skin temperature

Data on skin temperature in young combat athletes at rest showed that in younger and middle age groups, skin temperature is less stable at the same body points than in older schoolchildren. In body points located on the lower limbs, temperature indicators are somewhat lower.

The difference in skin temperature values at the same body points in all age groups does not exceed 1°C, except for the foot, where the temperature difference is 1.6°C. On open parts of the body in these age groups, false temperature is almost undetectable.

Thus, a comparative assessment of our data showed that in children of the younger group, skin temperature at most points is somewhat higher than in children of older age groups. This is consistent with the data of M.E. Marshak, who notes that adult skin temperature is lower than that of adolescents.

According to our data, the temperature of open body areas in schoolchildren living in hot climates exceeds similar indicators in studies of children's skin temperature in temperate climates.

Muscle performance

Indicators of muscle performance at rest were taken only from young athletes of the middle age group. The dynamics of muscle performance were determined by indicators of high and low amplitudes, as well as by the duration of dynamic work.

As the research results showed, before training sessions at rest, high ergogram amplitude was observed in 31.7% of observations and low amplitude in 68.3%; the average duration of work was 6 minutes and 58 seconds. In almost 70% of observations, low amplitudes predominated on the ergogram.

This section of the dissertation presents the results of research on the influence of muscular work performed by young athletes during swimming training sessions. Since young swimmers were studied, regular swimming training can be considered an adequate physical load.

The effect of these loads was studied in two directions: first, the influence of a single training session (which we designate as an "acute effect"), and second, the influence of prolonged training sessions over one, three, and five months.

The acute effect of swimming training sessions was assessed using these indicators. The session lasted one and a half to two hours. Measurements were taken 2–3 minutes after the end of swimming.

Influence of single training sessions

The study of muscle strength under the influence of single training sessions was conducted on 40 young athletes across 120 observations. Twelve observations were conducted in the younger age group (11–12 years), 45 observations in the middle age group (13–14 years), and 68 observations in the older age group (15–17 years).

Reviewing the research data already presented above for younger schoolchildren in the younger group (11–12 years), it can be noted that the forearm extensors possess the least strength, while the thigh extensors possess the greatest strength.

These data correspond to morphological concepts regarding the power of the mentioned muscle groups. Training sessions in this age group have not yet had a significant impact on the development of muscle strength in the young athletes under study, since they were essentially beginner swimmers. The influence of a single training session was studied after 6–8 training sessions, once the schoolchildren had mastered the basic elements of swimming technique (Table No. 2).

Table 2

The influence of muscle strength indicators under single and month-long training sessions of young kurash wrestlers and fencers

Age groups	Indicators	Before training session				After training session				Over one month			
		Number of	Range of indicator	M± n	± δ	Number of observati	Range of indicator fluctuatio	M± n	± δ	Number of observati	Range of indicator fluctuations	M± n	± δ
	Shoulder Flexors Extensors	12 12	12-23 10-31	18,7 ±1,0 23,8 ±1,5	4,70 4,25	12 12	14-24 14-31	18,0 ±1,2 23,8 ±1,5	4,30 5,6	12 12	14-21 16-30	18,5± 0,70 24,0± 1,60	±2,70 ±3,68
11-12 year	**Forearm Flexors Extensors**	12 12	17-25 9-30	21,0 ±1,80 15,2 ±1,0	3.03.80	12 12	16-25 14-17	19,0 ±0,80 14,2 ±0,48	3.01.70	12 12	18-26 18-21	22,5± 0,74 17.7,± 0,60	±2,60 ±3,0
	Thigh Flexors Extensors	12 12	15-24 52-85	20,5 ±1,80 74,2 ±1,18	6.70 13.60	12 12	15-19 48-81	17,0 ±0,80 69,6 ±5,20	2.80 18.20	12 12	20-30 68-92	26,0± 0,74 81.5,± 1,40	±2,60 ±5,0
	Lover leg flexors extensors	12 12	12-25 34-60	15,5 ±1,60	5.60 6.60	12 12	12-17 33-51	13,6 ±0,90	8.30 13.50	12 12	18-31 33-51	28,5± 0,68 44.7,± 1,80	±8,60 ±0,60

				52,2 ±1,8 8				44,7 ±3,8 0					
	Shoulder Flexors extensors	45 45	19-32 20-38	24,0 ±1,3 7 29,5 ±1,7 0	2. 50 5. 50	45 45	18-31 18-40	23,0 ±0,3 4 26,0 ±0,7 3	3. 80 5. 10	45 45	16-34 23-42	23,5± 0,54 31.5,± 0,78	±4, 0 ±5, 0
13-14 year	**Forearm flexors extensors**	45 45	18-58 13-27	26,0 ±1,7 0 19,0 ±0,3 7	5. 10 2. 50	45 45	15-32 13-28	23,0 ±0,3 7 16,0 ±0,3 0	2. 50 2. 10	45 45	19-36 14-32	26,8± 0,60 21.0,± 0,34	±4, 80 ±2, 20
	Thigh flexors extensors	45 45	17-37 62-151	26,0 ±0,5 0 93,6 ±1,5 0	3. 70 10 .4 0	45 45	18-39 52-145	24,0 ±0,6 0 80.0 ±1.7 0	4. 50 11 .5 0	45 45	23-44 64.150	29,2± 0,40 96.0,± 2,27	±2, 80 ±1 5,4 0
	Lower leg flexors extensors	45 45	14-31 43-101	22,0 ±0,4 0 63,5 ±1,7 0	3, 0 4, 70	45 45	13-31 40-91	19,0 ±0,5 0 59.0 ±1.5 0	4, 30 10 ,4 0	45 45	17-33 51-116	23,0± 0,33 78.1,± 2,80	±4, 20 ±9, 0
	Shoulder flexors extensors	63 63	17-39 28-60	26,5 ±0,6 9 70,0 ±0,5 3	5, 44 4, 50	63 63	19-35 26-63	24,5 ±0,6 0 36.5 ±1.0	4, 80 7, 90	63 63	19-38 30-68	28,5± 0,39 43.1,± 0,70	±3, 10 ±6, 10
	Forearm flexors extensors	63 63	24-46 15-32	33,0 ±0,6 0 23,0 ±0,6 0	4, 80 4, 50	63 63	22-41 15-26	30,5 ±0,4 8 21.0 ±0.3 8	3, 80 3, 10	63 63	23-48 19-36	35,0± 0,50 27.0,± 0,54	±4, 40 ±4, 0
15-17 year	Thigh **flexors extensors**	63 63	23-48 75-204	35,7 ±0,6 3 123, 7±8, 30	5, 30 18 ,4 0	63 63	22-41 15-26	32,8 ±0,6 8 116. 2±1. 40	5, 50 17 ,8 0	63 63	25-58 76-202	39,0± 0,60 141.0, ±3,20	±4, 60 ±2 4,5 0
	Lowe leg flexors extensors	63 63	19-34 60-156	35,7 ±0,6 3 123, 7±8, 30	3, 90 10 ,2 0	63 63	15-33 61-150	22,8 ±0,4 6 82.5 ±2.3 0	3, 40 18 ,4 0	63 63	19-40 66-150	28,0 ±0,4 0 97.5, ±1,9 0	±4, 50 ±1 6,1 0

From the table, it can be seen that according to the initial electrodynamometry data, muscle strength of the flexors of the shoulder, thigh, and lower leg in all age groups is significantly lower than the strength of the extensors of these muscle groups, and only in the

forearm muscle group was a different pattern observed. The greatest strength is exhibited by the extensor muscle groups of the lower extremities – the thigh and lower leg.

Conclusion. Reviewing the research data already presented above for the younger group (11–12 years old), it can be noted that the forearm extensors possess the least strength, while the thigh extensors possess the greatest strength.

These data correspond to morphological concepts regarding the power of the mentioned muscle groups. Training sessions in this age group have not yet had a significant impact on the development of muscle strength in the young athletes under study, since they were essentially beginners. The effect of a single training session was studied after 6–8 training sessions, once the boys had mastered the basic elements of martial arts technique.

In this age group, a uniform decrease in muscle strength of both flexors and extensors of the upper extremities can be observed. A more pronounced decrease in muscle strength was observed in the lower extremities. The reduction in muscle strength indicators in this age group is statistically significant ($P < 0.02$).

A decrease in muscle strength after training sessions was observed across all indicators in the older age group as well. For the strength of the flexor muscle groups after the training session, it amounted to 10,400 g, and for the extensors – 14,700 g. Accordingly, the strength of the shoulder flexors decreased by 4,500 g, and that of the extensors – by 11,100 g. These changes for the older age group are statistically significant ($P < 0.02$).

P.S. The continuation of this scientific article, based on data on the effect of training sessions over a period of one to four months, will be presented in future publications of this journal, along with the conclusions and the list of references used for this article..

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