Warm-up in the discipline of computer sports "combat arena"

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Abstract

Objective of the study was to compare various warm-up complexes involved in the discipline of computer sports "combat arena".

Methods and structure of the study. The scientific work included two stages. At the first stage, a survey was made of 32 athletes involved in the "combat arena" (Dota 2) of the first or third sports category, according to the results of the survey, 3 sets of exercises for warm-up were compiled. In the second part of the study, 10 young men from 18 to 25 years old took part. The participants of the study were asked to perform a warm-up and play a game match in the rating mode in the chosen form of the program. Immediately after the warm-up, the tone of the muscles of the hand and forearm, the trapezius muscles in a relaxed and tense state, thermography of the fingers and hands, and the level of concentration of attention were measured.

Results and conclusions. The revealed relationships between the tone of the relaxed trapezius muscles, delta tone and concentration of attention indicate the expediency of including in the training process those involved in the "combat arena" means aimed at reducing the tone of the trapezius muscles and muscles of the hand and forearm.

The greatest efficiency was shown by the warm-up complex No. 2, lasting 22 minutes 40 seconds, consisting of 25% of physical exercises and 66.2% of digital ones, which includes the largest amount of physical exercises, compared with other complexes.

Keywords: *computer sports, warm-up, combat arena, muscle tone.*

Introduction. The growth of competition in computer sports is accompanied by a constant increase in the requirements for the technical and tactical skills and cognitive abilities of the players. Warm-up requirements before the match are also undergoing changes and are an integral part of the preparation for the competition. The effectiveness of the warm-up in esports has not only a direct impact on the performance in the game, but is also directly related to the performance of the players and their ability to realize their maximum potential during the game.

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Results of the study and their discussion. At the first stage, to identify the structure and content of the warm-up for those involved in various computer sports disciplines, a special online portal was used - the "e-

sportsman warm-up calculator" warmten.ru. Developed by the staff of Lesgaft National State University, St. Petersburg, to conduct training sessions with students studying in the sport of "computer sports". Athletes were asked to create their own set of exercises (digital and physical) for warming up, perform them and assess their own readiness for competitive or training activities on a ten-point scale (where 1 is not

Table 1. *Benchmarks for those involved in the "combat arena" after using various warm-up complexes*

Index	Warm-up complex number		
	Warm-up No. 1	Warm-up No. 2	Warm-up No. 3
Number of samples	50	50	50
Percentage of wins	60	70	50
Duration	17 min 50 s	22 min 40 s	33 min 30 s
PhE	21,5%	25,0%	25,4%
DE	67,3%	66,2%	68,7%
t1	73,6±4,9	79,8±4	80,4±6,9
T1	93,5±5,5	99,7±6,3	102,5±4
ΔT1	20±6,3	19,9±7,2	22±7,8
t2	100,7±5	106,6±9	108,5±5,1
T2	117,1±8,2	120,8±9,1	119±4
ΔT2	16,4±9,6	14,3±11,2	10,5±5,5
t3	99,1±7	92,5±5	90,9±7
T3	114,5±7,2	108,5±5	105,7±5,9
ΔT3	15,4±8,3	16±6,9	14,7±8,7
t4	92,5±6,4	95,5±8	89,5±5
T4	104,5±5,4	105,4±5,7	104,5±4,5
ΔT4	12±5,7	9,9±6,6	15,1±6,9
s1	87,8±9,1	93,5±3	100,5±6
S1	101,8±5,4	100,6±3,1	114,6±8,8
ΔS1	14,0±8,9	7,1±3,8	14,1±7,5
s2	103,9±7,8	98,4±7	96,6±5,9
S2	122,3±6,1	117,4±6,2	126,5±9
ΔS2	18,3±10,3	18,9±8,2	29,9±10,1
vl	189,5±6,1	188,2±7,1	186,7±4,3
VL	220,5±9	221,3±8,2	218,5±7
ΔVL	31±11,8	33,1±10,1	31,8±7,1
vp	188,9±6,1	186,2±7,9	184,8±3,8
VP	212,9±4,6	222,7±1,8	230,9±5,1
ΔVP	24,3±8,3	36,5±8,2	45,8±6,5
tpk	27,0±2,1	27,3±2,1	29,1±2
tlk	27,1±2,0	28,1±3	29,0±2,5
tpp	26,1±2,0	27,7±3,5	27,5±2,5
tlp	26,0±2,0	28,0±3,5	27,4±2,5
К, баллы	70,6±8,7	71,6±9,8	74,3±6,0

Notes: PhE - physical exercises, DE - digital exercises; tpk is the temperature of the right hand; tpp-temperature of the fingers of the right; tlk is the temperature of the left hand; tlp is the temperature of the left fingers; K - the level of concentration of attention before the start of the match; Km is the duration of maintaining concentration of attention; T - tense muscle tone (right hand); t is the tone of the relaxed muscle (right hand); S - tense muscle tone (left hand); s-tonus of a relaxed muscle (left hand); ΔS - delta tone (left hand); ΔT - delta tone (right hand); T1 - Dorsal interosseous muscle of the hand (Musculi interossei dorsalis); T2 - Short muscle that removes the thumb of the hand (Musculus abductor pollicis brevis); T3 - Extensor of fingers (Musculus extensor digitorum); T4 - Shoulder muscle (Musculus brachioradialis); S1 - Finger extensor (lat. Musculus extensor digitorum); S2 - Long radial extensor of the wrist (lat. Musculus extensor carpi radialis longus); VL - left trapezius muscle (lat. Musculus. Trapezius); VP-trapezius muscle right (lat. Musculus. Trapezius).

ready, 10 is fully ready), indicate what type of program (game) the athlete is engaged in. The total duration of the warm-up was automatically calculated, as well as the ratio (duration and number) of digital and physical exercises in the selected complex. Based on the results of the assessment of the complexes, a rating was formed based on the average rating of users.

Muscle tone was assessed according to the generally accepted method using a mechanical myotonometer "Sirmai" (Hungary). When processing the data, the indicators of the tone of tense (T, S, V) and relaxed (t, s, v) muscles, as well as the difference between them (delta tone - Δ) were taken into account. Using the Flir Cat thermographic camera, the temperature of the fingers and hand of each hand was recorded. The level of concentration of attention of the study participants was measured using the Neurosky Mindwave neuroheadset.

Three sets of warm-up exercises were chosen for comparison. All complexes included three blocks of exercises, in a different ratio: physical, cognitive and special exercises (from the chosen game discipline).

Warm-up complex No. 1 included: squats (2x15 reps, 30 s rest ≈ 60 s), push-ups (3x10 s 40 s rest ≈ 110 s), exercises for the fingers (60 s), playing OSU (3 cards x 180 s ≈ 540 s), finishing off Dota2 creeps (1 map ≈ 180 s), organizational time (120 s).

Warm-up complex No. 2: turning and tilting the head with fixation (40 s), multidirectional rotation of the arms in the shoulder joints (30 s), squats (2x15 times, 30 s rest ≈ 60 s), exercises for the fingers (60 s), "fist, palm, rib" (kinesiology exercise) (120 s), circular movements with the hands (30 s), playing "OSU" (3 cards x 180 s ≈ 540 s), finishing off "creeps" in the Dota2 game client (180 s), search for differences in two pictures (2 cards - 90 s ≈180 s), organizational time (120 s).

Warm-up complex No. 3: jumping in place with claps above the head (2x30 min, rest 30 s), "hand gymnastics" (360 s), "fist, palm, rib" (kinesiology exercise) (60 s), "speed of thinking" cyberten.ru (180 s), overthrow or turbo mode (every man for himself) (1200 s), organizational time (120 s).

The control indicators of those involved in the "combat arena" after using various warm-up complexes are given in Table 1. The highest percentage of victories - 70% was shown by the set of exercises No. 2. The maximum level of concentration of attention was revealed after using the set of exercises No. 3 - 74.3±5.9 points.

The total duration of the warm-up complex No. 1 was 1070 seconds: 230 s - 21.5% of physical exercises, 720 s - 67.3% digital, 120 s, -11.2% organizational. The total duration of complex No. 2–1360 seconds, 340 s, 25% of physical exercises, 900 s - 66.2% digital, organizational time 120 s - 8.8%. The total duration of warm-up No. 3 -2010 s, 510 s - 25.4% physical exercises, 1380 s - 68.7% digital, organizational time - 120 s - 6%.

It was revealed that the subjects showed not the highest level of concentration of attention after performing the most effective set of exercises, which may indicate that concentration of attention is an important, but not a determining indicator of competitive performance. To identify the relationships between the studied indicators, a correlation analysis was carried out. A fragment of the correlation matrix is given in Table. 2. An average significant positive relationship was found between the delta tone of the trapezius muscles and concentration of attention, which indicates that the greater the difference between a relaxed and tense trapezius muscle, the higher the level of concentration of attention ($p<0.05$), a negative significant correlation was found between the

Table 2. *A fragment of the correlation matrix of the studied indicators*

Index	Winrate	t2	T2	ΔT2	vl	ΔVL	vp	ΔVP
T1	0,564*							
T3	-0,510*							
s1	0,627*							0,510*
S1	0,589*							
VP	0,874**							
ΔVP	0,753**							
K, points		0,538*	-0,632*	-0,936 ***	-0,912 ***	0,506*	-0,873 ***	0,625*

*Notes: from 0.900 to 1 - very high connection; from 0.7 to 0.9 - high connection; from 0.5 to 0.7 - medium connection; *** differences are significant, at the significance level $p<0.001$; ** differences are significant, at the significance level $p<0.01$; * differences are significant, at the $p<0.05$ significance level.*

tone of the relaxed trapezius muscles and the concentration of attention.

Hypertonicity of the trapezius muscle, which is responsible for the movements and statics of the shoulder, shoulder blade and neck, can negatively affect mental activity. The continuous tension of these muscles can cause fatigue and pain, which leads to a decrease in the athlete's concentration and performance. On a long-term basis, this leads to the appearance of chronic pain and posture disorders, which negatively affects the performance of eSports athletes.

A negative significant relationship was found between concentration of attention, delta tone and tone of the tense short muscle that abducts the thumb of the right hand ($p<0.05$). Positive significant relationships ($p<0.05$) between the percentage of victories and the tone of the tense dorsal interosseous muscle of the hand, tense and relaxed extensor of the fingers of the left hand, tone and delta tone of the right trapezius muscle and a negative significant relationship between the percentage of victories and the tone of the tense extensor of the fingers of the right hand were determined. hands.

High tone of the muscles of the hands, caused by muscle tension or fatigue, can lead to disorganization of movements, make it difficult to perform precise manipulations [1], and also cause unpleasant (painful) sensations in the muscles, which automatically lead to a decrease in the concentration of the athlete's attention. Relaxed hand muscles can improve the accuracy and efficiency of gaming tasks, which, in turn, helps to increase concentration, reduce stress and tension [2].

Conclusions. According to the results of the study, those involved in the discipline of computer sports - "combat arena", can be recommended to include three blocks of exercises in the warm-up: physical, cognitive, special.

The greatest efficiency, expressed in the number of victories, was shown by the warm-up complex No. 2, which has an average duration of 22 minutes 40 seconds and includes 25% of physical exercises and 66.2% of digital ones.

The revealed relationships between the tone of the relaxed trapezius muscles, delta tone and concentration of attention indicate the expediency of including in the training process those involved in the "combat arena" means aimed at reducing the tone of the muscles of the arms and trapezius muscles.

References

1. Kosmina E.A., Makarov Yu.M., Gural O.N. Vliyaniye tonusa i sily myshts kisti i predplechya kibersportsmenov 18-25 let na sorevnovatelnuyu rezultativnost [Influence of the tone and strength of the muscles of the hand and forearm of esportsmen aged 18-25 on competitive performance]. Tsennosti, traditsii i novatsii sovremennogo sporta [Values, traditions and innovations of modern sports]. Proceedings international scientific Congress. In 3 parts. Minsk, October 13-15, 2022. Vol., Part 1. Minsk: Belorusskiy gosudarstvennyy universitet fizicheskoy kultury publ., 2022. pp. 212-217.
2. Solovyova N.V. Individualizatsiya programm razminki [Iindividualization of warm-up programs]. E-Scio. 2021. No. 10 (61). pp. 1-5.